Doctoral Dissertation:

Analysis of Physician Anaesthesia Workforce Crisis in Nigeria: An Insider's Action Research

Written by: Bisola Olabisi Iretunde Onajin-Obembe

ISM THE INTERNATIONAL SCHOOL OF MANAGEMENT

PARIS • NEW YORK • SHANGHAI • NEW DELHI • SÃO PAULO • CAPE TOWN

DETAILS

Author Name: Bisola Olabisi Iretunde Onajin-Obembe

Year: 2020

Title: Analysis of Physician Anaesthesia Workforce Crisis in Nigeria: An Insider's Action Research

Document type: Doctoral dissertation

Institution: The International School of Management (ISM)

URL: https://ism.edu/ images/ismdocs/dissertations/onajinobembe-phd-dissertation-2020.pdf

Analysis of Physician Anaesthesia Workforce Crisis in Nigeria:

An Insider's Action Research

Dissertation

Submitted to the International School of Management

in Partial Fulfilment of the

Requirements for the Degree of

DOCTOR OF PHILOSOPHY

International Business Management

By

BISOLA O. I. ONAJIN-OBEMBE (MBBS, FWACS, MBA)

Paris, France

March 2020

Abstract

There is a crisis of physician anaesthesia workforce in Nigeria. The insufficient surgical workforce including a lack of physician led-anaesthesia care is a major barrier to safe essential and emergency care in Nigeria. The specialist training programmes in the country, have not been able to produce the minimum number of physician anaesthetists for Nigeria while the situation is exacerbated by persistent brain drain. The purpose of this study is to analyse the physician anaesthesia workforce crisis in the 36 States and the Federal Capital Territory (FCT) of Nigeria; to find out the specialist anaesthesia workforce density and conduct a gap analysis between the current workforce and the required workforce by the end of 2030. This study also models a physician diploma in anaesthesia training programme as a potential solution to the workforce crisis.

The theoretical framework for this study combines elements of human resource management namely human capital theory, workforce analytics, and strategic workforce planning with workbased learning and transformational change using participatory action research (PAR) carried out by an insider. The approach taken is a mixed method using quantitative numerical data of physician anaesthesia workforce from various sources, along with action research, as part of a multi-method qualitative research design. The participants were intentionally selected for focus group and expert panel discussions. Key findings of the study are a national physician anaesthesia crisis which is alarming in the Northern zones, gross gender imbalance in the anaesthesia workforce and extremely low capacity for specialist training. The physician diploma in anaesthesia is a successful model. Recommendations are based on a systems approach to provide services and training in all the geopolitical zones in Nigeria. This will require a futurist solution such as the formation of a Nigerian Institute of Global Anaesthesia and also providing the appropriate leadership.

Acknowledgements

I am thankful to God for the strength, wisdom, and ability to complete this study.

I sincerely appreciate all the vision helpers, teachers, colleagues, and friends at International School of Management that have encouraged me during my study. Thank you.

I acknowledge and appreciate Prof. Stanley Smits who triggered my interest in Change Management and inspired me to be futuristic and creative. I acknowledge and appreciate my thesis supervisor, Dr. Tobias De Coning who inspired me through his seminar on leadership of higher education institutions. Both lecturers made me embark on this journey of imagining a better future.

I could not have done this study without the management and my colleagues at the Federal Medical Centre, Abuja. I acknowledge the medical director and a visionary leader, Dr. Chinwe Igwilo; the director of hospital services Dr R Felix, the three consultant anaesthesiologists that participated in this action research namely Dr Olagbale Solanke, Dr Emmanuel Ugwu and Dr Olatunde Olawoye; and my four diplomates of anaesthesia namely Dr. Vivian Orjiah, Dr Chioma Ilokanuno, Dr Christopher Ukah and Dr Olugbenga Abolade. These are real people who have allowed me to take part and contribute to their training. I have also learnt from working with my FMC Abuja family.

Finally, I sincerely appreciate my husband Olubunmi Obembe and my sons Daniel, Samuel and David who are always supportive of me. I honour the memory of my mother, Folakemi Fasan-Onajin who was alive when I started my PhD but passed on to glory on 16th March 2018.

Table of Contents

List of Tables

List of Figures

Definition of Research Terms

Physician Anaesthesia Specialists (PAS): in this study PAS refers to licensed specialist anaesthetists (anaesthesiologists) who are the "fellows". They are highly skilled medical doctors having specialized in the field of anaesthesiology and completed extensive full-time residency training to be qualified as perioperative medical doctors. Specialist anaesthetists practise in many different environments, and not just the operating theatre. PAS are trained to lead anaesthesia teams in the operating rooms, intensive care units, pain clinics, emergency units and in parts of the hospital where sedation and anaesthesia care may be required. Many PAS work in academic departments of anaesthesia in the university teaching hospitals and therefore are involved in teaching medical students and residents doctors, as well as carry out research.

Physician Anaesthesia Providers (PAP): this is an umbrella term referring to all medical doctors practising anaesthesia; or still in training or are formally qualified to administer anaesthesia. This is the physician anaesthesia workforce pipeline. The medical doctors may have passed the primary (or screening) examination for anaesthesia and is in a residency programme or is in a formal diploma in anaesthesia training programme, or has completed the diploma, membership, or the fellowship.

In Nigeria, the National Postgraduate Medical College of Nigeria and the West African College of Surgeons are the two recognised bodies responsible for the teaching, training and licensing of specialist anaesthetists who are referred to as "fellows" and other cadres of physician anaesthetists referred to as "diplomates" and "members".

Chapter 1: Introduction

The Anaesthesia Health Workforce has been a chief concern in Nigeria since the late 1990's (Soyannwo & Elegbe, 1999, 2000). The rural areas in Nigeria, served by district hospitals, have grossly inadequate perioperative, anaesthesia and surgical healthcare capacity like many other low and middle income (LMIC) countries (Atiyeh, Gunn, & Hayek, 2010; Kalu, Eshiet, Ukpabio, Etiuma & Monjok, 2014; Henry, Frenkel, Borgstein, Mkandawire & Goddia, 2015). In the era of the millennium development goals (MDGs) from 2000 to 2015, the idea of taking actions to build, nurture and retain the neglected anaesthesia health workforce at the first level of health care provision was suggested (Cherian, Choo, Wilson, Noel, Sheikh, Dayrit & Groth, 2010).

The Anaesthesia workforce is still an unsolved issue in the present era of the sustainable development goals (SDGs) 2016 to 2030 (Davies, Vreede, Onajin-Obembe & Morriss, 2018). The raison d'être for the Diploma in Anaesthesia in tertiary level hospitals was examined, questions were raised on the outcome of middle level anaesthesia workforce training for the West African region and the programme was judged to have failed to fulfil its objectives (Bode, Olatosi, Amponsah & Desalu, 2013). On the contrary, to promote an urban-rural shift in workforce, Kalu et al. (2014) recommended shorter training programmes such as the Diploma in Anaesthesia for physicians specifically to equip them with the appropriate skills and knowledge for patient care the community.

The deficiency in the number of qualified anaesthetists is not only a local concern (Henry, Windapo, Kushner, Groen & Nwomeh, 2012; Kalu et al., 2014), but has become a national and global concern (Kempthorne, Morriss, Mellin-Olsen & Gore-Booth, 2017; Dohlman, 2017). The mortality and morbidity resulting from the anaesthesia workforce crisis can no longer be ignored (Ottaway & Kabongo, 2017; Biccard, Madiba, Kluyts, Munlemvo, Madzimbamuto….African, 2018; Dare, Onajin-Obembe & Makasa, 2018). The training of

non-physician anaesthesia providers in countries where there are no physicians and particularly, in sub-Saharan African countries, as suggested by some concerned stakeholders, was a quick-fix for the workforce crisis.

Non-physician anaesthesia providers are not licensed medical doctors but are other cadres of health workers, trained to work in operating rooms supervised by licensed surgical specialists who are fully responsible for the perioperative care of surgical patients (UNTH, 2010). Therefore, focusing on training non-physician anaesthesia providers to replace physician providers, does not provide a long-term solution. Also, it fails to consider the consequences of omitting, training and empowerment of the physician anaesthesia workforce in those areas where physician anaesthesia providers are lacking (Chu, Rosseel, Gielis & Ford, 2009; Atiyeh, Gunn & Hayek, 2010; Henry et al., 2015; Lipnick, Bulamba, Ttendo & Gelb, 2017). Whereas a workforce framework has been suggested as a global concern (Morriss, Ottaway, Milenovic, Gore-Booth, Haylock-Loor, Onajin-Obembe, Barreiro & Mellin-Olsen, 2018), and need assessment surveys at State levels in Nigeria has been performed (Kalu et al., 2014), no study has as yet been performed to analyse the physician anaesthesia workforce crisis as it affects Nigeria as a nation.

Bashford & Vercueil (2019) observed that most studies on anaesthesia were performed by researcher from high income countries (HICs) on the state of anaesthesia provision in LMICs. The authors also stated that clinical trial by LMIC collaborators were notably largely absent because they lack the human, financial and institutional capacity for research. This study is unique and unlike those identified by Bashford & Vercueil (2019) because it is neither a study performed by researchers from HICs meant to explore the problems of LMICs (Hodges, Mijumbi, Okello, McCormick, Walker & Wilson, 2007), nor is it a research describing the delivery or evaluation of interventions led by high-income partners to improve provision (Hewitt-Smith, Bulamba, Ttendo, Pappenheim, Walker &

Smith, 2018). Additionally, it is neither a study of interventions, rooted deeply in the concept of international aid, equipment donation, education, checklist implementation, and service redesign (Gatrad, Gatrad & Gatrad, 2007; Albert, Mndolo, Harrison, O'Sullivan, Wilson & Walker, 2017). This study is a deliberate and strategic action, first to analyse the national crisis in Nigeria and most importantly to implement a programme planned to intentionally increase the physician anaesthesia workforce which is one of the responsibilities of the researcher who is an influencer, trainer and anaesthesia leader in Nigeria, Africa and the world (Amponsah, 2018; Enright, 2018).

Background

The shortage of global healthcare workforce has reached epic proportions demonstrated by imbalances in the total numbers and geographical distribution of health workers. Furthermore, the skills mix of available health workers especially in sub-Saharan Africa is grossly deficient (Anyangwe & Mtonga, 2007). The workforce providing healthcare in sub-Saharan Africa is overburdened and overstressed (Oleribi, Momoh, Uzochukwu, Mbofana, Adebiyi, Barbera, Williams & Taylor-Robinson, 2019; Chen, Evans, Anand, Boufford, Brown, Chowdhury, Cueto……. Wibulpolprasert, 2004). The outbreak of Lassa fever beginning in late December 2019 in Nigeria (WHO, 2020), contributed to the existing major forces the country has to contend with. These forces included firstly, the devastation of human immunodeficiency virus / acquired immune deficiency syndrome (HIV/AIDS), which is noted for increasing workloads on health workers, exposing them to infection, and stressing their morale (Tawfik & Kinoti, 2003; Chen et al., 2004).

Secondly, the chronic migration of doctors and nurses from Nigeria and poorer to richer countries leading to a severe national brain drain (Alkire & Chen, 2004; Chen et al., 2004; Jenkins, Kydd, Mullen, Thomson,……& Wong, 2010). In sub-Saharan Africa, the

number of physicians per inhabitant is 23 per 100,000 people, which is extremely low when compared with 310 per 100,000 people in high income countries (HICs). Consequently, leading to a severe shortage of health-care workers and a decline in the population's health status (Mills, Schabas, Volmink, Walker, Ford, Katabira, ... & Montaner, 2008; Docquier & Rapoport, 2012; WHO Regional Office for Africa, 2016; World Bank, 2017).

Thirdly, the education, training and employment of professional healthcare providers, have not been matched with the health needs of the population (Adeloye, David, Olaogun,……., Ideolorunkanmi, 2017); resulting in disproportion in the workforce for healthcare (Zurn, Dal Pz, Stilwell & Adams, 2004). All these have been compounded by the long years of neglect and underinvestment in appropriate health workforce (Chen et al., 2004; Kabene, Orchard, Howard, Soriano & Leduc, 2006).

Fourthly, Awofeso (2010) suggested a group of interrelated issues specific to Nigeria, such as shrinkage, over time, of the percentage of gross domestic product (GDP) that the government spends on health and issues resulting in a vicious circle of poverty. Amongst the issues identified by Awofeso (2010) are, deteriorating conditions of health, a poorly operated public health management systems, unsanitary living conditions in rural and sub-urban areas, limited facilities and medications for effective delivery of clinical services, and underpaid rural-based clinicians. These issues are associated with the level of economic development of a country which, according to Zurn et al. (2004), have demonstrated a positive correlation with the number of available healthcare workforce. Countries with lower GDP per capita spend much less on health care than countries with higher GDP; and these countries are experiencing a crisis in health workforces (Wanderer & Nathan, 2018). The implication is a cascade of the crisis because medical doctors are a subset of the health workforce; physician anaesthesia providers (anaesthesiologists) are a subset of medical doctors, while intensivists are a subset of anaesthesiologists.

Recently, the Nigerian health workforce including the anaesthesia workforce is being threatened and is at high risk of falling ill and dying from Lassa fever outbreak (Nigeria Health Watch, 2020). Lassa fever is an acute and sometimes severe viral haemorrhagic illness endemic in West Africa. It can be transmitted to humans via contact with Lassa virus-infected rodents (multimammate rats) and exposure to their excreta, blood, or meat. Incubation takes 2 to 21 days. Most cases occur in rural communities where rat populations are high, and hygiene and sanitation conditions are poor (Asogun, Günther, Akpede, Ihekweazu, & Zumla, 2019). Therefore, surgical patients infected with Lassa fever, for example an infected pregnant woman coming for emergency caesarean section is a mortality risk and a death sentence to the attending anaesthesiologists.

In the first two months of 2020, the tracking report on Lassa fever in Nigeria, confirmed 472 laboratory cases. The report also confirmed 70 deaths with a case fatality ratio of 14.8% occurring in 26 states in Nigeria including the Federal Capital Territory (FCT). Of the cases reported, 75% occurred in three states namely Edo having 167 cases and the highest at the time of reporting, followed by Ondo with 156 cases and Ebonyi with 30 cases. The report indicated that between January and February of 2020, fifteen confirmed deaths from Lassa fever infection occurred among health care workers. This included one male anaesthesiologist who got infected while providing anaesthesia for a Lassa fever patient and a female medical officer, infected while assisting during the surgical operation. They were present in the operating room with the index patient who also died from Lassa fever (Nigeria Health Watch, 2020). The vital role of the anesthesiologist as intensive care specialist has become evident with the unprecedented healthcare crisis caused by a pandemic novel beta coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) or corona virus disease (COVID-19) (Odor, Neun, Bampoe, Clark, Heaton, Hoogenboom, Brown, Patel, & Kamming, 2020).

The crucial threshold of 228 skilled health professionals per 100,000 population was identified in 2006 by the World Health Organization's World Health Report. Below this number, countries were very unlikely to reach essential health targets and were considered to be in workforce crisis (WHO, 2006). The estimate at that time showed that 57 countries had shortages in their health workforce which translates to a combined global deficit of 2.4 million doctors, nurses and midwives. These shortfalls were more extreme in sub-Saharan Africa which includes Nigeria. Seven years down the line, in 2013, the crisis has worsened with a total of 83 countries described to be below this threshold (Campbell, Dussault, Buchan, Pozo-Martin, Arias, Leone, Siyam, & Cometto, 2013). In addition, improvements in health care can only be enabled by a health workforce that is fit for purpose (Campbell, Buchan, Cometto, David, Dussault, Fogstad, ... & Quain, 2013; Nancarrow, 2015; Pálsdóttir, Barry, Bruno, Barr, Clithero, Cobb, ... & Strasser, 2016).

The surgical workforce refers to surgeons, anaesthetists, and obstetricians (SAO) and they form a significant proportion of the skilled health professionals. Meara, Leather, Hagander, Alkire, Alonso, Ameh et al. (2015) demonstrated that having a SAO ratio of twenty per 100,000 population reduced morbidity and mortality indices and therefore this number was recommended by the Lancet Commission on Global Surgery (LCoGS) as the target SAO ratio. Bearing in mind that the surgical workforce crisis markedly affected low- and middle-income countries (LMICs), it is unfortunate that there were no national data for 23 of the 57 countries considered by the World Health Organization (WHO) to be in health workforce 'crisis' (Hoyler, Finlayson, McClain, Meara & Hagander, 2014).

Anaesthesiology (often referred to as anesthesia) is a diversified specialty requiring physicians to draw upon their knowledge of pharmacy and physiology and to utilize their technical skills to provide perioperative care, critical care, emergency care and pain management (Canadian Medical Association, 2018). Nigerian authors describe

anaesthesiology as a specialized medical field that deals with the science and practice of anaesthesia (Onajin-Obembe & Alagbe-Briggs, 2015). Emmanouil, Goldacre & Lambert (2017) referred to the description of anaesthesia by Dawn (2008) and the Royal College of Anaesthetists (2016) as one of the most 'holistic' specialties in medicine, because it has a positive impact on almost all clinical areas in hospital practice. Cooper (2017) suggested that anaesthesia is the largest hospital-based specialty, and their work interfaces with other departments such that the anaesthesia workforce supports the care of all patients in the hospital sector.

Physician anaesthetists are scarce in many developing countries and where available, they preferred to work in cities further depriving remote and rural areas of essential and emergency anaesthesia services (Cherian et al., 2010; Kalu et al., 2014). In Cross Rivers State in Nigeria, physician anaesthetists and nurse anaesthetists were located only in the urban hospitals while the rural areas were critically underserved. In addition, the survey by Kalu et al. (2014) showed that there were no practicing physician anaesthetists or surgeons employed by the Cross River State Ministry of Health.

There is also an unequal distribution of anaesthesiologists globally (Meara et al., 2015). The surgical workforce crises affect sub-Saharan Africa as confirmed by studies in some countries in West Africa, namely Sierra Leone (Kingham, Kamara, Cherian, Gosselin, Simkins, Meissner, … Kushner, 2009); Ghana (Choo, Perry, Hesse, Abantanga, Sory, Osen, Fleischer-Djoleto, Moresky, McCord, Cherian & Abdullah, 2010); Gambia (Iddriss, Shivute, Bickler, Cole-Ceesay, Jargo, Abdullah & Cherian, 2011); and Liberia (Sherman, Clement, Cherian, Ndayimirije, Noel, Dahn, … Kushner, 2011). The scenario is not different in countries in East Africa (Casey & Drum, 2019) such as Ethiopia (Reshamwalla, Gobeze, Ghosh, Grimes & Lavy, 2012); Rwanda (Petroze, Nzayisenga, Rusanganwa, Ntakiyiruta & Calland, 2012); Uganda (Linden, Sekidde, Galukande, Knowlton, Chackungal & McQueen,

2012); Tanzania (Penoyar, Cohen, Kibatala, Magoda, Saguti, Noel, … Cherian, 2012); and Malawi (Lavy, Tindall, Steinlechner, Mkandawire & Chimangeni, (2007).

According to Meara et al., (2015) sub-Saharan Africa and South eastern Asia are more affected by surgical workforce crisis compared with other regions of the world, and the anaesthesia workforce is most affected. Sixteen percent of the world population live in Africa (1.2 Billion) out of which an estimated population of 200 Million live in Nigeria, which remains the country with the largest population in sub-Saharan Africa (United Nations, January 2019). Nigeria, therefore, bears the brunt of any workforce crisis including the rare physician anaesthesia workforce. The surgical capacity survey performed in a rural part of southern Nigeria by Henry et al. (2012) showed that only one physician anaesthetist was available to serve 16 secondary hospitals.

Although, the target ratio of each specialist group that make up the SAO workforce was not specified in the study carried out by the LCoGS, Davies et al. (2018) computed the required number of specialist anaesthetists (A) and estimated that to achieve a reasonable standard of healthcare, as indicated by the global median maternal mortality rate, low and middle income countries (LMICs) should aim to have at least four physician anaesthesia providers per 100,000 of the population. However, the World Federation of Societies of Anaesthesiologists (WFSA) had earlier suggested that five specialist anaesthetists per 100,000 of the population will be required to mitigate the crisis in LMICs (Kempthorne et al., 2017).

Concerning Gambia, whose population is approximately 1.66 Million, the total number of physicians was claimed to be less than 0.05 per 100, 000 population. The number of SAO workforce for the country was 28 out of which 4 were physician anaesthetists. Therefore, health facilities in Gambia rely on paramedical staff to meet their surgical and anaesthesia needs (Iddriss et al., 2011). Concerning relativity in the SAO workforce, a survey

by Linden et al. (2012) showed there were 107 general surgeons, 97 specialty surgeons, 124 obstetricians and gynaecologists (Ob/Gyn), and only 17 anaesthesiologists in Uganda. Rwanda, having a population of 10.1 Million, had 50 surgeons (0.49 per 100,000 population) but no physician anaesthetists therefore, anaesthesia was provided by technicians, and six out of 44 hospitals that were surveyed did not have any trained anaesthesia provider (Petroze et al., 2012).

Likewise, Liberia having a population of 3.5 Million had 5 SAOs, none of which was a physician anaesthetist (Sherman, 2011). In 17 district hospitals surveyed by Choo et al. (2010) in Ghana, there were 3 surgeons, 3 obstetrician/gynaecologists but no physician anaesthetists. The evaluation of SAO capacity by Penoyar et al., (2012) in first-referral health facilities in Tanzania found there were 64 surgical specialists (i.e., physicians trained as surgeons). Out of these, 56 (88%) surgeons work and provide surgical healthcare in Tanzania's six largest hospitals. The authors also found there were only 11 anaesthesiologists that were formally trained and 16 general practitioners providing anaesthesia while 176 were non-physician anaesthesia providers. The study by LeBrun, Chackungal, Chao, Knowlton, Linden, Notrica, … McQueen (2014) confirmed that there were no physician anaesthesiologists in the majority of hospitals in Ethiopia and in the hospitals that were surveyed in Liberia, Rwanda and Uganda.

Unfortunately, as a career choice, anaesthesiology in Nigeria and sub-Saharan Africa has not enjoyed the same popularity as other surgical specialties (Ossai, Uwakwe, Anyanwagu, Ibiok, Azuogu & Ekeke, 2016). Anaesthesia was under-recognized by undergraduate students of medicine in Kenya, (Mwachaka & Mbugua, 2010). It was not appealing to medical students (Onyeka & Ewuzie, 2010; Alawad, Khan, Abdelrazig, Elzain, Khalil, Ahmed, & Adam, 2015) therefore, it was considered less prestigious when compared with surgery and other major specialties. In Nigeria, Ossai et al. (2016) found out that poor

teaching was one of the reasons provided for not choosing a career in anaesthesia. Although, Emmanouil, Goldacre and Lambert (2017) reported an improved trend in the choice of anaesthesia but this was amongst UK qualified doctors. Unfortunately, in many African countries, where physicians are insufficient, non-medical anaesthesia providers are responsible for administering anaesthesia to the surgical patients (Hodges et al., 2007; Nyamai, Ng'ang'a & Mutisya, 2013; Livingston, Zolpys, Mukwesi, Twagirumugabe, Whynot & MacLeod, 2014; Edgcombe, Baxter, Kudsk-Iversen, Thwaites & Bulamba, 2019).

A few countries, for example, Kenya and Uganda have resorted to training anaesthetic officers and nurse anaesthetists to fill in the gaps in their countries (Dubowitz, Detlefs & McQueen, 2009). Malawi and Mozambique are also implementing training programmes for officers of much lower level of training than nurse anaesthetist (Coghlan & Towey, 1979; Fenton, 1991; Mullan & Frehywot, 2007). As at 2010, Ghana had only one institution that was training physician anaesthetists (Amponsah, 2010). A survey of privately owned hospitals at Ilorin, Nigeria revealed that 6 (30%) of the twenty anaesthetic personnel providing anaesthesia for 20 (66.7%) of the thirty hospitals surveyed, were anaesthetic nurses and all the providers worked on part-time basis (Bolaji, Oyedepo, Abdulraheem & Oladipo, 2012).

The multicentre study by Onyekwulu, Nwosu and Ajuzieogwu (2014) on the anaesthesia workforce in Nigeria, was carried out in four tertiary hospitals in Nigeria, located within 3 States. Their finding of 0.113 physician anaesthesia provider per 100,000 population was based on the data collected from June 2011 to June 2012. At that time, a total of 100 physician anaesthesia providers including both the consultants and those in training were counted in the four hospitals studied. The current national physician anaesthetists' density for Nigeria needs to be calculated; and a complete geographical distribution of the physician

anaesthetists within Nigeria needs to be mapped out if plans are to be made for workforce transformation.

According to Huselid (2018), the term 'workforce analytics' referred to "the processes involved with understanding, quantifying, managing, and improving the role of talent in the execution of strategy and the creation of value". It includes metrics, that is measuring variables concerning the workforce; and also, analytics that is managing and improving the metrics that are important and critical for business success. Huselid (2018) advised that data must be used for decision making, rather than trying to measure every detail. Workforce analytics thus provide educators and trainers with answers to questions about how best to plan for their workforces. It is therefore valuable to know the data analytics that can provide answers towards making relevant impact on future-proofing anaesthesia care for the growing population. Instead of wasting time and energy on collecting all potential data points, Huselid (2018) believes that a more productive approach is to develop a deep, comprehensive understanding of a few chosen, strategically relevant, variables. Thus, workforce analytics must be designed intentionally for implementing changes.

The training of anaesthesia physicians can last between 3 to 7 years in Europe, but it is an average of 7 years in the UK (Egger Halbeis, Cvachovec, Scherpereel, Mellin-Olsen, Drobnik & Sondore, 2007). From hands-on knowledge and personal experience, fellowship training of physician anaesthetists in Nigeria runs for 5 to 6 years, as a medical postgraduate specialist training in teaching hospitals; and is referred to as residency programme. Fellowship training may last longer depending on when the resident completes all aspect of the training including completing the required dissertation and passing all aspects of the examination. Typically, these programmes are patient-focused, hands-on experience, and research-based. In more explicit terms, teaching hospitals are the higher education institutions

where medical doctors (the residents) acquire relevant specialist knowledge over a specified time, by working with more experienced supervisors and specialist consultants.

The capacity to transform the anaesthesia workforce will depend on the available accredited teaching hospitals, and the anaesthesia specialist consultants, who are altogether the providers, trainers, and researchers. The constituted boards of examiners in the postgraduate colleges are accountable for the validation of the expertise, competences and practice gained by resident doctors during their training period. The terms board-certified or college-certified are used for the medical specialists whose competency is found satisfactory after undergoing a formal examination on completion of their training programme.

The Nigerian 18 months diploma in anaesthesia (DA) programme is designed for medical doctors who do not wish to carry out research but desire to have additional qualifications to enable them practice as middle-level physician anaesthetists or anaesthesia service providers. The DA is one of the training options available in teaching hospitals in Nigeria. However, Bode et al. (2013) observed that this programme had become a stepping stone to the 5 - 6 years Fellowship in Anaesthesia programme. This trend indirectly recruits resident doctors for tertiary hospitals, making the DA programme a pathway to the Fellowship programme. This pathway was deemed unfavourable to anaesthesia service provision especially at secondary healthcare facilities (Soyannwo & Elegbe, 1999; Bode et al., 2013).

Soyannwo and Elegbe (1999) claimed that the tertiary institution-based DA programme indirectly reduced the number of clinical anaesthetists working in the secondary level hospitals in favour of tertiary level of health care. The study by Bode et al. (2013) demonstrated that only 9% of anaesthesiologists, who received their diploma, following training and certification by the West Africa College of Surgeons, remained in rural community hospitals. Generally, anaesthetists prefer large cities and urban areas with better

opportunities, rather than the inner cities and rural areas, thus contributing to the maldistribution of the surgical workforce (Hagander et al., 2015).

Statement of the Problem

Amongst the surgical workforce, the group globally and profoundly affected by the workforce crisis is the physician anaesthesia workforce particularly sub-Saharan Africa and South-East Asia (Cherian et al., 2010; LeBrun, Chackungal, Chao, Knowlton, Linden, Notrica, … McQueen, 2014; Meara et al., 2015). Currently, the number of medically qualified anaesthetists in Nigeria falls short of the needs of its growing population (Onajin-Obembe, 2019). This is because it takes 9 months to produce a baby. On the contrary, following graduation from high school at 18 years, it takes 6 years to complete medical school, one year for internship, one year for national youth corps service and 5 years for residency training. In order to produce an anaesthetist, a minimum of 31 years is required provided the doctors does nothing else but schooling.

Moreover, the anaesthesia workforce crisis was suggested to have a massive and negative impact on health, standard of living and general well-being of the population (Walker & Wilson, 2008; Meara et al., 2015); and low surgical workforce density was found by Biccard et al. (2018) to significantly contribute to the higher postoperative mortality rate seen in African surgical patients despite a lower patient-risk profile and lower occurrences of postoperative complications.

The deficiency in the number of physician anaesthetists informed the training of non-physician anaesthesia providers and other cadres of providers such as anaesthetic officers and nurse anaesthetists to fill in the gaps in some sub-Saharan Africa countries (Nyamai, Ng'ang'a & Mutisya, 2013; Livingston et al., 2014; Edgcombe, Baxter, Kudsk-Iversen, Thwaites & Bulamba, 2019), while nurse anaesthetists are the only group of non-physician

anaesthesia providers recognised Nigeria. The insufficient surgical workforce including a lack of physician led-anaesthesia care, is a major barrier to providing safe surgical care for billions of people worldwide (Soyannwo & Elegbe, 1999; Dubowitz et al., 2009; Bode et al., 2013; Onyekwulu et al., 2014; Hoyler et al., 2014; Hagander et al., 2015; Epui, Tindimwebwa, Mijumbi, Chokwe, Lugazia, Ndarugirire, Twagirumugabe & Dubowitz, 2017). Hence, the need for comprehensive data on physician anaesthetists currently working in Nigeria, as well as an in-depth analysis and understanding of the dynamics of the workforce crisis as it affects the different geographical regions and States in Nigeria.

The shortage of anaesthetists in Nigeria is further made worse by maldistribution and brain drain (Bode et al., 2013; Onyekwulu et al., 2014; Kalu et al., 2014; Anetoh & Onwudinjo, 2020). The impact is a lack of essential and emergency anaesthesia services at the secondary health care level, such as federal medical centres and community hospitals (Bangdiwala, Fonn, Okoye & Tollman, 2010). There are no deliberate strategies to enhance anaesthesia service were the impact of the crisis are most felt.

The results of my study will provide a strong evidence and raise the awareness for the need of physician anaesthetists. These will enable the establishment of a high enough sense of urgency required for a change and transformation process (Kotter, 1995; 2007; 2012, p. 26). Furthermore, the results will be relevant to the Nigerian Federal Ministry of Health for the implementation of the national surgical, obstetric, anaesthesia and nursing plan (NSOANP), which is a more robust plan than that recommended by LCoGS (Meara et al., 2015).

Additionally, the results will provide a knowledge resource and reference for more action research that can influence transformative changes in the training and management of physician anaesthesia workforce. The analysis is relevant to the anaesthesia faculties of both

the National Postgraduate Medical College of Nigeria (NPMCN), and the West African College of Surgeons (WACS).

Furthermore, following the analysis of the results, the creation of innovative training programmes in the teaching hospitals in Nigeria will be encouraged. The results should also influence new policy formulation by the Medical and Dental Council of Nigerian (MDCN). It will enable a proactive response by the agency representing medical and dental specialists in Nigeria namely the Medical and Dental Consultants Association of Nigeria (MDCAN). This study will inform the formation of practical and strategic solutions for physician anaesthesia workforce as it relates to the WHO's advice for promoting universal health coverage (UHC) globally (WHO, 2010).

Purpose of the Study

The overall purpose of this study is to analyse the dynamics of the physician anaesthesia workforce crisis in all the 36 States and the FCT of Nigeria; to present the absolute number of practising anaesthetists including the consultants and trainees. The study will determine the specialist anaesthesia workforce density and conduct a gap analysis between the current workforce and the required workforce by the end of year 2030. The level of anaesthesia services available in each State will be determined; and the number and location of accredited hospitals for training medically qualified anaesthetists in Nigeria will be mapped.

Physician anaesthesia workforce contributes to the specialist surgical workforce density. This is the second (Indicator 2) of the six indicators proposed by the LCoGS and accepted by the World Bank as World Development Indicators (WDI) (The G4 Alliance, 2018). The LCoGS recommended a surgical workforce density of at least 20 surgical, anaesthetic, and obstetric (SAO) specialists per 100,000 population by 2030 (Meara et al.,

2015); while Davies et al. (2018) computed the required number of specialist anaesthetists (A) to be at least four physician anaesthesia providers (PAPs) per 100,000 population. This study will make available an analysis of the nationwide, medically qualified anaesthesia workforce using high quality, timely and reliable data which can only be accessible to an insider researcher.

Finally, this study will report on a physician anaesthesia capacity building model using the DA programme and brain-based learning principles at the Federal Medical Center, Abuja, which is essentially a secondary level hospital in Nigeria.

Theoretical Framework

The demographics of Nigeria is constantly and rapidly changing (United Nations, 2019), hence a thoughtful, proactive plan to increase the physician anaesthesia workforce is required. The theoretical framework for this study combines human capital theory, workforce analytics and strategic workforce planning which are elements of human resource (HR) management with workbased learning to drive transformational change using an action research model. This study also highlights leadership as it applies to the 21st Century anaesthesia workforce. The theoretical basis for investing in human capital was developed by Becker in his 1964 book (Becker, 1993) and this theory is becoming increasingly important worldwide because it focuses on the impact of education and training on human capital.

Mathis, Jackson, Valentine and Meglich (2017, p. 9) broadly defined human capital as "the collective value of the capabilities, knowledge, skills, life experiences, and motivation of an organizational workforce." The authors explained that human capital involves what individuals contributes to organizational achievement; stating that human capital is sometimes called "intellectual capital to reflect the thinking, knowledge, creativity, and decision making that people in organizations contribute". Olaniyan and Okemakinde (2008) while acknowledging the works of Schultz (1971), Sakamota and Powers (1995),

Psacharopoulos and Woodhall (1997) stated that human capital theory assumes that formal education is instrumental and necessary to improve the production capacity of a population. According to Antonaras and Dekoulou (2019, p.186), human capital theory now underscores the idea that training and capacity development are 'returnable investments' which the organisation must plan and budget for as opposed to the idea that it is a cost to be avoided by the organisation. Therefore, human resource training programmes must be performed based on clear capital investment models.

Armstrong (2006) suggested that an awareness of the need for change informs the initiation of the whole process while workforce analytics provides answers to questions about how best to manage the workforce (Huselid, 2018). Thus, analysing workforce is necessary before initiating an implementation change process of any kind, whether transactional change, transitional change, or transformational. Huselid (2018) commented that researchers of HR management practices and evidence-based management movement such as Marler & Boudreau (2017), Rynes & Gulik (2007), and van der Togt & Rasmussen (2017) produced management policy and practice documents and carried out implementation programmes by using extant research, whereas, workforce analytics use existing research to create study design and instruments and also use the firm's own data to develop and test the model.

Minbaeva (2018) suggested that effective human capital analytics require three interrelated facets namely data quality, analytical competencies, and strategic ability to act. Effective systems thinking and diagnostics were noted to be essential for creating and executing effective workforce analytics programs (Levenson, 2018). According to Herold & Fedor (2008, p.52), transformational leadership was more strongly related to followers' commitment to change than practices peculiar to change, especially when the change had significant personal impact. While Kirby & Stewart (2007) opined that strategic leadership

was a key factor in an organization's ability to adapt, evolve, and prevail amidst turbulent disruptions.

Bearing in mind the ability to act in a strategic way (Minbaeva, 2018), a highly situational model based on an insider action research initiative is introduced, to understand and provide insight to the DA training programme. In this action, as the researcher, I act as a participant, taking my place as an actor and an agent of change as opposed to playing the role of detached observer often seen in positivist science (Coghlan & Brannick, 2014, p. 8).

The action research approach underpins the notion of the scholar-practitioners (Burkholder, Cox & Crawford, 2016) who integrate scholarship into their practice and produce knowledge that can be used or acted upon, that is, knowledge that is robust for scholars and actionable for practitioners (Wasserman & Kram, 2009; Coghlan, 2013; Coghlan & Brannick, 2014, p. 8). This idea, highlighted by Coghlan & Brannick (2014) was captured as reflective-practitioner (Schon, 1983), the practitioner-researcher (Jarvis, 1999), and the manager-researcher (Coghlan, 2004). Coghlan and Brannick (2014, p.8) drawing from work done by Argyris and Schon (1974) and Torbert & Associates (2004) referred to action researchers as those who engage in science of action and also produce what Mohrman, Lawler & Associates (2011) termed "useful research".

Research Questions

RQ 1: What is the ***physician anaesthesia provider*** workforce density per 100,000 population in Nigerian and in each of its 36 States/Territory?

RQ 2: What is the ***physician anaesthesia specialist*** workforce density per 100,000 population in Nigeria and in each of its 36 States/Territory?

RQ 3: Taking 4 anaesthetists per 100,000 population as the target, what is the ***gap*** between the current workforce densities and the recommended number of anaesthetists?

RQ 4: What are the main ***demographic features*** of physician anaesthesia workforce in Nigeria?

RQ 5: What are the major ***dynamic factors*** that contribute to this gap and what is the nature of the ***dynamic interaction*** between these identified factors?

RQ 6: Can a ***brain-based diploma in anaesthesia programme*** at a secondary level hospital (Federal Medical Centre) be a practical solution to the anaesthesia workforce crisis?

Nature of the Study

My position is in alignment with the epistemological assumption highlighted by Reason & Torbert (2001) that the purpose of carrying out academic research and writing a dissertation exceeds describing, understanding, and explaining the world, but most especially aims to transform it. This study is unique in that it focuses on physician anaesthesia workforce specifically, thereby making an in-depth study of and laser-like focus on one specialty within the surgical workforce. This analysis is more robust because it covers more than one State and is not limited to a region but considers the whole country.

This study is unlike the study of Kalu et al. (2014) which focused on the Cross River State alone or Bolaji et al. (2012) which was on privately owned hospitals in Ilorin, the capital of Kwara State. This analysis is also uniquely different from Onyekwulu et al. (2014) who studied anaesthesia workforce in four tertiary hospitals from only 3 States in Nigeria. This study applies workforce analytics by using multiple sources to enhance the internal and external validity of the findings and reduce the potential resistance by stakeholders and concerned persons.

The philosophy of pragmatism is adopted, by which the research question, as considered by Saunders, Lewis & Thornhill (2012, p. 143), is a vital determining factor as it concerns the research philosophy. Pragmatics are able to simultaneously combine positivist

and interpretivism positions within the scope of a single research depending on the nature of the research question (Burkholder et al., 2016). The importance of research is in the findings' practical consequences, and I agree with Saunders, Lewis, and Thornhill (2012, p. 144) that a single viewpoint cannot show the whole picture considering there may be multiple viewpoints and numerous realities.

Unique to this study is also an attempt to change the narrative and the landscape by modelling a potential solution to the physician anaesthesia workforce crisis. This is the first and only study so far that has deliberately carried out an action research and transformational change that ask a new question to discover a new strategy for training physician anaesthetists for secondary level anaesthesia care. This study explores if a brain-based diploma in anaesthesia programme, implemented at a secondary level hospital (Federal Medical Centre), can indeed be a practical solution to the anaesthesia workforce crisis. Therefore, transformational change claims to focus on ways to breakout of the existing organizational frame and think 'outside the box' of dominant ideas" (Goes, Friedman, Seifert & Buffa, 2000, p. 164).

According to Bigelow and Arndt, (2005), transformational change is futuristic, and the influence of the leader is central to its success therefore permeates discussions of transformational change. The leader creates and champions a vision; therefore, leadership is vital to transformational change. This study is being performed from an insider researcher's perspective as a complete member of the profession (Adler & Adler, 1994, p.380). As a life member of my professional association, the Nigerian Society of Anaesthetists (NSA), I have primary access, meaning that I have the privilege of getting into the organizational system to undertake research (Brannick & Coghlan, 2007). The higher the status of the researcher, the more access she/he has or the more networks she/he can access (Brannick & Coghlan, 2007).

In addition, I have secondary access to documentation, data, people, and meetings based on my professional relationship with both the chairman and secretary of the NPMCN's Faculty of Anaesthesia, and the MDCN's deputy registrar, as well as my profile as the president of the NSA for 5 years (2014 to 2018). My privileged position gives me access to a great number of anaesthetists in Nigeria. Additional access to insider information is because I am a Fellow of the West African College of Surgeons (WACS) having successfully passed the examination in October 2001. In addition, I have been involved in training specialist anaesthetists at the University of Port Harcourt Teaching Hospital since 2002 (for approximately 18 years). Furthermore, I am involved in the training of anaesthesia diplomates at the Federal Medical Center, Abuja since 2016.

Thus, the research design enables credible, reliable, and relevant data to be collected and analysed to support subsequent recommendations. Coghlan and Brannick (2014, p. 132), writes that an insider action researcher is engaged in the first-person research, using preunderstanding (Gummesson, 2000, p. 58) of organisational (e.g. anaesthesia society) knowledge and organisational (professional) studies for her own personal and professional development. Borrowing Nielsen and Repstad (1993) expression, the researcher will use preunderstanding to move from closeness to distance and back again.

For the estimation of workforce numbers, establishing a profile of the medically qualified anaesthesia workforce in Nigeria and assessing its adequacy, the following five key data sources will be used:

1. The NSA 2016 directory for the data on all physician anaesthesia providers.
2. The NPMCN for data (obtained in January 2019) on specialist anaesthetists in Nigeria who are fellows of that college.

3. The MDCN which is the agency responsible for registration of all medical doctors and specialists in Nigeria. The list of the doctors who have registered their additional qualifications in anaesthesia with the MDCN as of December 2018 will be used.
4. The WACS publishes the names of all fellows of the college on their website. The data of Nigerian specialist anaesthetists will be mined for the estimation of anaesthesia specialist workforce.
5. Personal communications by phone and emails to the registrar of the MDCN, the chair and secretary of the anaesthesia faculty of the NPMCN, and to heads of anaesthesia departments in teaching hospitals will be used to collect the most up to date data.

Triangulation between the various data sources will be used to support the credibility of the study. These data will provide the best estimates of the total workforce size and relevant information namely demographic data, work status information, and workforce location. Secondary data on the general population and distribution per State published by the Federal Bureau of Statistics and National Population Commission (NPC) of Nigeria will be used to calculate the State workforce density. The data will be analysed using Excel Spreadsheet. The physician anaesthetist provider training capacity will be assessed via analysis of available accredited hospitals. Mapping of workforce and hospitals will be done using editable maps from SlideModel.com.

Significance of the Study

This study is important because the ability to provide quality of anaesthesia service in any hospital is a reflection of the anaesthesia workforce, which in turn determines the volume and variety of surgery that can be performed in that hospital (Chern et al., 2010). It is also of note that an insufficient surgical and anaesthesia workforce was considered by several researchers to be a considerable barrier to safe, surgical care for the billions of people worldwide (Meara et al., 2015; Hagander et al., 2015; Dubowitz et al., 2010; McQueen,

2010; Hoyler et al., 2014). This study acknowledges the global convergence of four international initiatives and movements referring to the WFSA (Kempthorne et al., 2017); the Global Initiative for Emergency and Essential Surgical Care (GIEESC); the Lancet Commission on Global Surgery (Meara et al., 2015); and Global Alliance of Surgery, Obstetric, Trauma, and Anaesthesia Care (G4 Alliance). The extensive collaborative work performed by these bodies led to a marked interest in formulating strategies to provide safe surgery and anaesthesia to the global population. Moreover, these bodies all called for and acknowledged the importance of more data to be collected for analysis in order to properly identify the disparities and the unmet needs for access to safe and affordable surgical, perioperative and anaesthesia healthcare.

The WHO resolution 68/31 on "Strengthening emergency and essential surgical care and anaesthesia as a component of universal health coverage" approved during 68th World Health Assembly in 2015 (WHA 2015); and the WHA 2016 resolution 69/11 on "Health in the 2020 Agenda for Sustainable Development"; which was amended at 70th WHA (2017) as decision point 70/22, altogether provides important steps towards national capacity building and health systems strengthening, thus makes it imperative to measure surgical indicators in order to track progress. Resolution 70/22 calls upon the WHO Director-General to report the progress every 2 years. Having a country level data on anaesthesia workforce supports the decision on data collection which will enable planning and implementation on a global scale.

Finally, the findings of this action research will provide a country-level baseline dataset, knowledge and information that can be used for anaesthesia workforce planning, and for setting training targets for anaesthesia workforce in alignment with universal health coverage (UHC). Knowing the available anaesthesia specialists and their geographical location within Nigeria, promises to be a valuable human resource map. This research strives to further contribute to finding a practical solution for workforce crisis as it concerns

physician anaesthesia providers. Moreover, it aims to help in the training of a sustainable number of anaesthetists, by planning a continuous rolling programme over time. The urgency to close the workforce gap in anaesthesia before the end of 2030 calls for change leaders to take appropriate action.

Definition of Key Terms

For this study, the definition of the LCoGS and the MDCN will be adopted.

Surgical workforce density: the number of specialist surgical, anaesthetic, and obstetric physicians who are working per 100,000 population.

Anaesthesia workforce density: this is an indicator of anaesthesia workforce availability. It is defined as the number of specialist anaesthesia providers who are working per 100,000 population.

Specialist Anaesthetist: a medical practitioner who is practising anaesthesia and is on the specialist register of the Medical and Dental Council of Nigeria and who has been appropriately trained in anaesthesia.

Consultants: refers to specialists in various fields in medicine. They are appointed as Consultants in teaching hospitals or secondary level hospitals. In Nigeria, they are the medical teachers and examiners.

Consultant anaesthetist: is an anaesthesiologist (specialist in anaesthesiology) and a potential anaesthesia trainer.

Fellow in Anaesthesia: a specialist in anaesthesiology who has completed a full 5 to 6 years residency training in anaesthesia and has fully satisfied the requirements of the postgraduate specialist's programme in anaesthesiology.

Residency or Fellowship programme: this is a specialist training programme in an accredited teaching hospital. The duration of the training is approximately 5 years. The graduates of this programme are called Fellows.

Diplomats in Anaesthesia refers to postgraduate doctors who have acquired additional skills and knowledge in anaesthesia having successfully completed a formal diploma in anaesthesia programme. They are eligible to work as medically qualified anaesthetists in Nigeria and West Africa but are not eligible for appointment as Consultants in Teaching Hospitals or Lecturers in Universities.

Physician Diploma in Anaesthesia Programme: this is a twelve to eighteen months programme for doctors during which clinical anaesthesia skills and knowledge are acquired. Doctors will work as members of a team and undertake elective and emergency theatre sessions, rotate around the major specialties of anaesthesia and undertake pre- and post-operative ward rounds. They will also attend all academic seminars and make presentations as requested by their supervising Consultants.

Teaching Hospitals are tertiary level hospitals where the highest level of healthcare and specialized care of patients are provided, as well as the training of doctors, nurses and healthcare providers. These hospitals are usually affiliated with medical colleges and universities.

Federal Medical Centres: Federal Medical Centres (FMCs), were established in Nigeria by the Federal Government in the states that do not have Federal University Teaching Hospitals. As of December 2018, there are 23 FMCs in Nigeria out of which two have been upgrades to Federal Medical Teaching Hospitals.

Summary

The limited physician anaesthesia workforce is a growing concern in Nigeria as well as globally and has become a crisis that requires attention and solution. Physician anaesthesia providers form a vital part of the surgical workforce which is also a good proportion of the skilled health professionals required to reach essential health targets by a country. In order to reach the global median maternal mortality rate, countries including Nigeria should have a surgical workforce (SAO) ratio of twenty per 100,000 population and at least four physician anaesthesia (A) providers per 100,000 population. In contrast to the impact of anaesthesiology as a specialized medical field, it has not been a popular and appealing career choice for medical students and doctors; thereby worsening the workforce crisis and leading to the training of non-physicians as anaesthesia providers in many African countries.

Anaesthesia workforce analytics would enable stakeholders to understand, quantify, manage, and improve anaesthesia workforce in Nigeria in a proactive way. The anaesthesia workforce data, accessible to an insider researcher forms the pillar of this research. The theoretical framework combines human capital theory, workforce analytics, strategic workforce planning, transformational change, and leadership, as well as modelling of a brain-based diploma in anaesthesia programme to solve the anaesthesia workforce crisis. The findings of this study will be of value to Nigeria for national capacity building and by extension to the global community in order to strengthen emergency and essential surgical healthcare as an important component of universal health coverage. Finally, it responds to an identified gap in the workforce literature and the insider researcher hopes to contribute through action research.

Chapter 2: Review of Literature

This chapter draws from a comprehensive review of the available literature; and notes from pioneers of anaesthesiology in Nigeria. It also draws from publicly available government policy documents and from global organisations. In addition, it draws from grey literature (meaning information that was not easily accessible or not formally published), from websites of relevant postgraduate colleges, and from websites of universities that published information on their departments of anaesthesiology. The history of Anaesthesia and the profession of Anaesthesiology in Nigeria with important milestone people, places, dates and developments were retrieved from personal records of the national society and newsletters consisting of writings by Prof. Dorothy ffoulkes-Crabbe and Prof. Eniola Elegbe, the publicly available diary of Prof. R.A Gordon, as well as personal communications with Prof. Olaitan Soyannwo.

This chapter covers the following:

- Nigeria country profile
- History of Anaesthesia in Nigeria
- The Nigerian Healthcare System
- Legal and Regulatory Framework for Anaesthesia Specialist Training in Nigeria.
- The Physician Postgraduate Anaesthesia Programmes in Nigeria
- The Current Surgical System, the Constraints and Challenges.
- Physician Brain Drain.
- Work-based Learning and Brain-based Anaesthesiology Curriculum.
- Resolution WHA 68:15, Universal Health Coverage (UHC)
- National Surgical, Obstetrics and Anaesthesia Plan (NSOAP)
- Theoretical Framework for the Study

Nigeria Country Profile

The Federal Republic of Nigeria is an English-speaking, West African nation along the Gulf of Guinea with a population of 200,964,000 (United Nations, 2019) making it the 7th largest population in the world. The country is located on the west coast and shares boundaries with Benin, Niger, Cameroon, and Chad. Nigeria's population, growing at a rate of 2.54% is projected to reach 210 million by 2022 and 401 million by 2050, to become the world's fourth most populous country (CIA, 2019). Nigeria is approximately 923,768 sq. km, about 4 times bigger than United Kingdom (approximately 243,610 sq. km) from which it gained independence in 1960. The Nigerian terrain is described as southern lowlands merging into hills and plateaus; with mountains in the southeast and plains in the north (CIA, 2019).

Administratively, the country operates a three-tiered federal system of governance comprising Federal, the 36 States and the FCT, Abuja and 774 Local Government Areas or Councils (LGAs). For political and administrative purposes, the country is divided into 6 geopolitical zones namely South West, South-South, South East, North West, North East and North Central (Figure 1). These geo-political zones comprise states with similar culture, ethnic groups, and a common history. The states are semi-autonomous under a state government while the FCT is governed by a minister. Each state is divided into local governments, totaling 774 LGAs in the nation. The LGAs are further divided into 9,565 political wards, which are the focus of primary health care (PHC) provision that is currently being revitalised to achieve universal health coverage (UHC) (FMOH, 2018).

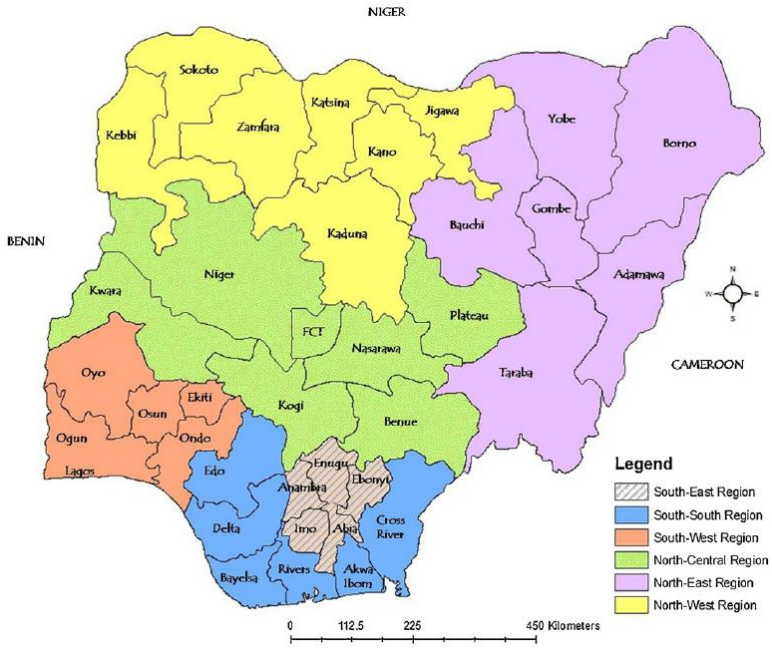


Figure 1. Federal Republic of Nigeria showing the six geopolitical zones

Source: https://images.app.goo.gl/GRyH4mYJ3zRC8Wrx9

Nigeria is one of the 15 countries of the Economic Communities of West African States (ECOWAS). It is home to approximately 47% of the West African population and about 20% of the population of the African Continent. Nigeria has a birth rate of 38.4 births/1,000 population, higher than the average (36 births/1,000) in sub-Saharan Africa (World Bank 2017 est.), and it is the 13th highest in the world (CIA 2017 est.). The urban population forms half (50.3%) of the Nigerian population and the migration rate is 4.23% annual rate of change (CIA 2018 est.). The country has a young population structure wherein about 62% of the population are children, adolescents, and young adults, thus it has one of the largest population of youths in the world (Table 1). Nigeria has a high dependency ratio of 87.3% (World Bank, 2018) worsened by a fertility rate of 5.45 (World Bank, 2017). It is a multi-ethnic and culturally diverse society. Life expectancy is 59.3 years in Nigeria, with 57.5 years for males and 61.1 years for females compared to 80.9 years in the United Kingdom and 80.1 years in North America. (CIA 2019 est.).

Table 1: Age Structure of Nigerian Population

Age Group (Years)	Percentage (%)	Male	Female
0-14 years	42.45	44,087,799	42,278,742
15-24 years	19.81	20,452,045	19,861,371
25-54 years	30.44	31,031,253	30,893,168
55-64 years	4.04	4,017,658	4,179,739
More than 65 years	3.26	3,138,206	3,494,524

(CIA, 2018 est.)

Scattered all over the country are significant population clusters with the highest density areas being in the South and South-West. The major urban areas population are Lagos 13.463 million; Kano 3.82 million; Ibadan 3.383 million; ABUJA (capital) 2.919 million; Port Harcourt 2.343 million; Benin City 1.628 million (2018) (CIA 2018 est.). The size and the complexity of the country presents a huge challenge to health policy makers. The predominant ethnocultural groups are the Yoruba in the South West, the Igbo in the South East and Hausa/Fulani in the North, there are more than 350 ethnic groups and more than 500 languages in the country (FMOH, 2018).

Nigeria has one of the largest stocks of healthcare workforce in Africa (WHO GHWA, 2008), but there is significant inequality in the geographical location of healthcare workforce and facilities (Adeyanju, Tubeuf, Ensor, 2017; Ogundele, Pavlova & Groot, 2018). The workforce for healthcare is concentrated in tertiary level health institutions in urbanized areas of the southern part of the country, particularly in Lagos (WHO, 2016; FMOH, 2019); and the combined density of nurses, midwives and doctors is 200 per 100,000 population which is below the critical threshold (228 per 100,000) required to effectively deliver essential health services to inner and less developed areas of the country (WHO, 2010). The

expenditure on health care dropped from 6% of GDP in 2012 to 3.6% in 2015, occupying the 167th position in the world (WHO, GHO 2017).

Nigeria's economy is classified as lower-middle-income by the World Bank. Its gross national income (GNI) estimated for 2018 is $1,960, which is lower than Ghana's $2130 compared with $41,330 in the United Kingdom and $62,850 in the United States of America. (World Bank, 2019). The study performed by the African Development Bank (2019) showed that Nigeria accounted for nearly one fifth (20%) of continental GDP and about three quarters (75%) of the West Africa economy although trade within the ECOWAS was only 3.7% of the total activities, while exports to the other countries in Africa was estimated at 12.7% (AfDB, 2019). Nigeria's economy is petroleum-based, having the 13th largest crude oil production in the world (CIA, 2011 est.) and is Africa's biggest oil exporter (World Bank, 2019). The country's revenue from oil account for 90% of export earnings and over three quarters of government revenue. Nigeria has a natural gas production capacity of 29 billion cubic meters (CIA, 2010 est.) making it the 29th producer globally and the largest natural gas reserves on the continent. The general population in rural Nigeria are known to practice small-scale low-input subsistence farming as the major occupation.

Reported in the biannual economic update of April 2019, Nigeria's economy has been influenced by volatile oil prices; the economic growth rate in 2018 was 1.9%, higher than 0.8% in 2017 and it may stay above 2% in 2019 for a while (World Bank, 2019). This trend is due to a more broad-based economy which includes services such as information and communications technology that contributes to the non-oil, non-agricultural growth. Nigeria's economic growth rate is below the population growth rate, government projections and pre-recession levels (World Bank, 2019)

Nigeria ranked 152 of 157 countries in the World Bank's 2018 Human Capital Index. The World Bank's 2019 report noted that the widening North-South divide in recent years

was due to the Boko Haram insurgency which hindered economic development in States located in the northern zones of Nigeria. Large pockets of Nigeria's population were observed to live in poverty, without adequate access to basic services, while the lack of job opportunities was a notable contributor to the high poverty levels, of regional inequality, and of social and political unrest in the country (World Bank, 2019). Nevertheless, Nigeria has enjoyed a stable political clime since 1999. The incumbent president, Muhammadu Buhari who won the elections for a second term will run another four-year tenure till May 2023.

History of Anaesthesia in Nigeria

According to Schram (1971), modern day healthcare got to Nigeria in the 1800's through foreign doctors who travelled with the early explorers and traders to provide for their needs. However, Good (1991) stated that Protestant and Roman Catholic missions were the ones that pioneered Western medicine and public health for the people of Africa, decades before colonial governments were able to provide health services. In Nigeria, Ajayi & Adebamowo (1999) re-echoing the lecture given by Easmon (1982) stated that the establishment of modern medicine coincided with when all European settlements were taken over by the British in 1850. This signalled the colonization of Lagos, Nigeria, leading to the extension of health care services, which was initially for the military but extended to benefit colonial civil servants (Ajayi & Adebamowo, 1999; Easmon, 1982). Starting from the pre-colonial days, what determined the access and type of medical care received by the citizens of Nigeria were their position, authority and privileges within the country (Alubo, 1987).

It took a couple of more decades for healthcare to be made accessible to indigenes through dispensaries that were opened by church missionaries at Obosi in 1880, as well as at Ibadan and Onitsha in 1886. Several historical writings claimed that the Sacred Heart Hospital was constructed in 1885 at Abeokuta by the Roman Catholic Mission (Schram,

1971; Omuta, Onokerhoraye, Okonofua, Obanovwe, Isah, Chiwuzie, Okoro, Onojeta, Omoraka, Eregare & Akpomera, 2014). The activities of the missionaries allowed health care services to reach the indigenes along with evangelism to convert people to the faith (Ajayi & Adebamowo, 1999). The first western orthodox hospital was the African Hospital established in Lagos by the military in 1893 to provide healthcare to members of the British Armed Forces during the colonial era. However, the first hospital for civilians was the St. Margaret Hospital built in Calabar in 1897 (Schram, 1971, as cited in Scott-Emuakpor, 2010).

Most of the healthcare facilities (bush hospitals) originally constructed with grass, thatch, bamboo and mud by the British military during the World War 1 (1914 to 1918) were later rebuilt with brick and timber thus became civilian hospitals after the war (Ajenifuja B, 2011; Omuta, Onokerhoraye, Okonofua et al., 2014). From 1930 to 1945, a period of 15 years, the number of hospitals in Nigeria increased from 71 to 116. In 1930, 47 hospitals were documented to be owned by the government, while 23 were owned by Christian missions. However, by 1945, the government owned 69 hospitals while the Christian mission hospitals were 46. Only one private hospital existed during the period (Omuta, Onokerhoraye, Okonofua et al., 2014).

Information on the website of the National Orthopaedic Hospital, Igbobi, Lagos claimed that the current hospital was a makeover of the 1943 World War II rehabilitation Centre for wounded soldiers. It was further developed into a hospital under the British Colonial Medical Services on 6th of December 1945 and it exist today as the National Orthopedic Hospital, Igbobi, Lagos (NOHIL, 2019). The Colonial Office in London provided the workforce and determined the kind of services that were available in Nigeria, along with Gambia, Ghana (the Gold Coast) and Sierra Leone under a central administration until this

was transferred to the regional governments between 1952 and 1954 (Scott-Emuakpor, 2010; Cornelius, Amujo & Pezet, 2019).

During the colonial period, the medical doctors in Nigeria were either civil servants or evangelist-missionary doctors (Ityavyar, 1987). Scott-Emuakpor (2010) writes that the West African Council for Medical Research was established in February 1954. At independence, on the 1st of October 1960, the African Hospital was handed over to the new Federal Government of Nigeria; and on 27th May 1967, the hospital was taken over by the newly created Lagos State Government. This hospital became the Lagos Island General Hospital rendering qualitative services to millions of patients, irrespective of race, creed, colour, social status, and religion (General Hospital Lagos, 2019).

The University College, Ibadan

As published on its website (uch-ibadan.org.ng), the University College, now known as University of Ibadan, was established on 17th November 1948 with three founding faculties: Arts, Science and Medicine. The new faculty of medicine was linked to the academic unit of the University of London to enable the Ibadan graduates obtain its medical degree which is the Bachelor of Medicine and Bachelor of Surgery (MBBS). However, the non-availability of a suitable hospital for the clinical training of medical students, led to the relocation of Ibadan medical students, after completing their basic medical studies, to London for their clinical training in partner medical schools in Britain. This arrangement continued until the completion and opening of the brand new University College Hospital on 20th November 1957. It was officially opened by the Princess Royal and in attendance were special guests including Sir Eric Pridie (KCMG, OBE, DSO) who was then the Chief Medical Adviser to the Colonial Office and Dr. T. C. Hunt DM, FRCP. Also present were Hon. Chief S. Ladoke Akintola who was the Federal Minister of Health. Amongst the dignitaries were Hon. Shettima Kashim the Federal Minister of Education, and Sir Kofo

Abayomi MD, the Vice-Chairman the Management Board of the hospital (uch-ibadan.org.ng).

The account of the history published on the University of Ibadan website stated that it cost the Central Government of Nigeria a sum of four and a half million pound sterling (£4.5) to complete the construction, furnishing and equipping of the UCH. The excerpt from the talk broadcast by Sir Sydney Phillipson CMG at Lagos on 31st July 1952 states, "for the hospital will be a consultant medical centre for the whole country and from the hospital, will go out highly qualified doctors for the service throughout Nigeria" (uch-ibadan.org.ng).

Thus, the University College Hospital (UCH) Ibadan was establishment in 1957, proudly the first of University Teaching Hospitals in Nigeria (Coker & Sridhar, 2010) whereas, the second hospital, the Lagos University Teaching Hospital (LUTH) was established in 1962. In both teaching hospitals, medical care including anaesthesia service were provided by expatriates (Elegbe, 2010). The expatriates were assisted by the medical officers, nurses and dispensers whom they had trained to help them administer ether anaesthesia, an historical anaesthetic agent first demonstrated on 16th October 1846 at the Massachusetts General Hospital, Boston, USA (Robinson & Toledo, 2012).

Early Anaesthetic Equipment. The anaesthetic equipment used at the UCH at that time was the state-of-the-arts Epstein Mackintosh and Oxford (E.M.O) inhaler (Figure 2). It was manufactured in 1953 by Pentland Scientific Instrument Co. (Wood Library Museum). The EMO inhaler was designed by applying the basic laws of physics to vaporization of a liquid (Morgan, 1995). It combined high quality engineering to produce a robust, calibrated, accurate and portable anaesthetic vaporizer that can be used in almost any geographical location (Stetson, 1968; Morgan, 1995). It can deliver any concentration of anaesthetic irrespective of variations in temperature throughout the range likely to be encountered in clinical practice making it a durable apparatus. (Morgan, 1995; Elegbe, 2010).

Figure 2: The Epstein-Macintosh-Oxford Inhaler

Source: https://www.woodlibrarymuseum.org/museum/item/1050/epstein-macintosh-oxford-inhaler

Anaesthesia Service Providers: Anaesthesia services were provided at the UCH by Dr. Phillis Mary Edwards from the UK who was head of anaesthesia, and the following doctors: DR Rigg, Denis J Waters from Cardiff, Rustum Y Gool, Ronald S Lambie, John Farman from Cambridge, and LM Beckham from Canada. The senior registrars were expatriates from the UK and the registrars were mostly Indians (UCH, 2019; Elegbe, 2010).

Also stated by Professor Eniola Elegbe while delivering her paper at the West African College of Surgeons Conference at Calabar in 2010, was that the training of Nigerian doctors for additional qualifications in anaesthesia, namely the diploma and fellowship, were undertaken in the UK and Canada in the early 1950s. The first set of Nigerian physicians to acquire the Diploma of Anaesthesia (DA) from the UK in the late 1950s were Dr. Francis Obiakpani who worked at the General Hospital, Lagos, and Dr. (Mrs.) Wuraola Ogunyemi at the Orthopedic Hospital, Lagos. The first Nigerian doctor to complete the Fellowship in Anaesthesia in the UK was Dr. Philip Nwachukwu. He obtained the Fellowship of the Royal College of Surgeons, England and joined the UCH in 1963 on his return to Nigeria.

Furthermore, Elegbe (2010) listed other pioneer Fellows in Anaesthesia to include Dr. Wensley Vidal Mobolaji Fowler who returned to Adeoyo General Hospital, Ibadan and later transferred to LUTH; Dr. Samuel Adekunle Oduntan initially worked at the General Hospital, Ijebu Ode and later became a staff of University of Ibadan; Dr. Joseph Adepegba O. Sodipo joined LUTH while Dr. Joseph Adegboyega O. Magbagbeola came back from the UK to join the UCH in 1966. Dr. Jane Anwan, the only female doctor at that time, started her training at UCH in 1961, proceeded to the UK in 1963 to complete her fellowship and thereafter returned to work as an anaesthetist at UCH in 1966 (Elegbe, 2010). Anaesthesia at UCH was initially a part of the Department of Surgery until it became an independent academic department in 1966, and Prof S.A. Oduntan was the first anaesthesiologist to head the department. During the inauguration of the West Africa Confederation of Societies of Anaesthesiologists at Warri in 2002, Prof. Dorothy ffoulkes-Crabbe in her lecture, informed the conference participants that in 1967, there were only a total of 11 fully qualified anaesthesia specialists (Fellows) in Nigeria (ffoulkes-Crabbe, 2002).

The next generation of Nigerians who were pioneer anaesthesia providers at the UCH, according to Prof Eniola Elegbe included Drs. Christopher Ekundayo Famewo and Olufunso Akinyemi who completed their anaesthesia fellowship in Canada and UK respectively before returning to UCH. Similarly, Dr. Odugbesan obtained his fellowship from Canada. The group of anaesthetists that left UCH in the 1970's to complete their residency in the UK included Dr. Olufemi Babatunde Ogunnaike, Dr. Nathaniel Ademuyiwa Thomas, Dr. Ayorinde Dosunmu, Dr. Udezuo Beatrice Umeh, Dr. Eniola Olanrewaju Elegbe (the informant herself) and Dr. Benjamin E. Nkonogho Mengot. Dr. Olaitan Soyannwo was the first home trained Fellow in Anaesthesia, while Dr. Olaniyi Oladapo was the first Anaesthesia Fellow that passed the examination of the West African College of Surgeons (1983).

Academic Departments of Anaesthesia

Department of Anaesthesia, Lagos University Teaching Hospital (LUTH)

Professor Dorothy ffoulkes-Crabbe, at the inauguration of West African Confederation of the Societies of Anaesthesiologists (WACSA) in Warri, Nigeria on 21st November 2002 gave an account of the establishment of department of anaesthesia in LUTH. She recounted that Dr. Shirley Fleming from the anaesthesia department of the University of Toronto, Canada started the department of anaesthesia at LUTH in 1962 from where she began formal postgraduate training of physician anaesthetists. This was the first independent academic department of anaesthesia in Nigeria and in West Africa (ffoulkes-Crabbe, 2002). Fleming's appointment was recommended and facilitated by Professor Roderick A. Gordon from the anaesthesia department in Toronto. She was sponsored by the Canadian International Development Aid. She was assisted by Dr. Aileen K. Adams, who later became Dean (1985 – 1988) of the Royal College of Anaesthetists (RCoA), the professional agency with the responsibility of maintaining the standards of anaesthesia in the United Kingdom.

Professor ffoulkes-Crabbe gave credit to Professor Gordon as instrumental to the development of the specialty of Anaesthesia in Nigeria. He also trained Nigerian doctors in his department at Canada over three decades. Dr. Dorothy Jane O. ffoulkes-Crabbe joined LUTH in 1968 after her Fellowship in the UK and worked with Prof. Shirley Flemming, Drs. Shodipo, Fowler and Shomolu (Desalu, 2009). The Vice Chancellor of University of Lagos, Professor Rahamon A. Bello while giving his opening address at the inaugural lecture of Professor Olusola Temitayo Kushimo on March 4, 2015 acknowledged her as the first Fellow by examination of the Faculty of Anaesthesia of the Postgraduate College of Nigeria (FMCA, 1984) and that she was trained partly in LUTH and UK. Professor Kushimo, therefore also holds the Fellowship of the Royal College of Anaesthetists, England (FRCA, 1982).

Other Academic Departments of Anaesthesia

The department of anaesthesia of the Ahmadu Bello University, Zaria according to Elegbe (2010) was pioneered by Dr. Bodmas and Dr. Latima who later returned to Papworth Hospital Cambridge. Dr Vimal from India continued to provide anaesthesia services at the hospital long after the Europeans left Nigeria. At the end of the Nigerian civil war in 1967, Dr. Nwachukwu and Dr. Thaddeus Ikechucku Eze-Ashi started the department of anaesthesia at the University of Nigeria, Enugu. The pair began the Post Basic Nursing Anaesthetist Programme at the University of Nigeria Teaching Hospital (UNTH), Enugu in 1971.

The department of anaesthesia of the University of Calabar, accredited in 1986, was pioneered by Dr. Ene Effiong with the assistance of Dr Sylvia Akpan; both were Fellows of UK Colleges. Prof. Mathias Obiaya assisted by Dr. Samuel Ukponwan, both Fellows of Colleges in the UK, began the anaesthesia department at the University of Benin Teaching Hospital while Dr (Mrs.) Oji later started the university diploma course in anaesthesia at Benin. Dr. Ponus pioneered the department of anaesthesia at the University of Jos Teaching Hospital (Elegbe, 2010).

Professor Roderick Angus Gordon (1911 – 1998) and Anaesthesia in Nigeria

Professor Roderick A. Gordon, writing on the University Project, Lagos stated that in February 1962, a delegation from Nigeria consisting of the Minister of Health, the Registrar of the University and the Dean Designate (Professor H.O. Thomas) of a Medical School that was to be established at the University of Lagos, visited the University of Toronto. The top priority on their mission was to seek assistance in staffing the new Medical School and to headhunt for a Professor of Anaesthesia. Their meeting with the staff of the department of Anaesthesia resulted in Dr. Shirley Fleming accepting the offer to organize the first,

autonomous, anaesthesia department in the new University of Lagos Medical School (Gordon's Personal files; Gordon, 1967).

Expatriate Anaesthesiologists in Nigeria

Dr. Shirley Fleming arrived Lagos in July 1962 as the first Professor appointed to the Faculty. Early in 1963, she was joined by Dr. Earl Russell from Queen's University and later by Dr. Aileen Adamson of Cambridge, and Dr. Oswald Dawkins from Jamaica and the University of Michigan. During Dr. Fleming's summer vacation at Toronto in 1963, she shared her dissatisfaction with the Nigerian arrangement and the inability to continue paying her salary at the North American rate because of economic and political reasons. Considering the financing and administrative threat to her department, Dr. Fleming was uncertain about continuing the project. Fortunately, Dr. John Hamilton who was the Dean of Medicine at the University of Toronto, succeeded in getting the Education Director of the External Aid Branch at the Department of External Affairs to finance travels and salaries. Therefore, Dr. Fleming and her team of two Canadian staff members, namely Dr. Russell and Dr. Robert Hooper, a senior resident from the University of Toronto returned to Lagos in the autumn of 1963 with the support of the Canadian government (Gordon, 1967).

Dr. Fleming remained as Professor until 1968, when she handed over to Dr. V. Fowler. During her tenure, Dr. Fleming was assisted by a succession of Canadian anaesthetists with financial support from the External Aid division of the Department of External Affairs. In addition to Dr. Russell and Dr. Hooper these individuals were: Oswald Dawkins and Eric Webb from the University of British Columbia; Joseph McCammon from the University of Manitoba; Wells Renwick, Warren Squire, John Jacobs, R.L. Matthews, and David Cole from the University of Toronto; Richard McCutcheon from the Queen's University; and Matthew Bazoian, from University of Hamilton. The Canadian government support for the project was withdrawn in 1969.

Gordon's Network

In January 1964, Prof Gordon visited Lagos to familiarize himself with the project and to assist Dr. Fleming in resolving whatever local problems that she may be having. Prof Gordon spent two weeks visiting LUTH where he also attended the meeting of the West African Association of Surgeons, as an invited guest speaker. This trip began his relationship with the senior anaesthetists in Nigeria and Ghana and with a few Nigerian trainees who later came to Toronto for part of their training. These mentees eventually took over the management of the Lagos department. Prof. Gordon was also elected as Honorary Fellow of the West African Association of Surgeons. Professor Gordon, at that time was the chairman of the Membership Committee of the WFSA. He persuaded the Federation at the 1964 World Congress in Sâo Paulo to authorize membership for Regional Societies in situations where the number of anaesthetists was too few to support a national society.

During Prof Gordon's visit in 1964, he was asked by the Dean of the Medical School at University of Ibadan to arrange for Canadian assistance for the Department of Anaesthesia at that institution. Canadian External Aid agreed to finance an anaesthetist for that department and Dr. Ronald Lambie from the University of Manitoba was appointed. He was succeeded by Dr. Maurice Beckham of Kitchener. From 1968 this department of anaesthesia at the UCH has been headed by qualified Nigerians (Gordon's personal file).

In 1965, as documented in Gordon's diary, was the request by the Regional Surgeon of the (then) Mid-West Region of Nigeria, to arrange a teaching program for general practice physicians at the Benin General Hospital. External Aid provided additional funding for this project and from the autumn of 1965 to 1967, the Canadian staff at Lagos provided anaesthetic service and teaching in Benin City on a one-month rotation basis. In 1969, this department was taken over by Dr. Matthias Obiaya, who was the first practitioner trained in this program and who qualified FFARCS (Eng.) after gaining additional training at Lagos,

Toronto and Cambridge. Dr. Obiaya became the first head of the Department of Anaesthesia when a Medical School was established in the University of Benin following the Nigerian civil war (Gordon's personal file).

Anaesthesia Training Concepts

A concern of the WFSA in the early 60's was to promote training in anaesthesia at the international level, in line with its objective of "providing better anaesthesia for all the peoples of the world". According to Gordon (1967), at the Sao Paulo meeting of the World Federation of Societies of Anaesthesiologists in 1964, an "Educational Foundation" chaired by Dr Robert Hingson of Cleveland, was formed to help plan training centres in those parts of the world where trained anaesthetists were rare, and modern anaesthesia is practically non-existent. This committee had two continental trustees from each continent or region, and with the President and Secretary of the Federation acting ex-officio members. There were two concepts on the optimum method of achieving training in anaesthesiology.

The first concept (Hingson's concept): This was to establish "Continental Training Centres" with considerable budgets and equipment, to which trainees would be sent by their governments for various periods of training. These would be staffed by a basic indigenous staff, reinforced by "visiting professors" from abroad, who would volunteer their services for short periods of time. Transportation and expenses were to be paid by the WFSA Foundation and the government of the host country. The first centre, a Spanish-speaking centre was established in Caracas, Venezuela, in 1966 for the continent of South America and the second centre, an English-speaking was established in Manila in December1970 (Zorab, 1976).

The second concept (Gordon's Concept): This was to create and manage strong teaching departments of anaesthesia in medical colleges of the developing countries, which must eventually be staffed by appropriately trained indigenous physicians. The aim,

according to Gordon (1967), was to extend the availability of modern anaesthesia to the under-doctored areas of the world by teaching every physician something about anaesthesia so that he may be able to provide perioperative and anaesthesia care for low risk surgical patients in the environment in which he works. The basic training will depend on the environment and the available drugs and equipment. While the medical schools in Africa, Asia and South America have such departments, Gordon (1967) strongly believed that what will be required to fulfil the teaching function is to strengthen those department by well-trained anaesthetists. Gordon (1967) argued that designation of any one department of anaesthesia as a "Continental Training Centre" would delay, or entirely destroy, the development of adequate teaching departments in all the other medical schools of a region. He opined that partial training in anaesthesia would be granted to a small number of physicians at the cost of depriving the whole region of the facilities required to give useful training to every medical student and intern (Gordon, 1967).

The programmes of development undertaken by the Canadians and British in Nigeria, Uganda, and Kenya were recognized, and it was further recognized that, as far as the WFSA was concerned, “the development of anaesthesia in Nigeria was a Canadian responsibility” (Gordon, 1967). The WFSA focussed on the overseas training of selected East Africans who will then return as staff to work at the Kenyatta National Hospital, Nairobi. Similarly, financial assistance was made available for young European teachers of anaesthesia to spend one year in Nairobi. The WFSA President at that time was Professor Mayrhofer, and he recommended the sum of US$ 4,000 per year starting in 1976 in support of this bilateral training arrangement with Kenya. According to Zorab (1976), this arrangement was a priority because there was no other anaesthesia training centre in East Africa between Egypt and South Africa and it was impractical to send trainees from East African countries such as Kenya, Tanzania and Zambia to a training centre in West Africa.

The Nigerian Anaesthesia Workforce project championed by Gordon and Flemming from 1962 was acknowledged as successful beyond all expectations, and its influence spread to other parts of West Africa. The Professorial Chairs at Lagos, Ibadan, Benin and Harare (University of Zimbabwe) were later occupied by native Africans, all of whom entered the specialty through this project and who spent some time at University of Toronto following their training in Africa. Each of these departments later had an active post-graduate training programme and a West African specialty qualification.

In 1970, the West African College of Surgeons was incorporated to include Faculty of Anaesthesiology, and Prof Gordon was honored by election as Fellow in Anaesthesia of the West African College of Surgeons (FWACS). In 1991–92, Professor Dorothy Ffoulkes-Crabbe of Lagos University, one of the pioneer trainees, became President of the West African College of Surgeon.

The Nigerian Society of Anaesthetists (NSA)

The NSA originated from the Society of Anaesthetists of West Africa.

Society of Anaesthetists of West Africa (SAWA): This regional society was inaugurated on 8 January 1965, at Korle Bu Hospital, Accra, Ghana, during the fifth annual general meeting of the Association of Surgeons of West Africa. Professor Gordon and Professor W. W. Mushin of University of Wales were present. The society was registered in Lagos, Nigeria, on Saturday 29 July 1966 and was admitted as a member of the WFSA on 11 August 1966 (Overseas News, 1967). Professor Shirley Fleming became the first President of SAWA, while Professor Gordon was elected Honorary President. Gordon was a regular visitor to the Department in Lagos for two weeks each year in January or February until 1969. This Society, SAWA became a member of the WFSA (Gordon's Personal files).

The Nigerian branch of SAWA: This branch, composed mainly of Lagos and Ibadan members held its first meeting on 22 April 1967, at the University College Hospital, Ibadan, Western State. The second meeting took place on 24 June 1967, at the College of Medicine in Lagos. There was a good attendance at both meetings. Case reports were presented followed by discussions and demonstrations of equipment. The annual general meeting was said to have taken place on 12 January 1967, at the University of Sierra Leone, Freetown. Professor Gordon and Professor Otto Mayrhoffer of Vienna, the guest-speaker during the annual general meeting at University College Hospital, Ibadan in 1966, were elected Honorary Fellows of the SAWA. The members of the Executive Committee for 1967 were: Professor Shirley Fleming, Lagos, President; Dr Amao Oduro, Accra, 1st Vice President; Dr L. Beckham, Ibadan, 2nd Vice President; Dr Joseph Sodipo Jr, Lagos, Secretary/ Treasurer; Dr Samuel Odutan, Ibadan; Dr Tagoe, Freetown; and Dr Boetang, Accra (Overseas News, 1967).

Nigerian Society of Anaesthetists as an Independent Entity: The NSA was formally launched at the Old Great Hall of College of Medicine, University of Lagos in 1979 (NSA Files and Website). The board members of the NSA are listed in Appendix A. Prior to this, the NSA members functioned actively as members of the Society of Anaesthetists of West Africa (SAWA), which had been in existence since 1965. The President at re-inauguration was Dr. Christopher Famewo, while Dr. Olaniyi Oladapo was the secretary. Membership was open to all Physician Anaesthetists in the six geo-political regions of Nigeria. It was also extended to Nigerian Physician Anaesthetists in Diaspora. The NSA was registered with the Corporate Affairs Commission on the 12th of July 2000 and this was updated on the 11th of October 2018 by the researcher who was at that time the President.

The aims and objectives of the society as specified in the NSA constitution are:

> "to promote the interest and advancement of the specialty of Anaesthesia in all facets in Nigeria; to provide the much-needed communication and interaction among physicians practicing Anaesthesia in Nigeria; to guide and assist the government of the Federal Republic of Nigeria in the provision of an efficient and effective anaesthetic service to the people of Nigeria; and to cater for the welfare of all physician anaesthetists in Nigeria and maintain a good standard of practice and ethics in the specialty."

To maintain standards, the NSA assists in organizing update lectures, seminars and workshops for non-physician anaesthetists who are mostly anaesthetic Nurses in the various zones of the country. The annual general meeting of the society has taken place regularly in the last week of November since 1996.

The Nigerian Healthcare System

The health care in Nigeria is pluralistic with provision of healthcare by the public and the private sectors, as well as by modern and traditional systems. It is believed that public institutions provide up to 70% of the healthcare services in Nigeria. The public healthcare system in Nigeria is a three-tier system consisting of the primary, secondary, and tertiary healthcare services. The primary healthcare service is at the grass root or community level. It is the responsibility of the Local Government Area (LGA) to provide Community health centers.

The secondary healthcare service is provided by the General Hospitals at the State level and is the responsibility of their respective State Governments while the tertiary healthcare service is directly under the Federal Government. These systems sometimes run parallel health systems instead of a synergism and referral system. It is not unusual to have

Specialist Hospitals being developed by both the State Ministry of Health and Federal Ministry of Health (FMOH).

The FMOH has under its supervision 20 Federal Teaching Hospitals (Table 2). These are tertiary institutions affiliated with universities; each unique in the history, origin and the philosophy guiding its formation.

Table 2: List of Federal Teaching Hospitals in Nigeria

S/N	Name of Hospital	Location	State
1	University of Benin Teaching Hospital	Benin City	Edo
2	University of Calabar Teaching Hospital	Calabar	Cross River
3	University of Abuja Teaching Hospital	Gwagwalada	FCT
4	University College Hospital	Ibadan	Oyo
5	Obafemi Awolowo University Teaching Hospital	Ile-Ife	Osun
6	University of Ilorin Teaching Hospital	Ilorin	Kwara
7	Irrua Specialist Teaching Hospital	Irrua	Edo
8	University of Nigeria Teaching Hospital	Ituku-Ozalla	Enugu
9	Jos University Teaching Hospital	Jos	Plateau
10	Aminu Kano University Teaching Hospital	Kano	Kano
11	Lagos University Teaching Hospital	Lagos	Lagos
12	University of Maiduguri Teaching Hospital	Maiduguri	Borno
13	Nnamdi Azikwe Teaching Hospital	Nnewi	Anambra
14	University of Port Harcourt Teaching Hospital	Port Harcourt	Rivers
15	Usman Dan Fodio University Teaching Hospital	Sokoto	Sokoto
16	University of Uyo Teaching Hospital	Uyo	Akwa Ibom
17	Ahmadu Bello University Teaching Hospital	Zaria	Kaduna
18	Federal Teaching Hospital	Abakaliki	Ebonyi
19	Abubakar Tafawa Balewa University Teaching Hospital	Bauchi	Bauchi
20	National Hospital	Abuja	FCT

http://health.gov.ng/

Of note is the University of Abuja that went through a metamorphosis from being a specialist hospital of the Federal Capital Development Authority in 1992, to be a Federal Medical Centre of the Federal Ministry of Health in 1993, and finally upgraded in 2006 to the University of Abuja Teaching Hospital. Other teaching hospitals, for example, the Obafemi Awolowo University Teaching Hospital were founded based on unique philosophies (OAUTH). Under the supervision of the FMOH are twenty-two Federal Medical Centres (Table 3), and thirteen specialty hospitals (Tables 4, Table 5, and Table 6).

Table 3: Location of all Federal Medical Centres in Nigeria

S/N	Name of Hospital	Location	State
1	Federal Medical Centre	Abeokuta	Ogun
2	Federal Medical Centre	Asaba	Delta
3	Federal Medical Centre	Azare	Bauchi
4	Federal Medical Centre	Bida	Niger
5	Federal Medical Centre	Birnin Kebbi	Kebbi
6	Federal Medical Centre	Birnin Kudu	Jigawa
7	Federal Medical Centre	Ebutte-Metta	Lagos
8	Federal Medical Centre	Gombe	Gombe
9	Federal Medical Centre	Gusau	Zamfara
10	Federal Medical Centre	Ido-Ekiti	Ekiti
11	Federal Medical Centre	Jalingo	Taraba
12	Federal Medical Centre	Katsina	Katsina
13	Federal Medical Centre	Keffi	Nassarawa
14	Federal Medical Centre	Lokoja	Kogi
15	Federal Medical Centre	Makurdi	Benue
16	Federal Medical Centre	Nguru	Yobe
17	Federal Medical Centre	Owerri	Imo
18	Federal Medical Centre	Owo	Ondo
19	Federal Medical Centre	Umuahia	Abia
20	Federal Medical Centre	Yenogoa	Bayelsa
21	Federal Medical Centre	Yola	Adamawa
22	Federal Staff Hospital	Jabi	FCT

http://health.gov.ng/

Table 4: Specialty Hospitals in Nigeria

S/N	Name of Hospital	Location	State
1	Federal Neuro-Psychiatric Hospital	Maiduguri	Borno
2	Federal Neuro-Psychiatric Hospital	Calabar	Cross-River
3	Federal Neuro-Psychiatric Hospital	Uselu, Benin-City	Edo
4	Federal Neuro-Psychiatric Hospital	Enugu	Enugu
5	Federal Neuro-Psychiatric Hospital	Kaduna	Kaduna
6	Federal Neuro-Psychiatric Hospital	Yaba	Lagos
7	Neuro-Psychiatric Hospital	Aro, Abeokuta	Ogun
8	Federal Neuro-Psychiatric Hospital	Kware	Sokoto

Table 5: National Orthopaedic Hospitals

S/N	Name of Hospital	Location	State
1	National Orthopaedic Hospital	Enugu	Enugu
2	National Orthopaedic Hospital	Igbobi	Lagos
3	National Orthopaedic Hospital	Dala	Kano

Table 6: National Eye and Ear Centres

S/N	Name of Hospital	Location	State
1	National Eye Centre	Kaduna	Kaduna
2	National Ear Care Centre	Kaduna	Kaduna

http://health.gov.ng/

In addition, the Federal Ministry of Health also oversee the healthcare system in Nigeria through its agencies which include 14 Professional Regulatory Bodies and 19 Training Institutions spread across the Country. The Ministry also has seven Parastatals/Agencies under its purview. These seven are National Agency for Food and Drugs Administration and Control (NAFDAC), National Health Insurance Scheme (NHIS), National Primary Health Care Development Agency (NPHCDA), National Institute for Pharmaceutical Research and Development (NIPRD), Nigeria Institute for Medical Research (NIMR), Nigeria Centre for Disease Control (NCDC), and the National Arbovirus Research Institute (NARI).

For governance management, the FMOH provides and develops policies, strategies, guidelines, as well as plans and programmes to direct the national health care delivery system. The national health insurance scheme (NHIS) which was introduced in Nigeria following decree 35 of 1999, (New act 35 of 1999) was signed in May 1999. The scheme came into full operation in Nigeria in 2005 (Chukwunwike, 2005) and has not achieved much in terms of alternative and sustainable funding mostly because of non-involvement of the beneficiaries in planning, decision making and implementation (Metiboba, 2011). The National Primary Health Care Development Agency (NPHCDA) provides a source of technical knowledge and expertise on the provision of PHC and monitors PHC delivery on behalf of the Federal Ministry of Health.

The Private Health Care System is supported by private healthcare providers who are mostly individuals (solo enterprise) that set up clinics and hospitals for profit. There are very few group practices while investor owned practices are very rare. There are various social classes of private clinics and hospitals to meet the needs of the population. The private hospitals vary from well-equipped small clinics to sparingly equipped clinics depending on the level of investment, the specialty and area of interest, taste, and preference. There are also private hospitals with facilities for carrying out major surgeries, medical, paediatric, obstetric consultations as well as in-patient management. These hospitals are few and tend to employ young medical practitioners and invite specialist consultants from the teaching hospitals when required. The State Ministry of Health (SMOH), for example through its agency, such as Health Facility Monitoring and Accreditation Agency (HEFAMAA) in Lagos State should ideally provide licensure of private clinics who on their part should furnish all the required information such as case-loads, personnel, equipment etc. The compliance with this regulation is mixed.

There is a clear relationship between different parts of the health system. The federal ministry of health (FMOH) along with state governments makes the plan and put into place regulations on health matters. The NHIS is a parasternal under the FMOH, with an executive secretary that reports to the minister of health. Other healthcare providers in the country include faith-based, traditional healers, non-governments organizations (NGOs). Each level of governments makes its budgetary provision to health. The country also gets support from donor agencies and international organizations. The private out-of –pocket expenditure in Nigeria accounts for over 70% of the estimated $10 per capital expenditure on health (FMOH 2004).

The various parties in the scheme are the regulators which are the government (FMOH), the NHIS, the health maintenance organizations (HMOs), the providers (various hospitals), payers (employer of labor and employee) and users (as employees). The contributions from the employers and employees go into a common fund, as a social insurance. The fund is distributed to the various HMOs who pay the providers. Clients are registered with these HMOs via their employers who have endorsed specific HMOs for its organizations. Every employer can register with the HMO endorsed by its organization and each employer may register one spouse and 4 children under the age of 18 years.

The scheme employs the pre-payment system, in which all users regularly pay a fixed amount (premium) and in return receive a defined package of health benefits. Conditions that fall under primary care are covered by a capitation fee. These fees are fixed for conditions classified and paid up-front to the providers through the HMOs. The payment to the provider through the HMO is based on the number of clients registered by the various providers with the HMOs.

For secondary and tertiary level care (specialized) conditions, the fee-for- service (FFS) payment method is employed. The various diseases are categorized by the NHIS and

HMOs and a flat agreed rate is assigned. This is like the diagnosis related group (DRGs) practiced in some Western countries for reimbursement (Steinwald and Dummit, 2011). Averagely, every user of the NHIS is allowed hospital admissions for a maximum of 14 days in a calendar year, within a standard ward that excludes amenity services.
This system is in operation for employers in the federal sectors, armed forces and other uniform agencies and a few state governments.

Access to the countries NHIS presently covers less than 5% of the Nigerian population. Every user of the scheme is expected to report first to its HMO where he/she is signed up and then referred to its organization's healthcare provider for primary care. Where the care required is specialized, such client is further referred to the next level, which can be within the same healthcare setting or another. The HMOs are informed of the levels of care provider at the commencement of care and on discharge because this knowledge of patient movement from one treatment care level to another is important for adequate documentation and bills settlement by the HMOs. The providers are expected to notify the HMOs because secondary and tertiary levels cares can only be paid as fee-for -service (FFS), (FMOH, 2004). Because of the poor quality of healthcare services provided and system inefficiencies experienced in the Nigerian healthcare service, most clients prefer to pay premium fee for excellent services signaling a need for prestige healthcare services in Nigeria.

Legal and Regulatory Framework for Anaesthesia Specialists Training in Nigeria.

The healthcare sector in any country is highly protected by the medical council of that country. There are peculiar regulations regarding registration of healthcare service organizations, registration of professional members of the healthcare team and registration and usage of drugs. The medical schools and universities all have to be accredited by the respective regulatory bodies; while training programmes for medical specialist, nurses and

support services must reach the minimum required national standard for approval to be issued.

There are regular accreditation reviews of various stakeholders of the healthcare services and the license to practice may be revoked if found to be below the recommended standards. Therefore, knowing the requirements and legal implications in relation to any form of healthcare service is important. This section takes a look at the various legal, regulatory bodies as it applies to medical and surgical training and practice and in particular anaesthesia specialty in Nigeria. This includes the West African College of Surgeons, the Medical and Dental Council of Nigeria, and the National Postgraduate Medical College of Nigeria as well as, the physician postgraduate training and teaching hospitals.

The West African College of Surgeons (WACS)

Historically and as documented on their website, the organization that will become the WACS was conceived towards the end of 1959. This occurred during a chance meeting on a flight to Accra between Victor Anoma Ngu, a young Cameroonian Surgeon and Charles Bowesman, a British Surgeon in the services of the Ghana Government at Kumasi. The duo discussed the need for Surgeons practicing in West Africa to meet occasionally and exchange experiences. A seed was planted in the mind of Victor Ngu and this later translated to the Association of Surgeons of West Africa (ASWA).

It was recorded that the first Council Meeting of ASWA was held in Ibadan, Oyo state Nigeria on December 3, 1960 and its first annual conference was held in 1961. Since ASWA's main objective was to promote post-graduate education and training in surgery, this informed the establishment of the WACS during its annual meeting at Accra in 1969, and both entities were operated side by side. In 1973, at Benin City the functions, assets, and liabilities of the Association, ASWA were transferred to the WACS (the College) while the association ceased to exist (WACS website; Bode, Olatosi & Ademuyiwa, 2012). Thus, The

West African College of Surgeons grew from the Association of Surgeons of West Africa, which was founded in 1960 (Ajayi & Adebamowo, 1999; Omigbodun, 2012).

The objectives of the WACS are firstly to promote, organize and conduct postgraduate education and training in Surgery, related disciplines, and specialties in West Africa through the composition of Faculties. In this regard, Surgery is all encompassing and includes Anaesthesiology, Dental Surgery, Obstetrics and Gynaecology, Ophthalmology, Oto-rhino-laryngology, and Radiology as well as General Surgery and related Sub-specialties as the College may determine when required. Secondly, to foster and coordinate education and research in Surgery and related disciplines. Thirdly, to cooperate with appropriate national and international bodies worldwide with aims and objectives likely to promote, assist, develop, and advance the interests of the College in achieving its objectives. Fourthly, to prepare and publish journals, pamphlets, and memoranda, singly or in collaboration with other bodies or organization as may be considered useful in support of these objectives. Fifthly, to conduct, participate in and appoint representatives or delegates to meetings, symposia, conferences, and other bodies on medical and related disciplines, and lastly to set up appropriate committees for the consideration of the objectives of the College.

The Medical and Dental Council of Nigeria (MDCN)

Before 1960, the Colonial Department of Health regulated the conduct of medical and dental practitioners through its Medical Practitioners Disciplinary Board. The history of the MDCN, well documented on its website, revealed that medical personnel were registered by the General Medical Council in England. A few years afterwards, in 1963, the federal parliament of the Medical and Dental Practitioners Act was promulgated leading to the establishment of the Nigeria Medical Council (NMC) as the first regulatory body for Medicine and Dentistry in Nigeria. The NMC was later succeeded by the Medical and Dental Council of Nigeria (MDCN), a statutory creation of the Military Decree No 23 of 1988. This

decree, with the return of constitutional government of Nigeria is now known as the "Medical and Dental Practitioners Act, Cap. 221, Laws of the Federation of Nigeria 1990" (https://mdcn.gov.ng/). Also published on its website, the medical and dental professions in Nigeria are regulated by the Act with the following four mandates:

> " (a) regulation of training in Medicine, Dentistry and Alternative Medicine in Nigeria; (b) regulation of Medical, Dental and Alternative Medicine practice in Nigeria; (c) determination of the knowledge and skills of these professionals; and (d) regulation and control of Laboratory Medicine in Nigeria".

The MDCN mission to "regulate the practice of Medicine, Dentistry and Alternative Medicine in the most efficient manner that safeguards best healthcare delivery for Nigerians" underlies these mandates. The Vision is be the foremost Professional Regulatory body in Nigeria. The Act that set up MDCN charges the council with the responsibilities as follows: Firstly, to determining the standards of knowledge and skill to be attained by persons seeking to become members of the medical or dental profession and reviewing those standards from time to time as circumstances may permit. Secondly, to secure the establishment and maintenance of registers of persons entitled to practice as members of the medical or dental profession and the publication from time to time of lists of those persons; thirdly, reviewing and preparing from time to time, a statement as to the code of conduct which the Council considers desirable for the practice of the professions in Nigeria; and, fourthly, to perform the other functions conferred on the Council by the Law.

The Council is empowered to make rules of professional conduct and is also empowered to establish the medical and dental practitioners' disciplinary tribunal and medical practitioners investigating panel for the enforcement of these rules of conduct. The MDCN stated that,

> "these rules of conduct are made to enable doctors and dentists in Nigeria maintain universally acceptable professional standards of practice and conduct. They serve as standards in relationship of medical and dental practitioners with the profession, their colleagues, patients, members of allied professions and the public".

However, by amendment in Decree No. 78 of 1992, the functions of the Medical and Dental Council of Nigeria were expanded to include the fifth and sixth mandates as follows:

> "(e) supervising and controlling the practice of homeopathy, and other focus of alternative medicine (naturopathy, acupuncture and osteopathy), and (f) making regulations for the operation of clinical laboratory practice in the field of Pathology, which includes Histopathology, Forensic Pathology, Autopsy and Cytology, Clinical Cytogenetics, Haematology, Medical Microbiology and Medical Parasitology, Chemical Pathology, Clinical Chemistry, Immunology and Medical Virology".

The doctor holding an MBBS bachelor's degree must show that he has also done one-year internship in a recognized hospital before issuing a certificate of practice to such person. All medical graduates, in addition to the internship must show proof of having completed the national service youth corps before further professional progress can be allowed.

The National Postgraduate Medical College of Nigeria (NPMCN)

As published on its website (https://npmcn.edu.ng/), the NPMCN was established to further enhance medical specialty training specific to Nigeria and to produce specialists in all branches of Medicine and Dentistry. It was set up as the tertiary institution at the apex of Medical Education by the National Postgraduate Medical College Decree No. 67 of 24th September 1979, now Cap N59 Laws of the Federation 2004, as a body corporate with perpetual succession and a common seal. The NPMCN is a sister college of the WACS along with the Ghana College of Physicians and Surgeons (GCPS) and these colleges collaborate in

training and accreditation; and also formulate commons strategies to advance postgraduate medical education in Anglophone West Africa (Bode, Olatosi & Ademuyiwa; 2012).

The NPMCN provide higher medical education through the organisation of the curricula for professional postgraduate education in the various specialized branches of medicine and dentistry; as well as the conduct of professional postgraduate examination of candidates to certify them as Specialists (https://npmcn.edu.ng/). These specialists become Consultants in Tertiary Health Institutions and Lecturers in the Universities' Medical and Dental Schools. The functions of the national College include:

> "the accreditation of training institutions for professional postgraduate training of doctors and dentists; the organization of professional postgraduate training programmes, curricula development, and the conduct of update courses for training in the various specialized branches of medicine and dentistry; the conduct of professional postgraduate examinations for candidates in the various Faculties; the organization of one year Clinical Attachment (training abroad) for qualified resident doctors; and carrying out any other activities necessary in the furtherance of postgraduate medical education and quality healthcare in Nigeria".

The vision of the NPMCN is:

> "to produce medical and dental specialists of the highest standards who will provide world class services in teaching, research and health care. The mission of the college is to plan, implement, monitor, and evaluate postgraduate programmes required to produce medical and dental specialists of the highest quality, competence and dedication, who will provide teaching and optimal healthcare for the people".

The national College aims to maintain lifelong learning via professional development programmes.

The faculty of anaesthesia examining board organizes its own examinations and select its examiners. In 1982, following an initial slow start, the first convocation was held by the NPMCN and 31 foundation fellows in the faculty of anaesthesia were inaugurated. Three years after, in 1985, three more Fellows were inaugurated, making a total number of 35 Nigerian Anaesthetists (listed in Appendix B). From 1984 to 1987, Prof Oduntan was the chairman of faculty while Prof Obiaya was elected secretary taking over from the foundation chairman and secretary, Professors WV Fowler and JO Shodipo respectively.

The Physicians' Postgraduate Anaesthesia Programme in Nigeria

As of 2019, there are three valid programmes in Nigeria with different pathways and requirements. This include the Fellowship, Membership and Diploma Programmes (https://npmcn.edu.ng/).

Anaesthesia Specialist Training Programmes (Membership and Fellowship)

The training of specialist doctors for the anaesthesia specialty (also known as residency) like all medical specialization in Nigeria is carried out at Teaching Hospitals that are affiliated with Universities, or at Specialist Hospitals. These training centres must be accredited for postgraduate training by the NPMCN and/or the WACS (for surgical specialties). The sister college of the WACS is the West African College of Physicians (WACP) which is responsible for medical specialties. Skills and knowledge assessment of all residents (specialists in training) are performed on a continuous basis as a work-based learning programme.

The postgraduate programmes and examinations of the two Colleges are similar therefore residents can choose to be validated by any or both colleges i.e. NPMCN, WACS or both. There are three levels of examination namely the Primary, Part 1/Membership and Part 2/Fellowship. The objective of the primary examination is to ensure that residents have a

firm understanding of the Basic Sciences relevant to the specialty of Anaesthesia. It is highly recommended that residents attend short courses in Basic Sciences run by the Postgraduate Medical Colleges within the sub-region. The subjects covered include basic and applied physiology, pharmacology, and anatomy; physics relevant to anaesthesia; general pathology as related to anaesthesia; and biochemistry.

The Membership and Fellowship in Anaesthesia: This programme aims to train highly proficient and knowledgeable anaesthetists capable of functioning independently in the West African sub-region and elsewhere in the world. The course runs for a total of 5 years in 2 parts consisting of Membership (3 years) and Fellowship (Membership plus 2 years). The postgraduate programmes were recently re-structured into a 36 months training for Membership, followed if so desired, by a further training for 24 months to obtain the Fellowship (Omigbodun, 2012; Ajao, Ugwu & Eke; 2012; https://www.wacscoac.org/).

Except for the primary examination, resident doctors are required to keep logbooks of their cases, as well as present a training certificate duly signed by their supervisors and institutional heads before they can be admitted for examinations. Unlike previous years, the WACS programme now has provisions for candidates to exit with a Membership Certificate (Yawe, 2018) or to proceed to complete the Part two examination and thereby obtain the Fellowship certificate. Candidates no longer need to leave the programme midway without any certification if they do not meet the whole requirement for a Fellowship. With the various pathways and available options i.e. Diploma, Membership and Fellowship, achieving a high success rate at the chosen level of training is feasible (https://www.wacscoac.org/). The demand for anaesthesia service within the Nigerian healthcare system will continue to increase because new evidence showed that health institutions in Nigeria may be in excess of 33,303 general hospitals, 20,278 primary healthcare post, 59 teaching hospitals and federal medical centres (Omoruan, Bamidele and Phillips, 2009).

Physicians Postgraduate Diploma in Anaesthesia: To qualify to sit for the diploma in anaesthesia examination, the physician must spend a minimum of twelve months in an accredited training hospital. During the period, the physician must acquire knowledge and skills and should be able to provide high-quality care to all patients. The one-year post-graduate diploma in anaesthesia programme of the University of Lagos, established in 1965, was also the first postgraduate programme of the university and the first in West Africa. At the commencement of the programme, in 1965, the only African faculty was Dr. WV Fowler (ffoulkes-Crabbe, 2002).

The DA programme was started at the University of Ibadan in October 1968. While the priority of the NPMCN was on running the fellowship programmes in anaesthesia, individual anaesthetists in their various universities' department of anaesthesia including University of Jos, started the one-year DA programme with degrees awarded by the respective university. This cadre of physician anaesthetists gained enough theoretical knowledge and developed practical anaesthesia skills in anaesthesia; thus, enabling them to provide safe anaesthesia in specialist and general hospitals within the country and to continue in a lifelong learning if they so wish (personal experience).

Today, hospitals with department of anaesthesia accredited by either the NPMCN or the WACS on the recommendation of the anaesthesia faculty can train doctors for the DA awarded by the respective colleges. Most of the hospitals with accreditation have both the NPMCN and the WACS accreditation (Elegbe, 2010). The DA is registrable as a specialist qualification with the Medical and Dental Council of Nigeria (personal experience).

Teaching Hospital Consultant/Specialist Requirement in Nigeria

All the honorary consultants in the teaching hospital are also medical academic staff of the university and they must be certified Fellows of either the NPMCN or its equivalent, the WACS or the WACP. Board certified specialists from the UK, USA or Canada may also

be employed but they must be registered to practice in Nigeria by the MDCN (https://mdcn.gov.ng/). All specialists are mandated to attend at least one conference annually to update themselves and these conferences issue points towards the continuous medical education (CME). In addition, the quality of academic activities is ensured through university assessments of research and teaching programmes and these are used for academic staff promotion. The minimum time interval for staff assessment is three years (personal experience).

The Current Surgical System, the Constraints and Challenges

As depicted in Figure 3, the current surgical system is an interdependent network of individuals and institutions in the health system (Meara et al., 2015; NSOANP, 2019). Appropriately equipped healthcare facilities and operating rooms are important for safe, timely and affordable surgical, perioperative and anaesthesia care, but this can only be achieved with a skillful surgical and anaesthesia workforce (Meara et al., 2015). The basis of a functional health system is the shared delivery of infrastructure (Kim, Farmer & Porter, 2013). The patient lives in the community where surgical care should begin. Through a referral system, the patient can receive first level emergency or elective surgical care from the district hospital. The tertiary centers serve as hubs for training, research and system-wide quality improvement (Meara et al., 2015, NSOANP, 2019).

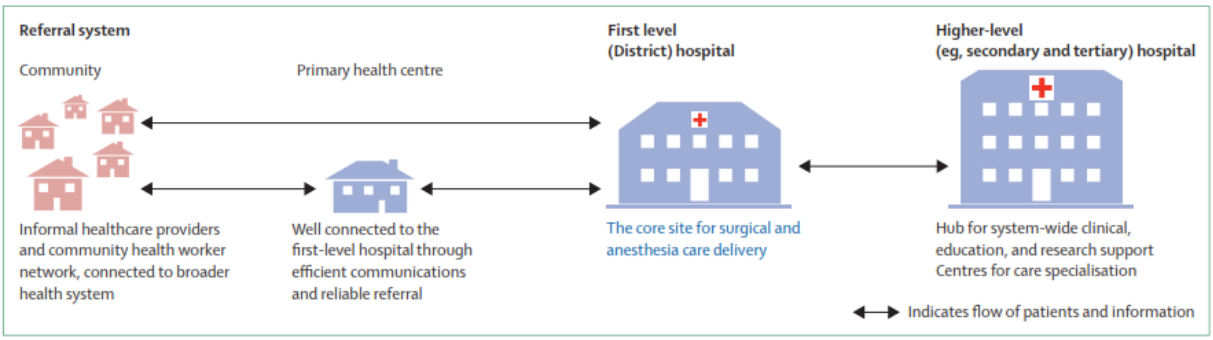


Figure 3. The current surgical system

> *The surgical system is an interdependent network of individuals and institutions that reside within the health system.* (Meara et al., 2015)

The challenge in the surgical system cannot be separated from that of the Nigerian health system, therefore an inadequate surgical workforce mirrors the inadequate workforce for healthcare at the lower levels of care compared with tertiary centers (Welcome, 2011). Moreover, the rate at which the population is growing in Nigeria further complicates the workforce crises (Pacqué-Margolis, Muntifering, Ng & Noronha; 2011). Despite a well-structured health system in Nigeria (FMOH, 2019), development of the primary healthcare in previous years, did not improve the health experience of the population especially those living outside the urban areas (Omoruan, Bamidele & Phillips, 2009). Considering that the delays in receiving care can occur in any part of the referral system, the FMOH developed the National Strategic Health Development Plan II (2018-2022). This second plan was made with the mission to ensure that the Nigerian populace have universal access to comprehensive, appropriate, affordable, efficient, equitable and quality essential health care through a strengthened health care system. Unfortunately, this plan did not include surgical healthcare as a public health concern.

In Nigeria, like all other LMICs, patients were known to seek safe care very late, usually after complications have set in, or they have become desperate (Kumar, Heller, Pandey, Tewari, Bala & Oanh, 2001; Anorlu, Orakwue, Oyeneyin & Abudu, 2004; Khan, Hanif, Iqbal, Shahzad, Shafique & Khan, 2015; Ademola-Popoola, Opocher & Reddy, 2019). For example, concerning the pattern and outcome of acute abdomen of surgical origin at a Nigerian tertiary hospital, late presentation accounted for the poor outcome in the patient with strangulated inguinoscrotal hernia and the patient with gangrenous sigmoid volvulus (Nwashilli, Okobia, Osime & Agbugui, 2017). The outcome of late presentation in the hospitals resulted in high morbidity and mortality (Ekeke, Okonta & Igwe, 2016). Retinoblastoma (RB), according to Ademola-Popoola, Opocher & Reddy (2019) was the

most common cancer affecting the eyes, affecting children below 5 years of age in more than 90% of cases. Although, in developed and high resource countries, patients having RB survived and retained their sight, unfortunately, the results in low-resource countries were worse. This was grossly due to the late presentation of patients resulting in delayed intervention. These patients also had social, cultural and economic challenges.

The Nigerian Surgical Outcome Studies reported that 10% of critical care admission was unplanned and mortality in the group was 100% compared with mortality of 23.5% in the group with planned admission (Osinaike, Ayandipo, Onyeka, Alagbe-Briggs, Mohammed et al., 2019). Furthermore, rural dwellers and the poorest in Nigeria lack financial risk protection, they also must pay for care from their low earnings, resulting in catastrophic expenditure (Onwujekwe, Hanson and Uzochukwu, 2012). This financial burden from seeking surgical care is typical of individuals in LMICs, and for those in the poorest wealth quintiles within countries of all income groupings (Shrime, Dare, Alkire, O'Neill & Meara, 2015).

The LCoGS's report (Meara et al., 2015) stated that protection against catastrophic personal payments for health care was a critical component to ensuring affordable access to essential health services. The authors defined catastrophic expenditure, in reference to the households capacity to pay (Wyszewianski, 1986) as "direct medical payments for surgical care that exceed 10% of earned income or 40% of income after basic needs for food and shelter are met", and out-of-pocket payments are defined as private expenditures. According to Shrime et al. (2015), 33 million cases of catastrophic expenditure occurred annually from the direct medical costs of surgical services, and an additional 48 million cases occurred each year when non-medical related costs, such as food and transportation expenses, were included.

Shrime et al. (2015) found that one quarter of surgical patients faced financial catastrophe from seeking surgical healthcare and the financial burden fell on the poor. This pattern of catastrophic impoverishment was confirmed in a study done in Kenya (Salari, Di Giorgio, Ilinca & Chuma, 2019) and in Malawi (Bijlmakers, Wientjes, Mwapasa, Cornelissen, Borgstein, Broekhuizen, Brugha & Gajewski, 2019). However, several authors found that financial catastrophe from seeking surgical care occurred not only in LMICs amongst the population in the poorest wealth quintiles but also in high income countries (HICs) (Quintal, 2019).

The Lancet Commission recommended a "target of 100% protection against catastrophic expenditure from out-of-pocket payments for surgical and anaesthesia care by 2030". The Commission opined that reaching this target will require an approach to financing surgical services that accounts for healthcare provision for the poor, including financing mechanisms based on pooling of risk through general taxation or insurance models rather than user fees while seeking healthcare. Importantly, they support a progressive pathway to UHC that commits to coverage for the poor from the beginning, including surgery within all basic UHC packages, platforms, and relevant policies. Figure 4 depicts a summary of other constraints in addition to financial that countries in the low- and middle-income groups have to deal with.

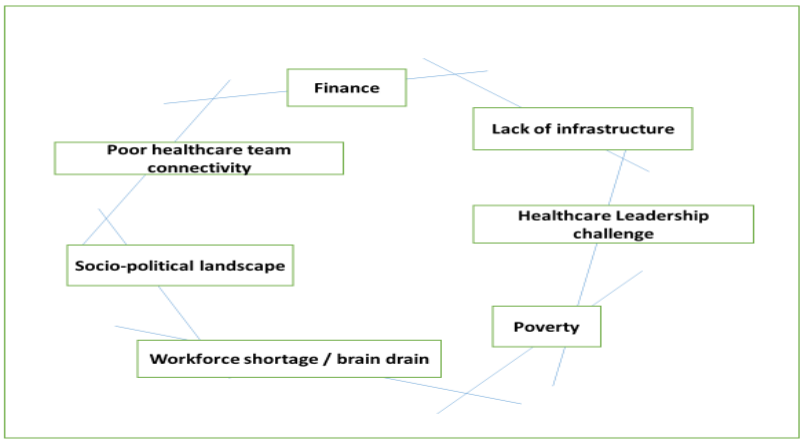


Figure 4: Constraints of Surgical and Anaesthesia Healthcare in LMIC's

Physician Brain Drain

According to the Collins Dictionary, brain drain refers to the movement of large numbers of scientists or academics away from their countries to another where the conditions and salaries are better. The Cambridge English dictionary defines brain drain as loss of many highly skilled and educated people from one country to another. Brain drain, specifically, refers to the *migration* of schooled and skilled individuals from a less developed region or country to a more economically established one. Muula (2005) defined brain drain as both a loss of health workers (hard brain drain) and unavailability of research results to users in Africa (soft brain drain). A major constraint in surgical care provision is the phenomenon of physicians' brain drain.

Other researcher referred to physicians' brain drain as the migration of medical doctors from resource-poor countries to developed countries (Mackey & Liang, 2013); the international migration of scientists (and in this situation, physicians) in pursuit of better opportunities (Ioannidis, 2004); or migration of healthcare personnel in pursuit of greener pastures or better standard of living and higher quality of life, higher salaries, availability of advanced technology and better political conditions in more advanced countries (Dodani & Laporte, 2005). Siankam (2011), using eco-psychopolitical framing, suggested that medical migrants leave their countries to empower themselves, for example, for their professional development. They also migrate to promote their wellbeing, gain financial security, resist oppression and escape structural violence (Tankwanchi, 2018).

Sheikh, Naqvi, Sheikh, Naqvi & Bandukda (2012) observed that physician migration (brain drain) may occur from a multifactorial gap due to the supply and demand in developed countries and a lack of job satisfaction in developing countries. It has been established by several authors that brain drain of healthcare workers, occurred mostly from low- and low/middle-income countries to resource-rich countries and from rural to urban areas

(Ihekweazu, Anya & Anosike, 2005; Ahmad, 2005; Serour, 2009; Schumann, Maaz & Peters 2019). Emigration was listed along with death, as factors resulting in complete losses to the health sector; and in avoidable situations, they are termed as “direct wastage” of health personnel reflecting attrition of people from the health workforce (Davlo, 2005).

Consequently, physicians brain drain undermines health service delivery in the emigrating physicians' country of origin because physician supply is already inadequate in those countries (Tankwanchi, Özden, Vermund, 2013). The consequences of emigration have far reaching effect by exacerbating economic decline, jeopardizing political security, and triggering mass emigration (Ahmad, 2005). According to Dohlman, DiMeglio, Hajj & Laudanski, (2019) the loss of trained health personnel from areas where health systems are already stressed to their limits leave the remaining professionals overwhelmed and demoralized.

There is a continuous large scale migration of medical specialists from sub-Saharan countries to mainly the UK and USA (Cheng & Yang, 1998; Hagopian, Thompson, Fordyce, Karin, Johnson & Hart, 2004; Alkire & Chen, 2005; Mullan, 2005; Clemens, 2007; Docquier & Barghava, 2007; Dumont & Zurn, 2007; Clemens & Pettersson, 2008; Castles & Miller, 2009; Clemens, 2011; Tankwanchi, Ozden & Vermund, 2013). From 1986 to 1995, a period of ten years, 61% of medical graduates from the same medical school in Ghana, left the country (Davlo & Nyonato, 1999). Of these leavers, most went to the UK (55%) and the USA (35%) whereas only 6.2% was estimated to migrate to South Africa.

The study by Hagopian et al. (2004) showed that out of the 5334 sub-Saharan African international medical graduates (IMGs) in the United States, Nigerians were 2158 (40%), the highest number followed by South Africa with 1943 (30.8%). Concerning the findings of Hagopian et al. (2004), Rodnick, 2006 commented, “we are on the horns of a dilemma, unable to fill our residencies with qualified US graduates, so we turn to those eager to leave

their own countries. This can't be good for Africa….". The study of the whereabouts of the 1995, 1996, and 1997 graduating medical doctors of the University of Nigeria (UNN) by Ihekweazu, Anya & Anosike (2005) revealed that 40% of medical graduates were currently living abroad (50% for female graduates), and the most popular foreign destinations, having the largest number of graduates were the USA, followed by the UK and Ireland.

The increase in migration trends over a period of ten years from 2002 to 2011 was more than 50% in Nigeria (+1,113) and Ghana (+243), more than 100% in Ethiopia (+274), and over 200% (+244) in Sudan (Tankwanchi Ozden & Vermund, 2013). Another study performed by Tankwanchi, Vermund & Perkins (2015) using data from the 2013 masterfile of the American Medical Association Physician (AMA) and projected to 2015 with linear regression, suggested an increasing annual admission rate of Sub-Saharan African émigrés into the US physician workforce after 2010. The increase resulted from the rising number of SSA-born physicians that attended medical schools outside Africa. This indicated a new trend towards younger migrants. The study made by Thomas (2016) suggested that in the last 30 years, a higher number of skilled Africans moved to the US through graduate student migration mechanisms, rather than through recruitment of workers; and that the Diversity Visa Programme had become the second most important process through which skilled emigration from Africa occurred.

Duvivier, Burch and Boulet (2017) found that nearly one-quarter (24%) of active physicians in the USA are international medical graduates (IMGs), and more than 50% of IMGs are from LMICs. African migrant physicians form 5.9% of IMGs in the USA workforce, among which 11,697 (86.2 %) were citizens from an African country who graduated from medical school in their countries. There was a threefold increase in the number of physicians who received their medical education in African and graduated from medical schools in sub-Saharan countries in 2015 compared with 2005. The economic

consequences of brain drain of doctors is enormous considering the cost of educating LMIC medical doctors prior to their emigration (Mills, Kanters, Hagopian, Bansback, Nachega, Alberton, Au-Yeung, Mtambo, Bourgeault, Luboga, Hogg & Ford, 2011; Kirigia, Gbary, Muthuri, Nyoni & Seddoh, 2006; Kirigia, Gbary, Nyoni, Seddoh & Muthuri, 2006). The sponsorship of medical students' training by government was stated as a lost investment when young graduates seek permanent employment abroad (Bezuidenhout, Joubert, Hiemstra & Struwig, 2009). Kiriga, Gbary, Muthuri et al. (2006) using Kenya as an example, estimated that for each medical doctor that moves abroad, a country loses about 517,931 US dollars' worth of returns on investment. Kirigia, Gbary, Nyoni et al., (2006) estimated the economic loss due to emigration of 18,960 medical doctors from 14 African countries to be 35.16 Billion US dollars while the total cost of training them was approximately 1.25 Billion US dollars.

The estimated economic cost for LMICs from excess loss of life associated with out migration of physician was made by Saluja, Rudolfson, Massenburg, Meara & Shrime (2020). The authors concept was based on quantifying the economic value of a life, with the lives that a medical doctor saves, and the number of medical doctors migrating from LMICs to live and work in HICs. They estimated an annual loss of US$15.86 billion (95% CI $3.4 to $38.2) due to medical doctors migration from LMIC's to HICs. The authors found that the countries that incurred the greatest total costs were India, Nigeria, Pakistan, and South Africa. Consequently, the cost was greatest in the WHO African region and in low- income countries when considered as a percent of gross national income. The importance of the economic loss model of Suleja et al. (2020) to Nigeria is that policymakers in the country can observe that the excess mortality cost for Nigerian medical doctors who emigrate to HIC is approximately $3.1 billion annually (95% CI $0.8 to $7.5).

The World Health Organization (2006) reports that medical brain drain has a negative impact on the health systems of the developing countries mostly in Africa, making them to face crippling health workforce shortages. The worldwide shortage of 7.2 million healthcare providers estimated in 2013 is predicted to reach 15 million by 2030 if this phenomenon is not actively curtailed (WHO, 2013; Liu, Goryakin, Maeda, Bruckner & Scheffler, 2017). The estimated shortage of physicians worldwide is 2.8 million (WHO, 2016). The healthcare workforce contributes to promotion of health and wellbeing, prevention of disease, diagnosis, treatment and rehabilitation. Emigration of doctors and nurses (and other health professionals) therefore cripples the already fable national and district health systems thereby reducing performance and ability to provide universal health care. According to Saluja et al. (2020), economic consequences of medical brain drain is much more than the movement of human capital, because excess mortality has been strongly associated with loss of physicians.

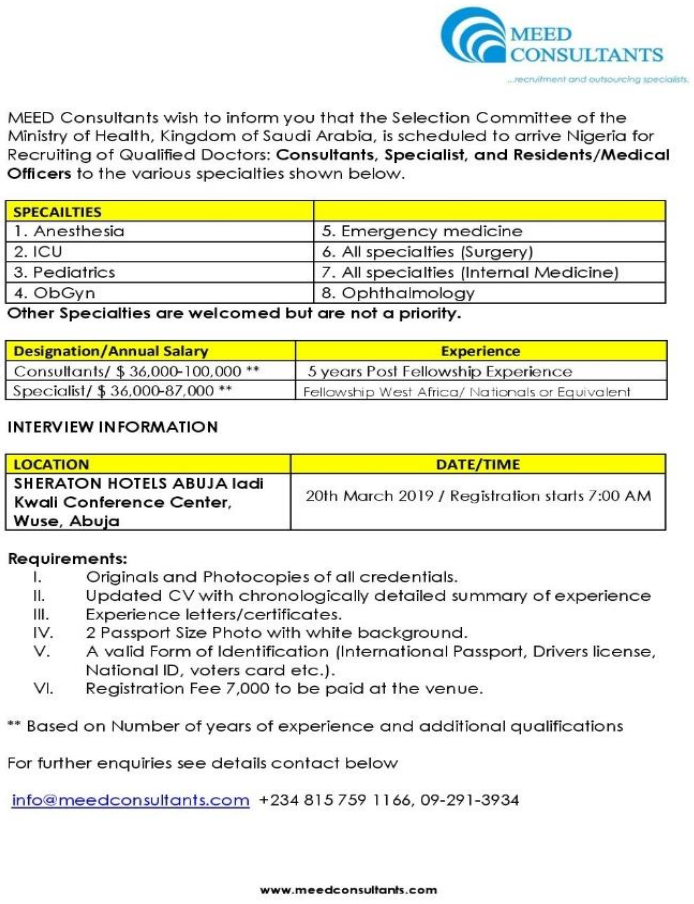
The causes of brain drain are multifactorial and complex. Ojo, Ugochukwu and Obinna (2011) revealed a relationship between poor leadership of a country and brain drain, whereas Adefusika (2010) highlighted various causes of brain drain which can be either internal or external political, economic, social, and technical factors. Afzal, Madroor and Shafgat (2012) refer to the "push and pull" factors causing migration. Several researchers suggested that the key push factors included: "weak health systems; insecurity, including violence in the workplace; poor living conditions; low remunerations; lack of professional development opportunities, e.g. continuing education or training; lack of clear career development paths" (Awases, Gbary & Chatora, 2004; Afzal, Madroor & Shafgat, 2012; Suciu, Popescu, Ciumageanu & Buzoianu, 2017). In particular, the brain drain amongst physicians in Greece, was linked to the country's severe financial woes resulting in unemployment, job insecurity, income reduction, over-taxation, together with limited budgets for research institutes (Ifanti, Argyriou, Kalofonou, Kalofonos, 2014; Zavras, Zavras,

Kyriopoulos & Kyriopoulos, 2016). Other push factors named are the risk of HIV infection; nepotism in recruitment and promotion; political unrest/civil wars; wide-spread poverty; poor governance; and case overload (Awases, Gbary & Chatora, 2004).

The factors pulling skilled workforce to developed countries include the availability and access to information, communication and technology (ICT), facilitation of the legal process and application for visa by head hunters and talent poachers; aggressive recruitment of healthcare workers for richer countries; availability of employment opportunities; attractive salaries and working conditions (Stilwell, Diallo, Zurn, Vujicic, Adams & Poz, 2004;). A study by Bezuidenhout, Joubert, Hiemstra & Struwig (2009) on the reasons for doctor migration from South Africa indicated that pull factors (financial factors, 86.2%; and better job opportunities, 9.3%), as well as push factors (high crime rate in South Africa, 75.9%) were the major reasons for leaving. Furthermore, the secure living conditions; and opportunities for intellectual growth are attractive to professional (Kirigia, Gbary, Nyoni, et al., 2006).

The study carried out at a medical school in Pakistan by Sheikh, Naqvi, Sheikh, Naqvi & Bandukda (2012) revealed that out of 323 medical students, 195 (60.4%) wanted to pursue their careers abroad. The authors stated that the students who wished to migrate reasoned that the salary abroad was more lucrative. The other reasons given were better quality training, increased job satisfaction, better way of life, support from relatives abroad, including more opportunities, and better working environment. In addition to pull factors, Muula (2005) suggested “grab” factors emanating from the developed nations since the pull factors merely attract skilled labour to the recipient country while the push is from the exporting country. Lofter (2012) stated that Jamaica health workers brain drain was complex and had multiple dimensions therefore the solutions will require international funding bodies and all nations to be committed and supportive so that meaningful impact can be made.

The brain poaching from Nigeria and recruitment of medical specialists by foreign countries through international recruitment campaigns have been used to mitigate shortfalls in the number of physicians in their countries. Figure 5 is an example of international recruiting campaign for Saudi Arabia, intentionally packaged for brain poaching from Nigeria. According to Mills, Schabas, Volmink, Walker, Ford, Katabira, ... & Montaner (2008), offices have been established in South Africa by western recruitment agencies, such as O'Grady Peyton International (USA and UK) and Allied Health (Australia) to facilitate the recruitment of health workers. Ahmad (2005) cautioned that indiscriminate poaching is unlikely to serve the long term interests of either the origin or the receiving countries because the consequences of frail health systems are observed in other sectors of the economy.



MEED CONSULTANTS

...recruitment and outsourcing specialists.

MEED Consultants wish to inform you that the Selection Committee of the Ministry of Health, Kingdom of Saudi Arabia, is scheduled to arrive Nigeria for Recruiting of Qualified Doctors: **Consultants, Specialist, and Residents/Medical Officers** to the various specialties shown below.

SPECAILTIES	
1. Anesthesia	5. Emergency medicine
2. ICU	6. All specialties (Surgery)
3. Pediatrics	7. All specialties (Internal Medicine)
4. ObGyn	8. Ophthalmology

Other Specialties are welcomed but are not a priority.

Designation/Annual Salary	Experience
Consultants/ $ 36,000-100,000 **	5 years Post Fellowship Experience
Specialist/ $ 36,000-87,000 **	Fellowship West Africa/ Nationals or Equivalent

INTERVIEW INFORMATION

LOCATION	DATE/TIME
SHERATON HOTELS ABUJA Iadi Kwali Conference Center, Wuse, Abuja	20th March 2019 / Registration starts 7:00 AM

Requirements:

I. Originals and Photocopies of all credentials.
II. Updated CV with chronologically detailed summary of experience
III. Experience letters/certificates.
IV. 2 Passport Size Photo with white background.
V. A valid Form of Identification (International Passport, Drivers license, National ID, voters card etc.).
VI. Registration Fee 7,000 to be paid at the venue.

** Based on Number of years of experience and additional qualifications

For further enquiries see details contact below

info@meedconsultants.com +234 815 759 1166, 09-291-3934

www.meedconsultants.com

Figure 5: International recruiting campaign

The deliberate recruitment of healthcare workers from LMICs by professional agencies and corporations is not unique to Nigeria. Once or twice a year, the corporate headquarters of Shoppers Drug Mart, perform recruitment road shows into South Africa. This is to hunt for pharmacists and other health workers on behalf of Canada, promising candidates a "guaranteed annual minimum earnings of $100 000" which is a huge salary compared with the typical South African earnings (Saluja et al., 2020; Fourcier, Simeons & Giuffrida, 2004; Attaran & Walker, 2008).

Contrary to the WHO's report, Record and Mohiddin (2006) affirms an economic perspective of physician brain drain claiming that remittances from migration are a large and growing source of foreign exchange for poor countries and these tend to go directly to households. Hunter's (2013) study on migration routes of scientists showed that international mobility benefits all parties including countries that are net exporters of researchers thereby confirming that brain drain has gains. While confirming the views of international bodies like the United Nations and the WHO, Hooper (2008) argued that wealthy countries have a moral obligation to reduce the flow of healthcare worker to the developed world.

To change this trend, the Nigerian government partnered with some agencies and the private sector to mobilize resources to develop and retain capable and motivated health workers in their right numbers and right distribution (FMOH, 2019). Some authors have proffered various solutions to medical brain drain, such as taking a policy position, increasing physician income, mandatory public service for healthcare workers, improving facilities and working conditions thereby address the pull factors, as well as shifting from higher to lower skilled health workers (Cooper & Aiken, 2006; Ike, 2007; Kollar & Buyx, 2013). Taking a more strategic global action, such as, creating increasing collaboration between health ministries in advanced countries and developing countries was claimed to be favourable in the five countries studied by Astor, Akhtar, Matallana, Muthuswarmy, Olowu, Tallo & Lie

(2005). While agreeing with the idea of collaboration, Serour (2009) suggested that a code of practice on international recruitment of health personnel was needed.

Taking a policy position according to Kollar and Buyx (2013) remains controversial but they suggest a strategy of implementation to be carried out without further delay. On the other hand, Mackey and Liang (2012) opined that since efforts to strengthen the domestic health have failed to address brain drain, global solutions such as adoption of mandatory global resources and staff-sharing programmes and implementation of state-based health service corps should be applied. A study carried out by Okeke (2013) confirmed the success of wage increase programme for physicians in Ghana. The author found that the Ghanaian doctors working and living abroad fell by 10% after 6 years of its implementation.

Although, the causes of brain drain are well articulated, most of the solutions are based on how to influence the factors. The solution also examines how the brain that has been drained (physicians in diaspora) can be of benefit to their home country and thereby diminish the effect of brain drain. Adefusika (2010) proffered some solutions such as mobilization of doctors in diaspora by encouraging their participation virtually. In addition, the author suggested that the Nigerian government formulate a national diaspora policy; and also ensure economic share-ship by taking advantage of the dual citizenship status, as well as connecting diaspora productivity through temporary engagements in Nigeria. However, these solutions may not prevent new physician (who already have the intention to migrate at a point in their career) from migrating.

For a well-performing health workforce, entry and exits need to be managed. Therefore, the WHO (2007) advised that the distribution and performance of existing health workers be effectively managed. According to Liese and Dussault (2004), to retain highly trained staff, and redistribute the health workforce, African countries need to offer internally competitive wages and benefit packages. Non-monetary incentives, such as training,

professional development, improved work environments, and appropriate equipment, are also important to improve motivation, quality, and productivity.

In recognition of increasing transnationalism, the WHO (2010) released a Code of Practice (CoP) which defined ethical standards for the recruitment of migrant health workers "in the manner that strengthens the health systems of the developing countries". The CoP advocates "circular migration as a partial solution to health personnel emigration, enabling health workers émigré to return periodically to their national countries to provide healthcare services without losing re-entry privilege in their adopted countries". This is vital to the promotion of trade, investment, knowledge exchange, health technology transfer with the home country.

Work-based Learning and Brain-based Anaesthesiology Curriculum

Work-based learning (WBL) is a broad term that is used to describe blending a traditional education with experience in the workplace. The idea of learning through experience was first suggested by Dewey (1938). However, Kolb (1984, p. 38) stating that, "learning is the process whereby knowledge is created through the transformation of experience", further developed experiential learning and acknowledged John Dewey, Kurt Lewin, and Jean Piaget as the founders of the approach. Since the 1990s, a shift in learning theory led to the conception of experiential learning based on Kolb's learning cycle of 'concrete experience', 'reflective observation', 'abstract conceptualisation' and 'active experimentation'. This move prompted clinical teachers to consider how students and trainees might learn through taking part in workplace-based activity (Dornan, Scherpbier & Boshuizen, 2009; Sajjad & Mahboob, 2015).

Work-based learning is used to refer to a class of university programmes that bring together universities and work organizations in order to create new learning opportunities in

workplaces (Boud, Solomon and Symes, 2001, p. 4). It is defined as an educational strategy for students to experience real-life work and applies academic and technical skills to develop their employability. Educational courses integrate the school or university curriculum with the workplace to create a different learning paradigm. The three key elements to work-based learning suggested by Gray (2001) are learning through work, learning for work, and learning at work. These elements are like the conceptualisation of WBL applied by Seagraves, Osborne, Neal, Dockrell, Hartshorn and Boyd (1996) as an overarching term for learning for, at and in work.

Specific to the hospital as a workplace, Dornan, Scherpbier & Boshuizen (2009) stated that:

> "out-patient clinics, hospital wards, general practice surgeries, emergency departments, day surgery units and operating theatres are all places where doctors work, students learn to work and where students might later pursue their careers. So, clinical education is located in the workplace, defined as a place where students, doctors and patients come together in the conjoint pursuit of clinical care and learning. Students learn from experience, which we define as authentic (real as opposed to simulated) human contact that helps students learn about health, illness and disease, and how to be a doctor".

Learning at work include an involvement in the work itself, a colleague-cooperative approach, formal learning, and social interactions (Pillay, Boulton-Lewis, Wilss & Rhodes, 2003) which can provide a means of upskilling the workforce. Learning through work may involve the completion of on-site training courses which may be formally assessed and accredited. Learning for work may range from the secondary-school student on a two-week work-experience placement to university students spending a year in industry (Billett & Choy, 2013).

Sodiechowska and Maisch (2006) defined work-based learning as "where students are full-time employees whose programme of study is embedded in the workplace and is designed to meet the learning needs of the employees and the aims of the organisation". In terms of pedagogy, Boud and Middleton (2003) considers work-based learning as continued lifelong learning for adults following formal education. Akkerman and Bakker (2012, p. 154) suggest that a working environment (for example, hospital) and an educational institution (for example, university) 'mutually contribute to learning processes.' While learning can occur anywhere, and as such may involve instruction and/or an exploratory approach, the environment itself can prompt a more responsive attitude to learning.

Little (2006, p. 2) categorises WBL as 'learning that is derived specifically from doing a job of work and taking on a workplace role.' In an attempt to conceptualize and clarify WBL, Workplace learning (WPL) and work-related learning (WRL), Alan (2015) suggested that academic learning is a crucial aspect of many WBL programmes and may include an understanding of a possible theoretical underpinning of the learning that occurs on the job – i.e., an employee, or student, may align the learning with academic discourse or theory.

WBL has many pathways, as well as several programme variants depending on the education system, higher education institutions and businesses and these are recently being explored in the USA, Germany, Austria, and Switzerland (Graf, 2016, 2017; Chou, Jungblut, Ravinet & Vukasovic, 2017). The two main extremes are informal apprenticeship-type arrangements and the variants used in higher education for the teaching of complex knowledge and skills, such as in medical education (Swanwick, 2010). The experiential learning typical of medical specialization is known as residency (Yardley, Teunissen & Dornan, 2012; Poduval, 2015, p. 23). The informal apprenticeship-type arrangements such as hairdressing, plumbing, carpentry, and electrical work does not include a complementary

classroom-based or institutional learning. However, this remains a well-recognized method of skill formation and a source of skills in many developing economies.

Work-based learning meets the requirements of learners, as well as contributes to development of the organisation in the long term (Boud & Solomon, 2001). It offers the opportunity to apply practical theories from classroom work and to develop human relations skills through interaction with co-workers. In addition, workers can earn academic credit and exposure to specialised facilities. WBL supports the knowledge economy allowing industry to capitalise on new knowledge generated by HE by bringing together theory and practice.

Barnett (1999) assert that WBL strategies are a vital part in workforce development while Garnett (2001) suggest that it has the potential to provide the university with a unique opportunity to develop a new kind of knowledge-based partnership. HEIs and businesses, in what is now known as industry-university collaborations (IUCs), use WBL as a tool to educate and develop their students or workforce. IUC is regarded by Rybnicek and Königsgruber (2019) as ambition of policymakers and universities to develop 'third missions' in addition to the two traditional core missions of research and teaching, and to commercialize academic knowledge.

Work-based learning technique include encouraging people to reflect on their experience (Helyer, 2015); guidance by other workers and by experts; using mentors; demonstration and practice; simulation; task rotation and task variety; project work; and providing workers with problems to be solved (Billett, 2001; Boud, Keogh & Walker, 2013; Boud & Walker, 1998; Roberts, 2009). A successful WBL programme aligns academia with external drivers from the respective industry and society yet retain its reputation for quality assurance. Investment in the growth of anaesthesia workforce must consider the relevance of anaesthesia service provision to the need of healthcare sector, the population and economic prosperity. The current focus should be on developing a workforce with the appropriate skills

and knowledge for the provision of safe, affordable, and accessible anaesthesia to all surgical patients when needed.

Brain-based curriculum focuses on actor-centred adaptive decision making (Goldberg, 2001, p.71) which will enable the learner to seek answers and knowledge resulting from their needs and interests; without ignoring veridical decision making which relates to the facts, information and skills essential to anaesthesia practice. The brain learns best when attention and motivation are present, and real learning must also be exciting and meaningful. In addition, building relationships (the "contact urge" Gopnik et al., 1999, p. 23) and community, plays a critical role in learning.

The three critical elements for optimal mind/brain learning namely relaxed alertness, orchestrated immersion in complex experience, and active processing of experience (Caine, Caine, 2006) are the three pillars of a brain-based curriculum (Caine, Caine, McClintic & Klimek K, 2009, p. 21,113, 193). Relaxed alertness aims to create the optimal emotional climate for learning (Caine et al., 2009, p. 22). The first intervention for achieving relaxed alertness include reducing threat and enhancing self-efficacy because complex learning is enhanced by challenge and inhibited by threat associated with helplessness and fatigue (Bond, 2007; Saintonge, 2009). Secondly, engage social interactions because the brain/mind is social. Create a social relationship and personal connection with learners (mental state resonance) enhances learning (Siegel, 1999). Thirdly, engage the learners' innate search for meaning because this is the basis of intrinsic innovation and intrinsic motivation (Deci & Ryan, 2010). Fourthly, engage emotional connections which are critical to patterning (Dirkx, 2008).

Orchestrated immersion in complex experience requires creating optimal opportunities for learning (Caine et al., 2009, p. 114-116). In doing this, the intervention engages the learner's ability to perceive both parts and wholes because the brain/mind

processes parts and wholes simultaneously. In addition, engage the physiological in learning; engage their innate search for meaning; and acknowledge and engage developmental steps and shifts. The search for meaning occurs through patterning (Gopnik et al., 1999) and learning is developmental. There is a zone of proximal development where the capacity of the teacher matches the student's expanding capacity (Vygotsky, 1978).

The third pillar of brain-based learning is the active processing of experience which is by creating optimal ways to consolidate learning (Caine et al., 2009, p. 195). The interventions for achieving this is firstly by engaging the learners' capacity to learn from memorizing isolated facts and biographical events. The two approaches to learning by memorization are to store or archive isolated facts, skills, and procedures, while the other is to simultaneously engage multiple systems in order to make sense of experience. The second intervention is to engage both the learners' ability to focus attention and learn from the peripheral context. Thirdly, engage both conscious and unconscious processing. The unconscious aspects of the mind can have immensely powerful impact on how one thinks, feels, reacts, and behaves (Neville, 1989).

Learning can occur by reflection-in-action (Schon, 1983) otherwise known as reflective intelligence (Perkins, 1995). Fourthly, engage the learners' individual style and uniqueness because each brain is uniquely organized and some learners will exhibit creative intelligence, some analytic intelligence, and some practical intelligence (Sternberg, 1997).

Resolution WHA 68:15 and Universal Health Coverage

Universal Health Coverage (UHC) is defined as the desired outcome of health system performance whereby all people who need health services receive them, without undue financial hardship. In December 2012, a call by the United Nations General Assembly was made to all governments to "urgently and significantly scale up efforts to accelerate the

transition towards universal access to affordable and quality healthcare services" (United Nations General Assembly, 2013). UHC encompasses the three dimensions of who is covered (population coverage), what is covered (health-care benefits) and how much of the cost is covered (financial protection), all of which may expand over time (WHO report, 2010). Jimba, Cometto, Yamamoto, Shiao, Huicho & Sheikh, (2010) suggested that a focus on the goals namely, financial risk protection, equity in service use and quality of care, will require continuing political commitment and leadership to distribute available resources, especially human resources for health (HRH).

The World Health Assembly (WHA) in May 2015, passed Resolution 68:15, Strengthening Essential and Emergency Surgery and Anaesthesia as a component of Universal Health Coverage (WHO, 2015). The principle behind universal health coverage, that is equity and social justice was aimed at ensuring that all members of a society can access the health-care services they need without incurring financial hardship (Ooms, Brolan, Eggermont, Eide Flores, Forman, Friedman, Gebauer, Gostin, Hill, Hussain, McKee, Mulumba, Siddiqui, Sridhar, Van Leemput, Waris & Jahn, 2013; Savedoff, de Ferranti, Smith & Fan, 2012).

The resolution WHA 68.15 emerged following a train of other resolutions such as the resolution on quality of care (WHA 55.18); resolution on implementing the recommendations of the World report on violence and health (WHA 56.24); resolution on road safety and health (WHA 57.10); resolution on disability, including prevention, management and rehabilitation (WHA 58.23); resolution on health systems: emergency-care systems (WHA 60.22); also resolution on health workforce strengthening (WHA 64.6); resolution on the Prevention and Control of Non-communicable Diseases (WHA 66.10); resolution on antimicrobial resistance (WHA 67.25); and the resolution on strengthening of palliative care as a component of comprehensive care throughout the life course (WHA 67.19).

Resolution WHA 68.15 is all-inclusive because the surgical patient was included in any commitment and action that will ensure universal coverage, as outlined in the United Nations' sustainable development goal (SDG) 3.5. This implies that surgical and anaesthesia care are undeniably critical to strengthening healthcare systems worldwide and they are steadily gaining support from the World Health Organization (WHO) (Vaughan & Johnson, 2019). It also includes safe anaesthesia as being an indivisible and indispensable element of safe surgery, and both are a human right (Gore-Booth et al., 2018). To this end, perioperative mortality rate and surgical workforce density were listed amongst the key indicators in the WHO list of 100 Core Health Indicators (WHO, 2018). The World Health Assembly also made a commitment to regular progress reporting against the resolution in order to convert WHA 68.15 into action and measurable change (WHO, 2017; Gore-Booth et al., 2018).

However, workforce deficit is a primary hurdle to the implementation of WHA 68.15 and this is heightened by global medical brain drain (Tankwanchi, Vermund & Perkins, 2015;Thomas, 2016; Duvivier, Burch and Boulet, 2017), as well as the concentration of anaesthesiologists in urban centres and in private practice (Kalu et al., 2014; Henry et al., 2015; Gore-Booth et al., 2018; Schumann, Maaz & Peters, 2019). Although, equipment and medicines are important, they become useless in the absence of human resources. That is why workforce needs must be met first, both as a driver for change and as the essential resource to ensure that equipment and medicines are used appropriately and safely.

Numerous challenges to developing the anaesthesia workforce in LMICs have been documented. The major challenge in many LMICs is the tendency of Governments to undervalue anaesthesia (Li, 2014; Epui, 2017; Gore-Booth et al., 2018). In addition, the lack of salaries for anaesthetists in training makes it difficult for many doctors to develop careers in the anaesthesia specialty (Walker, Bashford, Fitzgerald & Wilson, 2014). It is now appreciated that emergency and essential surgical care and anaesthesia are efficacious and

cost-effective additions to the basic package of health services. Clearly, strengthening emergency and essential surgical capacity together with anaesthesia, particularly at the first-level referral hospitals, is a highly cost-efficient solution to the global burden of disease (Elkheir, Sharma, Cherian, Saleh, Everard, Popal & Ibrahim, 2014; Price, Makasa & Hollands, 2015; WHO, 2015; Vaughan and Johnson, 2019).

The National Surgical, Obstetrics and Anaesthesia Plan (NSOAP)

The National Surgical, Obstetrics and Anaesthesia Plan (NSOAP) is a response to the WHA 68.15 mandating countries to include emergency and essential surgical, obstetrics and anaesthesia care as integral component of Universal Health Coverage (Truché, Shoman, Reddy, Jumbam, Ashby, Mazhiqi, Wurdeman, Ameh, Smith, Lugazia, Makasa, Park & Meara, 2020). This resolution and mandate have been a wakeup call for the Federal Ministry of Health (FMOH) to act which led to the development of the 5-year (2019 – 2023) National Surgical, Obstetrics, Anaesthesia and Nursing Plan (NSOANP) for Nigeria (FMOH, 2019). The plan for Nigeria is the first plan to include nursing. The NSOANP is intended to be integrated into the National Strategic Health Development Plan and National Child Health Policy of 2018 to 2022, to ensure that emergency and essential surgical, obstetrics, anaesthesia and nursing care continue to be strengthened within the existing healthcare system.

Healthcare Policies are not new to Nigeria. Historically, in 1954, the Eastern Nigerian government articulated the overall national policy for Nationwide Healthcare Policy in its report on “Policy for Medical and Health Services” stating that the aim was to provide national health services for all (Scott-Emuakpor, 2010). The report was focused on developing rural health services since the urban services, at that time, was well developed. However, Healthcare planning in Nigeria dates to the 1940’s with The First Colonial

Development Plan from 1945 – 1955 (Decade of Development) and The Second Colonial Development Plan from 1956 – 1962. After independence in 1960, basic healthcare policy was followed with The First National Development Plan from 1962 – 1968; The Second National Development Plan from 1970 – 1975 (Ekundare, 1971); The Third National Development Plan from 1975 – 1980; The Fourth National Development Plan from 1981 – 1985; and Nigeria's Five Years Strategic Plan from 2004 – 2008 (Uche, 2019).

The NSOANP policy (FMOH, 2019) draws from the lancet commission's recommended surgical workforce density of 20 per 100,000 population. While Nigeria has only 1.65 per 100,000 population indicating a surgical workforce crisis, it plans to increase the surgical workforce density from 1.65 per 100,000 to 5 per 1000,000 by the year 2025. Ambitiously, training more physicians (specialists and non-specialists) and nurses from 2019 to 2025. This policy has attraction and retention strategies through SCAT-hands (Surgical care for all by trained hands). The targets are to increase residency training positions to 1000 per year and increase number of trained nurses by 50% which if successfully implemented will result in significant improvement in surgery and overall health for everyone. The NSOANP workforce objectives include:

> "Establishing training and education strategy based on population and needs of each State in Nigeria, this requiring a rural component of surgical and anaesthetic training programmes; developing a context-appropriate licensing and credentialing requirement for all surgical workforce; training and education strategy of ancillary staff based on peculiar need of each State; density and distribution of specialist surgical, anaesthetic, and obstetric providers; getting the number of surgical, anaesthetic and obstetric graduates and retirees; determining the proportion of surgical workforce training programmes accredited, and presence of task sharing or nursing" (FMOH, 2019).

Theoretical Framework for the Study

The theoretical framework for this study combines human capital theory and workforce analytics which are elements of human resource management with transformational change using an action research model of work-based learning.

Human capital was simplified by Pasban & Nojedeh (2016) to be anything but physical capital; and it refers to the education, skills, attributes, and capacity that enable employees to perform at the expected levels. The authors further stated that it displays an intrinsic talent that can change or moderate itself and other inputs. Several studies confirmed that human capital philosophy can affect the dynamism of the economy (Becker, 1996) and enhance innovativeness and financial performance measures (Selvarajan, Ramamoorthy, Flood, Guthrie, MacCurtain & Liu, 2007) thereby boosting the overall performance of an organization. Human capital is more than the ability and efficiency of people to transform raw materials and capital into goods and services, but it is the knowledge, skill, creativity, and health of the individual (Becker, 2002).

Human capital theory asserts that human resources is a key determinant of economic success in commercial and public organizations (Carmeli & Schaubroeck, 2005). Furthermore, it has been acknowledged that both training and workforce development are returnable investments (Antonaras & Dekoulou, 2019, p.186). In order to make a significant contribution to economic growth and development, formal education and training supported by investment in education are required (Schultz, 1971). Olaniyan & Okemakinde (2008) stated that "human capital theory emphasizes how education increases the productivity and efficiency of workers by increasing the level of cognitive stock of economically productive human capability, which is a product of innate abilities and investment in human beings". Kampelmann, Rycx, Saks & Tojerow (2018) found that firms' profitability (i.e. productivity-wage gap) rises when lower educated workers are substituted by higher educated ones (and

vice versa). The promoters of the theory consider that formal education is an investment in human capital, and it is equal to or more valuable than investments in physical capital (Fagerlind & Saha, 1997; Woodhall, 1997). From the economic point of view, both education and health care are keys to improving human capital together with the economic outputs of the nation (Becker, 1993).

Work-based training and education within the system of an organization will enhance productivity and result in workforce expertise (Zidan, 2001). In that context, investment in education equips individuals with knowledge and skills that improve their employability, increase productive capacities, and provide higher earnings in the future (Trostel, Walker & Woolley, 2002). Human capital development is important for development for its intrinsic value as a development goal (Cohen & Soto, 2007).

Workforce analytics provides answers to questions about how best to manage the workforce (Huselid, 2018). An inspiring quote by George Bernard Shaw states that, "The only person who behaves sensibly is my tailor. He takes new measurements every time he sees me. All the rest go on with their old measurements." The analysis of the current workforce is therefore necessary to begin the process of implementing any kind of change whether transactional change, transitional change, or transformational. Consequently, the temptation to use extant research to formulate new policies and plans must be avoided by HR practitioners (Marler & Boudreau, 2017; Rynes & Gulik, 2007; van der Togt & Rasmussen, 2017). In addition, having quality data alone is not sufficient for effective human capital analytics unless there is, according to Minbaeva (2018) the appropriate analytical competencies and the ability to act strategically. Likewise, the implementation of workforce analytics programs is bound to fail without first ensuring effective systems thinking and diagnostics (Levenson, 2018). Huselid (2018) suggests a focus on data for decision making instead of trying to measure everything.

Transformation change will require the appropriate leadership. The transformational leadership style was defined by Burns (1979, p. 21) as "the process through which leaders and followers help each other to advance to a higher level of morality and motivation". According to Armenakis, Harris & Field (1999), in order for transformational change to occur, the sentiments of the participants must be positively shaped by five key message change components. These are firstly, discrepancy, which is the believe that a change is required. Secondly, efficacy, which is the sentiment of confidence and the belief that the change recipient and the organization can successfully implement a change. Thirdly, is appropriateness, referring to agreement concerning the change, that a specific change designed to address a discrepancy is the correct one for the situation. Fourthly, is principal support from the organization and belief that the formal leaders are committed to the success of a change. The fifth component is personal valence, reflecting the belief that the change is beneficial to the change recipient; there is something of benefit in it for them (Armenakis & Harris, 2009). Armenakis & Harris (2001) believes that using a framework to craft the change message can help create transformational readiness.

Knowing that the Nigerian health system is weak, that the health workforce crisis is preventing optimal healthcare delivery (Adeloye, David, Olaogun, Auta, Adesokan et al., 2017); and that it suffers from inadequate number of skilled personnel (Lawan, Amole & Khayi, 2017), because large numbers of qualified health personnel continue to leave the country in reaction to poor service conditions and poor human capital development plans (Ojo, Ugochukwu & Obinna, 2011); while also acknowledging that there is inequity in the distribution of health human resources between urban and rural areas (Abimbola, Olanipekun, Schaaf, Negin, Jan & Martiniuk, 2017); and that this has further adversely affected the development of primary healthcare facilities and delivery of services (FMOH, 2011); calls for workforce planning and action.

The ability to act (Minbaeva, 2018) in a highly situational model based on an insider action research initiative is introduced using an understanding of and the potentials in the DA training programme. As previously stated, action researchers act as participants, taking the role of actors and agents of change as opposed to the role of detached observers seen in positivist science. The action research approach underpins the notion of the scholar-practitioners who integrates scholarship with practice in order to generate actionable knowledge, that is, knowledge that is robust for scholars and actionable for practitioners (Wasserman & Kram, 2009; Coghlan, 2013; Coghlan & Brannick, 2014). This idea, highlighted by Coghlan and Brannick (2014, p. 8) are captured as reflective-practitioner (Schon, 1983), the practitioner-researcher (Jarvis, 1999), and the manager-researcher (Coghlan, 2004); they are those who engage in science of action.

In work-based learning, theory and practice are acquired simultaneously (Raelin, 2008, p. 64). The epistemology of work-based learning derives from the view that knowledge and learning are always occurring, and they are a part of our everyday life thereby requiring active participation on the part of the learners. This view interprets the home and workplace as a location for learning apart from the conventional classroom. Raelin (2008) explained the process of WBL through a model that integrates two dimensions: (1) theory and practice modes of learning and (2) explicit and tacit forms of knowledge (p. 65). While theory makes sense through practice and practice makes sense through reflection as enhanced by theory, WBL blends theory and practice in order to optimize learning (p. 67). In other words, theory and practice are interlinked (Dick, Stringer & Huxham, 2009, p. 6). Thus, the intention of the teacher and the understanding of the student are best achieved through action.

Raelin (2008, p. 67) explained that explicit knowledge is transmittable in formal, systemic language in other words, it is declarative knowledge (Anderson,1983; Nickols, 2000, p. 13-14), a “knowing that” (Ryle, 1945, p. 6); while the knowledge that is not

reportable because it is based on action within a specific context is tacit in reference to Polanyi (1966, p.134), Pleasants (1996, p.249) and a “knowing how” (Ryle, 1945, p.128; Nickols, 2000, p. 13-14). The conventional learning methodologies are theory-based classroom experiences which rely on explicit knowledge; whereas WBL is achieved through observable model of tacit skills that can be followed and imitated until the actions becomes intuitive (Raelin, 2008, p. 68-69).

According to Raelin (2008, p. 70), firstly, WBL is effective for individual learning in that it can combine conceptualization (explicit/theory), reflection (explicit/practice), experimentation (tacit/theory) and experience (tacit/practice) thus providing a solid foundation for learning. Secondly, WBL is effective for collective learning in that it can combine applied science (explicit/theory), action science (explicit/practice), action learning (tacit/theory) and community of practice (tacit/practice) thus providing a solid foundation for team, group, and organisational learning.

Chapter 3: Research Design and Methodology

Purpose of the Study

The overall purpose of this study was to analyse the dynamics of the physician anaesthesia workforce crisis in the 36 States and the Federal Capital Territory of Nigeria; and to present the absolute number of practising anaesthetists including the consultants and trainees. The study determined the specialist anaesthesia workforce density and analysed the gap between the current workforce and the required workforce by the end of year 2030. The level of anaesthesia services available in each State, as well as the number and location of accredited hospitals for training physician anaesthetists in Nigeria were mapped.

Physician anaesthesia workforce contributes to the specialist surgical workforce density. This is the second (Indicator 2) of the six indicators proposed by the LCoGS (Table 7) and accepted by the World Bank as World Development Indicators (WDI).

Table 7: Description of Lancet Commission Global Surgical Indicators

Global surgical indicator	Description
Indicator 1: access to timely essential surgery.	Percentage of the population who can access, within 2 hours, a facility capable of performing the bellwether procedures (caesarean section, laparotomy, and open fracture management).
Indicator 2: surgical, anaesthesia and obstetric density.	Number of physicians proceduralist in surgery, anaesthesia or obstetrics per 100 000 population.
Indicator 3: surgical volume.	Total number of surgical cases per 100 000 population.
Indicator 4: perioperative mortality rate.	Deaths occurring after any surgical procedure and before discharge from hospital (%).
Indicator 5: risk of catastrophic expenditure due to need for surgical care.	Direct out-of-pocket costs from surgical care exceeding 10% of total income or 40% of remaining income after food and housing are accounted for.
Indicator 6: risk of impoverishment due to need for surgical care.	Direct out-of-pocket costs from need for surgical care resulting in falling below poverty line of US$1.25/day.

Source: Meara et al., 2015

The LCoGS recommended a surgical workforce density of at least 20 surgical, anaesthetic, and obstetric (SAO) specialists per 100,000 population by 2030 (Meara et al., 2015); while Davies et al. (2018) computed the required number of specialist anaesthetists (A) to be at least four physician anaesthesia providers (PAPs) per 100,000 population. This study provided an analysis of the anaesthesia workforce using high quality, timely and reliable data that was accessible to the insider researcher.

Finally, this study modelled a physician anaesthesia capacity building framework using the DA programme and brain-based learning principles at the Federal Medical Center, Abuja, which is a secondary level hospital in Nigeria. The following questions have been developed to address the problem and purpose of the study.

RQ 1: What is the physician anaesthesia provider workforce density per 100,000 population in Nigerian and in each of its 36 States/Territory?

RQ 2: What is the physician anaesthesia specialist workforce density per 100,000 population in Nigeria and in each of its 36 States/Territory?

RQ 3: Taking 4 anaesthetists per 100,000 population as the target, what is the gap between the current workforce densities and the recommended number of anaesthetists?

RQ 4: What are the main demographic features of physician anaesthesia workforce in Nigeria?

RQ 5: What are the major dynamic factors that contribute to this gap and what is the nature of the dynamic interaction between these identified factors?

RQ 6: Can a brain-based diploma in anaesthesia programme at a secondary level hospital (Federal Medical Centre) be a practical solution to the anaesthesia workforce crisis?

Description of the Study Population.

The population of interest was the physician anaesthetists in Nigeria who are medically qualified doctors and having additional qualifications in anaesthesiology. As the literature survey highlighted, there is a crisis of anaesthesia workforce and a risk of morbidity and mortality associated with lack of perioperative care for surgical patients especially in underserved countries like Nigeria (Soyannwo & Elegbe, 1999, 2000; Kempthorne, Morriss, Mellin-Olsen & Gore-Booth, 2017; Ottaway & Kabongo, 2017; Biccard, Madiba, Kluyts, Munlemvo, Madzimbamuto….African, 2018; Dare, Onajin-Obembe & Makasa, 2018).

While the research output on workforce has increased in recent years, no study has yet been performed to analyse the physician anaesthetists' crisis as it affects Nigeria; and no deliberate or strategic action taken to address it.

Design Overview and Specific Design Elements

This insider action research superimposed workforce analytics (Huselid, 2018; Minbaeva, 2018) and workbased learning (Raelin, 2008) described in Chapter 2 on participatory action research (Coghlan & Brannick, 2014, p. 55). Insider action research is not limited to one academic discipline, but it is a research approach which has emerged over a period of time from a diverse range of disciplines (Brydon-Miller, Greenwood & Maguire (2003); which can also be likened to a family of approaches (Reason & Bradbury, 2008, p. 7). With this research, I take a position presented by Johnson and Onwuegbuzie that the "research world is becoming increasingly interdisciplinary, complex, and dynamic; therefore, many researchers need to complement one method with another, and all researchers need a solid understanding of multiple methods used by other scholars to facilitate communication, to promote collaboration, and to provide superior research" (2004, p. 15). By taking a non-

purist position, this insider research is a “melange” of design components that addressed the research questions.

The use of a “mixed method design” (Johnson, Onwuegbuzie & Turner, 2007; Palinkas, Horwitz, Green, Wisdom, Duan & Hoagwood K, 2015) is my response to the call by other researchers for its use in implementation research (Proctor, Landsverk, Aarons, Chambers, Glisson, Mittman, 2009; Landsverk, Brown, Chamberlain, Palinkas & Horwitz, 2012; Palinkas, Aarons, Horwitz, Chamberlain, Hurlburt & Landsverk, 2011; Aarons, Hurlburt & Horwitz, 2011). In support of mixed methods design, is that using one methodological approach, will not do justice to performing an evidence-based implementation programme; neither will it do justice when implementing new and innovative practices, interventions and programs (Palinkas et al., 2015) that have similar complexities to anaesthesia workforce crisis and modelling of a DA programme. In this research, focus groups are used along with action research as part of a multi-method qualitative research design suggested by Eriksson and Kovalainen (2016, p. 183).

This insider action research began with a positivism standpoint by taking observation and measurement as the essence of scientific endeavor (Eriksson and Kovalainen, 2016, p. 19) to establish a universal truth about physician anaesthesia workforce in Nigeria. Thereafter, from quantitative numerical data on workforce, analyses were made in relation to the current national and state populations in other to comprehend the crises being studied. This study draws from action research based on the framework of Coghlan and Brannick (2014, p. 9-13) described in more detail below. The participants were selected for focus group and expert panel discussions as specified by Krueger and Casey (2015, p.21) for their richness in opinions, perceptions and ideas including their feelings about physician anaesthesia workforce in Nigeria.

Action research is defined as a form of collective, self-reflective enquiry undertaken by participants in social situations in order to improve the rationality, coherence, satisfactoriness or justice of their own social or educational practices, as well as the understanding of these practices and the situations in which these practices are carried out Carr and Kemmis (1986, p. 162). This definition, also amplified by Kemmis and McTaggart (1988, p. 5) is ideal for research in one's own organization (Coghlan & Brannick, 2014). According to Greenwood and Levin (2006), modelling action research is a "continuous and participative learning process so as to create sustainable learning capacities and give participants the option of increasing control over their own situation." As suggested by Kemmis and McTaggart, this research models the three attributes of participatory research which are shared ownership of research projects, community-based analysis of social problems, and an orientation toward community action (2005, p. 273). The approach in this research aligns with the inclination of Kemmis and McTaggart (2005) to think in terms of people working together to develop a greater collective capacity to change the circumstances of their own lives in terms of collective capacity building (p. 324).

The overall research design of the study demonstrates a proactive inquiry with people (participants and anaesthetists), rather than research on people (Eriksson & Kovalainen, 2016, p. 166; Herr & Anderson, 2015; Heron & Reason, 2001). It was chosen to initiate a reflective process of progressive problem solving; based on individuals working with others in teams or as part of a "community of practice" to improve the issues and solve problems (Stringer, 2013). Coghlan and Brannick, (2014) states that action research aims to both take an action and create knowledge or theory about that action as the action unfolds; thus, leading to an action and a research outcome, unlike traditional research approaches which aim at creating knowledge only. Consequently, I model the DA programme as an action research, which was appropriately defined by Reason & Bradbury (2008, p.1) as "a participatory, democratic

process concerned with developing practical knowing in the pursuit of worthwhile human purposes, grounded in a participatory worldview".

MacDonald (2012) considers that participatory action research (PAR) is a subset of action research, while Gaffney (2008) suggested that it is described in the same way as action research with little to distinguish the two. Gillis & Jackson (2002, p. 264) referred to PAR as the "systematic collection and analysis of data for the purpose of taking action and making change" by generating practical knowledge. PAR has been used in educational research and learning and knowledge acquisition (Brydon-Miller & Maguire, 2009; Streck, 2014; Strode, 2015; Jacob, 2016; Serpa, Ferreira, Santos & Teixeira, 2018); and also used in promoting social change and solving problems (Selenger, 1997; McNicoll, 1999; Morris, 2002; Koch & Kralik, 2006; Savin-Baden & Wimpenny, 2007; Lykes & Mallona, 2008. PAR is increasingly being used as an approach, a research design, and an action methodology (McTaggart, 1991; Gillis & Jackson, 2002; Marshall & Rossman, 2006; Kesby, Kindon, & Pain, 2007; Chevalier & Buckles, 2013). Gaffney (2008) called attention to the use of PAR as an acronym by Kemmis and McTaggart to remember the process namely **P**lanning a change, **A**cting and observing the process and consequence of change, **R**eflecting on these processes and consequences, and then re-planning, acting and observing, reflecting, and so on …(2000, p. 595).

Brydon-Miller, Greenwood and Maguire (2003), in their maiden editorial of the journal "Action Research", believes that action research is emerging and is in the process of making history. They observed that common to the editorial board members is a "profound dissatisfaction with where they are" and referred to Ortrun Zuber-Skerritt statement that, "we should not leave a paradigm unchallenged simply because it is dominant". (Zuber-Skerritt & Farquhar, 2002, p. 103). Thus, this research shares a similar commitment to democratic social change (Brydon-Miller, Greenwood & Maguire, 2003) having a specific action (dealing with

the crisis) as its goal (Greenwood & Levin, 2007; McNiff & Whitehead, 2011), as well as an appeal to clinicians and providers working in practice environments because it translates swiftly into action so that transformative change can be observed during the process of research (Koch & Kralik, 2006, p. 24).

Therefore, action researchers take action (Coghlan & Brannick, 2014, p. 47). Although, “action research” was coined in 1944 by Kurt Lewin, it has become more robust, celebrating diversity in research, and generating interesting discourse. It does more than "leading to social action" and involves more than "a spiral of steps composed of a circle of planning, action and fact-finding" that was described in 1946 by Lewin (Lewin, 1997; 1946, p. 38). As articulated by Reason and Bradbury (2008), action research offers an interactive inquiry process that balances problem solving actions, implemented in a collaborative context with data-driven collaborative analysis or research, to understand underlying causes enabling future predictions about personal and organizational change which is an objective of this study.

Since this research involves an insider, it is opportunistic (Coghlan & Brannick, 2014, p. 122); and is “involving researchers as natives and actors, immersed in local situations generating contextually embedded knowledge which emerges from experience” (Coghlan & Brannick, 2014, p. 4). Borrowing the expression of Goffman (1959) used by Coghlan & Brannick, this study takes advantage of “back-staging” which is knowing organizations from the inside, “where public access is restricted” and “actors can drop their public persona as opposed to the ‘front region’, where performance is public for the benefit of the client or customer” (2014, p. 4).

Shani and Pasmore (2010[1985], p. 249), underscores action research as “an emergent inquiry process in which applied behavioral science knowledge is integrated with existing organizational knowledge to solve real organizational problems” and as “an evolving process

undertaken in the spirit of collaboration and co-inquiry *(*p. 439); also referred to as co-generation of knowledge (Bergold & Thomas, 2012; Koch & Kralik, 2006; Reason & Bradbury, 2001; Streubert & Carpenter, 2011; Young, 2013)**.** The outcome is envisioned to enhance practices and address the issue of anaesthesia workforce crises. Together with a group of participants at the Federal Medical Center, Abuja, the process adds value to this research by involving investigation through activity rather than theoretical response.

Action Research Methodology

For this study, rather than using the simple Stringers (2013) look, think, act or the more complex Bell's joint action planning, feedback, further data-gathering, diagnosis and action of an external consultant (Bell, 1998); I selected the more practical action research cycle described by Coghlan and Brannick comprising of pre-step (context and purpose), and four basic steps – constructing, planning action, taking action and evaluating action (Coghlan & Brannick, 2014, p. 9-11). This is illustrated in Figures 6 & 7. As an action researcher, I identify practical problems and generate potential solutions.

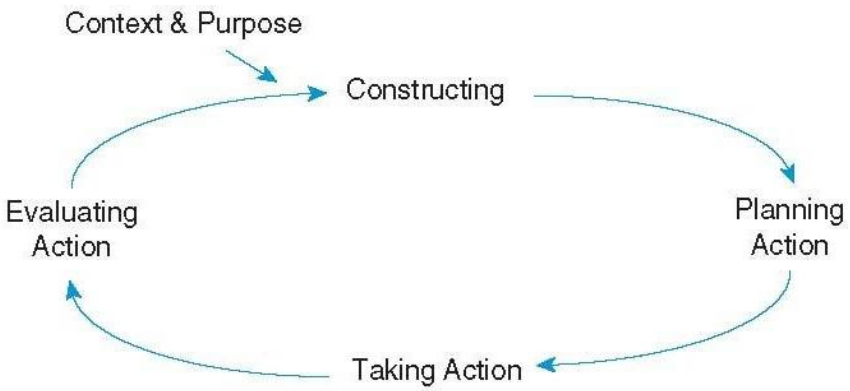


Figure 6. The Action Research Cycle

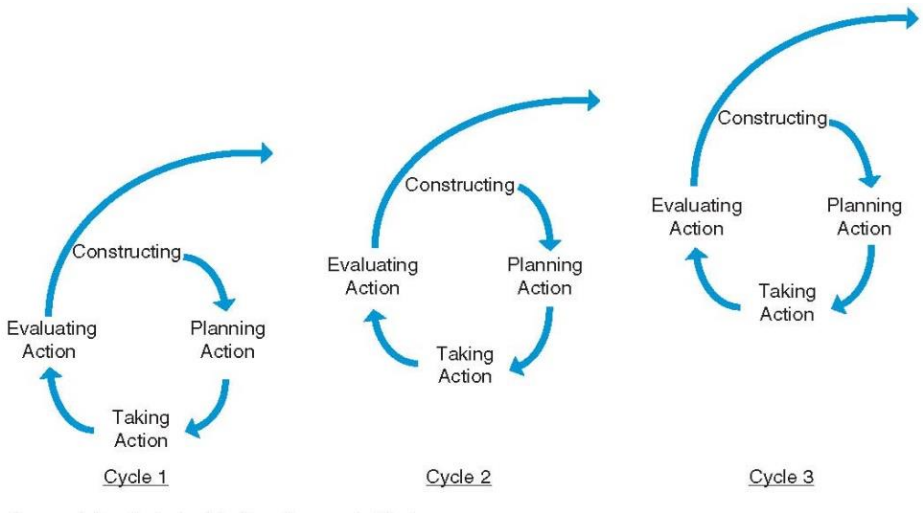


Figure 7. Spiral of Action Research Cycles

Focus Group and Panel Discussion

Since one of the purposes of this study was to find out the major dynamic factors that contributed to the anaesthesia workforce gap and the nature of the dynamic interaction between these identified factors, an expert focus group and panel discussion were chosen. In addition, a focus group was used to obtain feedback from the anaesthetists after completing the first brain-based diploma in anaesthesia programme at the Federal Medical Centre, Jabi. According to Krueger and Casey (2015, p. 2), a focus group is a special type of group in terms of purpose, size, composition, and procedures. While the panel discussion provided an in-depth understanding of anaesthesia workforce gap, the focus provided an evaluation of the model programme in the study. The focus group research method came into vogue after World War II and has been used in a variety of settings over the years (Merton, Fiske & Kendal, 1956; Kamberrelis & Dimitriadis, 2014; Stewart & Shamdasani, 2015; Eriksson & Kovalainen, 2016, p. 181).

A focus group design is a socially oriented research method which captures real-life data in a social setting and is particularly useful for achieving social change. Non-directive interviewing places the researcher in a less dominating role thereby allowing the respondents to comment on the areas they thought were most important (Krueger & Casey, 2015, p. 3).

Advantages of the Chosen Methods

Action research allows deliberate action to be taken to support the inquiry, as well as provide the opportunity for insights (Coghlan & Brannick, 2014, p. 3). It brings together action and reflection, theory, and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people, and more generally the flourishing of individual persons and their communities (Reason & Bradbury, 2008, p. 1).

It encourages creativity and democratic participation, as well as the use of a combination of analytical, investigative, and evaluative methods designed not only to diagnose or analyse but to also solve problems. Elliott (1991) cited action research as "a form of creative resistance because it transforms rather than simply preserves the old professional craft culture of teachers" (p. 49). Furthermore, the participants are in a real-world setting and have active roles unlike traditional research which involves participants only during the data collection stage.

The insider researcher is also a participant, taking the dual role of an actor and an agent of change as opposed to the role of a detached observer in positivist science. The action research approach underpins the notion of the scholar-practitioners, reflective-practitioner (Schon, 1983), the practitioner-researcher (Jarvis, 1999), and the manager-researcher (Coghlan, 2004) who integrate scholarship into their practice and generate actionable knowledge (Wasserman & Kram, 2009; Coghlan, 2013).

Brydon-Miller et al. (2014) quoted Elizabeth Kasl experience of the “transformative power of participatory processes as launched by students in course practicum projects and dissertation work”. Working collaboratively with others leads to community and organizational transformational changes (Bradbury, Waddell, O’ Brien, Apgar, Teehankee & Fazey, 2019; Fazey, Schäpke, Caniglia, Patterson, Hultman, van Mierlo & Wyborn, 2018), and also to personal changes in the action researcher because knowledge comes from doing (Bradbury-Huang, 2010; Bradbury, 2015; McTaggart, 1991). The insider action research demonstrates respect for people and for the knowledge and experience they bring to the research process (Brydon-Miller, Greenwood & Maguire, 2003).

Those who practise action research have a high sense of commitment towards developing more effective strategies and methods to promote social justice (Bradbury, 2015). Brydon-Miller, Greenwood and Maguire, (2003) suggested that action research is not merely about ‘doing good’, it is also about doing things well. The authors, Brydon-Miller et al. (2003) and Bradbury (2015) claimed that research conducted without a collaborative relationship with relevant stakeholders is likely to be incompetent. In the same mind, Lifvergren and Zandee (2017) realised that without involving all stakeholders in the redesign of a complex system such as healthcare, then meaningful transformation will be daunting. Fazey et al. (2018) believes that action-oriented knowledge creation is useful in addressing sustainability crises. Action research therefore provides a methodology in which the chasm between expert knowledge and stakeholder participation is overcome. Brydon-Miller et al. (2003) stated that the respect action researchers have for the complexity of local situations and for the knowledge people gain in the processes of everyday life makes it impossible to ignore what the ‘people’ think and want.

The focus group approach provided the advantage of flexibility. It has high face validity, meaning that it measures what it is intended to measure. In addition, it has a cost

benefit advantage because it generates quick results but cost little to conduct. The advantage of focus group dynamics over individual interviews is that it brings out aspects of the topic, as well as reveal information that may not be evident or anticipated by the researcher.

Materials and Data Collection

The research, which involved quantitative data in workforce analytics and qualitative, inductive, insider action research approach, was undertaken in three phases.

Workforce analytics

In phase one, data was derived from the combination of five data sources for the estimation of workforce numbers, establishing a profile of the anaesthesia workforce and assessing its adequacy. The data provided the following information on the physician anaesthetists: age group, gender, additional qualifications, hospital, and state/geographical location of listed physicians. Additional qualifications are an important measure of anaesthetists' human capital and is commonly requested for by employers of medical specialists nationally and globally. Phone calls and WhatsApp communications were used to get information on anaesthetists who were no longer in service by September 2019. The five data sources are as follows:

1. The NSA 2016 directory was mined for the data on all physician anaesthesia providers.
2. The National Postgraduate Medical College of Nigeria (NPMCN) provided data (September 2019 edition) on specialists' anaesthetists in Nigeria who are fellows of that college.
3. The Medical and Dental Council of Nigeria (MDCN) which is the agency responsible for registration of all medical doctors and specialists in Nigeria

provided the number of doctors who have registered their additional qualifications in anaesthesia with the MDCN as of December 2018.

4. The names of Nigerian anaesthetists with the Fellowship of the West African College of Surgeons was retrieved from the college website.
5. Personal communications by phone and email with the registrar of the MDCN, the chair and secretary of the Faculty of Anaesthesia of the NPMCN and with heads of anaesthesia departments in teaching hospitals provided the most up to date data.

Diploma in Anaesthesia Action Research

In phase two, action research was performed following Coghlan and Brannicks's framework published in their book 'Doing Action Research in Your Own Organization. Purposeful sampling was used. The participants were chosen because they were doctors in the set of 2018 DA programme while the consultant anaesthetists were selected because they were full staff or visiting faculty involved in training at the department of anaesthesia of the Federal Medical Center (FMC), Abuja. The sampling was characterized by homogeneity, but variation was noted for contrasting opinions and gender differences (male vs female). This involved a total of eight participants (actors) at the FMC, Abuja which was a real-world setting (Eriksson & Kovalainen, 2016, p. 165).

The Coghlan and Brannicks's framework has two research cycles. The first cycle is the core action research cycle, and the second cycle is the thesis action research (or reflection cycle), also termed as meta-learning. The first cycle comprised of a pre-step (context and purpose), and four basic steps – constructing, planning action, taking action, and evaluating action (Coghlan & Brannick, 2014, p. 9). Constructing involves a dialogic and collaborative activity of naming or framing issues that will serve as basis for the action to be planned, implemented, and evaluated (Coghlan & Brannick, 2014, p. 10).

Planning the action was the collective preparation by the consultants and management of FMC, Abuja for accreditation of the anaesthesia department. Taking the action included the accreditation visit and the brain-based curriculum, the work-based learning (operating room-based learning) DA programme and examination. Evaluating action was performed on completion of the DA examination. A focus group discussion was used for sharing the participants personal experiences and feedback on the programme as well as recommendations for improving and expanding the programme. The participants were encouraged to share their work experiences during the DA training period.

The second cycle was an inquiry-in-action into how the core action research project was planned, executed, and evaluated and how the researcher, as a manager, enacted her role in the project and reflected on it thereafter. The action research drew from the expertise of the researcher, and the environment (FMC, Abuja) in which the research was undertaken (Krueger & Casey, 2015). Essentially, an insider action researcher is pursuing a first, second, and third person research. The first-person research is for the purpose of personal and professional growth while that of the second person is a collaborative work with organizational members on a specific action project. The third person research is aimed at generating contribution to knowledge inferred from experience.

Focus group and Panel Discussions

The phase 3 of this action research were the fact-finding inquiries to address the major dynamic factors that contributed to physician anaesthesia workforce gap and the nature of the dynamic interaction between these identified factors. In order to have a coordinated response, the participants were intentionally invited to the 26th Nigerian Society of Anaesthetists (NSA) annual conference held at Port Harcourt, Nigeria in November 2018.

Table 8: Strategic Stakeholders Focus Group

Name of Strategic Stakeholder	Profile
Cmdr. (Rtd) Olaniyi Oladapo	President of the West African Confederation of Societies of Anaesthetists, Former Coordinator, School of Anaesthetic Studies, General Hospital, Badagry, Examiner in Faculty of Anaesthesia
Prof. Eniola Elegbe	Professor of Anaesthesiology, President, Nigerian Society of Anaesthetists (2008 to 2012), Examiner Faculty of Anaesthesia
Prof. Olaitan Soyannwo	Professor of Anaesthesiology, Member, Board of Trustees of the Nigerian Society of Anaesthetist
Dr. Shuaib Belgore	Senior Technical Adviser representing the State Federal Minister of Health, Dr. Osagie Ehanire (the Patron of the Nigerian Societhy of Anaesthetists)
Dr. Olubusola Alagbe-Briggs	Head, Department of Anaesthesiology, University of Port Harcourt Teaching Hospital, Nigeria

The first inquiry was a strategic focus group discussion with five stakeholders held in the morning of 21st November 2018. This included four anaesthesia experts who were also examiners and trainers and one senior technical adviser representing the Federal Minister of Health (Table 8).

The second inquiry was held in the second session on the same day with a panel discussion amongst a set of seven high-level stakeholders (Table 9). Both inquiries were video recorded and transcribed. The moderator was the insider researcher who is also a Consultant Anaesthesiologists and the President of the Nigerian Society of Anaesthetists (2014 – 2018), thus demonstrating the spirit of participatory action research, which is a proactive inquiry with people, rather than research on people (Eriksson & Kovalainen, 2016, p. 166; Herr & Anderson, 2015; Heron & Reason, 2001).

Table 9: High-Level Stakeholders Panel

Name of Strategic Stakeholder	Profile
Prof Opubo B. da Lilly-Tariah	Professor of Oto-Rhino-Laryngology, President, National Postgraduate Medical College of Nigeria, Faculty Examiner.
Prof. King David T. Yawe	Professor of Surgery; President, West African College of Surgeons (2016 – 2018).
Dr. Udugbai Ilevbare	Deputy Registrar, Medical and Dental Council of Nigeria.
Dr. Shuaib Belgore	Senior Technical Adviser representing the Honorable Federal Minister of State for Health, Dr. Osagie Ehanire (the Patron of the Nigerian Society of Anaesthetists)
Dr. Tola Olatosi	Secretary General (2015 – 2018), West African College of Surgeons; Consultant Anaesthesiologist.
Magor General Shina Ogunbiyi	Consultant Anaesthesiologists; President, Critical Care Society of Nigeria (CCSN).
Prof. Emmanuel Ameh	Consultant Paediatric Surgeon; Committee Co-Chair, National Surgical, Obstetrics, Anaesthesia and Nursing Plan (2019 – 2023) for Nigeria.

Data Processing and Analysis

Triangulation between the various data sources was used to support the credibility of workforce analytics. These data provided the best estimates of the total workforce size and relevant information namely demographic data, work status information, and workforce location. Secondary data on the general population and distribution per state published by the Federal Bureau of Statistics and National Population Commission (NPC) of Nigeria (NPC, 2006) was used to calculate the workforce density. The data was analysed using Microsoft Excel Spreadsheet. The training capacity for physician anaesthetists was assessed via analysis

of available accredited hospitals and honorary anaesthesia consultants within the hospitals. Mapping of workforce and hospitals was done using editable maps from SlideModel.com.

Insider action research is an inductive process, therefore meta-learning of reflecting on the action research cycles and its implementation can lead to the emergence and development of a theory. This reflection on reflection allows action research to go beyond mere problem solving but to provide meta-learning, i.e., learning on learning (Coghlan and Brannick 2014, p. 12). The meta cycle of inquiry includes reflections on: (1) the content of what is being constructed, planned, acted and evaluated; (2) the process of how the action plan is constructed, planned, implemented, and evaluated; (3) the premise or underlying principles governing attitudes and behavior (Figure 8).

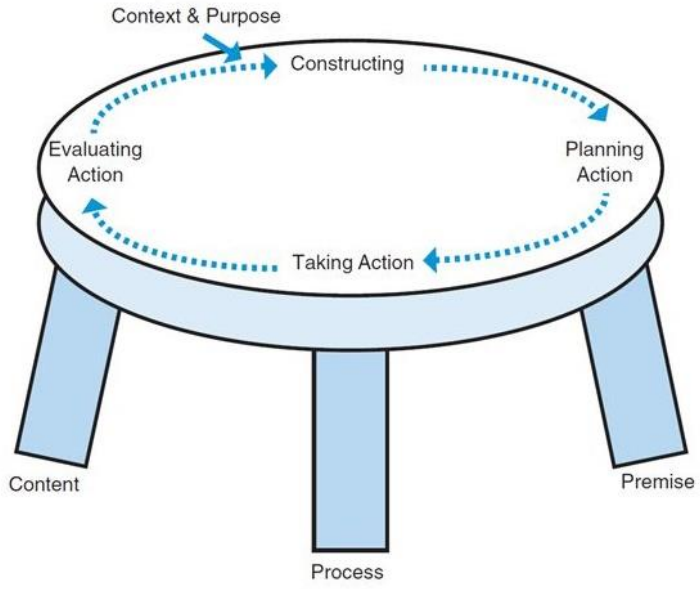


Figure 8. Meta-cycle of Action Research

Source: Doing Action Research in your own Organization (Coghlan & Brannick, 2014, p. 13).

Validity and Reliability

Brydon-Miller, Greenwood and Maguire (2003) suggested that action research meets criteria of validity testing more effectively than do most other forms of social research. The results are deemed 'valid' because expert research knowledge and local knowledges were combined. This was why the interpretation of the results and the design of actions based on those results involved the local stakeholders who are best positioned to understand the processes. Therefore, amongst the social sciences, action research has the best prospects in facing the combined demand for rigor and relevance (Greenwood & Levin, 2008; Levin & Greenwood, 2011).

Rigor was based on quality because action research is conducted in the present tense and choices were made following reflection. Contributing to the quality of this research was the excellent cooperation between the action researcher, consultant anaesthetists and the management of the FMC. This is important because, action research is seen as a strategy that aims at solving pertinent problems where problem owners and engaged researchers learn together and reflect in the same co-generative process (Greenwood & Levin, 1998, 2007). This action research was performed in close collaboration with the research participants (co-actors and anaesthetists) and it was a situation of practical problem solving (anaesthesia workforce development). Insider research or inquiry from the inside involves researchers as natives and actors, immersed in local situations generating contextually embedded knowledge which emerges from experience (Coghlan & Brannick, 2014, p. 4). Action research meets the test of action, something generally not true of other forms of social research.

The practice of experiential focusing (Gendlin, 1981, p.16), reflecting (Raelin, 2008, p. 74), interpreting, and taking action by the participants enhanced the quality of this research (Coghlan & Brannick 2014, p. 23,60). This enabled the anaesthesia team to be reflective and collaborative as part of its identity as interiority served as the key to combining practical and

scientific knowing in action research (Coghlan, 2011). The authenticity of action research is fulfilled through the process imperatives of being attentive, intelligent, reasonable, and responsible (Coghlan & Brannick 2014, p. 179). The critical skill of reflection by the action researcher, is a critical link between the concrete experience, the judgment and taking action (Coghlan & Brannick 2010, p. 25).

The collective interest in making the Federal Medical Center, Abuja relevant for the training of anaesthetists made the action research highly significant to the top management. This study takes advantage of back-staging, that is knowing organizations from the inside, where public access is restricted and actors can drop their public persona as opposed to the 'front region', where performance is public for the benefit of the client or customer (Goffman,1959; Coghlan & Brannick, 2014, p. 4). Although, the insider researcher had a deep political and emotional engagement in her field, the fact that she was able to function as a critical and reflective researcher, as well as create a critical distance to experiences from the field (Levin, 2012), in this case the Federal Medical Center, Abuja contributed to the integrity of this study.

This research is not a one-off project but part of creating the future of anaesthesia workforce in Nigeria. While conventional researchers worry about objectivity, distance, and controls, action researchers are concerned about relevance, social change, and validity tested in action by the most at-risk stakeholders. According to Coghlan (2011), generality and theory generation is a requirement for internal validity in action research therefore this study derived some implications for the DA programme which can be applied to start-up other training programmes for all Medical Centres in Nigeria.

Assumptions

The number of physician anaesthesia providers (PAP) for low- and middle-income countries was taken as 4 per 100,000 population (Davies, Vreede, Onajin-Obembe & Morriss, 2018).

Gap = Desired workforce density - Current workforce density.

Workforce densities derived using NSA 2016 directory = (No. of Workforce ÷ population in 2006) × 100,000.

Where 2006 national population = 140,431,790. The 2006 States population is taken from the same source (http://nigeria.opendataforafrica.org/ifpbxbd/state-population-2006).

Workforce densities derived using NPMCN 2019 data = (No. of Workforce ÷ population in 2019) × 100,000.

Where 2019 population = 199,370,289 (March 2019 World Review).

Limitation of the Study

The creativity and flexibility of this study, although an advantage, may also be a disadvantage because the insider-researcher, as part of the profession, may find it difficult to stand back to assess and critique it. Nielsen and Repstad (1993), share examples of insider-researcher experience and preunderstanding as knowledge of the everyday life and everyday jargon, knowledge of legitimate and taboo phenomena of what can be talked about and what cannot, what occupies colleagues' minds, how the organization works, and who to turn to for gossip. Coghlan and Brannick (2014, p. 134) advised to be in tune with one's own feelings to know where one's feelings of goodwill or frustrations are directed.

In addition, being close to data, the insider-researcher may assume too much and not probe as much as an outsider who is ignorant of the situation. It is important to retain an awareness of other people's perspectives, their definitions, and understandings; as well as

allow for alternative reframing of the current thinking. This can be done through epistemic reflexivity, which is constant analysis of one's lived experience, as well as one's theoretical and methodological assumptions. Coghlan and Brannick (2014, p. 136) suggest journaling is an important mechanism for learning to reflect on and gain insights into your own preunderstanding.

The potential challenges of the study are that the ownership of the story may be contested and consent for the researcher to share the story may be queried. However, the agreement of the participants to be video recorded implies legitimate consent and ensures that the voice of the participants was heard and preserved.

Focus group discussions has less control over the session when compared with individual interviews. The data may proof difficult to analyse. Getting relevant information requires moderators' skills and the groups may be troublesome. Being president of a professional society, doing an executive PhD in international management, having taught change management to undergraduate management students in Paris, and now carrying out an insider research in one's own organization enabled the development of excellent moderator skills. The combination of participatory action research with focus group and expert panel approach may sufficiently offset some of the limitations. Furthermore, qualitative research is not a linear activity but is associated with correcting, revising, reviewing, and changing many parts of the research elements. This is like a circular process, referred to as circularity. An awareness that going back and forth is essential in qualitative research so that the researcher can arrive at linking the empirical material with the focus of the study and the context. In addition, reflexivity, that is reflecting on the whole research process including the interpretations during the process and the positions taken, helps to establish the validity of the accounts of the phenomena studied (Schwandt, 2001).

Ethical Assurance

The researcher did not require a formal consent for carrying out action research at the Federal Medical Centre, Abuja because it was a participatory process aimed at transformative change. Secondly, this is a natural work environment and the doctors are involved in their normal duties and responsibilities concerning the training programme and the insider researcher does not need approval to do her job. Thirdly, a waiver of consent is increasingly common around the world in insider action research, as well as in observational research involving time-sensitive events. Fourthly, action research is a low risk intervention. Furthermore, the doctors will receive the current work-based training and are involved in learning together. All stakeholders are willing participants and are eager to see a transformation in the anaesthesia workforce. Finally, all stakeholders willingly submitted their profile and pictures via emails, as well as gave informal consent and willingly allowed video recordings of the discussions. However, approval from the ethics committee will be required for the findings to be published in a journal.

Summary

The purpose of this mixed method insider research is to analyse the physician anaesthesia workforce crisis in Nigeria using workforce analytics (Huselid, 2018; Minbaeva, 2018). It is also to model a work-based (Raelin, 2008) anaesthesia training programme using a brain-based curriculum (Caine, Caine, McClintic & Klimek K (2009) that will lead to additional qualifications in anaesthesia, that is the award of the diploma in anaesthesia of the West African College of Surgeons. This is an insider action research based on the framework of Coghlan and Brannick (2014) with the involvement of participants in transformational changes (Bradbury, Waddell, O' Brien, Apgar, Teehankee & Fazey, 2019; Fazey, Schäpke, Caniglia, Patterson, Hultman, van Mierlo & Wyborn, 2018) and co-generation of knowledge

(Bergold & Thomas, 2012; Koch & Kralik, 2006; Reason & Bradbury, 2001; Streubert & Carpenter, 2011; Young, 2013).

Chapter 4: Findings of the Study

Introduction

This chapter analyses the results of the data collected to address the research questions. First, the results of the NSA 2016 directory are analysed to provide a snapshot of the absolute number of practising anaesthetists including the consultants and trainees in the 36 States and the FCT of Nigeria. This chapter presents the results of specialist anaesthesia workforce density calculated based on the NSA 2016 directory and the most detailed and complete National and State population data (http://nigeria.opendataforafrica.org/ifpbxbd/state-population-2006). The gap between the States, Zones, and National 2016 workforce densities relative to the desired workforce densities by the end of year 2030 are calculated. The level of anaesthesia services available in each State, as well as the number and location of accredited hospitals for training physician anaesthetists in Nigeria are listed and mapped out.

Then, the data from the Medical and Dental Council of Nigeria (MDCN) is presented showing the number of doctors who have registered their additional qualifications in anaesthesia with the MDCN as of December 2018. In addition, the results of the most current (September 2019) specialist anaesthetists' data from the National Postgraduate Medical College of Nigeria (NPMCN) are analysed. Email and phone call on the anaesthesia workforce are used to retrieve relevant additional information and data.

The findings from the Strategic Stakeholders focus group and the High-level Stakeholders Panel provide insights into the major dynamic factors that contribute to the PAP gap and the nature of the dynamic interaction between these identified factors. The findings of the Diploma in Anaesthesia action research are analysed using the Action Research Framework of Coghlan and Brannick (2014). The findings of the first cycle (core action research cycle), and the second cycle (thesis action research/ reflection cycle), are presented.

The first cycle describes the pre-step (context and purpose), and four basic steps – constructing, planning action, taking action, and evaluating action (Coghlan and Brannick, 2014: 9). Finally, the results of the DA examination and feedback from the anaesthesia diplomates are presented.

Results of the Main Study and Answers to Research Questions 1 to 4.

RQ 1: What is the ***physician anaesthesia provider*** workforce density per 100,000 population in Nigerian and in each of its 36 States/Territory?

The physician anaesthesia providers include all the grades of medical doctors providing anaesthesia services in the hospitals captured in the 2016 Nigerian Society of Anaesthetists Directory. The physician anaesthesia provider (PAP) workforce density based on a total of 717 physician anaesthetists captured in the NSA 2016 directory and the population figure of 140,431,790 (2006) is ***0.51 PAP per 100,000 population***. The PAP workforce density per State and Regions is shown in tables 10 to 15; while Figure 9 shows the comparison of the densities of physician anaesthesia providers across the 6 geopolitical zones.

Table 10: Physician Anaesthesia Provider workforce density per State in the North Central Zone of Nigeria

North Central (NC) Zone	Population	No of PAPs	Density per 100,000
Benue State	4,253,641	5	0.12
Kogi State	3,314,043	10	0.30
Kwara State	2,365,353	6	0.25
Nasarawa State	1,869,377	12	0.64
Niger State	3,954,772	3	0.08
Plateau State	3,206,531	20	0.62
FCT	1,406,239	63	4.48
Total	20,369,956	119	0.58

Without the FCT, the NC zone has a PAP density of 0.34 per 100,000 population.

Table 11: Physician Anaesthesia Provider workforce density per State in the North Eastern Zone of Nigeria

North Eastern Zone	Population	No of PAPs	Density per 100,000
Adamawa State	3,178,950	1	0.03
Bauchi State	4,653,066	3	0.06
Borno State	4,171,104	6	0.14
Gombe State	2,365,040	10	0.42
Taraba State	2,294,800	1	0.04
Yobe State	2,321,339	0	0.00
Total	18,984,299	21	0.11

Table 12: Physician Anaesthesia Provider workforce density per State in the North Western Zone of Nigeria

North Western Zone	Population	No of PAPs	Density per 100,000
Jigawa State	4,361,002	2	0.05
Kaduna State	6,113,503	24	0.39
Kano State	9,401,288	28	0.30
Katsina State	5,801,584	1	0.02
Kebbi State	3,256,541	3	0.09
Sokoto State	3,702,676	13	0.35
Zamfara State	3,278,873	1	0.03
Total	35,915,467	72	0.20

Table 13: Physician Anaesthesia Provider workforce density per State in the South Eastern Zone of Nigeria

South Eastern Zone	Population	No of PAPs	Density per 100,000
Abia State	2,845,380	16	0.56
Anambra State	4,177,828	10	0.24
Ebonyi State	2,176,947	15	0.69
Enugu State	3,267,837	47	1.44
Imo State	3,927,563	28	0.71
Total	16,395,555	116	0.71

Table 14: Physician Anaesthesia Provider workforce density per State in the South-South Zone of Nigeria

South-South Zone	Population	No of PAPs	Density per 100,000
Akwa Ibom State	3,902,051	16	0.41
Bayelsa State	1,704,515	7	0.41
Cross River State	2,892,988	26	0.90
Rivers State	5,198,716	66	1.27
Delta State	4,112,445	17	0.41
Edo State	3,233,366	53	1.64
Total	21,044,081	185	0.88

Table 15: Physician Anaesthesia Provider workforce density per State in the South Western Zone of Nigeria

South Western Zone	Population	No of PAPs	Density per 100,000
Ekiti State	2,398,957	1	0.04
Lagos State	9,113,605	122	1.34
Ogun State	3,751,140	17	0.45
Ondo State	3,460,877	4	0.12
Osun State	3,416,959	25	0.73
Oyo State	5,580,894	35	0.63
Total	27,722,432	204	0.74

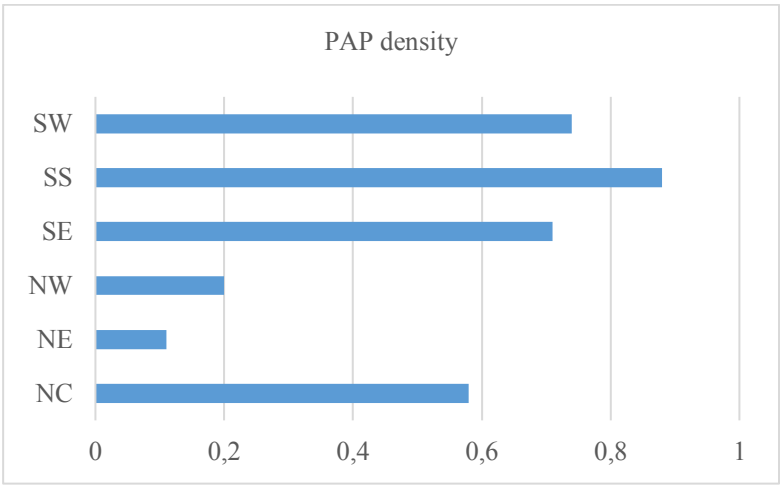


Figure 9. Comparison of the densities of Physician Anaesthesia Providers across the 6 geopolitical zones of Nigeria

RQ 2: What is the ***physician anaesthesia specialist*** **(PAS)** workforce density per 100,000 population in Nigeria and in each of its 36 States/Territory?

The registration trend of PAS with the Medical and Dental Council of Nigeria (MDCN) is shown in Table 16. The categories of Physician Anaesthesia Providers with additional qualifications (specialists) recognised and registered by the MDCN at the end of December 2018 and the workforce density using the most current population (March 2019 World Review) is shown in Table 17. The physician anaesthesia specialist (PAS) workforce density based on the number of specialists in the NSA 2016 directory and the population figure of 140,431,790 (2006) is 0.14 PAS per 100,000 population. The PAS workforce density per State and Zones is shown in Tables 18 to 23.

Table 16: The Registration Trend of Physician Anaesthesia Providers by the MDCN from 1960 to December 2018

Period	No of PAP registered
1960 - 1964	1
1965 - 1969	2
1970 - 1974	2
1975 - 1979	0
1980 - 1984	2
1985 - 1989	2
1990 - 1994	27
1995 - 1999	44
2000 - 2004	18
2005 - 2009	41
2010 - 2014	58
2015 - 2018	57
Total	**254**

Source: Medical and Dental Council of Nigeria, December 2018

Table 17: Physician Anaesthesia Specialists (with Additional Qualifications) registered by the Medical and Dental Council of Nigeria (December 2018)

Categories	Additional Qualification	No	Density per 100,000 Population (2019)
Category A	Fellowship in Anaesthesia	149	0.07
Category B	Membership/Part 1	12	0.01
Category C	MSc/Diploma in Anaesthesia	93	0.05
Total		254	0.13

Source: Medical and Dental Council of Nigeria, December 2018

Table 18: Physician Anaesthesia Specialist workforce density per State in the North Central Zone of Nigeria

North Central Zone	No of Specialist Consultants	Density per 100,000
Benue State	1	0.02
Kogi State	3	0.09
Kwara State	6	0.25
Nasarawa State	1	0.05
Niger State	2	0.05
Plateau State	5	0.16
FCT	23	1.64
Total	41	0.20

Without the FCT, the NC zone has a PAS density of 0.01 per 100,000 population.

Table 19: Physician Anaesthesia Specialist workforce density per State in the North Eastern Zone of Nigeria

North Eastern Zone	No of Specialist Consultants	Density per 100,000
Adamawa State	0	0.00
Bauchi State	0	0.00
Borno State	1	0.02
Gombe State	1	0.04
Taraba State	0	0.00
Yobe State	0	0.00
Total	2	0.01

Table 20: Physician Anaesthesia Specialist workforce density per State in the North Western Zone of Nigeria

North Western Zone	No of Specialist Consultants	Density per 100,000
Jigawa State	1	0.02
Kaduna State	6	0.10
Kano State	9	0.10
Katsina State	0	0.00
Kebbi State	1	0.03
Sokoto State	1	0.03
Zamfara State	1	0.03
Total	19	0.05

Table 21: Physician Anaesthesia Specialist workforce density per State in the South Eastern Zone of Nigeria

South Eastern Zone	No of Specialist Consultants	Density per 100,000
Abia State	4	0.14
Anambra State	2	0.05
Ebonyi State	1	0.05
Enugu State	14	0.43
Imo State	6	0.15
Total	27	0.16

Table 22: Physician Anaesthesia Specialist workforce density per State in the South-South Zone of Nigeria

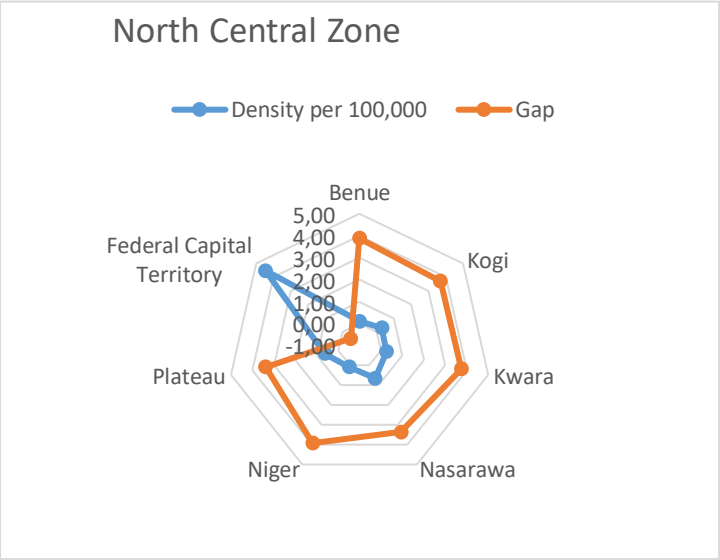
South-South Zone	No of Specialist Consultants	Density per 100,000
Akwa Ibom State	5	0.13
Bayelsa State	3	0.18
Cross River State	6	0.21
Rivers State	15	0.29
Delta State	7	0.17
Edo State	15	0.46
Total	51	0.24

Table 23: Physician Anaesthesia Specialist workforce density per State in the South Western Zone of Nigeria

South Western Zone	No of Specialist Consultants	Density per 100,000
Ekiti State	1	0.04
Lagos State	25	0.27
Ogun State	7	0.19
Ondo State	2	0.06
Osun State	11	0.32
Oyo State	14	0.25
Total	60	0.22

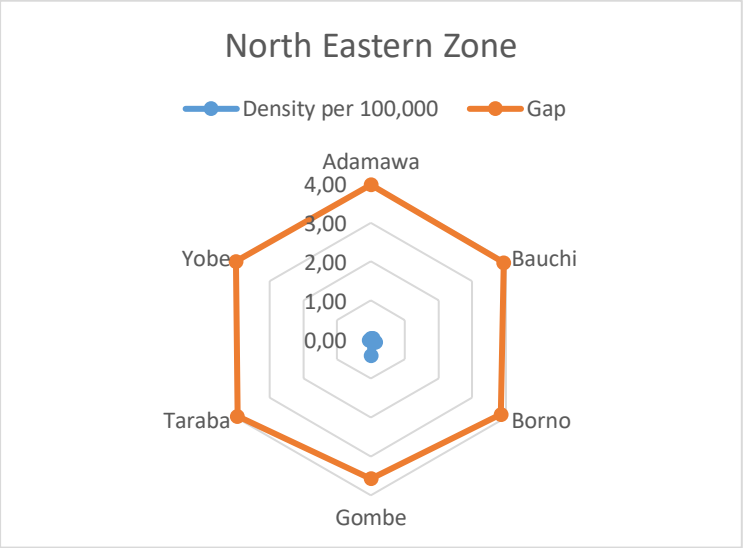
RQ 3: Taking 4 anaesthetists per 100,000 population as the desired (recommended) workforce density, what is the gap between the current and recommended anaesthesia workforce densities?

The Gap is the recommended Physician Workforce Density (4 per 100,000 population) minus PAP (0.51/100,000 population). The Gap in Nigeria is 3.49 PAP per 100,000 population. The Gap per State and Zone is shown in Figures 10 to 15.



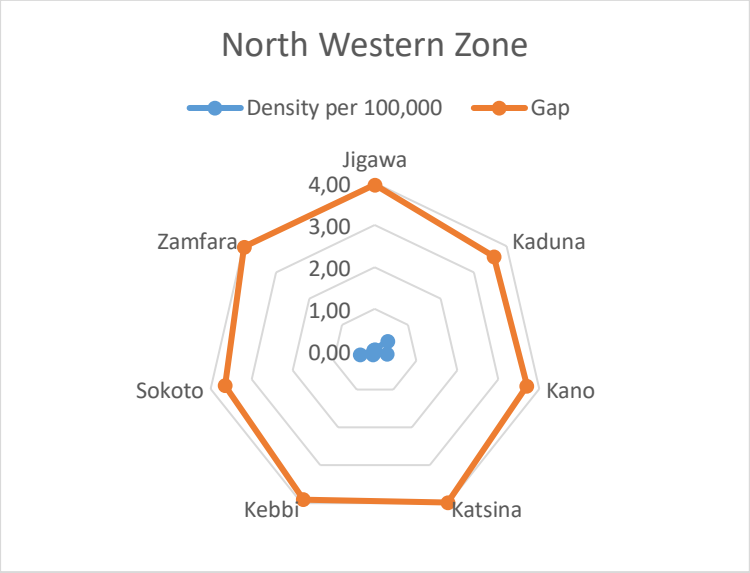
North Central Zone	Density per 100,000	Gap
Benue	0.12	3.88
Kogi	0.30	3.70
Kwara	0.25	3.75
Nasarawa	0.64	3.36
Niger	0.08	3.92
Plateau	0.62	3.38
FCT	4.48	-0.48

Figure 10. The gap between the recommended and the current workforce densities per State in the North Central Zone of Nigeria



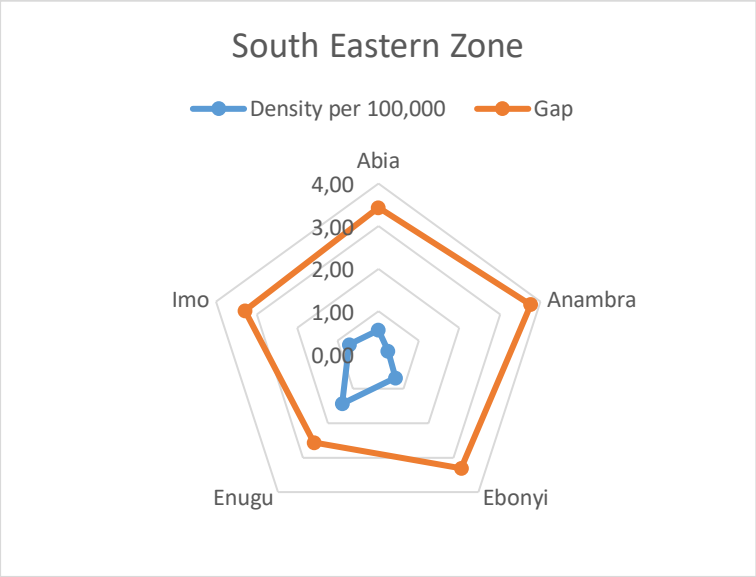
North Eastern Zone	Density per 100,000	Gap
Adamawa	0.03	3.97
Bauchi	0.06	3.94
Borno	0.14	3.86
Gombe	0.42	3.58
Taraba	0.04	3.96
Yobe	0.00	4.00

Figure 11. The gap between the recommended and the current workforce densities per State in the North Eastern Zone of Nigeria



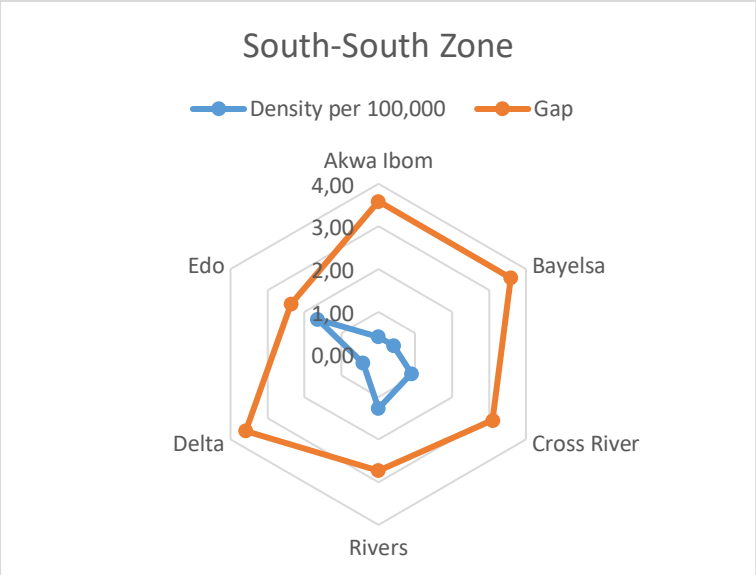
North Western Zone	Density per 100,000	Gap
Jigawa	0.05	3.95
Kaduna	0.39	3.61
Kano	0.30	3.70
Katsina	0.02	3.98
Kebbi	0.09	3.91
Sokoto	0.35	3.65
Zamfara	0.03	3.97

Figure 12. The gap between the recommended and current workforce densities per State in the North Western Zone of Nigeria



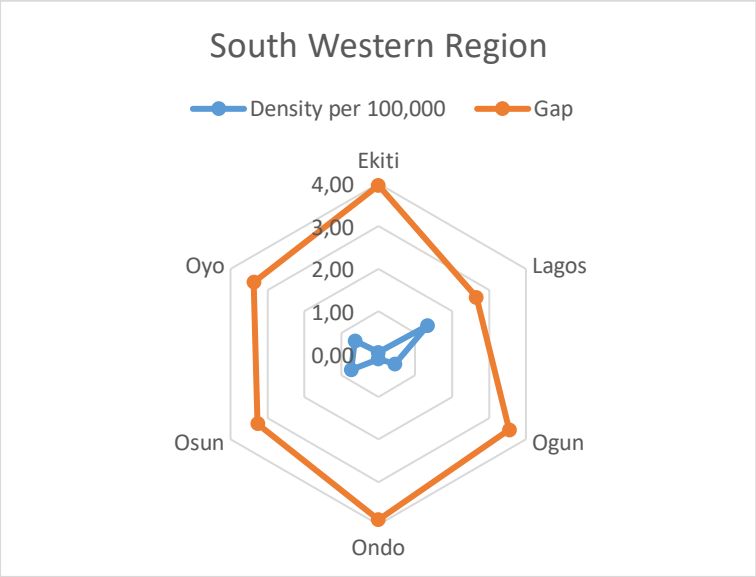
South Eastern Zone	Density per 100,000	Gap
Abia	0.56	3.44
Anambra	0.24	3.76
Ebonyi	0.69	3.31
Enugu	1.44	2.56
Imo	0.71	3.29

Figure 13. The gap between the recommended and current workforce densities per State in the South Eastern Zone of Nigeria



South-South Zone	Density per 100,000	Gap
Akwa Ibom	0.41	3.59
Bayelsa	0.41	3.59
Cross River	0.90	3.10
Rivers	1.27	2.73
Delta	0.41	3.59
Edo	1.64	2.36

Figure 14. The Gap between the recommended and current workforce densities per State in the South-South Zone of Nigeria



South Western Zone	Density per 100,000	Gap
Ekiti	0.04	3.96
Lagos	1.34	2.66
Ogun	0.45	3.55
Ondo	0.12	3.88
Osun	0.73	3.27
Oyo	0.63	3.37

Figure 15. The gap between the recommended and current workforce densities per State in the South Western Zone of Nigeria

RQ 4: What are the main demographic features of physician anaesthesia workforce in Nigeria?

Amongst the Consultants, 64 (32%) were female and 136 (68 %) were male; the Registrars were 99 (21.4%) female and 364 (78.6%) male, while the Diplomates were 16 (29.6%) female and 38 (70.4%) male. The gender distribution for all PAPs and the three categories of PAP's are shown in figures 16 to 19.

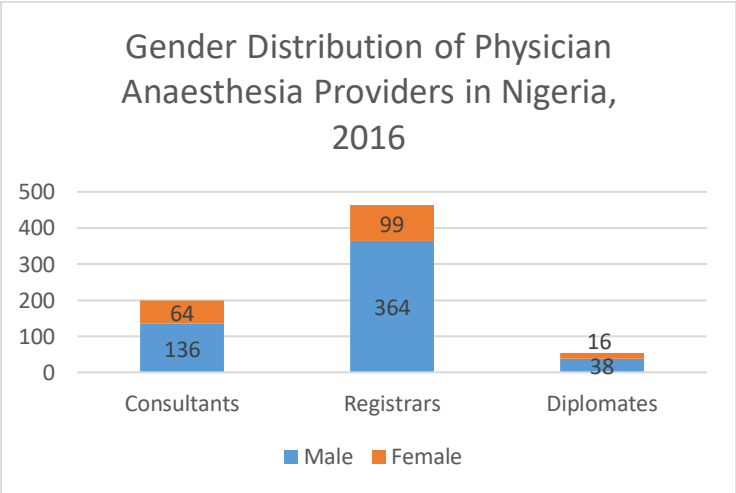


Figure 16. The gender distribution of consultant specialists, registrars and diplomates as of 2016

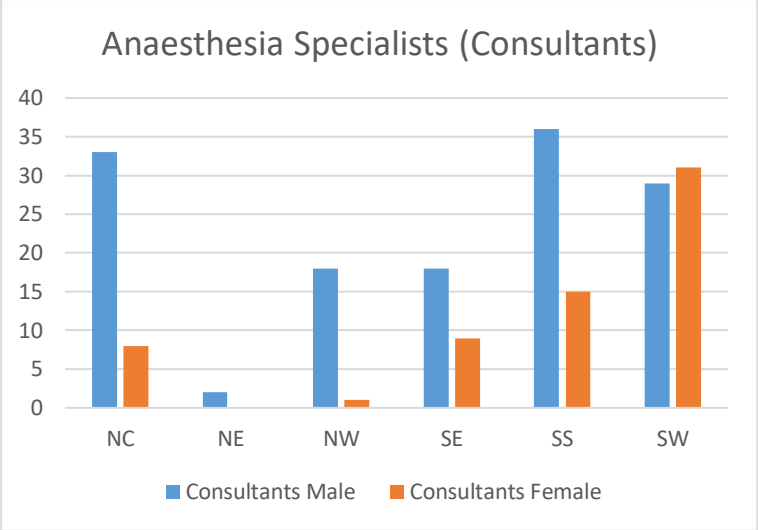


Figure 17. The gender distribution of consultant specialists in the six geopolitical zones as of 2016

Figure 17 shows all the zones had more male consultants than female consultants except SW zone with 31 (51.7%) female consultants and 29 (48.3%) male consultants. Other zones NC had 33 (80.5%) male and 8 (19.5%) female consultants; NW had 18 (94.7%) male and 1 (5.3%) female consultants; SS had 15 (29.4%) female and 36 (70.5%) male consultants; while SE had 9 (33.3%) female and 18 (66.7%) male. The 2 (100%) consultants in the NE Zone are males.

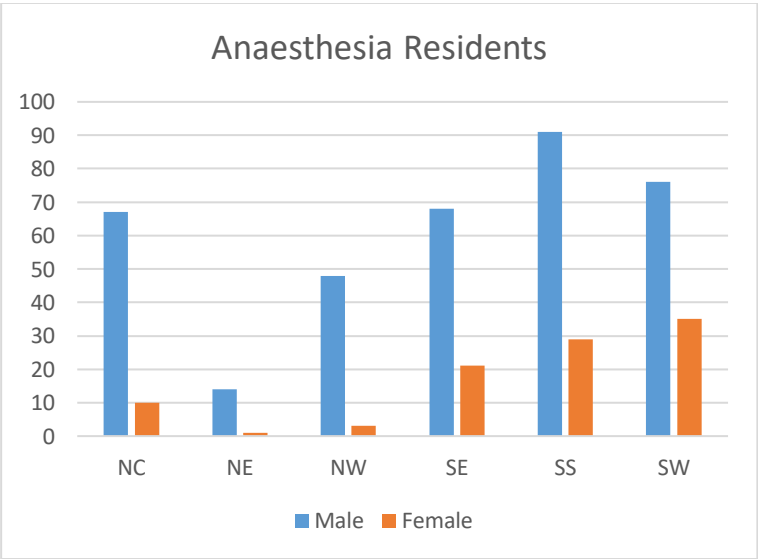


Figure 18. The gender distribution of anaesthesia residents in the six geopolitical zones as of 2016

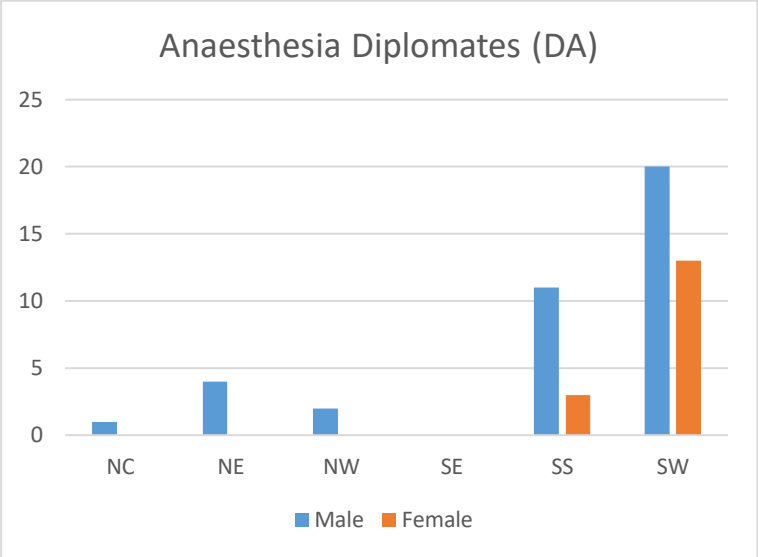


Figure 19. The gender distribution of anaesthesia diplomates in the six geopolitical zones as of 2016

Figure 18 shows the gender distribution of anaesthesia residents in all the 6 geopolitical zones was predominantly males compared with the females: NC 87%, NE 93.3%, NW 94.1%, SE 76.4%, SS 75.8%, and SW 68.5%. There were no diplomates in the SE zone while all the diplomates in the 3 Northern zones were male (100%). The SS and SW zones had 11 (84.6%) males and 20 (60.6%) males respectively compared with the female diplomates (Figure 19).

As of 2019, there were a total of 41 anaesthesia training institutions in Nigeria. Thirteen institutions were teaching hospitals with full accreditation for training renewable every 5 years (Figure 20); there were 10 teaching hospitals, 2 general hospital and 1 specialist hospital that had partial accreditation which is renewable or upgradable to full accreditation after 2 years (Figure 21). Five tertiary hospitals were denied accreditation and would require re-visiting (Figure 22). There were eight Federal Medical Centres and 2 Federal Medical Teaching Hospitals that also had partial accreditation renewable or upgradable to full

accreditation after 2 years (Figure 23). Out of the 23 Federal Hospitals in Nigeria, only 10 had accreditation for training anaesthesiologists (Figure 24).

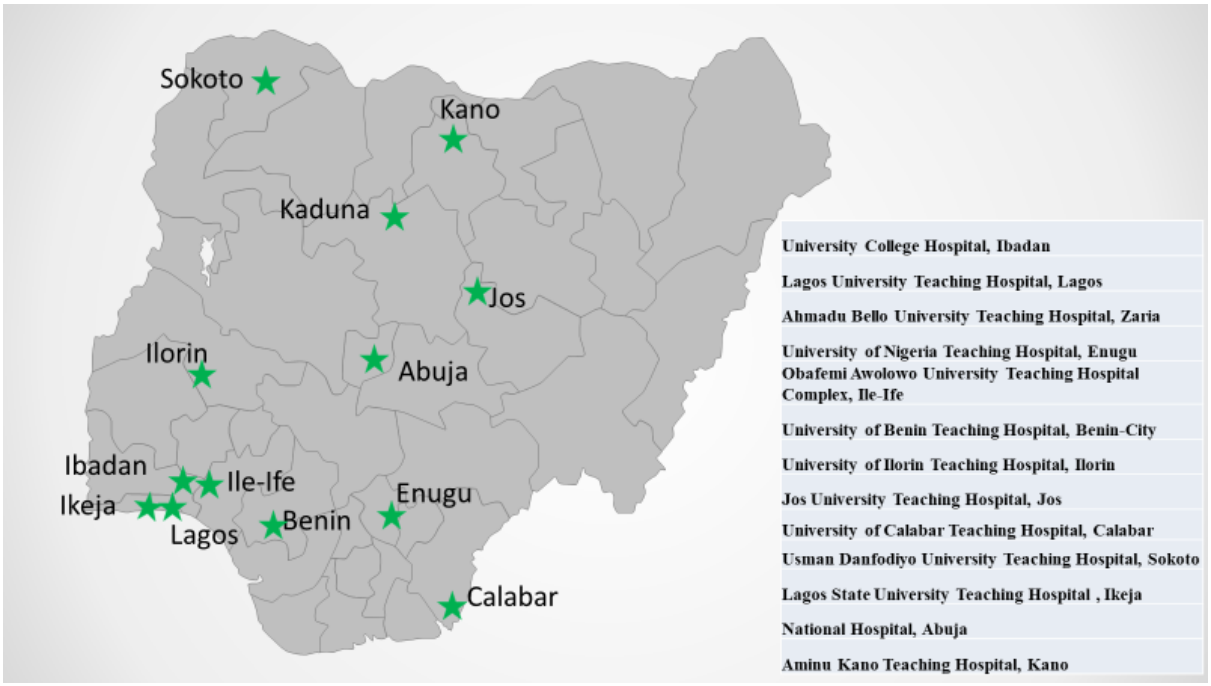


Figure 20: Teaching Hospitals with full accreditation for training

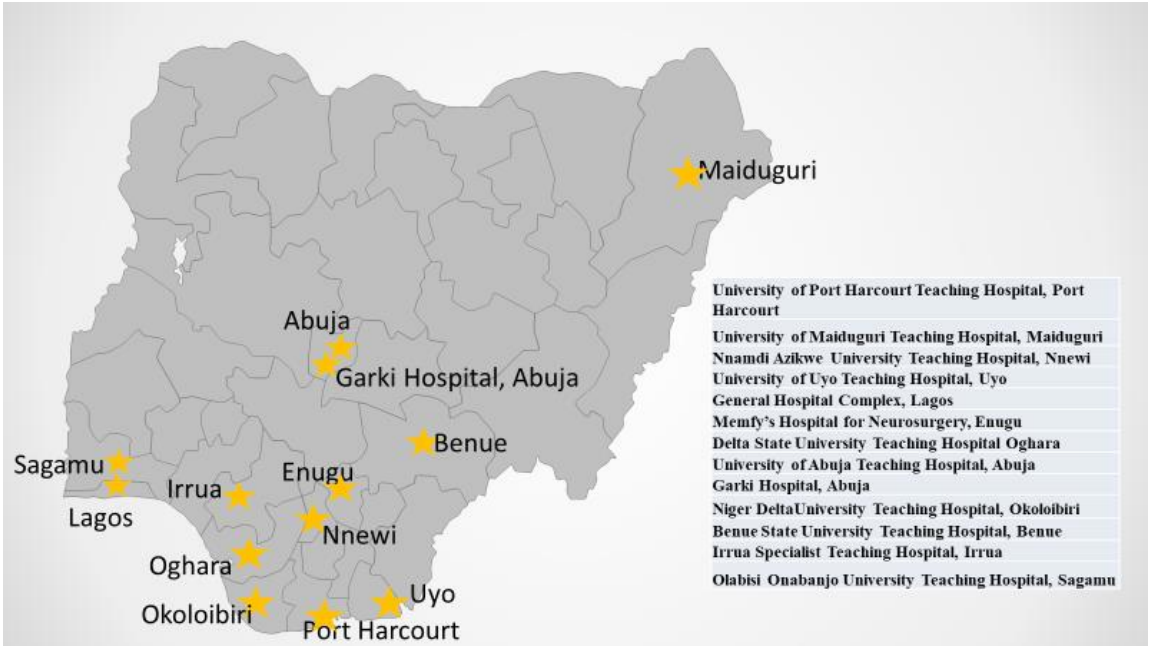


Figure 21: Teaching Hospitals with partial accreditation for training

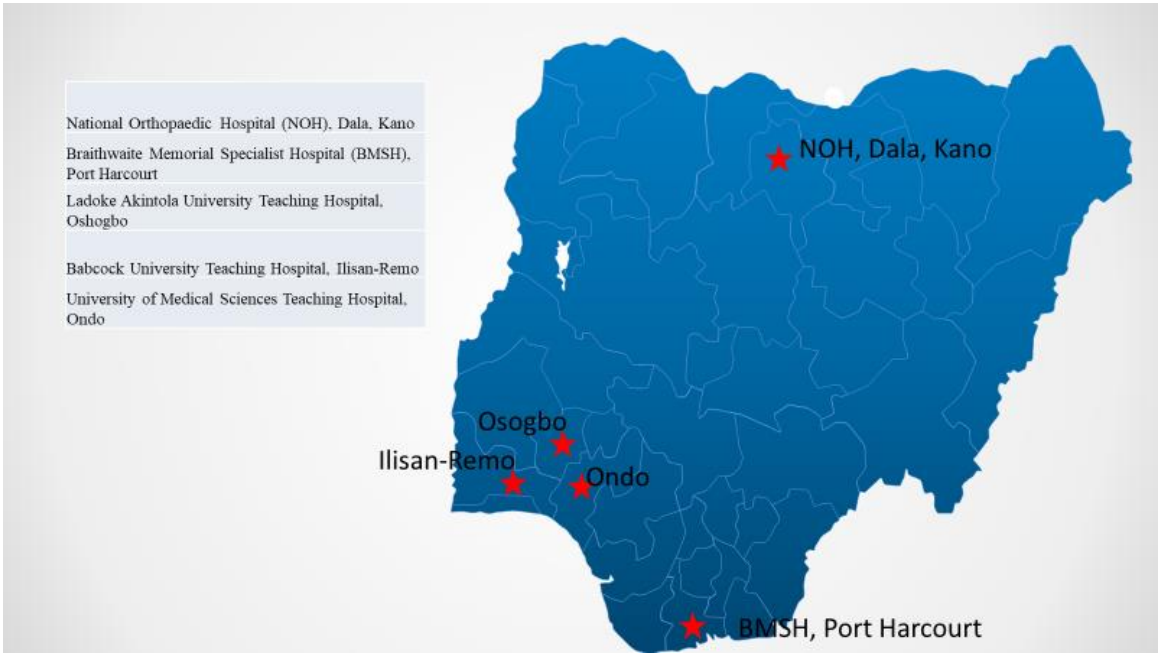


Figure 22: Teaching Hospitals denied accreditation for training.

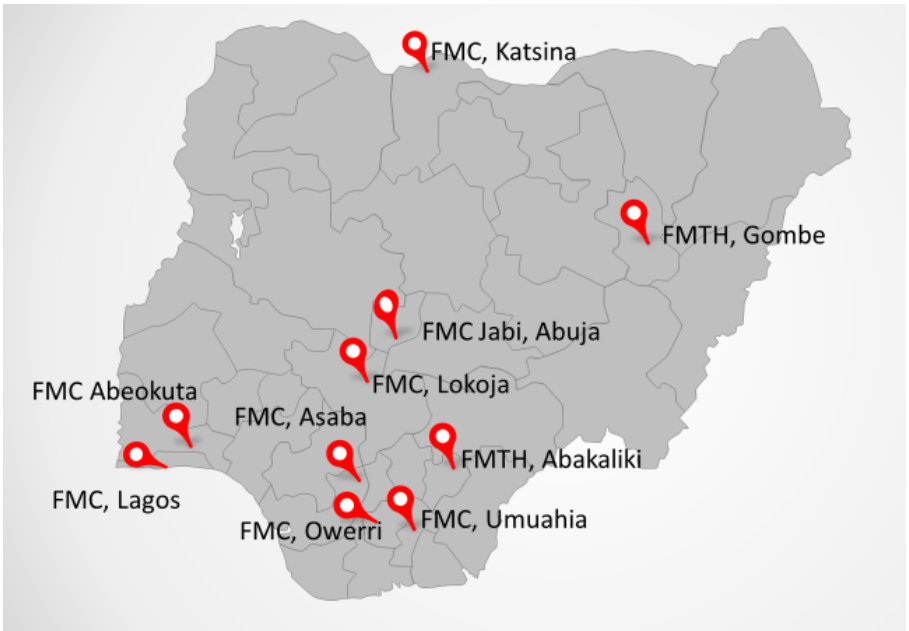


Figure 23. Federal Medical Centres and Federal Medical Teaching Hospitals accredited for training

Figure 24. Federal Medical Centres with no capacity for training

Answer to Research Question 5.

RQ 5: What are the major dynamic factors that contribute to anaesthesia workforce gap and what is the nature of the dynamic interaction between these identified factors?

These issues were explored through two sets of stakeholders focus group panel discussions held during the 26th annual conference of the Nigerian Society of Anaesthetists, at Port Harcourt on Wednesday, the 21st November 2018. The first group (Group 1) was a strategic stakeholders focus-group (SSFG) panel discussion while the second group (Group 2) was a high-level stakeholders' panel (HLSP) presentation (Table 24). Group 1 was a more homogenous group getting its members from anaesthesia specialty together with the senior technical adviser to the Federal Minister of Health. Group 2 was a more diverse group with high level member-representatives of the MDCN, the WACS, the NPMCN, the NSA together with the senior technical adviser to the Federal Minster of Health.

Table 24: Members of the two Focus-Groups

Group 1- Strategic Stakeholders Focus Group	Group 2 – High Level Stakeholders Panel
Dr. Shuaib Belgore (SB)	Dr. Shuaib Belgore (SB)
Cmdr. (Rtd) Olaniyi Oladapo (OO)	Prof Opubo B. da Lilly-Tariah (DLT)
Prof. Eniola Elegbe (EE)	Prof. King David T. Yawe (KDY)
Prof. Olaitan Soyannwo (OS)	Dr. Udugbai Ilevbare (UL)
Dr. Olubusola Alagbe-Briggs (OAB)	Dr. Tola Olatosi (TO)
	Prof. Emmanuel Ameh (EA)
	Dr. Shina Ogunbiyi (SO)

By asking open ended questions, a variety of dynamic factors that contributed to the anaesthesia workforce gap as well as the nature of the dynamic interaction between the factors emerged from Group 1 and 2.

The relevant dynamic factors developed from the discussions and comments of the participants are:

1. **Lack of a Multi-level Training Strategy for the expansion and effectiveness of departments of anaesthesia**: According to EE:

> We cannot move medicine as a whole forward without a good and a strong department of anaesthesia. The nature of anaesthesia services makes it relevant at all levels of service provision, and Nigeria being a huge country requires different levels of manpower that is appropriate for every level of healthcare.

OS and OO agrees with EE that, “we must train nurses, anaesthetic assistants, as well as doctors at the two levels which is the diplomate level and the fellowship level”. EE stated that, the Fellows are the trainers therefore they must set and monitor standards through their various colleges.

2. **Lack of regional training schools in Nigeria**: OO shared his experience organizing training school for Lagos State. He said:

> Anaesthesia is the denominator to all respective surgical operations whether it is performed by an anaesthetist or a surgeon who is using local anaesthesia. The rate at which we are producing fellows in anaesthesia can never meet our anaesthesia requirements in this country.

In support of anaesthesia training strategy, OO gave an example from obstetric care saying:

> If all the deliveries in this country were to be done by consultant obstetricians, they cannot cope, that is why they have the midwives. Likewise, in anaesthesia, we have primary, secondary and tertiary responsibilities which are purely the responsibilities of consultants. The primary and secondary responsibilities are for middle manpower.

Citing the survey of anaesthesia requirement for Lagos State OO stated that:

> Lagos State has over 26 hospitals and about 300 surgeons; but 80% of the operations performed in the operating theatres in Lagos State are what can be managed by primary and secondary anaesthesia providers who are anaesthetic nurses and diplomates.

By establishing a training school in Lagos State in 2006, they were able to grow from 12 physician anaesthetists (middle-level anaesthesia manpower) and 12 anaesthetic nurses to over 122 anaesthesia providers in 2018. This has provided at least 4 trained anaesthesia manpower in each hospital in Lagos State. OO declared that:

> Workforce can be increased by being more strategic with training" and suggested, "if we can have that kind of school of anaesthetic studies, in the 6 geopolitical zones of this country, we will be able to meet our anaesthesia workforce and we will be able to train anaesthetic technicians, anaesthetic nurses and physician anaesthetists.

3. **Slow turn out rate of Fellows**: OO specifically stated that, the rate at which we are producing fellows in anaesthesia can never meet our anaesthesia requirements in this country.

UI said the MDCN has in its database, “Two Hundred and Twenty (220) specialist anaesthetists out of the total number of 8,198 specialists in Nigeria. Anaesthesia occupies the 10th position in the hierarchy in terms of the numbers of each specialty group.

According to OS:

> Building workforce within the health sector has to start from the undergraduate level. Several studies in Nigeria has shown that anaesthesia is not a popular specialty area for medical students to go into. We need to encourage our students through exposure to anaesthesia during the training period.

All the panellists agreed that medical students must be mentored and encouraged.

EA emphasized that, knowing the number of medical graduates to train and the number of anaesthetists required for Nigeria are needful. We cannot train without knowing the numbers. We may either under- or over-train. TO observed that “enrolment into the DA programme went down in the last decade”.

4. **Abysmal residency pass rate of anaesthesia residents**: The pass rate for anaesthetists in the residency programmes does not reflect the number of doctors in the residency programmes. The panel was informed by TO that this is being addressed by various steps to increase the quality of trainers and make them more committed to training. Evaluating and assessment mechanisms are moving towards Objective Structural Clinical Examination (OSCE). An OSCE enables a reliable assessment of a candidate’s competence. Each examination station is designed to focus on an area of clinical competence and the tasks represent real-life clinical situations. The content and scoring processes are standardized.

5. **Anaesthesia is unknown at both policy and professional levels**:

OS declared that:

> At both policy and professional levels, most people don’t know what anaesthetists do. They just think that they (anaesthetists) put people to sleep and wake them up. And

> they (people) don't even realize that the major part of the job is the waking up and that is where the skills of the anaesthetist and the issue of safety comes in…… the work of the anaesthetist extends beyond surgery and beyond the theatre. We can make sure that other health professionals realize the importance of anaesthesia and safety, understand the need for provision of anaesthesia in multiple settings, and the part they (anaesthetists) play in the medical team. Nobody can come for anaesthesia without the anaesthetist knowing what is wrong with that patient either medically or surgically.

On the major achievements in surgery, like separation of conjoined twins or open-heart surgery, OS expressed concern that, "it is the surgeon that comes forward and takes the accolade, nobody talks about the anaesthetists. We are undermined but anaesthetists are trained to be good team players and we are always there to provide the service when required".

6. **Anaesthesia is an unpopular career**: OS acknowledged that, "several studies in Nigeria has shown that anaesthesia is not a popular specialty area for medical students to go into". SB commented that, "anaesthesia is grossly underappreciated but by no means is it a minor profession. It is extremely important. Virtually, it is a profession that keeps people alive whether going through surgery or intensive care." While EA and DLT both agreed that there is no surgery without anaesthesia. KTD says that:

> We need to have medical doctors to train as specialists and we need to improve the intake of medical schools. In Nigeria we have less than 3,000 graduating from medical schools annually. At 4,000 medical graduates per annum, we will need 200 years to meet the minimum number of specialists for Nigeria. It means there must be a stirring up process, we need to have improvement in the training facilities. Our college for example in trying to improve the ratio of qualified anaesthetists and the number of trainees…… This will be achieved by not only accrediting more centres

including private hospitals that meets minimum standards, but by also insisting on bringing in facilities that can improve training more efficiently.

7. **Discriminatory encouragement and mentoring of medical students**: EA cited a colleague's perception, stating that, "Surgeons have been encouraging medical students to become surgeons and are not encouraging them to be anaesthetists". He wonders how we are going to perform surgery without anaesthesia. All the panellists agreed that medical students need to be encouraged to specialize in anaesthesia. They agreed to finding effective ways of mentoring our students because it is our collective responsibility and should not be about protecting our individual profession. Everyone must make sure that we have enough doctors for our population. DLT said, " there must be better co-ordination between the surgeons and anaesthetists" and the "bottom line is safe anaesthesia, safe surgery, safe patient. We need to synergize and maximize surgical and anaesthesia workforce".

8. **High attrition rate**: according to SB,

> It will be difficult to say that there will be a medical doctor at every primary healthcare centre in Nigeria. In some states the professionals do not even exist, we are dealing with so many things, the attrition rate of medical personnel in the country is high. We have about 10,000 primary health care centres, which comes up to at least one primary healthcare centre in each political ward delivering care to people. Some wards will need more than one healthcare centre for efficient healthcare delivery at that level. It will therefore be difficult to say that there will be a medical doctor at every one of this primary healthcare centre because in some states the professionals do not even exist. We are dealing with so many things in addition to the high attrition rate of medical personnel in the country.

9. **Unequal geographical distribution of medical specialists:** EA felt that: apart from Lagos and Rivers State, FCT is one of the most resourced states in Nigeria in terms of workforce. TO acknowledged that "there is a need to make available inducement for the anaesthetist that provides rural service".

10. **Lack of appreciation for Membership Qualification in Anaesthesia as a workforce solution:** KDY explained that:

> There are 22 nations in the West African College and 18 are very active. The problems with workforce have been so complex; and very complex that we would not take a Nigerian solution and apply to the whole WA region. We must look at middle level manpower development for the various specialists. We have 7 faculties in the WACS. Quite early in the life of the college, the Faculty of Anaesthesia was discovered to be so crucial and it was one of the specialties that had a faculty status quite early and I think it has not been disappointing at all. So, when the need for middle level manpower came up, it was one of the 3 faculties that developed a programme to improve on the manpower for this subregion. What they did was very important. Today, they have trained quite a number of categories of anaesthesia specialists in addition to the anaesthesia nursing training in Nigerian and West Africa. I talk as a West African. There is a need to have an exit form of middle manpower other than the diploma in anaesthesia. Faculty of anaesthesia was early in preparing a structured document for the purpose of Membership. I think it is very good. What this has done, not for Nigeria, which resisted membership, but for other countries in the subregion, is that Ghana, for example has effectively deployed everything you need to know about the membership structure, career structure and the amount of liquid that comes in. And it has been so attractive that it is now difficult for candidates who have completed membership because quite a lot of them are refusing to return for

> the fellowship programme. The reason is that the pay is so good, the second reason is that they are now working effectively in the rural areas in general hospitals where the bulk of surgical burden is located.

11. **Brain Drain and Migration**: Concerning brain drain and migration, TO expressed concern as such:

> Tracking of where the anaesthetists are and what they are doing as well as having a database is challenging. Many specialists have migrated to work in the USA and UK. While those who qualified with a DA went on to complete the Fellowship programme and are no longer available for primary and secondary level anaesthesia care. Some also changed specialties and are no longer practicing anaesthesia.

While UL agreed to this, he said, "It is the responsibilities of specialists to make sure they are registered by the MDCN and to renew their registration annually". UL confirmed there have been an increase in the request by our specialists for letters of recommendation from the MDCN for visa purposes.

12. **Lack of Career structure for the Diplomates in Anaesthesia**: TO stated that, "there is no clear career pathway for the doctors who completed the diploma in anaesthesia programme therefore many of them are leaving anaesthesia".

Result of the Diploma in Anaesthesia Programme and Answers to Research Question 6 (RQ 6).

RQ 6: Can a brain-based diploma in anaesthesia programme at a secondary level hospital (Federal Medical Centre) be a practical solution to the anaesthesia workforce crisis?

The findings of this action research will be provided in two cycles, the first and second cycles (Coghlan & Brannick, 2014, p. 9, 12).

The First Cycle

Pre-step (context and purpose) – Physician anaesthesia training in Nigeria was provided mostly in the tertiary hospitals /teaching hospitals. Not surprisingly, anaesthetists prefer large cities and urban areas with better opportunities, rather than the inner cities and rural areas, thus contributing to the maldistribution of the surgical workforce (Hagander et al., 2015). From experience, the likelihood of physician anaesthesia providers working in primary and secondary settings was highly unlikely. The purpose of the action research was to demonstrate that running a diploma in anaesthesia training programme in a secondary hospital has the potential of scaling up services, strengthening the workforce and therefore changing the narrative from brain drain to brain gain.

Four basic steps:

Constructing: as stated in Chapter 3, constructing involves a dialogic and collaborative activity of naming or framing issues that will serve as basis for the action to be planned, implemented, and evaluated. A strategic conversation and brain storming took place on a flight from Abuja to London on 7th April 2016 between Dr. Chinwe Igwilo (CI), the Medical Director of the Federal Medical Center, Abuja and the researcher. This resulted in a mutual agreement that starting a diploma in anaesthesia programme will be an interesting adventure for the two staff consultant anaesthesiologists at FMC Abuja. The two consultants are Dr. Emmanuel Ugwu (EU) and Dr. Olatunde Olawoye (OTO). This programme should make them focused on building anaesthesia workforce instead of being pulled by opportunities in bigger hospitals. In addition, the programme promises to scale up surgical, obstetric and anesthesia services, as well as brand the FMC Abuja as a training centre for physician anaesthesia providers in the FCT, Abuja and its environs.

Planning Action: this is the collective planning and preparation for accreditation of the anaesthesia department at FMC, Abuja. The idea of starting a DA programme was further

discussed with the two staff consultant anaesthesiologists (EU and OTO), and the head of clinical services, Dr R.B. Felix (RBF). A couple of email communications between the researcher and the consultant anaesthesiologists were exchanged. A template used for the preparation of the accreditation document was sent on 3rd May 2016. The diploma in anaesthesia curriculum of the West African College of Anaesthesia emailed on the 27th October 2016 was adopted for the programme. Dr Olagbale Sholanke (OGS) and the researcher (BOO) were invited as visiting consultants/ lecturers to facilitate the training programme along with EU and OTO. Thus, a formal department of anaesthesiology was formed, an information booklet on the hospital was prepared by EU and OTO; and an invitation to accredit the department was sent to the Faculty of Anaesthesia of the West African College of Surgeons.

Taking Action: this is the actual accreditation visit, the running of a brain-based curriculum, and the work-based learning (operating room-based learning) during the DA programme and validation by the WACS examination. The diploma in anaesthesia programme was modeled as a brain-based curriculum to facilitate work-based learning. Following the visit of the accreditation panel in May 2016, the programme began in November 2016 by transferring two male participants who were already medical staff of the FMC, Abuja to the Department of Anaesthesiology. They were Dr Christopher Ifeanyi Ukah (CIU) from the Department of Surgery, and Dr. Olugbenga Abolade (OAB) from the Department of Paediatrics. They were both employees and received salaries from the FMC. The other participants were Dr. Vivian Orjiah (VO), a female doctor from Ronsberger Health Maintenance Organization, a health insurance company who joined in December 2016 and Chioma Ilokanuno (CHI), a female doctor from a private hospital who joined in March 2017. The female participants were self-sponsored all through the DA programme. They paid a bench fee to the FMC Abuja for the training. The four participants had supervised hands-on

practice and operating room-based learning while working and taking call duties. They also participated in reflective writings, informal group discussions and seminars. The four doctors took part in a five-day residential revision programme organized by the West African College of Surgeons at the University of Port Harcourt Teaching Hospital from 12 to 16 March 2018, a month before sitting for the Diploma in Anaesthesia examination.

Evaluating Action: The participants' knowledge, skills and practice were validated during the Diploma in Anaesthesia Examination in the second week of April 2018 which was approximately after 12 to 18 months in the training programme. The examination was conducted at the University College Hospital, Ibadan by a board of examiners from the Faculty of Anaesthesia, WACS. All the 4 participants that was presented as examination candidates by the FMC Abuja satisfied their examiners in all parts of the DA examination. They were conferred with the Diploma in Anaesthesia of the West African College of Surgeons (DA, WACS) at a ceremony that took place on the 24th of January 2019 at the Hotel King Fahd Palace, Hotel, Dakar, Senegal.

The Second Cycle

The second cycle was an inquiry-in-action into how the core action research project was planned, executed, and evaluated and how the researcher, as a manager, enacted her role in the project and reflected on it thereafter.

The planning of the Core Action Research was a result of the researcher recognising the opportunity available at the FMC, Abuja. Although, there was a national crisis of anaesthesia workforce and there was brain drain but the researcher thought of a possible solution to the crises by utilising the specialists at the FMC (brain gain) to train diplomates (brain train). The researcher had creative ideas and the medical director was willing to try out the DA programme. While the FMC, Abuja was transformed into a platform for work-based training, the researcher emerged as the facilitator with insider knowledge. Her role as the

President of the Nigerian Society of Anaesthetists at that time, as well as being a Fellow of the West African College of Surgeons gave credibility to the idea. In addition, being a Faculty member in the Department of Anaesthesia, College of Health Sciences of the University of Port Harcourt made her an authentic collaborator. The researcher had a solution mind-set and was determined to be a change agent.

Execution was possible with teamwork and trust. Every team member was important to executing the DA programme. Execution would not be possible without CI, who was the Medical Director of the FMC, Abuja, and a champion for the programme. The followers were RBF, who was the head of clinical services; and the two hospital consultants EU and OTO who were strongly committed to the programme. The visiting consultant, OGS shared his wealth of experience while BOO, the researcher/manager co-ordinated the programme and set the tone. BOO crafted her role as mentor and motivator by providing the objectives, goals, and vision for the DA Programme. Even though the researcher was not hands-on in the theatre, she maintained a strong e-presence through emailing of reflective assignments and providing feedbacks to the diplomates during the programme and had a face-to-face interaction with the participants as required.

There was a sense of community involved and the researcher was empathetic and shared in the personal experiences of the members of the department of anaesthesia. The researcher's visit and face-to-face question and answer session anchored by the FMC Consultants in the theatre was positive and inspiring to the participants and staff members of the anaesthesia department. The interest and involvement of the researcher in the success of the participants, informed the organization of accommodation and logistic support to the four doctors when they came to the University of Port Harcourt Teaching Hospital for the five-day residential revision programme organized by the West African College of Surgeons.

Essentially, as previously stated in Chapter 3, an insider action researcher is pursuing a first, second, and third person research. The first-person research is for the purpose of personal and professional growth while that of the second person is a collaborative work with organizational members on a specific action project which in this case is the DA programme. The third person research is aimed at generating contributions to knowledge inferred from experience in carrying out a brain-based curriculum in the workplace (FMC, Abuja), in order to brain gain and train.

Focus Group Feedback on the DA Programme.

A focus group discussion was held on the 25th of July 2018 in the operating theatre seminar room of the FMC, Abuja. Present were the four participants who had completed the DA programme namely CIU, OAB, VO and CHI; as well as the researcher (BOO), and a Consultant Anaesthesiologist (OTO). Also, in attendance as observers were three newly recruited participants for the next cycle of DA programme. The purpose of the focus group discussion was for the participants to share their work experiences during and after the DA training period and to record their feedback on the programme (Tables 25 and 26).

Table 25: Summary of Participants Positive Experience during the DA Programme

	Challenging but interesting DA Programme	Confidence Enhanced	Consultants were helpful and encouraging	Community Spirit	Concluding Impression
CIU	Coming from a surgical background, I didn't expect it (DA) to be as interesting as it became	It (DA) brought a whole new challenge and looking back now I can say it made me more confident	This place (FMC) is adequate because of the attention received from the consultants who were always on ground.	Thanks to the team and the support we received	We tend to be better respected than when we started the programme. And the DA…like a stamp to all the learning we have done and intensive training.
OAB	But when we actually saw the volume of work, it was actually challenging at first but with time, we started understanding some things.	We found that in this place we were exposed to the practical aspect early and that gave us more confidence".	The trainers - they are like our friends…you can actually tell them some things and they are there to guide you so it is better here than maybe in other places.	The DA afforded us the opportunity to understand teamwork better. Some of us realised our strengths and our deficiency. We were able to put everything together to make the best.	Anesthesia is a very good profession and I don't think I want to do anything else.
VO	Anaesthesia has been really interesting. Anaesthesia – the knowledge of anaesthesia is broad, it makes you know a little about everything	And then your confidence level as a doctor definitely comes up and you are not like when you are just a medical officer	Our trainers were interested in us beyond the training…They were more like big brothers, the infused teaching with jokes in between and that made everybody to relax	Everybody (the whole team at FMC) was following you up and making sure you study…	But as a diplomate in anaesthesia, you are at the middle level /mid managerial level and out there, the advantage turns out to be the disadvantage (most people don't know about the DA so they are confused).

Four relevant positive themes were derived from the discussions:

1. Challenging but interesting programme.
2. Confidence building: enhanced level of confidence
3. Consultants support: they were helpful and encouraging.
4. Community experience: the FMC, Abuja is a like a community.

The relevant negative themes concerning the DA programme was from the female participants. These are challenging family issues and sponsorship because they were not employed staff of the FMC, Abuja.

Table 26: Summary of the Participants Discouraging Experiences

Participants	Family and Domestic Challenges	No Sponsorship
CHI	It wasn't an easy task, but I had to fashion out ways on how to meet up with the responsibilities. I tried to delegate most things or find a way to be able to do what I am supposed to do, like the school run, I had to get somebody that can do it when I am not there. My small cousin, I brought her to, I taught her some things so all of them go to school together and come back together. I prepare the meals, pack them in the freezer maybe for 2 weeks. I limited my social life	I had to make up for the money that I am not getting. I had to fashion out a way to give myself some timetable and know when I am supposed to be working, when I am supposed to be reading.
VO	"Barely 3 months into the programme, my daughter fell ill". She had fever, complicated by seizures which landed her in Intensive Care for 9 days and a hospital admission for 1 month. "I couldn't continue with the programme, I couldn't read, I couldn't concentrate, I was a caregiver at her hospital". Eventually when she was discharged: "she had setbacks in her developmental milestones, so we had to start physiotherapy".	"A lot of emotions, mixed emotions, should I continue with the programme, should I not, the anaesthetist saved my daughter... this is good, like I don't need to be told about the importance anymore, but at some point there was no interest. And that was the point when the private hospital also lost interest in sponsoring me"

Feedback from Consultant Anaesthesiologist and Trainer (OTO)

OTO gave some background on why he has a passion for workforce development saying that:

> My experience has been that coming from my own background, before I came into anaesthesia, I had primaries in public health; and I was a medical officer in one of the hospitals in Jos. And incidentally, I came across Dr. Mrs Isamade, who challenged me… gave me her textbooks, got me for the interview, interviewed me and brought me into the programme. I passed primaries, I passed my diploma….and I finished my training (Fellowship) in five years…. so I have always had this kind of push to encourage medical officers and I see that many of them, (there are so many people around, not just in this hospital, around) who are probably confused; they have done primaries in O&G (obstetrics and gynaecology), surgery and they have not gotten a place (for specialist training). So, I say come, come and do anaesthesia.

On his teaching experience on the FMC, Abuja DA Programme he said that:

> It was a great experience teaching, off course as a teacher, you also need to update your knowledge, read, stay with them (participants), put them through…this is how you hold the laryngoscope…this is how to put in a spinal…you correct them; you also want to be careful not to discourage them. I kept telling them you can do this; so it is a great experience to see those who came with nothing, zero knowledge of anaesthesia coming out; now I can sit down and say go and do that case; and they are doing cases, doing well, intubating patient, stabilising patients. Sometimes in our morning review…they argue with us about what they have read…and they challenge us to go back and read, the knowledge base is increasing, and so interaction must be great. I am challenged to do more…more people are interested in the programme… and even for the new set that has come, it will amaze you what they can do in a few months. I think it is worthwhile.

Concerning the DA Programme OTO commented:

> In such a short while, we made impact…anaesthesia is so important that you can't manage, you just have to keep moving, get capacity, build capacity. So, the difference is that, in just a few months that they spend in the hospital, is wow. You look at a patient and you know that this patient is in trouble in A&E (accident and emergency), you need to intervene, and you know what to do. You're not thinking…go and call them in theatre. So, it is a good experience.

On gaining momentum: "Somebody (Dr Raman) came from FCDA (Federal Capital Development Authority) who said, Vivian told me about this programme. She said, go to FMC, they will sort you out". The process of admission is easy: "I took it (Dr Raman's application letter) to the CMAC, the same day he signed, and he said come in …and so he is ready to start DA, he is so excited as if jump in now finish and then go back to FCDA…he is from … General Hospital, Kuje.

On advocacy for DA OTO further stated that:

> I have been to FCDA…you know I spoke with the MD of General Hospital (GH), Bwari. The Federal Capital Development Authority (FCDA) controls all the GHs in Abuja, so I spoke with the health management board and I said, "you can send your people here, we train them and they go back to those hospitals and they man your theatres as anaesthetists". So …we are trying to expand, let them come, spend 18 months and go back (with a diploma in anaesthesia). And if we do that for 5 years you will be surprised how many anaesthetists (physician anaesthesia providers) that will be are available.

On advantages of having Diplomates: "It will make our cities safe". OTO feels anaesthesiologists can all share experiences, skills, and knowledge by phone calls because "we will have common language" and we can collaborate. We are sure that those patients

in those hospitals are in safe hands. He also commented on making progress with anaesthesia workforce: “there is still a long way to go, we have a large distance to cover; so, we just keep moving, we will get better”.

Summary of Major Findings

The purpose of this mixed method study is to analyse the dynamics of the physician anaesthesia workforce crisis in the 36 States and the Federal Capital Territory of Nigeria; and to present the absolute number of practising anaesthetists including the consultants and trainees. The study determined the specialist anaesthesia workforce density and analysed the gap between the current workforce and the required workforce by the end of year 2030. The level of anaesthesia services available in each State, as well as the number and location of accredited hospitals for training physician anaesthetists in Nigeria were mapped.

The study found that the physician anaesthesia provider (PAP) workforce density in Nigeria is ***0.51 PAP per 100,000 population.*** The zone having the lowest PAP workforce density is NE zone with 0.11 per 100,000 and SS has the highest, 0.88 per 100,000. The FCT in the NC zone has a PAP workforce density of 4.48 per 100,000 population. Edo State and Rivers State in the SS zones has 1.64 and 1.27 per 100,000 population respectively; Enugu State in the SE zone has 1.44 per 100,000 population, and Lagos State in the SW zone has 1.34 per 100,000 population.

The zone with the lowest Physician Anaesthesia Specialists (PAS) density is the NE zone having 0.01 per 100,000 while SS zone has the highest, 0.24 per 100,000 population. Amongst the States, the FCT has the highest PAS density of 1.64 per 100,000 population, followed by 0.46 for Edo State and 0.43 for Enugu State.

The PAP Workforce gap for FCT is less than 0 (-0.48) while 32 State has gaps of over 3.1 per 100,000 population except for Edo, Enugu, Lagos, and Rivers States with gaps of 2.36, 2.56, 2.66 and 2.73, respectively.

There are more male than female PAPs and PASs (Consultants). Compared with the males, the female Consultants, Residents and Diplomates are 32%, 21% and 29.6% respectively. In the zones, only the SW has more female PAS recording 51.7% and exceeding the 48.3% for male PAS.

The major dynamic factors that contributes to anaesthesia workforce gap and the nature of the dynamic interaction between these identified factors are as follows: lack of a multi-level training strategy for the expansion and effectiveness of departments of anaesthesia, lack of regional training schools in Nigeria, slow turn out of fellows, and the abysmal residency pass rate of anaesthesia residents. Furthermore, anaesthesia as a profession is unknown at both policy and professional levels. Anaesthesia is an unpopular career, and the perceived discriminatory encouragement and selective mentoring of medical students in favour of surgery were not helpful. In addition, the high attrition rate, unequal geographical distribution of medical specialists in Nigeria favouring the FCT and the Southern zones have contributed to the gap. As a workforce solution, a lack of appreciation of membership qualification in Nigeria and a lack of career structure for the diplomates in anaesthesia has made these pathways unattractive. There is no denying that brain drain by foreign recruitment and outsourcing specialists have played a part in facilitating specialist workforce migration from Nigeria.

The insider action study found out that the DA programme implemented at the FMC, Abuja is a successful model. It resulted in the transition of the FMC into a training Center in addition to scaling up of the hospital. The 4 participants trainees recruited for the diploma in anaesthesia programme, completed their training within a period of 12 to 18 months. The

general feedback from the participants was positive. Despite the challenges faced by the female diplomates during their training, they proved to be determined and were also encouraged by the team. A great sense of community was an advantage for both learning and workplace training at the department of anaesthesia of the FMC, Abuja.

Chapter 5: Implications, Recommendations and Conclusions

Anaesthesia workforce crisis is a daunting situation that attracted intense global interest within the last 10 years (Cherian et al., 2010; Meara et al., 2015; Kempthorne et al., 2017; Davies et al., 2018,). In Nigeria, the increase in the number of anaesthetists over the past 5 decades, when compared with the enormous population growth, makes the numerical improvement insignificant (Soyannwo & Elegbe, 1999; Onajin-Obembe, 2019). The anaesthesia workforce output from the programmes of the two postgraduate colleges in Nigeria namely the WACS and the NPMCN did not meet the countries need; while the DA programme of the WACS held in the teaching hospitals failed to achieve its objective of providing middle-level anaesthesia manpower for the rural and sub-urban areas (Bode et al., 2013). Although, African countries have resorted to non-physician anaesthesia providers as a solution, no consensus has been achieved and anaesthesia workforce solution has continued to be highly controversial (Gordon, 1967; Zorab, 1976; Coghlan and Towey, 1979; Fenton, 1991; Hodges et al., 2007; Mullan & Frehywot, 2007; Dubowitz et al., 2009; Nyamai et al., 2013; Livingston et al., 2014).

Therefore, coming at an appropriate time is this pragmatic, mixed method, insider action research. It combined both positivist and interpretivism positions within the scope of a single research to analyse the anaesthesia workforce crisis in Nigeria, as well as modelled a transformational solution. This is in accordance with the epistemological assumption that the purpose of performing academic research and discourse is more than describing, understanding, and explaining the world, but also involves changing it (Reason & Torbert, 2001). While answering the Research Questions posed, this study is unique in simultaneously studying and also solving the crisis by testing the DA model of anaesthesia workforce training.

Implementing the DA programme allowed professional, departmental and hospital transformation to occur. This is not surprising because working collaboratively leads to transformational change (Bradbury et al., 2019; Fazey et al., 2018). This action research also allowed transformational leaders, at the FMC Abuja, to emerge. According to Bradbury-Huang (2010); Bradbury (2015); and McTaggart (1991) personal changes occur because knowledge comes from doing. The focus group discussions provided important feedback from participants after completing the DA programme and this is relevant for the next spiral cycle of action. The strategic stakeholders' in-depth exploration of dynamic factors that contributed to anaesthesia workforce crisis in Nigeria also provided valuable insight for consideration when creating a solution. The cost benefit of having the stakeholders for a focus group discussion was remarkable as this took place as a side event during the 26th Nigerian Society of Anaesthetists (NSA) annual conference held at Port Harcourt, Nigeria in November 2018, and at no extra cost. Featuring side events allowed for meetings, discussions, and research to be held simultaneously at conferences.

The anaesthesia workforce training concept proposed and supported by Gordon (1967) was not intended to be tested in this study. However, the results of implementing a DA programme at the FMC Abuja was a serendipitous finding confirming that establishing an autonomic, locally run department of anaesthesia, can provide the dual functions of service and training. This is indeed an effective and efficient model of optimizing anaesthesia workforce. Although Gordon (1967) referred to medical schools having department of anaesthesia for such purpose by suggesting that:

> If we are to extend the availability of modern anaesthesia to the under-doctored areas of the world, we must realize that our primary objective must be to teach every physician something about anaesthesia-in fact, enough that he may be able to manage the ordinary anaesthetics required in the environment in which he works. The

> requirements of his environment and the limitations it imposes on drugs and equipment will of necessity dictate what his basic training should be. There can be no doubt that the best time and place to do this will be in the medical schools of the developing countries during the undergraduate and intern years. To achieve this requires the establishment and maintenance of strong teaching departments of anaesthesia in these medical schools, which must eventually be staffed by appropriately trained indigenous physicians. It is to be noted that, almost without exception, the medical schools of Africa, Asia, and South America have such departments. To fulfil their teaching functions, however, most need strengthening by the addition of further well-trained anaesthetists. The teaching staffs of such departments should be "indigenous" at the earliest possible moment, and in most instances this means the recruitment and training of the appropriate native physicians.

From Gordon's (1967) point of view, teaching anaesthesia in the undergraduate and intern years in medical schools, was logical. My study specifically focused on teaching anaesthesia, hands-on in the workplace, to enable young doctors to become middle level anaesthesia specialists; and to allow them to obtain additional qualifications while working. The logic was to make them relevant in primary and secondary level hospitals and to transform FMCs to both service and training centres.

Action research is proactive and makes it possible to keep repeating the cycle in a progressive way referred to by Coghlan and Brannick (2014, p.11) as a spiral of action research cycles. This study presents the first of such cycles. Repeating the cycles has the potential to transform consecutive participants, thereby gradually and steadily transforming the crisis and moving it towards the desired future. The transformative power of the participatory process of the research in the workplace (FMC, Abuja) was driven by all-inclusiveness and authenticity. Since it is research in action, instead of an ethical approval,

this study received organizational support through the willingness of all stakeholders to participate and collaborate in creating the future of anaesthesia workforce in Nigeria. This typifies an ideal "participatory, democratic process concerned with developing practical knowing in the pursuit of worthwhile human purposes, grounded in a participatory worldview" (Reason & Bradbury, 2008, p.1). Undoubtedly, the workforce development programme at the FMC, Abuja was carried out as a physician anaesthesia provider-centered education and training.

As the researcher, my limitation of being close to data was mitigated by involving other anaesthesiology experts in a focus group discussion so that their voices can be heard. In mediating the meeting, I played the role of a learner by asking relevant questions, listening attentively and co-generating knowledge. I was engaging in second person research, which Coghlan and Brannick (2014) described as working on practical issues of concern to one's organization (professional society) in collaboration with colleagues and relevant others. Moreover, a more diverse group of stakeholders was involved in order to get diverse perspectives, definitions and understandings of the crisis. The video recordings and clips ensured that no information was missed, and this enabled thorough analysis. If need be, the video recordings can be accessed for alternative reframing of the current thinking. This is important as a reference for future implementation.

This Chapter is a result of reflection on reflection, allowing the action research to go beyond mere problem solving to provide meta-learning, i.e., learning on learning (Coghlan & Brannick 2014, p. 12). In this Chapter, I lay out Implications, Recommendations and Conclusions of the present study. Implications are exposed as they relate to the original Research Questions, and in the context of the published literature on the subject, as well as the expressed views of the participants. The research significance is, once more reflectively underscored. Recommendations for future anaesthesia workforce training and for anaesthesia

leadership are set out. I also present my recommendations for future research. The key points are enumerated in the Conclusion.

Implications of the Study

The problem is that amongst the surgical workforce, the group globally and profoundly affected by the workforce crisis is the physician anaesthesia workforce (Cherian et al., 2010; Meara et al., 2015). The number of physician anaesthetists in Nigeria does not reflect the needs of its growing population; while shortage of anaesthetists in Nigeria is worsened by maldistribution and brain drain, thus negatively impacting essential and emergency anaesthesia services at the secondary health care level and community hospitals (Soyannwo & Elegbe, 1999; Bode et al., 2013; Onyekwulu et al., 2014). In the past, there seemed to be no deliberate strategies to enhance anaesthesia services where the impact of the crisis were most felt.

The purpose of this mixed method, insider action research is to analyse the dynamics of the physician anaesthesia workforce crisis in the 36 States and the FCT of Nigeria and calculate the workforce gap in reference to the required workforce by the end of year 2030. The associated objectives are to find out the major dynamic factors that contribute to the gap, and also the nature of the dynamic interaction between these identified factors; and to model a brain-based diploma in anaesthesia programme at the Federal Medical Centre, Abuja, being a secondary level hospital in Nigeria.

Beginning with workforce analytics, answers to Research Question 1 to 4 provided quantitative numerical data on workforce which were analyzed in relation to the national and state populations and presented in tables and charts to understand the crises being studied. The focus group panelists discussion provided an in-depth insight into Research Question 5, a description of the major dynamic factors that contribute to the anaesthesia workforce gap and

the nature of the dynamic interaction between these factors. The participants in the DA programme provided valuable feedback on their experiences and these were analyzed thematically for consistent and divergent views to provide answers to Research Question 6. In addition to answering those questions, this study seeks, through a participatory research in action, to demonstrate the potential in a brain-based diploma in anaesthesia programme at the Federal Medical Centre, Abuja (the workplace). This study seeks to co-generate knowledge (Bergold & Thomas, 2012; Koch & Kralik, 2006; Reason & Bradbury, 2001; Streubert & Carpenter, 2011; Young, 2013) that will improve anaesthesia practices and address the issue of anaesthesia workforce crises.

Thus, I present a unique and exciting opportunity and adventure of combining scholarship with pragmatism; integrating scholarship into practice and generating actionable knowledge (Wasserman & Kram, 2009; Coghlan, 2013). The remainder of Chapter 5 will attempt to underpin the notion of the scholar-practitioner. The findings outlined in Chapter 4 presented a series of quantitative (workforce analytics) and qualitative findings and the implications will be addressed accordingly.

Discussion of RQ1. This Research Question asked: What is the ***physician anaesthesia provider*** workforce density per 100,000 population in Nigerian and in each of its 36 States/Territory?

Workforce analytics in this study showed that the ***PAP*** workforce density per 100,000 population in Nigerian is 0.51, which is lower than the density report for Nigeria (0.58) in the WFSA workforce map (WFSA, 2017). The Nigerian anaesthesia workforce density is in serious crisis compared with 9 per 100,000 population reported for Canada (Canadian Medical Association, 2018). The WFSA live Map shows that it is 17.85 per 100,000 in the United Kingdom; 20.82 per 100,000 population in the United States of America, 16.18 per 100,000 population in South Africa, and 23.0 per 100,000 in Australia. (WFSA, 2017). This

is worrisome because of the potential that these richer countries have to pull anaesthesia workforce away from Nigeria, so that the poor get poorer and the rich get richer. Dohlman, DiMeglio, Hajj & Laudanski (2019), considering that low-income countries are already severely understaffed as it concerns physicians, then superimposing the migration of the already scarce physicians to foreign countries on this delicate situation, can dangerously reduce access to and jeopardize healthcare in the source country. It will therefore require a deliberately formulated consistent strategy to increase the anaesthesia workforce density in Nigeria.

The density for the three zones in the South of Nigeria namely SW (0.74), SS (0.88) and SE (0.71) are above the national density, while the NW (0.20) and NE (0.11) zones are below the national density. The PAP density in the NC (0.58) is closer but slightly higher than the national density. The reason for this is that the FCT which has a PAP density of 4.48 per 100,000 population is an outlier in the NC zone. Without the FCT, the PAP density for the NC zone is 0.34 per 100,000 population and therefore lower than the national density. This finding implies that there is an attractive pull to FCT, the capital of Nigeria, leaving other parts of Nigeria critically under-served. Relative to the Southern zones, the Northern zones are severely underserved.

The anaesthesia workforce pattern in Nigeria shows a geographical preference for the capital and inequity favouring the Southern zones with a marked preference for the older cities in the well-developed States of Edo (1.64), Enugu (1.44), Lagos (1.34) and Rivers (1.27). These States are also home to the older universities namely University of Benin, University of Nigeria, University of Lagos, and the University of Port Harcourt. FCT Abuja, Lagos and Rivers States also have international airports and are easily accessible to and from other parts of the world. This pattern of distribution is comparable with the surgical workforce pattern of Meara et al. (2015) in that the poorest nations (Sub-Saharan Africa and

the Middle-East) are severely underserved in comparison to High-income countries in America and Canada, Western Europe, Australia.

The uneven distribution of physician anaesthetists is not peculiar to Nigeria or any low- and middle-income country. The national work patterns of anaesthesiologists in the USA showed that 95% of physician anaesthesia providers work in urban locations and there were both regional and gender differences in the trend (Baird, Daugherty, Kumar & Arifkhanova, 2015; Daugherty, Fonseca, Kumar & Michaud, 2010). However, William (2015) cautions on using anaesthesia manpower surveys in isolation, suggesting that common sense be used when interpreting and applying them.

Zurn et al. (2004) suggested that imbalance in the workforce for health is a complicated phenomenon having extensive and unprecedented range of possible situations which can be profession/specialty imbalances, geographical imbalances, institutional and services imbalances and gender imbalances. Efendi (2008) was concerned about the asymmetry in the distribution of health professionals in Indonesia with low number of professionals in the rural compared to the urban areas. For example, in Indonesia, the difficult geography presented great challenges to health service delivery therefore most health workers preferred to serve in urban areas, resulting in an uneven distribution of health workers and shortages in remote areas.

Discussion of RQ2. This Research Question asked: What is the ***physician anaesthesia specialist*** **(PAS)** workforce density per 100,000 population in Nigeria and in each of its 36 States/Territory?

The PAS are the specialists, most of whom have their primary assignments in Teaching Hospitals or Specialist Hospitals and are involved in training, research, and tertiary care. The PAS density for Nigeria is 0.14 per 100,000 population. The range in the Southern

Zones is 0.16 to 0.24. By removing FCT Abuja which has a PAS density of 1.64, the PAS density for NC zone comes down from 0.2 to 0.01. The NE and NW zones are 0.01 and 0.05 respectively. The implication is that the capacity for tertiary level care is critically low in Nigeria (PAS density is 0.14); with the exception of the FCT (PAS density is 1.64). This also means that inadequate access to anaesthesia care will inadvertently limit access to surgical care. This dependency is deadly, with the Northern zones at higher risks of associated perioperative morbidity and mortality when compared with the Southern zones.

Interestingly, at the FCT Abuja, the physician anaesthesia specialists (density of 1.64 per 100,000) form 40% of the physician anaesthesia providers (density of 4.48 per 100,000). The implication is that the FCT is best positioned to provide tertiary level care. Consequently, in Nigeria, if thoughtfully planned, the FCT can be made the hub for intentional training and mentoring of PAPs. This will greatly enhance the national potential to improve the supply chain of PAPs for anaesthesia service in other States; and/or increase the supply pool, if need be, of PAPs for further residency training at Teaching Hospitals in other parts of Nigeria. It is however crucial that the training of PASs be encouraged in the other parts of Nigeria. Specifically, in the NE Zone, four States namely Adamawa, Bauchi, Taraba, and Yobe States have no physician anaesthesia specialists (0 PAS per 100,000 population). It will be impossible for the four States to provide optimal tertiary level care for 80% of the population. Moreover, the training of PAPs and PASs to meet the needs of all Nigerians is a massive challenge, but for the four States without PAS, the training of anaesthesia teams will be impossible unless national and/or international help is provided.

In addition, not only is the number of PAS important for training but they must be able to demonstrate the characteristics of good teachers as stated by Wakatsuki, Vinagre, Marty, Thomsen & Macario (2018) in order to positively impact young doctors and residents. In this regard, quantity and quality of PAS are both important.

Discussion of RQ 3. This Research Question asked: Taking 4 anaesthetists per 100,000 population as the target, what is the ***gap*** between the current workforce densities and the recommended number of anaesthetists?

The national gap for Nigeria is 3.49. The implications of a national gap that approaches 4, is that there is a pressing need to create a nationwide strategy to implement policies that will support transformational change. The differences in the workforce gaps in the 6 zones in Nigeria can inform the policy makers and all stakeholders on how to prioritize the anaesthesia workforce training in each zone. The result also showed that FCT, Abuja stands out as the only place with a negative gap (-0.48) indicating that the minimum number of PAP for the population according to Davies et al. (2018) has been exceeded. However, this does not reflect the optimal number of PAP for the national population.

Considering that the FCT has both geographical advantage and potential to be branded as the surgical and anaesthesia destination of the country, this can only apply to elective surgical procedures. The challenge of providing essential and emergency surgical and anaesthesia care for Nigeria remains huge. Although, the number of public hospitals likely to be offering emergency or referral care in Nigeria is 879 and more than 90% of the population in Nigeria live within 2 hours of accessing care (Ouma, Maina, Thuranira, Macharia, Alegana, English, ... & Snow, 2018), this geographical accessibility to emergency hospital care, considering the findings of anaesthesia workforce gap in this study, does not guarantee optimum anaesthesia and surgical care when needed.

Discussion of RQ 4. This Research Question asked: What are the main demographic features of physician anaesthesia workforce in Nigeria?

The results show a lower percentage of female residents (21.4%) compared with female consultants (32%). There are more male residents (78.6%) compared with male

consultants (68%). This shows a de-feminisation of the anaesthesia workforce over a period if this trend remains the same. Historically, women have been underrepresented in Medicine (Toledo, Duce, Adams, Ross, Thompson & Wong, 2017) and the proportion of female anaesthesiologists in the 2013 workforce survey in the USA is 25% (Baird, Daugherty, Kumar & Arifkhanova, 2015). The trend of de-feminisation is also seen in all the zones except in the SW zone where there is a gender balance of the male (49.3%) and female (51.7%) consultants.

Nevertheless, there is a gender imbalance with 68.5% male residents in that zone. The implication of gender imbalance with a dominant pattern of an increasing number of male anaesthetists and a defeminisation trend in the anaesthesia profession is against the United Nations sustainable development goal 5, "to achieve gender equality and empower all women and girls". While women and girls make up half (49.3%) of the Nigerian population (CIA, 2018 Est), half of the world's population and therefore half of its potential, the gender gap in anaesthesia is undesirable. Raising women's participation in the workforce can boost economic growth (United Nations, 2015) and having female membership in boards correlates with higher profits (Norland, Moran & Kotschwar, 2016).

Discussion of RQ 5. This Research Question asked: What are the major dynamic factors that contribute to this gap and what is the nature of the dynamic interaction between these identified factors?

The stakeholders are not blind to the factors contributing to the physician anaesthesia workforce gap. The dynamic factors identified in the study are multifactorial, diverse, and complex. Twelve factors were identified by the stakeholders as shown in Chapter 4. To better discuss the implications, these factors are categorized into three main areas namely: Training, Professional profile, and Geographical location.

The factors associated with training are:

- Lack of a Multi-level Training Strategy for the expansion and effectiveness of departments of anaesthesia.
- Lack of regional training schools in Nigeria.
- Slow turn out rate of Fellows
- Abysmal residency pass rate of anaesthesia residents

The factors associated with professional profile are:

- Anaesthesia is unknown at both policy and professional levels.
- Anaesthesia is an unpopular career.
- Discriminatory encouragement and mentoring of medical students.
- High attrition rate.
- Lack of appreciation for Membership Qualification in Anaesthesia as a workforce solution.
- Lack of Career structure for the Diplomates in Anaesthesia.

The factors associated with geographical location are:

- Unequal geographical distribution of medical specialists.
- Brain Drain and Migration

The stakeholders view in this study is similar to that of Uma & Hanji (2013) on how famous anaesthesiologists are amongst the general population in India. Their findings portrayed that the general population demonstrated ignorance regarding the important role played by the anaesthesiologists in hospitals. The authors suggested that the reason for this is partly attributed to the casual bedside attitude of anaesthesiologists. Uma & Hanji (2013) suggested that anaesthesiologists should take the initiative to participate in public awareness programs in order to gain respect from and recognition by the general public.

Simini (2000) suggested that the name “anaesthesia” is obsolete because the discipline has grown beyond anaesthesia to encompass intensive care, pain management, and trauma care. Simini (2000) quoted the vice-president of Swedish Society of Anaesthesia and Intensive Care, Rolf Sandin of Kalmar Hospital, Sweden, as saying that the name, anaesthesia, “gives laymen, politicians, and even colleagues a very limited idea of our expertise”; also suggesting that, anaesthesia has “evolved over a few decades into the combination of applied physiology, applied pharmacology, and dexterity”.

The implication of the multifactorial and complex factors that contributes to the physician anaesthesia workforce gap demonstrates the need for a systems approach and a multilevel approach to transformational change. This will be extensively discussed in the recommendations for training and recommendations for leadership. Considering that Saudi Arabia, an aggressive workforce poacher, already has a PAP density of 4.76 per 100,000 population but continues to poach from the 0.51 per 100,000 in Nigeria, means we need to ensure that we are able to keep and motivate our anaesthesia talents and workforce. It is mandatory to checkmate the professional recruitment agencies and corporations who are actively and openly recruiting highly skilled physicians from Nigeria and other LMIC countries.

Discussion of RQ 6. This Research Question asked: Can a brain-based diploma in anaesthesia programme at a secondary level hospital (Federal Medical Centre) be a practical solution to the anaesthesia workforce crisis?

As already stated, and summarised in Chapter 4, this insider action study demonstrates that the DA programme implemented at the FMC, Abuja is a successful model. Carrying out strategic conversations are important before the implementation of any programme. These conversations enable the buy-in of stakeholders, participants, and actors in

an action research. Although, the action researcher should identify practical problems and generate potential solutions, these must become a strategy that the stakeholders are willing to participate in and co-create. Therefore, carrying out all the steps in the spiral of action research, comprising of the initial pre-step (context and purpose), followed by constructing, planning action, taking action, and evaluating action, will require maintaining momentum through strategic conversations.

It may be argued that a business strategy is only relevant to the private sector, nevertheless, national governments and their ministries of health can also benefit from understanding economic value of surgery and anaesthesia. These benefits can only occur by occupying a unique knowledge absence and demarcating, operationalizing, and "owning" it via the exercising of entrepreneurial judgement, despite the political, institutional, and cultural forces. Business strategy for the private sector (Spender, 2014), can be applied to workforce for health, and in this case to physician anaesthesia workforce. The need to recognize opportunities, as well as consider the associated uncertainties when creating workforce strategy is important.

Going back in history, as defined by Chandler, "strategy is the determination of the long-run goals and objectives of an enterprise and the adoption of courses of action and the allocation of resources necessary for carrying out these goals" (1962, p. 13). Unfortunately, it is still difficult to articulate or explain what strategy is because it is rather abstract and has many dimensions (Chaffee, 1985). On the other hand, Porter (1986, 1996) examines strategy from the competitive point of view, emphasizing that 'competitive strategy is about being different, thereby popularizing competitive advantage to create and sustain superior performance. It means deliberately choosing a different set of activities to deliver a unique mix of values (1985, p. 11-12).

Mintzberg (1994) indicated that strategy is, “a pattern in a stream of decisions”. Whereas, the opinion of Dess, Lumpkin and Taylor (2005) is that strategy involves three processes: analysis, decision, and action and that it is an on-going, evolving process that involves interaction, among the three processes. While Johnson, Whittington, Scholes, Angwin & Regner (2014) in their book, Exploring Strategy, refer to strategy as the long term direction of an organisation implying a more comprehensive view; Spender (2014) in his book on Business Strategy, opined that strategizing has more to do with disciplined guessing than with rigorous analyzing. The latter claims that strategic work relates to specific instances and must have its “boots on the ground”. Strategy must deal with what is both significant and particular to the action situation.

Michael Porter (1996) claimed “strategy is about being different” in order to compete, in contrast, Kim & Mauborgne (2015) proposed the Blue Ocean Strategy (BOS) which they claim gives the organization a clear advantage because it puts it in a class of its own, creating an uncontested market space where competition becomes irrelevant. According to BOS, “value innovation places equal emphasis on value and innovation”. Kim & Mauborgne (2015, p. 13) suggested that “value without innovation tends to focus on value creation on an incremental scale” thereby improving value but not sufficiently enough to make the organization stand out and achieve high performance. The authors further stated that, “innovation without value tends to be technology-driven, market pioneering, or futuristic, often shooting beyond what buyers can accept or pay for”. Therefore, “value innovation occurs when companies align innovation with utility, price, and cost positions” (p. 13). Similarly, Spender (2014, p. 10) opined that competition is not a condition that is necessary for value creation and when present, it will add indeterminacy and more constraints. In addition, any kind of purposive action under uncertainty calls for judgement and may generate value.

According to Chermack, van der Merwe & Lynham (2007) the ability of an organization to consistently harness change and constantly rediscover its entrepreneurial vision, rest on the organization's ability to continually create and hold strategic conversations. The authors referred to Van der Heijden (1997), who wrote that effective strategic conversation requires a common language, alignment of ideas, willingness to engage in rational argumentation and finally, the evolutions of ideas inside the organization.

The idea of building the language was linked with creating a business model by Spender (2014, p. 162) because it enables "communication" which implies knowledge transfer between people. The importance of language is also emphasized by Spender and Strong (2014, p. 61-63) suggesting that strategic conversations can be used to drive creativity and thereby add value to the organization through the business model. The promise of strategic conversations includes strengthening decision-making under uncertainty; developing and promoting an entrepreneurial workforce; and accelerating business growth all at a low or incremental cost to the organization.

Although, there is no fundamental formula for a business model, the effectiveness of the choices made while constructing a business model must be shaped by two factors: first, by the organizations ability to execute on the business model; and secondly by the business models suitabilit*y* to the business environment. These two factors which defines the 'opportunity space' are not the same for any two companies, are dynamic and constantly changing. They are influenced by the constraints on the business model.

Spender and Strong (2014, ii), quoted Naomi Fried, Chief Innovation Officer, Boston Children's Hospital as such, "In health care, innovation that makes a difference is rarely the product of a single individual – it takes a team. Strategic conversations show how to engage a range of stakeholders, from employees to external partners, to create business-model-enhancing change."

The authors aimed at sharing the burdens of business leadership practically between those with authority and those with important knowledge about how the business might best proceed. Although, Spender and Strong (2014) meant to produce a guide for leaders who want to engage an entrepreneurial workforce dedicated to creating value for their organization, they opined that strategic conversations are themselves a creative act of business model innovation which can be employed in many different ways (p. 196).

The foundation on which the strategic conversation concept was built (Spender and Strong, 2014), termed the "five iron laws of value creation" are as follows:

1. Innovating the business model is a company's primary source of sustainable growth and profit.
2. All business models require a leap of faith.
3. Companies must continually update their best models, so management must be perpetually entrepreneurial.
4. The better the knowledge flows and the more that relevant perspectives are brought to bear on the strategizing process, the more opportunity there is for innovation.
5. The benefits of business model innovation can best be realised when the innovation is done internally.

Furthermore, Spender and Strong (2014) affirm that the business model guides the attention of everyone involved on what details matter and which do not. It is a profoundly practical and empirical notion because so much of the detail is tied up with effective practice. It is impossible for anyone to appreciate the business model's essence unless they have worked in the firms specific situation, that is 'inhabited' it. Personally, I strongly agree with the idea that involving the employees in the creation of the business model through strategic conversation is so vital and no one inhabits the business model more than the employees who work within its constraints.

A business model, therefore, must be suited to the firm's circumstances. It involves the practice-based skills, with knowing how to generate purposive action in a context, not merely to think about it. There is no general theory or universal model to adopt. There is no theory on how to carry out profitable business. The strategy for a business model involves the task of imagining, creating, and occupying the unique space and time situation that the firm must inhabit if it is to create added value (Spender, 2014, p. 162). Thus, a business model does not happen on its own unless anticipated while preparation demands a language in which to think about the context's possibilities, practices, and outcome.

I will like to therefore equate strategic leaders (Schoemaker, Krupp and Howland, 2013) to entrepreneurs who, according to Spender (2014, p. 62), spend time and energy thinking and searching out the unique question (knowledge absences) they want to address and must therefore create a language capable of grasping the elements they wish to bring into fruitful collision, namely, their identity, intentions and context. Strategic leaders, according to Schoemaker, Krupp & Howland (2013) should be able to think strategically and navigate the unknown effectively by exhibiting the following six skills namely the abilities to anticipate, challenge, interpret, decide, align, and learn.

The DA programme resulted in the transformation of the FMC, Abuja into a training Center. The consequences were improved surgical and anaesthesia service through the scaling up of the hospital. This implies that having an accredited DA programme may highly likely, ensure the strengthening of surgical services within hospital, and initiatives designed to reinforce the health systems are usually promising. For transformational change to continue, leadership, such as seen in the global anaesthesia leaders at the FMC, Abuja will be required. This form of leadership is more strongly related to followers' change commitment (management and participants in the DA Programme) than change-specific practices,

especially when the change has significant personal impact (Herold, Fedor, Caldwell & Liu, 2008).

In this case, it should be noted that the followers were smart and talented medical doctors; and the leadership of the anaesthesia programme practiced regularly, the following seven interrelated tasks namely, direction, integration, mediation, education, representation, motivation and trust creation (Salacuse, 2006, p.62). The transformational leadership capabilities include coordination of resources, stronger collaboration across boundaries, communication amid uncertainty, and prioritization and discontinuing lower-level activities. The female diplomates delegated some family duties to others so that they can be able to work and study during the DA programme.

The four diplomates completed their training right on time within an 18 months period. Work-based learning demonstrated in this study shows that it is exciting, meaningful and offers real learning. In addition, building relationships, the "contact urge" and community played a critical role in learning (Gopnik et al., 1999). The community learning environment of the FMC, Abuja had a positive effect on the participants and facilitated optimal mind and brain learning by the four doctors. They demonstrated relaxed alertness, orchestrated immersion in complex experience and active processing of experience (Caine & Caine, 2006; Caine et al., 2009, p. 35, 116, 197).

A qualitative study of anaesthesia teachers, who consistently received overall ratings of 4+ on a 5 point rating scale for over a five year period revealed a set of characteristics which included dedication, commitment, enthusiasm for teaching, willingness to give time to teaching, enjoyment of one's own profession, understanding self as a role-model, motivation to upgrade and enrich one's own learning continually, and the ability to establish and maintain interactive professional relationships (Cleave-Hogg and Benedict, 1997).

In the operating room, the supervising consultants (OGS, OTO, EU and BOO), as suggested by Cleave-Hogg & Benedict (1997) also employed inquiry to enable their residents to think through complex situation; as well as learn through experiential and observational methods, followed by reflection and assessment. The characteristics of good teaching and a reflective approach to teaching can help residents to develop complex thinking skills and the acquisition of new knowledge. Wakatsuki, Tanaka, Vinagre, Marty, Thomsen & Macario (2018) suggested that teaching during patient care is an important competency for faculty. Their study of best practice for operating room teaching as perceived by anaesthesia residents revealed a bucket of characteristics including context, commitment, psychological safety, equanimity, and proper timing which are basically social; as well as teaching methods, such as autonomy, reasoning, literature, prior knowledge, flexibility, reflection, real-time feedback, and teach back.

Research Significance

The research questions posed by this study are addressed by combining two elements of human resource management, namely human capital theory and workforce analytics with transformational change using an action research model offering brain-based curriculum within the workplace. This research was designed firstly, to deepen an understanding of the anaesthesia workforce crisis in Nigeria; and secondly, to transform the crisis by countering brain-drain with brain gain and brain train initiatives. It was further intended to investigate through activity rather than theoretical response to anaesthesia workforce crisis.

Having a mixed method approach in this study allowed the researcher to use a combination of analytical, investigative, and evaluative methods to diagnose, analyse and solve problems. Furthermore, the insider action researcher pursues a first, second, and third person research. Consequently, this study meets the need for personal and professional

growth (first-person research); it enabled collaborative work on a DA programme with the Federal Medical Centre, Abuja (second person research); and finally, it generated contribution to knowledge inferred from experience (third person research). This study answered the call for the use of mixed method design in implementation research (Palinkas et al., 2015; Proctor et al., 2009; Landsverk et al., 2012 Palinkas et al., 2011; Aarons, Hurlburt & Horwitz, 2011).

General Recommendations for Future Training

There is a need to scale up the physician anaesthesia workforce by matching the training and skills set of physician anaesthetists with the level of perioperative care requirement. Considering that anaesthesiologist training varies all over the world and can last between 3 to 7 years in Europe, and averaging 7 years in the UK (Egger Halbeis, Cvachovec, Scherpereel, Mellin-Olsen, Drobnik & Sondore, 2007), this long training programme, although, desirable for tertiary level care, is an overkill for primary and secondary level perioperative care. Khan and Merry (2018) suggested that safe anesthesia and perioperative care can be provided for essential surgical services by clinicians with moderate levels of appropriate training, using relatively simple equipment, and a limited number of inexpensive generic medications. These requirements can be easily met in a primary and secondary level hospital.

I therefore recommend that the 12 to18 months Diploma in Anaesthesia programme at Federal Medical Centres and General Hospitals should be optimally and strategically developed as a work-based training, within the Nigerian Ecosystem. This is because it is a specific, measurable, achievable, realistic, and timely (SMART) solution. This solution also has the potential to match the needs of the population with the supply of competent and

motivated physician anaesthesia providers that are fit to lead and provide anaesthesia care in primary and secondary healthcare centres in Nigeria.

I agree with the recommendations of Cooper (2017) that all anaesthetists need to make a contribution to recruiting, nurturing, training, and retaining clinical staff to deliver health care. The DA Programme has a visible impact and a multiplier effect that can accelerate the attainment of UHC. The DA programme can be likened to a sprint (full speed in a short distance), while the Fellowship programme to a marathon (long-distance, long-lasting, or difficult tack). The existing Federal Medical Centres and General Hospitals in Nigeria, yet to be explored, have great potentials for further implementation action research.

These centres will require scaling-up for accreditation for surgery, obstetrics, and perioperative care in order to become workforce training centres. We are in a race against time and we need to tackle and overcome the physician anaesthesia workforce crisis in Nigeria. The DA programme is not a new programme, but it will have the best impact if a workplace brain-based curriculum like the model of the Federal Medical Centre, Abuja is both implemented and adequately funded.

Considering our ambitious projection is to move anaesthesia workforce up from 0.51 PAPs to a minimum of 4 PAPs per 100,000 population in 2030 (Figure 25), the obstacles of living, working and training in rural areas must be removed (Awofeso, 2010). In addition, Nigeria, having the highest population in Africa, should be at the forefront of building today, the anaesthetist of tomorrow. We must participate in breaking the human capital barrier in order to attain the 2050 vision for Africa (Fredriksen & Kagia, 2013). Investment in workforce training is desirable to gain $3.1 billion annual mortality benefit of physicians at Nigeria's current physician density and the value of statistical life (VSL) based on Nigeria's current domestic economic situation (Sulaja et al., 2020).

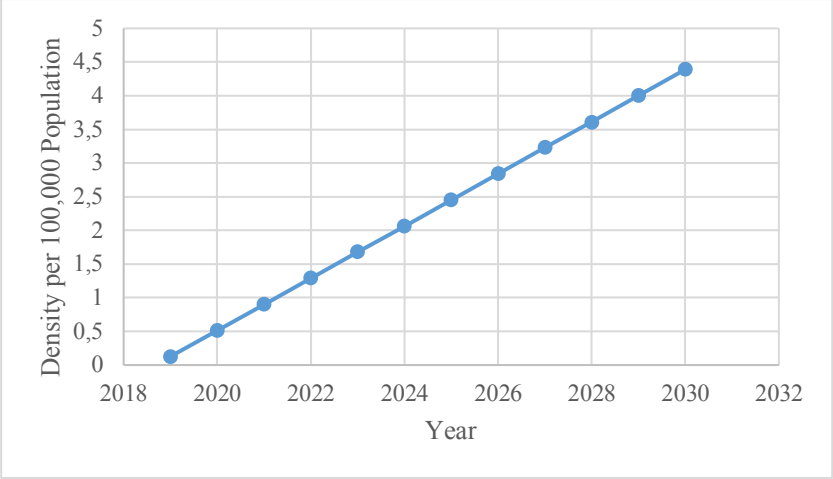


Figure 25. Physician anaesthesia provider density projection 2020 to 2030

The general recommendations for a successful DA programme in a Federal Medical Center include:

a. **Incentives for the anaesthesia teams and talent management**: the incentives must be appropriate and attractive enough to make academics at established teaching hospital (tertiary institution) in an urban area to support a secondary level hospital (Federal Medical Centre) probably in a sub-urban or rural area towards establishing a DA programme. This should involve training for all members of the surgical teams. The doctors in training must be financially incentivized, that is, be paid and recognized as full doctors and in addition given study grants. Incentives should also include non-financial interventions. For example, an appointment by the medical centre where the workforce training will be provided is highly recommended. This training should be in the form of continuing professional education for all members of the surgical team, not only for the physician anaesthetists. The recruitment of doctors originally from those areas may increase the willingness of physicians to serve in their home towns and villages.

b. **Logistic support**: appropriate accommodation, transportation, social and family support system must be made available to attract staff and medical doctors to new anaesthesia departments. Awofeso (2010) commented that amongst the obstacles to recruitment and retention of health workers in rural areas is the spartan living standards in those areas.

Therefore, to mitigate against spartan living standards, there must be extensive investment in rural development. In addition, learning is enhanced when an optimal environment is created (Caine & Caine, 2009, p. 21-22).

c. **Selection strategy, value proposition and triple loop learning**: doctors for the DA programme should be preferably selected locally from the same area or State where the workplace training is carried out. This will allow the building of community relationships and contact, that is the "contact urge" (Gopnik et al., 1999) which are important for meaningful learning. Retention of diplomates in a centre will then be influenced by passion for the healthcare improvement of that region, as suggested by Caine & Caine (2006). In the absence of community connections and contact, the risk of losing doctors to other specialties or to brain drain is highly likely.

d. **Attendance of leadership seminars**: diplomates must be given leadership training to develop their executive functions (Caine & Caine, 2009, p. 26), so that they will be prepared to lead anaesthesia units and/or pioneer new units. To jump the curve calls for a triple loop learning.

e. **Gender diversity**: it is important to provide female doctors with equal access to training, equal salary and equal opportunities in anaesthesia and leadership.

Specific Recommendations

The specific recommendations take into consideration firstly, the need to take surgery and anaesthesia services to all geopolitical zones using the existing workforce by creating a mobile model "Theatre on Wheels". Secondly, the need to reach the underserved States in Nigeria by proactive facilitation through the creation of the "Nigerian Institute of Global Anaesthesia". The logic behind this is to provide an efficient, equitable and sustainable manner to match population needs.

Service Provision Model - Theatre on Wheels (TOW)

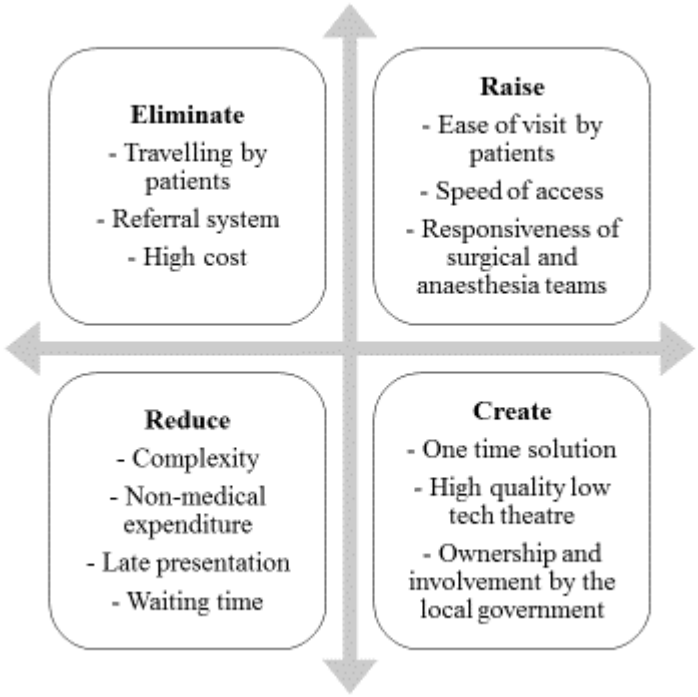


Figure 26: Eliminate-reduce-raise-create grid for the Theatre-On-Wheels

In Nigeria, like most LMIC's, the delays in receiving care can occur in any part of the referral system. It is the normal practice to seek safe care very late when complications have set in and the patients are desperate (Meara et al., 2015). The outcome of late presentation in the hospital are usually associated with high morbidity and mortality. Apart from this, because most patients do not have medical insurance, they also must pay for care out of their pockets (Aregbeshola & Khan, 2018; Aregbeshola & Khan, 2020).

For optimal perioperative care, I recommend a 2-operating room, equipped, essential surgical and anaesthesia care mobile unit with the capacity for providing general anaesthesia and regional anaesthesia. It should be factory-fitted with the essential equipment namely operating tables and lights, theatre furniture, user-friendly robust anaesthetic machines connected to oxygen concentrators, a portable mobile X-ray machines, and monitors especially the pulse oximeter. In addition, it should have resuscitation equipment, suction

machines and tubes and essential accessories for performing the Bellwether procedures – caesarean delivery, laparotomy, and open fracture treatment. For evidence-based practice, it should have a side-laboratory where the required investigations can be performed on-site e.g. urinalysis, serum tests for haematology and blood chemistry tests.

The TOW will need to have storage for anaesthetic and analgesia drugs especially ketamine (Joshi and Onajin-Obembe, 2015). Infusion fluids can be administered using a simple gravimetric intravenous method (Onajin-Obembe, 2008) thereby reducing the cost and complexity of using electrically powered infusion pumps. The TOW should be solar-powered and have generator back-up. A team of surgeons, anaesthesia providers and operating room nurses can be easily trained to run the TOW. It is important that the TOW driver be trained in basic life support (just like ambulance drivers) and should function as a porter whenever surgery is scheduled. Other members of the surgical team can be pulled from the community and district hospitals if necessary. The TOW and the team can serve up to five different communities in any local government area.

More work needs to be done to fine-tune this concept because not all the 774 local governments in Nigeria will require a mobile theatre. However, the TOW promises to increase the community access to operating room, offer a responsive, safe, and cost-effective solution. In addition, non-medical cost of accessing surgical and anaesthesia care such as transportation, lodging, food, and family escort cost will be markedly reduced by taking the theatre to the communities. There will be no need to set up temporary theatre as done during surgical outreaches (Alagbe-Briggs and Onajin-Obembe, 2013) because the TOW will offer a one-stop solution for global surgery. It will also address the problems of infrastructure. TOW reverses the order of referral and takes the surgical solution to the patients instead of the patient coming to the hospital. It can be used by local governments and state governments in

Nigeria. It can also be used as infrastructure sharing by independent surgeons or group of surgeons.

To encourage entrepreneurial development, the TOW can be run by independent healthcare practitioners as a service and infrastructure providers to surgeons and anaesthesia providers in private practice. The TOW has tremendous potentials as it can motivate the formation of group-sharing by surgeons who prefer to share instead of investing in operating rooms themselves. Also, the TOW as a whole or in parts can be donated or funded by companies as a corporate social responsibility towards an adopted local government area in any of the States in Nigeria. It will create jobs because the cleaning staff and additional porters can be locally staffed since they do not require special training.

Furthermore, surgical specialists from any part of the country will be sure that they will have a complete solution to work with if they need to provide essential surgical care to any community. The reception and clinic for screening patients can be set up in already available community schools, village halls or dedicated community clinics.

The Nigerian Institute of Global Anaesthesia (NIGA)

There is a need for anaesthesia services to reach all the geopolitical zones in Nigeria. My response to a shortage of trained staff is to "train the staff". The strategy for reaching the underserved States in Nigeria will require proactive and deliberate facilitation which can be achieved by creating a Nigerian Institute of Global Anaesthesia (NIGA) to oversee the process. The mission and goals of the NIGA should include:

1. Participation in strategic conversations and policy making on global anaesthesia issues at the State and Federal levels in Nigeria.
2. Organization of work-based leadership seminars and mentoring programmes for Anaesthesia teams.

3. Consultation and Assisting with the establishment of the diploma in anaesthesia programmes for Federal Medical Centres and General Hospitals in Nigeria.
4. Facilitating setting up, scaling-up and accreditation of the anaesthesia department to perform the Bellwether procedures at first level hospitals.

Appreciating that the availability and accessibility of human resources for anaesthesia service is central and crucial to surgical and emergency care delivery, it is mandatory for Nigeria to meet the minimum PAP workforce density of 4 per 100,000 population.

The operational strategy for NIGA: Both the diploma and fellowship programmes have traditionally been the prerogative of teaching hospitals where specialist (board certified) consultants are available to supervise and direct physicians-in-training (diplomates and residents). Unfortunately, this has led to populating the fellowship programme at the expense of the diploma programme (Bode et al., 2013). The operational strategy for NIGA is a "Go Ye" project in which dedicated anaesthesia specialists from the teaching hospital (higher-level hospital) are seconded to Federal Medical Centres or General Hospitals as supervising consultants/trainers/project managers for a specific period of two to three years. During this period, the consultant is expected to fulfil the mission and goals of NIGA by setting up at least two functional operating theatres. In addition, the consultant should scale up the implementation hospital to obtain accreditation. Thereafter, the training of at least 3 doctors for the diploma in anaesthesia at the hospital can be carried out using a brain-based, work-based programme.

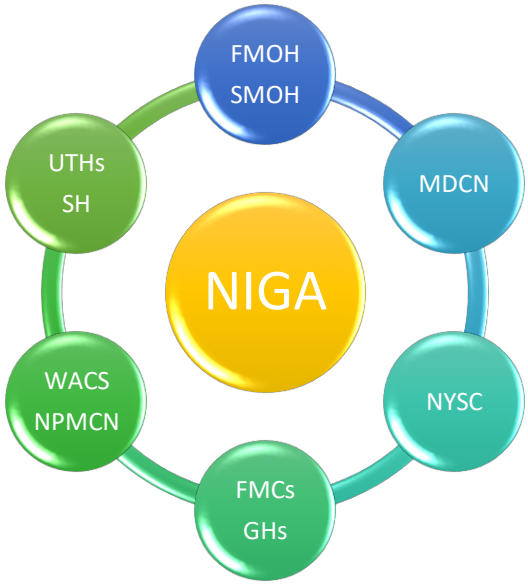
The goal of learning is performance, climbing from an unskilled present to a proficient future, from "cannot" to "can" (Raelin, 2008, p. ix). The work-based learner (doctor in this case) seeks to be more effective, to be able to produce a desired result (safe and quality anaesthesia). The "Go ye" is a biblical concept in which Jesus tells his disciples to "go ye into all the world and preach the gospel". Therefore, anaesthesia skills and

knowledge should be exported from tertiary hospitals to the district hospitals and to create the needed anaesthesia teams at geographical locations that are otherwise severely underserved.

The anaesthesia teams at Federal Medical Centres and General Hospitals should be able to provide situation specific services as suggested by Gordon (1967). These hospitals should be the prime location for knowledge acquisition, skills and hands-on practice where work-based learning can operate across many dimensions involving the surgical teams, other hospital departments, individuals, social environment and the community. Borrowing from Schon (1983), unpredictable circumstances will engage workers (the anaesthesia teams) in reflection-in-action, on-the-spot reframing, or spontaneous testing of old and new knowledge in order to arrive at a solution to the immediate problem (emergency surgery and anaesthesia).

The Stakeholders of the Nigerian Institute of Global Anaesthesia

The NIGA should strike a balance between all the stakeholders (Figure 27) and the environmental need while ensuring accountability to the Federal and State Ministries of Health. The well-established fellowship programme at the university teaching hospitals (UTHs) and Specialist Hospitals (SHs) which are mainly teaching, research and specialisation will be greatly enriched by carrying out programmes and research on global anaesthesia. The anaesthesia residents in the teaching hospital will have the privilege of disseminating their knowledge and sharing their skills through a rotation in the district hospital and a rural posting.



NSA: Safety First.

Community needs: Essential and Emergency Surgical and anaesthesia care

Figure 27. The stakeholders of the Nigerian Institute of Global Anaesthesia

The diploma in anaesthesia syllabus of the West African College of Surgeons (WACS) is recommended (Appendix C). The roles of the two colleges, the WACS and NPMCN are accreditation of all hospitals, professional examinations, and validation. The Nigerian Medical and Dental Council already recognises the diploma in anaesthesia as an additional qualification for doctors and diplomates therefore they will play a relevant role of licensing newly qualified physician anaesthetists practicing in Nigeria. Since Nigerian graduates below the age of 30 years are mandated to spend one year enlisted for the National Youth Corp Service (NYSC), this can be used as a springboard into the DA programme for young doctors who have been posted to district hospitals.

The NYSC doctors can take advantage of a work-based learning programme to get a permanent job in a newly created anaesthesia department. The Nigerian Society of Anaesthetists (NSA), the professional body for all physician anaesthetists should champion this initiative as a community social responsibility because their motto is “Safety First”. Although, the programme should focus on anaesthesia and perioperative services for primary and secondary hospitals, these will require collaboration with all stakeholders because of

their interdependent roles. The success of NIGA will depend on having a credible board of directors and a chief executive with an excellent leadership and academic track record.

On the long run, there must be within the community, confident, competent, and motivated anaesthetists with executive brain function who have been trained on the job, for the job. The emphasis is on learning together (organizational learning) because all the categories of anaesthetists in the healthcare system including service providers, researchers, teachers, leader practitioners and specialty experts will all be involved at some point. Having academic autonomy, that is the freedom of the faculty members to operate freely, leads to intellectual wealth of great quality (Pandey, 2004). This means that the consultant is free to teach and research what he or she chooses within the anaesthesia curriculum; and the doctor in training has a choice to participate in the learning process. Without lowering the standards, self-motivated doctors need to be employed and retained by the participating district hospital.

Recommendations for Global Anaesthesia Leadership

As appropriate for result-driven leadership of the 21st century Global Anaesthesia Projects, the researcher recommends six leadership pillars which are discussed in this section (Figure 28).

Figure 28. The 6 leadership pillars for the 21st Century global anaesthesia leader

Strategic Leadership

The success of global anaesthesia practice must not be left to chance but must be determined by the decisions that strategic leaders make to align the mission, goals and strategies of its programme with the external environment (needs of the population). Strategic leadership is a key factor in an organization's ability to adapt, evolve, and prevail amidst turbulent disruptions (Kirby & Stewart, 2007). It is a person's ability to anticipate, envision, maintain flexibility, think strategically, and work with others to initiate changes that will create a viable future for the organization (Bass, 2007). Strategic leadership is a process of providing the direction and inspiration necessary to create and implement the vision, mission, and strategies to achieve the organizational objectives. It is the ability to influence others to voluntarily make day-to-day decisions that enhance the long-term viability of the organization (Rowe, 2001). Therefore, training of anaesthesiologists for the 21st century must align with the vision of the global strategy on human resources for health, workforce 2030, which is "to accelerate progress towards universal health coverage and the United Nations Sustainable Development Goals by ensuring equitable access to health workers within strengthened health systems".

The capabilities needed for effective strategic leadership, according to Hitt, Haynes & Serpa (2010) include developing and communicating a vision; building dynamic core competencies; emphasizing and effectively using human capital; investing in the development of new technologies; engaging in valuable strategies; building and maintaining effective organisational culture; developing and implementing balanced controls; and engaging in ethical practices. The ability to adapt is influenced by the strategic leader's interpretation of the environment and reorientation of the institution as a result of seeing change as opportunities. While the strategic leadership of NIGA must respond quickly to the demand for immediate action, they must recognise the need for effective strategic planning.

The effective strategic leader must not only anticipate and forecast events in the external environment (observe from the outside), but must also evaluate strategy implementation and results strategically, and make strategic adjustments. In addition, building a highly effective, efficient, and motivated faculty and team, as well as selecting, developing and mentoring a talented team of leaders will ensure sustainability.

Strategic leadership of NIGA must build a culture that encourages strategic thinking across the institution. By so doing, they align culture with strategy (Goldman & Casey, 2010). Strategic thinking is "an immensely complex process, which involves the most sophisticated, subtle, and at times, subconscious elements of human thinking" (Mintzberg, 1994). Leaders unable to think strategically, fail because of personal factors, including their inability to shift from a technical to a strategic focus (Yukl, 2006). The strategic leadership of NIGA must therefore, avoid quick fixes and decision-making blunders. Anaesthesia is medical practice and must be led by medical doctors with a focus on patient safety. Effective strategic leaders must not compromise on promoting the rights of surgical patients to the enjoyment of the highest attainable standard of health (WHO, 2016).

Goldman and Casey (2010) derived the definition of strategic thinking from their review as, "conceptual, systems-oriented, directional, and opportunistic thinking (Hanford, 1995; Liedtka, 1998; Mintzberg, 1978) leading to the discovery of novel, imaginative organizational strategies (Heracleous, 1998). Anaesthesia values, beliefs and assumptions must be consistent with the actions when considering strategic leadership. Rowe (2001) comparing managerial, visionary, and strategic leadership, affirms that an organization will be more viable in the long term and better able to maintain its financial stability in the short term, if strategic leadership is prevalent in that organisation (Figures 29 and 30).

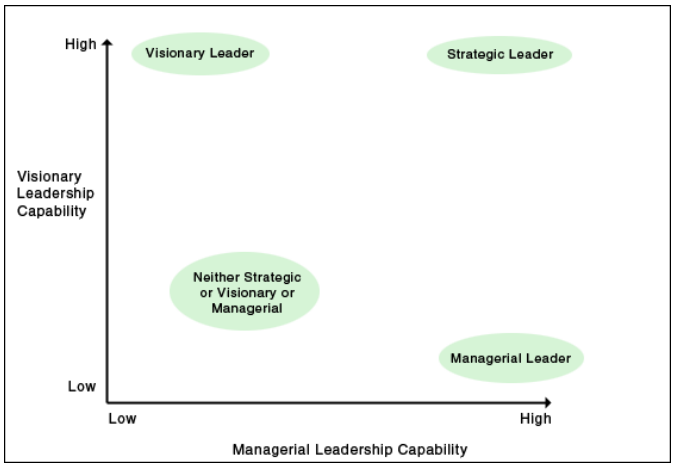


Figure 29. Comparison of the level of impact of the capabilities of managerial, visionary, and strategic leaders (Rowe, 2001).

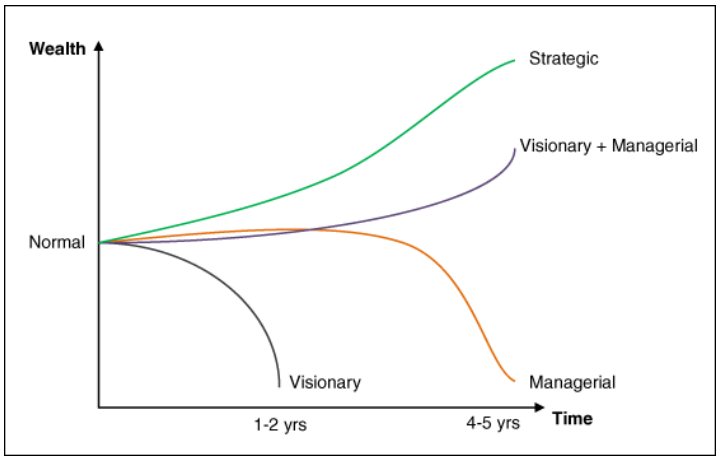


Figure 30. The wealth creation over time compared amongst managerial, visionary, and strategic leadership (Rowe, 2001).

Transformational and Change Leadership with the ability to lead Leaders

The Leaders of the 21st century NIGA must be both transformational and change leaders. In addition, they must have the ability to lead leaders because medical doctors are leaders. It is not enough to successfully craft and implement bold strategies, if the NIGA leaders lack understanding of the dynamic process which results in emerging opportunities and threats. Successful transformation requires flexibility and continuous transformation because it is not an end game. Transformational leaders can motivate their colleagues by

appealing to higher ideals and morale values. Being themselves specialists, the leaders of NIGA need to be influential, inspirational, and charismatic unlike transactional leaders that are described as task- and reward-oriented, structured and passive (Zellmer-Bruhn & Gobson, 2006; Korth, 2007; Garvin, Edmondson & Gina, 2008).

The leadership for NIGA must be able to lead change, along with transformation. Ashkenas (2015) differentiates the two as such: "Change means implementing finite initiatives, which may or may not cut across the organization because the focus is on executing a well-defined shift in the way things work; whereas, transformation is a portfolio of initiatives which are interdependent or intersecting". While change include principles and tool, such as making a business case, building a coalition of leaders, getting early results, and engaging stakeholders, the goal of transformation is to reinvent and discover a new or revised business model based on a vision of the future (Ashkenas, 2015; Kotter, 2012, p.52). Transformation is therefore unpredictable, iterative, and experimental entailing a higher risk.

NIGA's leadership need to exhibit the capabilities required to "jump the curve". This means while placing today's anaesthesia training or workforce crisis in a historical context, the leaders should be able to create a framework for managing change, as well as thriving in a future that will be radically different from the past or present. This can also be described as "standing in the future and building the present from the future" (de Coning, 2017) or "looking ahead and reasoning back" (Dixit & Nalebuff, 1991). Tom Peters, in his forward in Imparato & Harari's (1994) book, stated that the imperatives to jump the curve include "innovation, intelligence, coherence and responsibility".

Integrative Leadership

Defining "Integrative leadership", Hatala and Hatala (2005) stated that it is a "holistic, reflective and responsive approach to leading oneself, leading others and leading in the organizations". The authors of "Integrative Leadership" opines that the path of becoming an

integrative leader is a journey that begins with an invitation not an imposition. They further explained that Integrative leadership deals with awareness and obtaining inner peace and then choosing to resonate and act from that place of wholeness.

Sharing from her experience, Integrative leadership co-author, Lillas Hatala (2008) believes that the path of integrative leadership is all about love, trust, and the fairy dust. She expressed love, as the essence of great leadership; trust, as the essence of all relationships; and fairy dust represented whatever is needed in a relationship, team, organization, or situation. The authors believe that trust is built by being honest and truthful, keeping our words to ourselves and others, and following through on what we say we are willing to do (Hatala & Hatala, 2005). Integrative leadership is from our best self and the Ideal. Hatala & Hatala (2005), making reference to the story of the small statured, unimposing Sioux leaders of the 19th Century, Black Elk and Crazy Horse, writes that they successfully led tens of thousands of Sioux warriors because they had "inner peace and awareness".

Hatala & Hatala (2005) teaches integrative leadership model, as identity of the participants within the integrative framework of eight universal principles that form the matrix in which we live, work and play. The model of Hatala and Hatala (2005) has the following:

> "four energies or domains of intelligence; three levels of awareness; two choices that we face in each situation; and the oneness or integration that we feel when all domains, all levels are aligned with a higher intent in service to ourselves and others".

They stated that "oneness is the integration of our intents, thoughts, feelings and actions in alignment with a higher intent that leads to a state of flow psychologically, and a state of grace spiritually" (Figure 31).

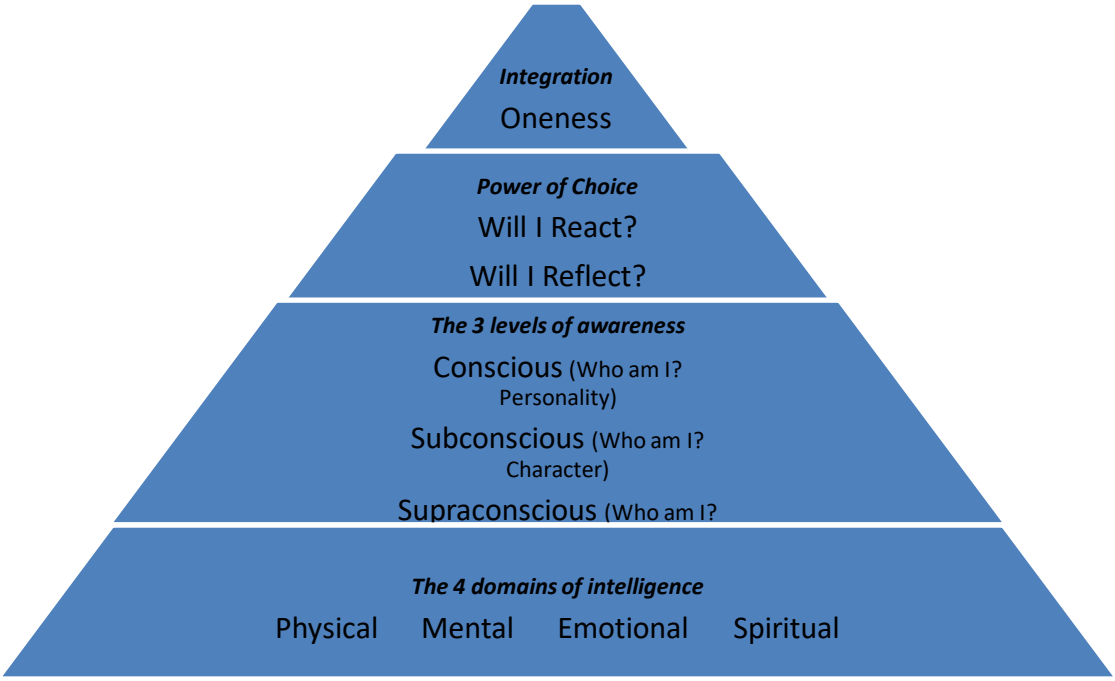


Figure 31. The *4-3-2-1 Integrative Leadership Model (Hatala and Hatala, 2005)*

Leadership using Systemic thinking

According to Peter Senge, understanding the system of an event is achieved by contemplating the whole, not any individual part of the pattern (Senge, 2006, p. 6). In his book, 'The Fifth Discipline' Senge (2006) quoted Edwards Deming, as such, "we will never transform our prevailing system of management without transforming our prevailing system of education" (p. xi). Therefore, if NIGA must survive in the future, we must discover how to tap people's commitment and capacity to learn at all levels of organization. Systemic thinking shares similar soft skills with integrative leadership such as learning based on love rather than fear; curiosity rather than insistence and on right answers rather than controlling.

The leadership of the 21st century anaesthesia workforce must have what Peter Senge, author of the Fifth Discipline refers to as "working teams" meaning people who need one another to produce an outcome. This is achieved by building on the discipline of developing shared vision (p. 218, 219). This interdependency is seen in the relationship between surgery, obstetrics, trauma and anaesthesia care because one specialty cannot make progress without

the other. As illustrated in Figure 32, the three core learning capabilities of an extraordinary team are fostering ***aspiration***, developing ***reflective conversation,*** and ***understanding complexities***, the approaches for developing them is called the five disciplines (Senge, 2006). These five disciplines are systems thinking, personal mastery, mental models, building shared vision and team learning.

Senge (2006) advised that these disciplines be developed as an "ensemble" because systems thinking (the 5th discipline) need the other four disciplines to realize its potential. Building a faculty that function together in an extraordinary way will require trust, complementing one another's strength, compensation for one another's limitation, common goals that are larger than individual goals, and who together are able to produce extraordinary results. It is important to have a systemic orientation while training anaesthesiologists because of the potential impact on surgery, obstetrics, and trauma care; as well as the effect on the local hospital, and outcome in terms of health indicators nationally, regionally and globally.

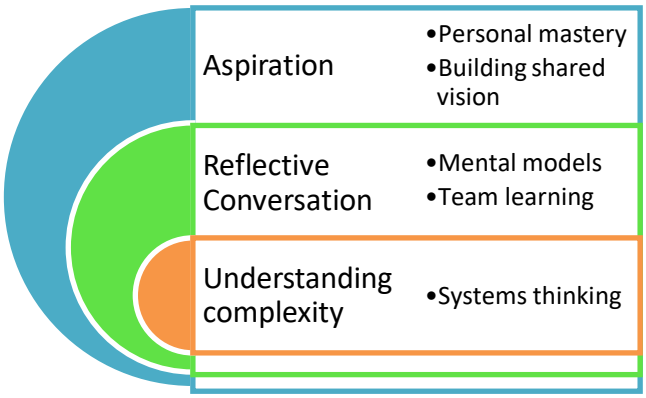


Figure 32. The three core learning capabilities of the five disciplines (Senge, 2006)

Global Mind-set and Global Leadership

Globalization is a major driver of higher educational institutions in that, we want to overcome national differences and embrace best practices from around the world. In educating the anaesthesia workforce of the 21st century, there is a need to see the global picture because any local anaesthesia workforce challenge will eventually have a cumulative or overall global impact on patient safety and therefore morbidity and mortality. The potential and opportunities for collaboration must be harnessed or explored by the leadership of anaesthesia training programmes in terms of getting the appropriate skilled and knowledgeable faculty. However, training doctors at the local hospital, where they practice and, in the community, where they are domiciled, has the potential to address the deficiency gaps in Nigeria.

For NIGA, the definition of global mind-set by Hitt et al. (2007) is most appropriate, "a set of individual attributes that enable an individual to influence individuals, groups, and organisations from diverse social, cultural, and institutional systems." The global leadership must also appreciate the interdependencies of surgery, obstetric, trauma care and anaesthesia and how they relate to public health; as well as the global context of the WHO goal of universal health coverage for all by 2030. A global leader must succeed in influencing those from different parts of the world to work together to achieve the sustainable development goals. Story (2011) demonstrated that domestic leaders with positive psychological capital (hope, efficiency, resilience, and optimism) are more likely to develop a global mind-set, a self-authored identity and cultural sensitivity which will enable them to eventually become global leaders (Figure 33).

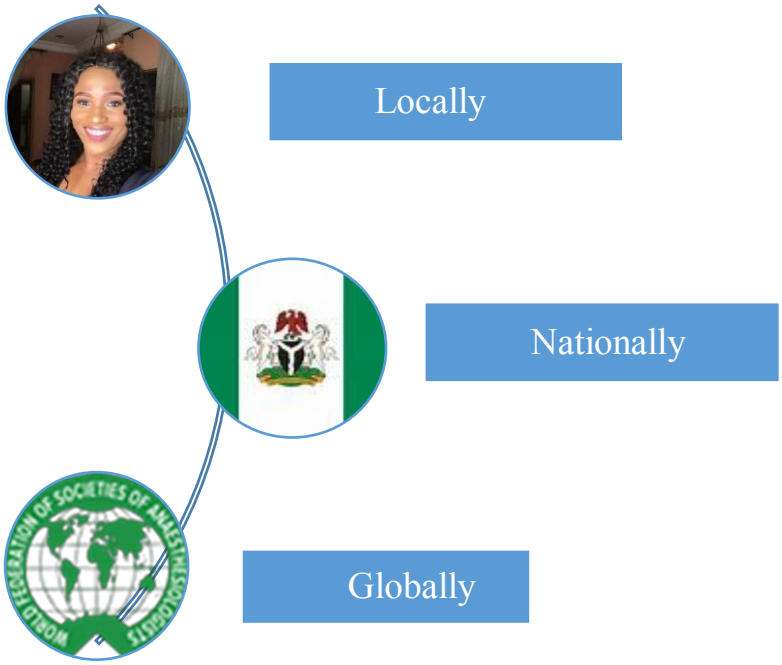


Figure 33. The leadership growth potentials of local leaders

Leadership by the Spirit

The expression, led by the Spirit is common in the Bible, giving instances where references were made to this (Luke 4: 18, Matthew 3: 13 – 16, Matthew 4: 1, Romans 8: 9-19, 1 Corinthians 2: 10 -12). This form of leadership is not well talked about in contemporary life and is not researched but there are extraordinarily strong testimonies of being led by the Spirit (Julian, 2014). Many leaders of Higher Educational Institutions have referred to being led by the Spirit while counselling their students and faculty. Suzanne Julian, the instruction coordinator for the Brigham Young University Harold B. Lee Library, shared her personal experiences and lessons learned during periods of prayers. These resulted in a series of events or decisions which are completely supernatural (Julian, 2014; Eyring, 2002). President Henry B. Eyring counselled not to miss opportunities in life, "But when you put the spiritual things first in your life, you will be blessed to feel directed toward certain learning, and you will be motivated to work harder. You will recognize later that your power to serve was increased, and you will be grateful", Eyring, 2002).

The 21st Century NIGA can only be successful if it functions as a "Learning Organization" – an organization that is continually expanding its capacity to create its future. It is not enough to merely survive (adaptive learning) but it must add to it "***generative learning***" to enhance its capacity to ***innovate***.

Recommendations for Future Research

One unequivocal finding of the present study is that the anaesthesia workforce is unacceptably low, and it is worse in the Northern zones of the country. One limitation of the present study is its dependence on secondary data which can only be a snapshot of anaesthesia workforce crisis. For future research, there will be a need to conduct longitudinal quantitative studies with real time data; and to continuously update anaesthesia workforce analytics. A continuation of the spiral of action research cycle at the FMC Jabi and replication of qualitative implementation action research in other Federal Medical Centres in Nigeria are vital to transformation and social change. More action researches would greatly contribute to our understanding of the impact of a proactive work-based learning programme in Nigeria. Research on the impact of life-long learning for anaesthesia, and for perioperative care providers, as well as research on hospitals as a learning organisation are areas to explore. It is imperative to carry out research on gender diversity amongst anaesthesia professionals at all levels in Nigeria for the purpose of improving gender balance.

Conclusion

In order to answer the research questions posed by this study, a mixed method (quantitative and qualitative) study approach as an insider action research was adopted. This is appropriate because the study concerns anaesthesia workforce crisis in Nigeria, "a professional and a social problem" taking place in a real-world context (Soyannwo & Elegbe,

1999, 2000; Cherian et al., 2010; Bode et al., 2014; Meara et al., 2015; Kempthorne et al., 2017) that require transformation (Morriss et al., 2018, Davies et al., 2018). A single methodological approach is often inadequate when implementing evidence-based and other innovative practices, interventions, and programs (Palinkas et al., 2015).

The researcher uses workforce analytics (Huselid, 2018, Minbaeva, 2018,) which are elements of human resource management with transformational change using an action research model of work-based learning to guide the design of the study (Wasserman & Kram, 2009; Coghlan, 2013; Coghlan & Brannick, 2014). The theory emerges from human capital theory (Becker, 1993; Mathis & Jackson, 2006) resting on the assumption that formal education is highly instrumental and necessary to improve the productive capacity of a population (Babalola, 2003); and action researchers take action (Coghlan & Brannick, 2014, p. 47) in an evolving process that is undertaken in the spirit of collaboration and co-inquiry *(*Shani & Pasmore, 2010).

In the present study, quantitative secondary data were collected from five data sources for workforce analytics. In addition, information from in-depth focus group discussions, and feedback from participants of the DA programme formed part of a multi-method qualitative research design (Eriksson & Kovalainen, 2016, p. 183). The insider researcher approach is particularly useful here since it provides the benefit of back-staging which is knowing organizations from the inside, where public access is restricted and actors can drop their public persona as opposed to the 'front region', where performance is public for the benefit of the client or customer (Goffman,1959; Coghlan & Brannick, 2014, p. 4).

The focus group discussion allowed the participants to tell their stories in the theatre seminar room of the FMC Jabi, a real-life setting, which is very useful for achieving social change. The focus group approach provided the advantage of flexibility. It has high face validity and has a cost benefit advantage because it generates quick results but cost little to

conduct. The advantage of focus group dynamics is that it reveals information that were not anticipated by the researcher. The stakeholders' panel discussions provided in-depth information on the dynamic factors contributing to physician anaesthesia workforce gap and the nature of interaction between the factors. The discussions which took place during the 26th NSA annual conference in November 2018, was at no additional cost to the researcher.

The results are 'valid' because expert research knowledge and local knowledges were combined. The interpretation of the results and the design of actions based on those results involved the stakeholders who are best positioned to understand the processes. Therefore, amongst the social sciences, action research has the best prospects in facing the combined demand for rigor and relevance (Greenwood & Levin, 2008; Levin & Greenwood, 2011). The necessities for formal institutional research board consent were not required because this was an hospital approved programme and a participatory action research. Since the study involved stakeholders' participation, and accreditation, it was deemed to be appropriate to carry out the insider research. Participants did not require confidentiality, and their remarks were attributed to them, allowing them to "own their own stories" (Patton, 2015, p. 499).

The findings of the study have been presented in Chapter 4. These findings were used to answer the research questions posed at the outset, and to provide recommendations both for future anaesthesia workforce expansion, and for future research in this field. In addition, the analysis of the crisis will contribute to the appropriate development of the DA training programme. This research is not a one-off project but part of creating the future of anaesthesia workforce in Nigeria. It is hoped that researchers, anaesthesia specialists, hospitals, NPMCN, the WACS, Policy Makers and the Federal and State Ministries of Health will be able to draw on this dataset as they set future Research, Policy, and Strategic agendas. Finally, all the participants in this study, to whom I owe a debt of gratitude, expressed their own views on anaesthesia workforce development and training, which I have shared here.

References

Aarons, G. A., Hurlburt, M., & Horwitz, S. M. (2011). Advancing a conceptual model of evidence-based practice implementation in child welfare. *Administration and Policy in Mental Health and Mental Health Services Research,* 38, 4-23.

Abdul-Rahman, M., Aryee, G., Essuman, R., Djagbletey, R., Lamptey, E., Owoo, C., & Boni, F. (2015) Factors influencing the choice of anaesthesia as a field of specialty in University of Ghana School of Medicine and Dentistry, Korle-Bu Teaching Hospital. *Southern African Journal of Anaesthesia and Analgesia,* 21:6, 166-168, DOI: 10.1080/22201181.2015.1089666

Abimbola, S., Olanipekun, T., Schaaf, M., Negin, J., Jan, S., & Martiniuk, A. L. (2017). Where there is no policy: governing the posting and transfer of primary health care workers in Nigeria. *International Journal of Health Planning and Management,* 32(4), 492-508.

Adefusika, J. A. (2010). Understanding the brain drain in the African diaspora: focusing on Nigeria. Senior Honours Project. Paper 164. Retrieved April 23, 2020 from http://digitalcommons.uri.edu/srhonorsprog/164

Adeloye, D., David, R. A., Olaogun, A. A., Auta, A., Adesokan, A., Gadanya, M., Opele, J. K., Owagbemi, O., & Ideolorunkanmi, A. (2017). Health workforce and governance: the crisis in Nigeria. *Human Resources for Health,* 15, 32. doi10.1186/s12960-017-0205-4.

Ademola-Popoola, D. S., Opocher, E., & Reddy, M. A. (2019). Contemporary management of retinoblastoma in the context of a low-resource country. *The Nigerian postgraduate medical journal*, *26*(2), 69–79. https://doi.org/10.4103/npmj.npmj_21_19

Adeyanju, O., Tubeuf, S., Ensor, T. (2017). Socio-economic inequalities in access to maternal and child healthcare in Nigeria: changes over time and decomposition analysis, *Health Policy and Planning*, 32 (8), 1111–1118. https://doi.org/10.1093/heapol/czx049

Adler, P. A., & Adler, P. (1994). Observational techniques. In N. K. Denzin, & Y. S. Lincoln (Eds.), Handbook of qualitative research (pp. 377-392). Thousand Oaks, CA: Sage.

African Development Bank (AfDB). Africa Economic Outlook (AEO) 2019. Retrieved from https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/2019AEO/AEO_2019-EN.pdf

Afzal, S., Masroor, S., & Shafgat, G. (2012). Migration of health workers: a challenge for health care system. *Journal of the College of Physicians and Surgeons Pakistan,* 22 (9), 586-587. doi:09.2012/JCPSP.586587.

Ahmad O. B. (2005). Managing medical migration from poor countries. *BMJ (Clinical research ed.)*, *331*(7507), 43–45. https://doi.org/10.1136/bmj.331.7507.43

Ajao, O., Ugwu, B., & Eke, N. (2012). Opinion: a case against the membership programme proposal of the West African College of Surgeons. *Journal of the West African College of Surgeons*, 2(3), 78–82.

Ajayi, O.O., Adebamowo, C.A. (1999). Surgery in Nigeria. *The Archives of Surgery,* 134(2):206–211. doi:10.1001/archsurg.134.2.206

Ajenifuja, B. (2011). Paediatrics Health Care in Nigeria: Yesterday, Today and Tomorrow. *Nigerian Journal of Paediatrics*, 38(4), 146 -158

Akkerman, S. F., & Bakker, A. (2012). Crossing boundaries between school and work during apprenticeships. *Vocations and Learning*, 5(2), 153-173.

Alagbe-Briggs, O.T., Onajin-Obembe, B.O.I. (2013)**.** Experience with Ambulatory Anaesthesia for Paediatric Inguinoscrotal Surgery in a Surgical Outreach. *Journal of Medicine and Medical Sciences,* 4(6), 225-229.

Alawad, A. A., Khan, W. S., Abdelrazig, Y. M., Elzain, Y. I., Khalil, H. O., Ahmed, O. B., & Adam, O. A. (2015). Factors considered by undergraduate medical students when selecting specialty of their future careers. The Pan African medical journal, 20, 102. https://doi.org/10.11604/pamj.2015.20.102.4715

Albert, V., Mndolo, S., Harrison, E. M., O'Sullivan, E., Wilson, I. H., Walker, I. A. (2017) Lifebox pulse oximeter implementation in Malawi: evaluation of educational outcomes and impact on oxygen desaturation episodes during anaesthesia. *Anaesthesia;* 72: 686–93.

Alkire, S., Chen, L. (2004). Medical exceptionalism" in international migration: should doctors and nurses be treated differently? Joint Learning Initiative working paper 7-3. http://www.globalhealthtrust. org/doc/abstracts/WG7/Alkirepaper.pdf

Allan, D. (2015). Conceptualising work learning: Exploring the educational discourse on work-based, work-related, and workplace learning. *Work Base Learning e-Journal International,* 5(1), 1-20.

Alubo, S. O. (1987). Power and privileges in medical care: An analysis of medical services in post-colonial Nigeria. *Social Sciences and Medicine*, 24 (5), 453-462.

Amponsah, G. (2010). Challenges of anaesthesia in the management of the surgical neonates in Africa. *African Journal of Paediatric Surgery,* 7, 134-9.

Amponsah G. (2018). Women anaesthetists in West Africa – Challenges and achievements. *Journal of the West African College of Surgeons*, 8(2), 1–43.

Anetoh, B. C., & Onwudinjo, V. G. (2020). Emigration and the problem of brain drain in Nigeria: A philosophical evaluation. *Journal of African Studies and Sustainable Development*, 3(1).

Anorlu, R. I., Orakwue, C. O., Oyeneyin, L., & Abudu, O. O. (2004). Late presentation of patients with cervical cancer to a tertiary hospital in Lagos: what is responsible?. *European journal of gynaecological oncology*, *25*(6), 729–732.

Antonaras, A., & Dekoulou, P. (Eds.) (2019). Cases on Corporate Social Responsibility and Contemporary Issues in Organizations. IGI Global.

Anyangwe, S. C., & Mtonga, C. (2007). Inequities in the global health workforce: the greatest impediment to health in sub-Saharan Africa. *International journal of environmental research and public health*, *4*(2), 93–100. https://doi.org/10.3390/ijerph2007040002

Anderson, J. R. (1983). The Architecture of Cognition. Cambridge, MA: Harvard University Press.

Aregbeshola, B. S., & Khan, S. M. (2018). Out-of-Pocket Payments, Catastrophic Health Expenditure and Poverty Among Households in Nigeria 2010. *International journal of health policy and management*, *7*(9), 798–806. https://doi.org/10.15171/ijhpm.2018.19

Aregbeshola, B.S., Khan, S.M. (2020). Out-of-pocket health-care spending and its determinants among households in Nigeria: a national study. *Journal of Public Health (Berl.)*. https://doi.org/10.1007/s10389-020-01199-x

Armenakis, A. A., Harris, S. G., & Field, H. S. (1999). Making change permanent: a model for institutionalizing change, in Pasmore, W. and Woodman, R. (eds). Research in Organizational Change and Development, Vol III, JAI Press, Greenwich, CT, p. 97-128.

Armenakis, A. A., & Harris, S. G. (2001). Crafting a change message to create transformational readiness. *Journal of Organizational Change Management*, 15 (2), 169-183.

Armenakis, A. A., & Harris, S. G. (2009) Reflections: our Journey in Organizational Change Research and Practice, *Journal of Change Management*, 9:2, 127-142, DOI: 10.1080/14697010902879079

Armstrong, M. (2006). A Handbook of Human Resource Management Practice (10th ed.). Kogan, London.

Ashkenas, R. (2015, January 15). We still don't know the difference between change and transformation [Blog Post]. Harvard Business Review. Retrieved from https://hbr.org/2015/01/we-still-dont-know-the-difference-between-change-and-transformation.

Asogun, D. A., Günther, S., Akpede, G. O., Ihekweazu, C., & Zumla, A. (2019). Lassa Fever: Epidemiology, Clinical Features, Diagnosis, Management and Prevention. Infectious disease clinics of North America, 33(4), 933–951. https://doi.org/10.1016/j.idc.2019.08.002

Astor, A., Akhtar, T., Matallana, M. A., Muthuswarmy, V., Olowu, F. A., Tallo, V., & Lie, R. K. (2005). Physician migration: views from professionals in Colombia, Nigeria, India, Pakistan, and the Philippines. *Social Science and Medicine,* 61(12), 2492-2500.

Atiyeh, B. S., Gunn, S. W., & Hayek, S. N. (2010). Provision of essential surgery in remote and rural areas of developed as well as low- and middle-income countries. *International journal of surgery (London, England)*, *8*(8), 581–585. https://doi.org/10.1016/j.ijsu.2010.07.291

Attaran, A., & Walker, R. B. (2008). Shoppers Drug Mart or poachers drug mart? *Canadian Medical Association journal = journal de l'Association medicale canadienne*, *178*(3), 265–268. https://doi.org/10.1503/cmaj.071733

Awases, M., Gbary, A., & Chatora, R. (2004). Migration of health professionals in six countries: a synthesis report. Brazzaville: WHO Regional Office for Africa. 2004. 67p.

Awofeso N. (2010). Improving health workforce recruitment and retention in rural and remote regions of Nigeria. *Rural and remote health*, *10*(1), 1319.

Baird, M., Daugherty, L., Kumar, K. B., & Arifkhanova, A. (2015). Regional and gender differences and trends in anesthesiologist workforce. *Anesthesiology,* 123(5), 997-1012. https://doi.org/10.1097/ALN.0000000000000834

Bangdiwala, S. I., Fonn, S., Okoye, O., & Tollman S. (2010). Workforce resources for health in developing countries. *Public Health Reviews*, Vol. 32, No 1, 296-318

Barnett, R. (1999). Learning to work and working to learn. In D. Boud, & J. Garrick. (Eds.), Understanding learning at work. London: Routledge.

Bashford, T., & Vercueil, A. (2019). Anaesthetic research in low- and middle-income countries. *Anaesthesia*, 74(2), 143–146. https://doi.org/10.1111/anae.14518

Bass, B. M. (2007). Executive and strategic leadership. *International Journal of Business*, 12 (1), 33-52.

Becker, G. S. (1993). *Human Capital – A Theoretical and Empirical Analysis, with Special Reference to Education* (3rd ed). Chicago: The University of Chicago Press, Ltd.

Becker, G. S. (2002). The age of human capital. Education in the Twenty-First Century, 3–8.

Bell, S. (1998). Self-reflection and vulnerability in action research: Bringing forth new worlds in our learning. *Systemic Practice and Action Research,* 11(2), 179-191.

Bergold, J., & Thomas, S. (2012). Participatory research methods: A methodological approach in motion. *Forum: Qualitative Social Research*, 13(4), 191-222.

Bezuidenhout, M. M., Joubert, G., Hiemstra, L. A., & Struwig, M. C. (2009). Reasons for doctor migration from South Africa, *South African Family Practice*, 51:3, 211-215, DOI: 10.1080/20786204.2009.10873850

Biccard, B. M., Madiba, T. E., Kluyts, H-L., et al (2018). Perioperative patient outcomes in the African Surgical Outcomes Study: a 7-day prospective observational cohort study. *Lancet,* 21, 391(10130), 1589-1598. doi:10.1016/S0140-6736(18)30001-1

Bigelow, B., & Arndt, M. (2005). Transformational change in health care: changing the question. *Hospital topics*, *83*(2), 19–26. doi:10.3200/HTPS.83.2.19-26

Bijlmakers, L., Wientjes, M., Mwapasa, G., Cornelissen, D., Borgstein, E., Broekhuizen, H., Brugha, R., & Gajewski, J. (2019). Out-of-pocket payments and catastrophic household expenditure to access essential surgery in Malawi - A cross-sectional patient survey. *Annals of medicine and surgery*, 43, 85–90. https://doi.org/10.1016/j.amsu.2019.06.003

Billett, S. (2001). Learning through work: Workplace affordances and individual engagement. *Journal of Workplace Learning*, 13(5), 209-214.

Billett, S. and Choy, S. (2013), "Learning through work: emerging perspectives and new challenges", *Journal of Workplace Learning*, Vol. 25 No. 4, pp. 264-276. https://doi.org/10.1108/13665621311316447

Bode, C. O., Olatosi, J. O., & Ademuyiwa, A. (2012). Accreditation of Training Programmes by the West African College of Surgeons. *Journal of the West African College of Surgeons*, 2(2), 95–109.

Bode, C. O., Olatosi, J., Amponsah, G., & Desalu, I. (2013). Has the middle-level anaesthesia manpower training program of the West African College of Surgeons fulfilled its objectives? *Anaesthesia Intensive Care*, 41(3): 359-62.

Bolaji, B. O., Oyedepo, O. O., Abdulraheem, I. S., & Oladipo, A. R. (2012). Anaesthesia manpower and services in private hospitals in Ilorin, Nigeria: a preliminary survey. *Savannah Journal of Medical Research and Practice*, 1(2), 18-23.

Bond C. (2007). The training of the "helpless physician". *Medscape General Medicine*, 9 (3): 47.

Boud, D., Keogh, R., & Walker, D. (2013). Reflection: Turning experience into learning. Routledge.

Boud, D., & Middleton, H. (2003). Learning from others at work: Communities of practice and informal learning. *Journal of Workplace Learning*, 15(15), 194-202.

Boud, D., & Solomon, N. (2001). Repositioning Universities and Work. In D. Boud, & N. Solomon. (Eds.), Work-based Learning: A New Higher Education? Buckingham: Society for Research into Higher Education and Open University Press.

Boud, D., & Symes, C. (2000). Learning for Real. In C. Symes, & J. McIntyre. (Eds), Working Knowledge: The New Vocationalism and Higher Education. Buckingham: Society for Research into Higher Education and Open University Press).

Boud, D., Solomon, N., & Symes, C .(2001). New Practices for New Times. In D. Boud, & N. Solomon. (Eds), Work Based Learning: A New Higher Education? Buckingham: Society for Research into Higher Education and Open University Press.

Boud, D., & Walker, D. (1998). Promoting Reflection in Professional Courses: The Challenge of Context. *Studies in Higher Education*, 23, 191-206.http://dx.doi.org/10.1080/03075079812331380384

Bradbury-Huang, H. (2010). What is good action research? Why the resurgent interest? *Action Research*, 8(1), 93–109. https://doi.org/10.1177/1476750310362435

Bradbury, H. (2015). Introduction to the Handbook of Action Research. In H. Bradbury, (Ed), Handbook of Action Research (3rd ed.). Sage Publications.

Bradbury, H., Waddell, S., O' Brien, K., Apgar, M., Teehankee, B., & Fazey, I. (2019). A call to Action Research for Transformations: The times demand it. *Action Research*, 17(1), 3 – https://doi.org/10.1177/1476750319829633

Brannick, T., & Coghlan, D. (2007). In Defence of Being "Native": The Case for Insider Academic Research. *Organizational Research Methods*, 10(1), 59–74. https://doi.org/10.1177/1094428106289253

Brennan, J., & Little, B. (1996). A review of Work Based Learning in Higher Education. DfEE: London.

Brydon-Miller, M., Greenwood, D., & Maguire, P. (2003). Why action research? *Action Research,* 1: 9-28.

Brydon-Miller, M., & Maguire, P. (2009). Participatory action research: Contributions to the development of practitioner inquiry in education. *Educational Action Research*, *17*(1), 79-93.

Burkholder, G. J., Cox, K., & Crawford, L. (2016). The Scholar-Practitioner's Guide to Research Design.

Burns, J.M. (1979), Leadership, Harper & Row, New York, NY.

Caine, G., & Caine, R. N. (2006). Meaningful learning and the executive functions of the brain. *New Directions for Adult and Continuing Education,* 110: 53-61.

Caine, R. N., Caine, G., McClintic, C., & Klimek, K. (2009). Brain/Mind Learning Principles in Action: Developing executive functions of the brain (2nd Ed.). Corwin Press.

Cambridge Dictionary. Brain drain. https://dictionary.cambridge.org/us/dictionary/english/brain-drain

Campbell, J., Dussault, G., Buchan, J., Pozo-Martin, F., Arias, M G., Leone C., Siyam, A., & Cometto G. (2013). A universal truth: no health without a workforce. Third Global Forum on Human Resources for Health, Recife, Brazil. World Health Organization. Retrieved from

http://www.who.int/workforcealliance/knowledge/resources/GHWA_AUniversalTruthReport.pdf.

Campbell, J., Buchan, J., Cometto, G., David, B., Dussault, G., Fogstad, H., ... & Quain, E. E. (2013). Human resources for health and universal health coverage: fostering equity and effective coverage. Bulletin of the World Health Organization, 91, 853-863.

Canadian Medical Association (2018). Anesthesiology Profile. Retrieved February 29, 2020 from https://www.cma.ca/sites/default/files/2019-01/anesthesiology-e.pdf

Carmeli, A., & Schaubroeck, J. (2005). How leveraging human resource capital with its competitive distinctiveness enhances the performance of commercial and public organizations. *Human Resource Management*, 44(4), 391–412.

Carr, W. and Kemmis, S. (1986) Becoming Critical. Education, knowledge and action research, Lewes: Falmer.

Casey, K.M., Drum, E.T. (2019). Where's anaesthesia? A call to action. *East and Central African Journal of Surgery,* 24 (3), DOI: 10.4314/ecajs.v24i3

Central Intelligence Agency. The World Fact Book. Africa: Nigeria. Retrieved August 6, 2019 from https://www.cia.gov/library/publications/the-world-factbook/geos/ni.html

Central Intelligence Agency (US). *Major Urban Area Population*. Retrieved August 18, 2019 from https://www.cia.gov/library/publications/the-world-factbook/fields/print_2219.html

Central Intelligence Agency. The World Fact Book. *Country comparison, Birth Rate.* Retrieved August 6, 2019 from https://www.cia.gov/library/publications/the-world-factbook/rankorder/2054rank.html

Chaffee, E. (1985). Three models of strategy. *Academy of Management Review*, 10 (1) 89-98

Chandler AD (1963). Strategy and Structure: Chapters in the history of American enterprise, MIT Press, p. 13.

Cheng, L., & Yang, P. Q. (1998). Global interaction, global inequality, and migration of the highly trained to the United States. *International Migration Review*, *32*(3), 626-653.

Chen, L., Evans, T., Anand, S., Boufford, J. I., Brown, H., Chowdhury, M., Cueto, M., Dare, L., Dussault, G., Elzinga, G., Fee, E., Habte, D., Hanvoravongchai, P., Jacobs, M., Kurowski, C., Michael, S., Pablos-Mendez, A., Sewankambo, N., Solimano, G., Stilwell, B., … Wibulpolprasert, S. (2004). Human resources for health: overcoming the crisis. *Lancet* (London, England), *364*(9449), 1984–1990. https://doi.org/10.1016/S0140-6736(04)17482-5

Cherian, M., Choo, S., Wilson, I., Noel, L., Sheikh, M., Dayrit, M., & Grote, S. (2010). Building and retaining the neglected anaesthesia health workforce: is it crucial for health systems strengthening through primary health care? *Bulletin of the World Health Organization*, 88, 637-39.

Chermack, T.J., van der Merwe, L., Lynham, S.A. (2007). Exploring the relationship between scenario planning and perceptions of strategic conversation quality. *Technological Forecasting and Social Change*, 74, 379 – 390.

Chevalier, J. M., & Buckles, D. J. (2013). Participatory Action Research: Theory and Methods for Engaged Inquiry. New York, Routledge.

Choo, S.S., Perry, H.B., Hesse, A.A., Abantanga, F., Sory, E., Osen, H., Fleischer-Djoleto, C., Moresky, R.T., McCord, C.W., Cherian, M., & Abdullah, F. (2010). Assessment of capacity for surgery, obstetrics, and anaesthesia in 17 Ghanaian hospitals using a WHO assessment tool. *Tropical medicine & international health*, 15, 1109-1115.

Chou, M., Jungblut, J., Ravinet, P., & Vukasovic, M. (2017) Higher education governance and policy: an introduction to multi-issue, multi-level and multi-actor dynamics, *Policy and Society*, 36:1, 1-15, DOI: 10.1080/14494035.2017.1287999

Chu K, Rosseel P, Gielis P, Ford N (2009) Surgical Task Shifting in Sub-Saharan Africa. *PLoS Med* 6(5): e1000078. https://doi.org/10.1371/journal.pmed.1000078

Cleave-Hogg, D. & Benedict, C (1997). Characteristics of good anaesthesia teachers. *Canadian Journal of Anesthesia,* 44 (6), 587-591.

Coghlan, C. J., & Towey, R. M. (1979). Anaesthesia by medical assistants (clinical officers) twenty-five years' experience in Kenya. *East African Medical Journal*, 56(6): 244-247.

Coghlan, D. (2004). Managers as learners and researchers. In D. Coghlan, T. Dromgoole, P. Joynt, & P. Sorensen. (Eds.), Managers Learning in Action (pp. 183-189). London: Routledge.

Coghlan, D. (2011). Action research: Exploring perspective on a philosophy of practical knowing. *Academy of Management Annals*, 5: 53 – 87.

Coghlan, D. (2013). Messy, iterative groping in the swampy lowlands: The challenges of insider scholar-practitioner inquiry. *Research in Organizational Change and Development*, 21, 121-147. doi:10.1108/S0897-3016(2013)0000021007.

Coghlan, D., & Brannick, T. (2014). Doing action research in your own organization (4th ed). LA: SAGE.

Coker, A., & Sridhar Mynepalli, K. C. (2010). Increase in healthcare facilities and rapid environmental degradation: A technological paradox in Nigeria's urban centres. *African Journal of Environmental Science and Technology*, 4(9), 577-585.

Collins Dictionary. Brain drain. https://www.collinsdictionary.com/us/dictionary/english/brain-drain

Cooper, R. A., & Aiken, L. H. (2006). Health service delivery: reframing policies for global migration of nurses and physicians – a US perspective. *Policy, Politics and Nursing Practice*, 7(3_suppl), 66S-70S. https://doi.org/10.1177/1527154406292853

Cooper, A. E. (2017). The future United Kingdom anaesthetic workforce: training, education, and role boundaries for anaesthetists and others, *British Journal of Anaesthesia*, 119 (1), i99–i105, https://doi.org/10.1093/bja/aex345

Cornelius, N., Amujo, O. & Pezet, E. (2019). British 'Colonial governmentality': slave, forced and waged worker policies in colonial Nigeria, 1896–1930, *Management & Organizational History*, 14:1, 10-32, DOI: 10.1080/17449359.2019.1578669

Dare, A. J., Onajin-Obembe, B., & Makasa, E. M. (2018). A snapshot of surgical outcomes and needs in Africa. *The Lancet*, 391(10130), 1553-1554.

Daugherty L, Fonseca R, Kumar KB, and Michaud P-C (2010). An Analysis of the Labor Markets for Anesthesiology, Santa Monica, Calif.: RAND Corporation, TR-688-EES, Retrieved from http://www.rand.org/pubs/technical_reports/TR688/).

Daugherty L, Fonseca R, Kumar KB, & Michaud P-C (2010). Is There a Shortage of Anesthesia Providers in the United States?. Santa Monica, CA: RAND Corporation, 2010. https://www.rand.org/pubs/research_briefs/RB9541.html.

Davies, J. I., Vreede, E., Onajin-Obembe, B., & Morriss, W. M. (2018). What is the minimum number of specialist anaesthetists needed in low-income and middle-income countries? *BMJ Global Health*, **3:** e001005. doi:10.1136/bmjgh-2018-001005

De Coning, T. (2016, June). Tobie De Coning: The transformational Journey. Lecture on Higher Educational Imperatives for the 21st Century. [Video File]. Retrieved from https://www.youtube.com/watch?v=S2vB3tOAHyc

Deci, E. L., Ryan R.M. (2010). Intrinsic motivation. Corsini Encyclopedia of Psychology, 1-2.

Desalu, R. (2009). *Dorothy Jane Oluman ffoulkes-Crabbe*. Retrieved from British Medical Journal website: https://www.bmj.com/content/339/bmj.b3573.full

Dess, G., Lumpkin, G.T., & Taylor, M.L. (2005). Strategic Management. 2 Ed. New York: McGraw-Hill Irwin.

Dewey, J. (1938). Experience & Education. New York, NY: Kappa Delta Pi. ISBN 0-684-83828-1

Dick, B., Stringer, E., & Huxham C. (2009). Theory in Action Research. *Action Research*, 7 (1): 5-12.

Dirkx, J. M. (2008). The meaning and role of emotions in adult learning. New Directions for Adults and Continuing Education, 120: 7 – 18.

Dixit, A., & Nalebuff, B. (1991). *Thinking Strategically: The Competitive Edge in Business, Politics, and Everyday Life*. New York: W.W. Norton & Company.

Docquier, F., & Rapoport, H. (2012). Globalization, brain drain, and development. Journal of Economic Literature, 50, 681–730. doi:10.1257/jel.50.3.681

Dodani, S., & LaPorte, R. E. (2005). Brain drain from developing countries: how can brain drain be converted into wisdom gain? *Journal of the Royal Society of Medicine*, 98:487-91.

Dohlman, L. E. (2017). International anesthesia workforce development. *Current Anesthesiology Reports*, *7*(1), 42-48.

Dohlman, L., DiMeglio, M., Hajj, J., & Laudanski, K. (2019). Global Brain Drain: How Can the Maslow Theory of Motivation Improve Our Understanding of Physician Migration?. *International journal of environmental research and public health*, *16*(7), 1182. https://doi.org/10.3390/ijerph16071182

Dornan, T., Scherpbier, A. J. J. A., & Boshuizen, H. P. A. (2009). Supporting medical students' workplace learning: Experience-based learning (ExBL). *The Clinical Teacher*, 6(3), 167-171.

Dovlo, D., & Nyonator, F. (1999). Migration by graduates of the University of Ghana Medical School: a preliminary rapid appraisal. *Human Resources for Health Development Journal*, *3*(1), 40-51.

Dovlo D. (2005). Wastage in the health workforce: some perspectives from African countries. *Human resources for health*, *3*, 6. https://doi.org/10.1186/1478-4491-3-6

Down, J. (2008). So, you want to be...an anaesthetist. *British Journal of Hospital Medicine,* 69(11), M180. doi:10.12968/hmed.2008.69. Sup11.31683

Dubowitz, G., Detlefs, S., & McQueen K. A. (2009). Global anesthesia workforce crisis: a preliminary survey revealing shortages contributing to undesirable outcomes and unsafe practices. *World Journal of Surgery,* 34 (3), 438-44.

Duvivier, R. J., Burch, V. C., & Boulet, J. R. (2017). A comparison of physician emigration from Africa to the United States of America between 2005 and 2015. *Human Resources for Health*, 15(1), 41.

Easmon, C.O. (1982) The beginning. Second Sir Samuel Manuwa Memorial Lecture presented at the West African College of Surgeons Conference. January 27, 1982 Lagos, Nigeria.

Economic Communities of West African States (ECOWAS). Member States. Retrieved from https://www.ecowas.int/member-states/ Accessed September 2, 2019.

Edgcombe, H., Baxter, L. S., Kudsk-Iversen, S., Thwaites, V., & Bulamba, F. (2019). Training non-physician anaesthetists in sub-Saharan Africa: a qualitative investigation

of providers' perspectives. *BMJ open*, *9*(3), e026218. https://doi.org/10.1136/bmjopen-2018-026218

Egger Halbeis, C. B., Cvachovec, K., Scherpereel, P., Mellin-Olsen, J., Drobnik, L., & Sondore, A. (2007). Anaesthesia workforce in Europe. *European journal of anaesthesiology*, *24*(12), 991–1007. https://doi.org/10.1017/S0265021507000762

Ekeke, O. N., Okonta, K. E., & Igwe, P. O. (2016). Surgical inpatient mortality in a Nigerian Tertiary Hospital. *Nigerian Journal of Clinical Practice*, 19: 308-312.

Ekundare, R. (1971). Nigeria's Second National Development Plan as a Weapon of Social Change. *African Affairs, 70*(279), 146-158. Retrieved March 7, 2020, from www.jstor.org/stable/719535

Elegbe, E. O. (2010). Anaesthesia 50 years on in Nigeria. Paper presented at the 50th Annual Scientific Conference of the West African College of Surgeons, Calabar, Nigeria, 6th to 13th February 2010.

Elliott, J. (1991). Action research for education change. Philadelphia: Open University Press.

Elkheir, N., Sharma, A., Cherian, M., Saleh, O. A., Everard, M., Popal, G. R., & Ibrahim, A. A. (2014). A cross-sectional survey of essential surgical capacity in Somalia. *BMJ open*, *4*(5), e004360. https://doi.org/10.1136/bmjopen-2013-004360

Emmanouil, B., Goldacre, M. J., & Lambert, T. W. (2017). Aspirations to become an anaesthetist: longitudinal study of historical trends and trajectories of UK-qualified doctors' early career choices and of factors that have influenced their choices. *BMC Anesthesiology*, 17(1), 100. doi:10.1186/s12871-017-0392-5

Enright A. (2018). Leading the World: Perspectives of a Female President of WFSA. International anesthesiology clinics, 56(3), 128–140. https://doi.org/10.1097/AIA.0000000000000194

Epui, I., Tindimwebwa, J. V., Mijumbi, C., Chokwe, T. M., Lugazia, E., Ndarugirire, F., Twagirumugabe, T., … & Dubowitz, G. (2017). Challenges of Anesthesia in Low- and Middle-Income Countries: A Cross-Sectional Survey of Access to Safe Obstetric Anesthesia in East Africa. *Anesthesia and Analgesia*, 124 (1), 290-299.

Eriksson, P., & Kovalainen, A. (2016). Qualitative Methods in Business Research: A Practical Guide to Social Research (2nd ed.) SAGE Publications: Los Angeles, London, New Delhi, Singapore, Washington DC.

Eyring, H. B. (2002). Education for Real Life. *Ensign*, October 2002, 18-19.

Fazey, I., Schäpke, N., Caniglia, G., Patterson, J., Hultman, J., van Mierlo, B., & Wyborn, C. (2018). Ten essentials for action-oriented and second order energy transitions, transformations, and climate change research. *Journal of Energy Research and Social Science*, 40, 54-70.

Federal Ministry of Health of Nigeria. List of Federal Medical Centres. Retrieved November 26, 2018 from http://www.health.gov.ng/index.php/parastatals/federal-medical-centres

Federal Ministry of Health of Nigeria. Retrieved February 18, 2020 from http://health.gov.ng/

Federal Ministry of Health (2019). National Surgical, Obstetrics, Anaesthesia and Nursing Plan for Nigeria. Strategic Priorities for Surgical Care (StraPS). Planning for a Future of Surgical Equity, Safety & Progress 2019 – 2023. Retrieved from National Postgraduate Medical College of Nigeria website: https://npmcn.edu.ng/

Federal Ministry of Health of Nigeria. National Primary Healthcare Development Agency. Comprehensive EPI Multiyear Plan 2011 – 2015, May 2011. Retrieved from http://www.nationalplanningcycles.org/sites/default/files/planning_cycle_repository/nigeria/cmyp_2011-2015_country_final.pdf

Federal Ministry of Health of Nigeria (2018). National Strategic Health Development Plan II (2018-2022). Retrieved from https://www.health.gov.ng/doc/NSHDP%20II%20Final.pdf

Ffoulkes-Crabbe, D. J. O (2002). Address delivered by Prof. Dorothy J.O. Ffoulkes-Crabbe on the inauguration of the West Africa Confederation of Societies of Anaesthesiologists at Warri, Nigeria on 21st November 2002. Nigerian Society of Anaesthetists Newsletter.

Fenton, P. M. (1991). Anaesthesia Training in Malawi. *Tropical Doctor*, 21: 156-158.

Fitzsimons, P. (2017). Human Capital Theory and Education. In M.A Peters (Ed), *Encyclopedia of Educational Philosophy and Theory*. Singapore: Springer Verlag.

Forcier, M.B., Simoens, S. & Giuffrida, A. (2004). Impact, regulation and health policy implications of physician migration in OECD countries. *Human Resources for Health* **2,** 12. https://doi.org/10.1186/1478-4491-2-12

Fredriksen, B., & Kagia, R. (2013). Attaining the 2050 Vision for Africa: Breaking the Human Capital Barrier. *Global Journal of Emerging Market Economies*, *5*(3), 269–328. https://doi.org/10.1177/0974910113505794

G4 Alliance – Global Alliance for Surgical, Obstetric, Trauma and Anaesthesia Care. Retrieved from http://www.theg4alliance.org/

Gaffney, M. (2008). Participatory Action Research: An Overview--What Makes It Tick?. *Kairaranga*, 9, 9-15.

Garvin, D. A., Edmondson, A. C., & Gina, F. (2008). Is yours a learning organisation? *Harvard Business Review,* 86(3), 109-116.

Garnett, J. (2001). Work based learning and the intellectual capital of universities and employers. *The Learning Organization*, 8(2), 78-82.

Gatrad, A. R., Gatrad, S., Gatrad, A. (2007). Equipment donation to developing countries. *Anaesthesi*a; 62: 90–5.

Gendlin, E. (1981). Focusing. New York: Bantam.

General Hospital Lagos. Brief History. Retrieved from http://www.ghlagos.org.ng/about/

German Global Surgery Association and Program in Global Surgery and Social Change at Harvard Medical School. Global Surgery and Anaesthesia Statistics: The Importance of Data Collection. New York: The G4 Alliance. 2018 License: CC BY-NC-SA 3.0 IGO.

Gillis, A., & Jackson, W. (2002). Research methods for nurses: Methods and interpretation. Philadelphia: F.A. Davis Company.

Goes, J. B., Friedman, L., Seifert, N., & Buffa, J. (2000). A turbulent field: Theory, research, and practice on organizational change in health care. In Advances in healthcare management I, ed. J. D. Blair, M. D. Fottler, and G. T Savage, 143-80. New York: JAI

Good C. M. (1991). Pioneer medical missions in colonial Africa. *Social science & medicine (1982)*, *32*(1), 1–10. https://doi.org/10.1016/0277-9536(91)90120-2

Goofman, E. (1959). *The Presentation of Self in Everyday Life*. New York: Doubleday.

Goldberg, E. (2001). The executive brain: frontal lobes and the civilized mind. New York: Oxford University Press.

Goldman, E. F., & Casey, A. (2010). Building a culture that encourages strategic thinking. *Journal of Leadership and Organizational Studies*, 17(2), 119-128.

Golafshani, N. (2003). Understanding Reliability and Validity in Qualitative Research. *The Qualitative Report*, 8(4), 597-606. Retrieved from http://nsuworks.nova.edu/tqr/vol8/iss4/6.

Gopnik, A., Meltzoff, A., & Kuhl, P. (1999). *The scientists in the crib: Minds, brains, and how children learn.* New York: William Morrow.

Gordon, R.A. University Project: Lagos. (Retrieved from his personal files – thanks to Ms. J. Gordon). http://www.anesthesia.webservices.utoronto.ca/Assets/Anesthesia+Digital+Assets/Anesthesia/Anesthesia+Digital+Assets/history/earlylagos.pdf

Gordon, R. A. (1967). The Canadian contribution to the anaesthesia training programme of the World Federation Societies of Anaesthesiologists. *Canadian Anaesthetists' Society Journal,* 14 (6), 495-499. Retrieved on February 23, 2020 from https://link.springer.com/content/pdf/10.1007%2FBF03004049.pdf

Gore-Booth, J., Mellin-Olsen, J., Morriss, W., Haylock-Loor, C., Onajin-Obembe, B., & Gelb, A.W. (2018). WFSA describes its vision for implementation of WHA 68.15. *The Bulletin of the American College of Surgeons*,103, 44–48.

Graf, L. (2016). The rise of work-based academic education in Austria, Germany and Switzerland, *Journal of Vocational Education & Training*, 68:1, 1-16, DOI: 10.1080/13636820.2015.1107749

Graf, L. (2017). Work-based higher education programmes in Germany and the US: Comparing multi-actor corporatist governance in higher education, *Policy and Society*, 36:1, 89-108, DOI: 10.1080/14494035.2017.1278872

Gray, D. A. (2001). Briefing on Work-based Learning. York: Higher Education Academy.

Greenwood, D. J., & Levin, M. (2007). *Introduction to action research: Social Research for social change* (2nd edn). Thousand Oaks, CA: SAGE.

Greenwood, D. J., & Levin, M. (2008). The reformed social sciences to reform the university: Mission impossible. *Learning and Teaching*, 1, 89-121.

Gummesson, E. (2000). *Qualitative Methods in Management Research* (2nd Ed). Thousand Oaks, CA: Sage.

Hagander, L., Holmer, H., Lantz ,A., Kunjumen, T., Finlayson, S., Hoyler, M., Siyam, A., Montenegro, H.6 Kelley, E. T., Campbell, J., Cherian, M. N., & Hagander, L. (2015). Global distribution of surgeons, anaesthesiologists, and obstetricians. The Lancet Global Health, S2, S9 – S11.

Hagopian, A., Thompson, M. J., Fordyce, M., Johnson, K. E., & Hart, L. G. (2004). The migration of physicians from sub-Saharan Africa to the United States of America: measures of the African brain drain. *Human resources for health*, *2*(1), 17. https://doi.org/10.1186/1478-4491-2-17

Hanford, P. (1995). Developing director and executive competencies in strategic thinking. In B. Garratt (Ed), Developing strategic thought: Reinventing the art of direction-giving (pp. 157-186). London, England: McGraw-Hill.

Hatala, R. J. & Hatala, L. M. (2005). Integrative Leadership: Building a foundation for personal, interpersonal & organizational success. Integrative Leadership Institute: Calgary, AB, Canada.

Hatala, L. M. (2008). Integrative leadership: Building a foundation for success.

Helyer, R. (2015). Learning through reflection: the critical role of reflection in work-based learning (WBL). *Journal of Work-Applied Management,* 7 (1), 15-27. https://doi.org/10.1108/JWAM-10-2015-003.

Henry, J. A., Windapo, O., Kushner, A. L., Groen, R. S., & Nwomeh, B. C. (2012). A survey of surgical capacity in rural southern Nigeria: opportunities for change. *World journal of surgery,* 36(12), 2811–2818. doi:10.1007/s00268-012-1764-0

Henry, J. A., Frenkel, E., Borgstein, E., Mkandawire, N., & Goddia, C. (2015). Surgical and anaesthetic capacity of hospitals in Malawi: key insights. *Health policy and planning*, *30*(8), 985–994. https://doi.org/10.1093/heapol/czu102

Herold, M., & Fedor, D. B. (2008). *Change the way you lead change: Leadership strategies that really work.* Stanford Business Books.

Herold, D. M., Fedor, D. B., Caldwell, S., & Liu, Y. (2008). The effects of transformational and change leadership on employees' commitment to a change: A multilevel study. *Journal of Applied Psychology*, 93(2), 346-357.

Heron, J., & Reason, P. (2001). The practice of cooperative inquiry: Research 'with' rather than 'on; people. In P. Reason & H. Bradbury. (Eds.), *Handbook of action and research. Participative inquiry and practice.* (pp. 179-188). London: Sage.

Herr, K., & Anderson, G. L. (2015). *The action research dissertation. A guide for students and faculty.* Los Angeles: Sage Publications Inc.

Hewitt-Smith, A., Bulamba, F., Ttendo, S., Pappenheim, K., Walker, I. A., Smith, A. F. (2018). A mixed-methods evaluation of the Association of Anaesthetists of Great Britain and Ireland Uganda Fellowship Scheme. Anaesthesia, 73, 284–94.

Hitt, M. A., Haynes, K. T., & Serpa, R .(2010). Strategic leadership for the 21st Century. *Business Horizons*, 53, 437-444.

Hodges, S. C., Mijumbi, C., Okello, M., McCormick, B. A., Walker, I. A., & Wilson, I. H. (2007). Anaesthesia services in developing countries: defining the problems. *Anaesthesia*; 62: 4-11 doi: 10.1111/j.1365-2044.2006.04907.x pmid: 17156220.

Hooper, C. R. (2008). Adding insult to injury: the healthcare brain drain. *Journal of Medical Ethics*, 34(9), 684-687.

Hoyler, M., Finlayson, S. R., McClain, C. D., Meara, J. G., & Hagander, L. (2014). Shortage of doctors, shortage of data: a review of the global surgery, obstetrics and anaesthesia workforce literature. *World Journal of Surgery*, 38(2), 269.

Hunter, P. (2013). Brain drain, brain gain or brain sharing? New studies of the migration routes of scientists show that international mobility benefits all parties including countries that are net exporters of researches. *European Molecular Biology Organization Report*, 14(4), 315-318. doi:10.1038/embor.2013.33. Epub 2013 Mar15.

Huselid, M. A. (2018). The science and practice of workforce analytics: Introduction to the HRM special issue. *Human Resource Management*, 57, 679 - 684. https://doi.org/10.1002/hrm.21916

Iddriss, A., Shivute, N., Bickler, S., Cole-Ceesay, R., Jargo, B., Abdullah, F., & Cherian, M. (2011). Emergency, anaesthetic and essential surgical capacity in the Gambia.

Bulletin of the World Health Organization, 89(8), 565–572. doi:10.2471/BLT.11.086892

Ifanti, A. A., Argyriou, A. A., Kalofonou, F. H., & Kalofonos, H. P. (2014). Physicians' brain drain in Greece: a perspective on the reasons why and how to address it. *Health policy (Amsterdam, Netherlands)*, *117*(2), 210–215. https://doi.org/10.1016/j.healthpol.2014.03.014

Ihekweazu, C., Anya, I., & Anosike, E. (2005). Nigerian medical graduates: where are they now?. *The Lancet*, *365*(9474), 1847-1848.

Ioannidis, J. P. (2004). Global estimates of high-level brain drain and deficit. *FASEB L*, 18 (9), 939-939.

Ike, S. O. (2007). The health workforce crisis: the brain drain scourge. *Nigerian Journal of Medicine,* 16(3), 204-211.

Imparato, N., & Harari, O. (1994). *Jumping the curve: Innovation and strategic choice in the age of transition.* San Francisco, CA: Jossey-Bass.

Ityavyar D. A. (1987). Background to the development of health services in Nigeria. *Social science & medicine (1982)*, *24*(6), 487–499. https://doi.org/10.1016/0277-9536(87)90338-8.

Jacobs, S. (2016). The use of participatory action research within education – benefits to stakeholders. *World Journal of Education*, 6(3), 48-55. https://doi.org/10.5430/wje.v6n3p48

Jarvis, P. (1999). *The Practitioner-Researcher*. San Francisco, CA: Jossey-Bass.

Jenkins, R., Kydd, R., Mullen, P., Thomson, K., Sculley, J., Kuper, S., Carroll, J., Gureje, O., Hatcher, S., Brownie, S., Carroll, C., Hollins, S., Wong, M. L. (2010). International migration of doctors, and its impact on availability of psychiatrists in low and middle income countries. *Plos one.* 2010 Feb;5(2):e9049. DOI: 10.1371/journal.pone.0009049.

Johnson, G., Whittington, R., Scholes, K., Angwin, D. & Regner, P. (2014). Exploring Strategy. 10th ed. Pearson Education Ltd.

Joshi, G. P., & Onajin-Obembe, B. (2016). The role of ketamine in low-and middle-income countries: what would happen if ketamine becomes a scheduled drug?. *Anesthesia & Analgesia*, 122(3), 908-910.

Jimba M, Cometto G, Yamamoto T, Shiao L, Huicho L, Sheikh M. (2010). Health workforce: the critical pathway to universal health coverage. Montreux: First Global Symposium on Health Systems Research; 2010. Available from: http:// www.hrhresourcecenter.org/node/3459 [accessed 10 September 2013].

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed Methods Research: A Research Paradigm Whose Time Has Come. *Educational Researcher*, 33(7), 14-26.

Johnson, R. B., Onwuegbuzie, A. J., Turner, L. A. (2007). Toward a definition of mixed methods research. *Journal of Mixed Methods Research*, 1:112–133. doi: 10.1177/1558689806298224.

Julian, S. (2014). *Led by the Spirit*. Brigham Young University 2013–2014, Speeches. speeches.byu.edu. Retrieved from https://speeches.byu.edu/talks/suzanne-julian/led-spirit/

Kabene, S. M., Orchard, C., Howard, J. M., Soriano, M. A., & Leduc, R. (2006). The importance of human resources management in health care: a global context. *Human resources for health*, *4*, 20. https://doi.org/10.1186/1478-4491-4-20

Kalu, Q. N., Eshiet, A. I., Ukpabio, U. I., Etiuma, A. U., & Monjok, E. (2014). A rapid need assessment survey of anaesthesia and surgical services in district public hospitals in Cross River State, Nigeria. *British Journal of Medical Practitioners,* 7(4), a733.

Kamberelis, G., & Dimitriadis, G. (2014). Focus Group Research: retrospect. In P. Leavy (Ed.), *The Oxford Handbook of Qualitative Research* (pp. 315-339). Oxford: Oxford University Press.

Kampelmann, S., Rycx, F., Saks, Y., & Tojerow, I. (2018). Does education raise productivity and wages equally? The moderating role of age and gender. IZA Journal of Labor Economics, 7(1), 1.

Kemmis, S., & McTaggart, R. (1988) The Action Research Planner, 3rd edition. Geelong, Victoria: Deakin University Press.

Kemmis, S., & McTaggart, R. (2000). Participatory action research. In N. K. Denzin & Y. S. Lincoln (Eds.), Handbook of Qualitative Research 2nd ed. (pp. 567-607), Thousand Oaks, CA, Sage.

Kemmis, S., & McTaggart, R. (2005). Participatory Action Research: Communicative Action and the Public Sphere. In N. Denzin, and Y. Lincoln, (Eds.), The Sage Handbook of Qualitative Research 3rd ed. (pp. 559-603), Sage, Thousand Oaks.

Kempthorne, P., Morriss, W. W., Mellin-Olsen, J., & Gore-Booth, J. (2017). The WFSA global anesthesia workforce survey. *Anesthesia and Analgesia*, 125, 981–990.

Kesby, M., Kindon, S., & Pain, R. (2007). Participation as a form of power: Retheorising empowerment and spatialising participatory action research. In Participatory action research approaches and methods (pp. 45-51). Routledge.

Khan, M. A., Hanif, S., Iqbal, S., Shahzad, M. F., Shafique, S., & Khan, M. T. (2015). Presentation delay in breast cancer patients and its association with sociodemographic factors in North Pakistan. *Chinese journal of cancer research = Chung-kuo yen cheng yen chiu*, *27*(3), 288–293. https://doi.org/10.3978/j.issn.1000-9604.2015.04.11

Khan, F. A., Merry, A. F. (2018). Improving Anesthesia Safety in Low-Resource Settings. .*Anesthesia and Analgesia*, 126(4), 1312-1320.

Kim, W. C., Mauborgne, R. (2015). Blue Ocean Strategy. How to create uncontested market space and make it competition irrelevant. Harvard Business Review Press.

Kingham, T. P., Kamara, T. B., Cherian, M. N., Gosselin, R. A., Simkins, M., Meissner, C., … Kushner, A. L. (2009). Quantifying surgical capacity in Sierra Leone: a guide for improving surgical care. Archives of surgery, 144(2), 122–128. doi:10.1001/archsurg.2008.540

Kirby, J., & Stewart, T. A. (2007). The Institutional Yes: How Amazon's CEO leads strategic change in a culture obsessed with today's customer. *Harvard Business Review*, 85(10), 74-82.

Kirigia, J. M., Gbary, A. R., Muthuri, L. K., Nyoni, J., & Seddoh, A. (2006). The cost of health professionals' brain drain in Kenya. *BMC Health Services Research*, *6*, 89. https://doi.org/10.1186/1472-6963-6-89

Kirigia, J. M., Gbary, A. R., Nyoni, J., Seddoh, A., Muthuri, L. K. (2006). The cost of health-related brain drain to the WHO African region. *African Journal of Health Sciences*,13:1–12.

Koch, T., & Kralik, D. (2006). Participatory action research in health care. Malden, MA: Blackwell Publishing.

Kolb, D. A. (1984). *Experiential Learning as the Source of Learning and Development*. Upper Saddle River, NJ: Prentice Hall.

Kollar, E., & Buyx, A. (2013). Ethics and policy of medical brain drain. *Swiss Med Wkly*. Oct 25; 143: w13845. Doi: 10.4414/smw.2013.13845.

Korth, K. (2007). Re-establishing the importance of the learning organisation. *Automotive design UY Production*, 119(11), 12.

Kotter, J. P. (1995). *Leading change: Why transformation efforts fail*. *Harvard Business Review*, 73, 59-67.

Kotter, J. P. (2007) *Leading Change: Why transformation fail.* Harvard Business Review. Retrieved from https://hbr.org/2007/01/leading-change-why-transformation-efforts-fail

Kotter, J. P. (2012). *Leading change* (1st ed.), (pp. 3-153). Boston, Massachusetts: Harvard Business Review Press.

Kreuger, R. A., & Casey, M. A. (2015). *Focus Groups. A Practical Guide for Applied Research* (5th ed). SAGE Publications, Inc.

Kumar, S., Heller, R. F., Pandey, U., Tewari, V., Bala, N., & Oanh, K. T. (2001). Delay in presentation of oral cancer: a multifactor analytical study. *The National medical journal of India*, *14*(1), 13–17.

Landsverk, J., Brown, H., Chamberlain, P., Palinkas, L. A., & Horwitz, S. M. (2012). Design and analysis in dissemination and implementation research. In Brownson RC, Colditz GA, Proctor EK, (Eds). *Translating science to practice* (pp. 225–260). New York: Oxford University Press.

Lavy, C., Tindall, A., Steinlechner, C., Mkandawire, N., & Chimangeni, S. (2007). Surgery in Malawi - a national survey of activity in rural and urban hospitals. Annals of the Royal College of Surgeons of England, 89(7), 722–724. doi:10.1308/003588407X209329

Lawan, U. M., Amole, G. T., & Khayi, J. H. (2017). Rural posting experience, requests for transfer, and perspectives about critical factors for staff retention among primary health care workers in urban Kano, Nigeria. *Nigerian Journal of Clinical Practice*, 20, 25-30.

LeBrun, D. G., Chackungal, S., Chao, T. E., Knowlton, L. M., Linden, A. F., Notrica, M. R., … McQueen, K. A. (2014). Prioritizing essential surgery and safe anesthesia for the Post-2015 Development Agenda: operative capacities of 78 district hospitals in 7 low- and middle-income countries. *Surgery*, *155*(3), 365–373. doi:10.1016/j.surg.2013.10.008

Levenson, A. (2018). Using workforce analytics to improve strategy execution. *Human Resource Management*, 57(3), 685-700.

Levin, M., & Greenwood, D. J. (2011). Revitalizing universities by reinventing the social sciences: Bildung and action research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (4th edn, pp. 27–42). Thousand Oaks, CA: SAGE.

Levin, M. (2012). Academic integrity in action research. *Action Research,* 10, 133-149.

Lewin, K. (1946). Action Research and Minority Problems. Journal of Social Issues, 2 (4): 4-46.

Lewin, K. (1997 [1946]). Action research and minority problems, In G. Lewin (Ed), Resolving Social Conflicts: Selected Papers on Group Dynamics (pp. 144-154). Washington DC: American Psychological Association.

Li, V. (2014). Access to safe anesthesia: a global perspective. *The Journal of Global Health*.

Liedtka, J. (1998). Strategic thinking: Can it be taught? *Long Range Planning*, 31, 120-129.

Liese, B., & Dussault G. (2004). The state of health workforce in sub-Saharan Africa: evidence of crisis and analysis of contributing factors. In: Africa Region Human Development Working Paper Series. The World Bank: Washington, DC.

Lilaonitkul, M., Kwikiriza, A., Ttendo, S., Kiwanuka, J., Munyarungero, E., Walker, I. A., & Rooney, K. D. (2015). Implementation of the WHO Surgical Safety Checklist and surgical swab and instrument counts at a regional referral hospital in Uganda–a quality improvement project. Anaesthesia, 70(12), 1345-1355.

Linden, A. F., Sekidde, F. S., Galukande, M., Knowlton, L. M., Chackungal, S., & McQueen, K. A. (2012). Challenges of surgery in developing countries: a survey of surgical and anesthesia capacity in Uganda's public hospitals. World journal of surgery, 36(5), 1056–1065. doi:10.1007/s00268-012-1482-7

Lipnick, M. S., Bulamba, F., Ttendo, S. & Gelb, A. W. (2017). The need for a global perspective on task-sharing in anesthesia. *Anesthesia and Analgesia*, 2017, 125:1049-1052.

Little, B. (2006). Employability and work-based learning. *Learning and Employability*, Series 2. York: The Higher Education Academy.

Liu, J. X., Goryakin, Y., Maeda, A., Bruckner, T., & Scheffler, R, (2017). Global Health Workforce Labor Market Projections for 2030. Human Resources for Health, 15, 11

Lofter, A. K. (2012). The "brain drain" of health care workers: causes, solutions, and the example of Jamaica. Canadian Journal of Public Health, 18, 103 (5): e376-378.

Livingston, P., Zolpys, 1. L., Mukwesi, C., Twagirumugabe, T., Whynot, S., & MacLeod, A. (2014). Non-technical skills of anaesthesia providers in Rwanda: an ethnography. *Pan African Medical Journal*, 19:97 doi:10.11604/pamj.2014.19.97.5205.

Lykes, M. B., & Mallona, A. (2008). Towards transformational liberation: Participatory and action research and praxis, in P. Reason and H. Bradbury (eds), The SAGE Handbook of Action Research (2nd edn). London: Sage, pp. 106-120.

MacDonald, C. (2012). Understanding Participatory Action Research: A Qualitative Research Methodology Option. *Canadian Journal of Action Research*, 13(2), 34 -50.

Macintosh, R., Mushin, W.W., Epstein, H.G. (1963). Vapour pressure. In: Macintosh R, Mushin WW, Epstein HG, editors. Physics for the Anaesthetist. 3rd ed. Oxford: Blackwell Scientific Publications; 1963. p. 68

Marler, J. H., & Boudreau, J. W. (2017). An evidence-based review of HR analytics. *The International Journal of Human Resource Management*, 28(1), 3–26.

Marshall, C., & Rossman, G. (2006). *Designing qualitative research*, (4th Ed.). Thousand Oaks: Sage.

Mathis, R. L, Jackson, J. H, Valentine, S. R., & Meglich, P. A. (2017). Human Resource Management (15th ed.) Cengage Learning.

McNicoll, P. (1999). Issues in teaching participatory action research. Journal of Social Work Education, 35(1), 51-62.

McNiff, J., & Whitehead, J. (2011). *All you need to know about action research* (2nd ed). SAGE Publications.

McQueen, K. A. (2010). Anesthesia and the global burden of surgical disease. *International Anesthesiology Clinics*, 48(2), 91-107

McTaggart, R. (1991). Principles for Participatory Action Research. *Adult Education Quarterly*, 41(3), 168-187. https://doi.org/10.1177/0001848191041003003

Meara, J. G., Leather, A. J. M., Hagander, L., Alkire, B. C., Alonso, N., Ameh, E. A., Bickler, S. W., Conteh, L., Dare, A. J., Davies, J., Mérisier, E. D., El-Halabi, S., Farmer, P. E., Gawande, A., Gillies, R., Greenberg, S. L., Grimes, C. E., Gruen, R. L., Ismail, E. A., Kamara, T. B., Lavy, C., Lundeg, G., Mkandawire, N. C., Raykar, N. P., Riesel, J. N., Rodas, E., Rose, J., Roy, N., Shrime, M. G., Sullivan, R., Verguet, S., Watters, D., Weiser, T. G., Wilson, I. H., Yamey, G., Yip, W. (2015). Global surgery 2030: evidence and solutions for achieving health, welfare, and economic development. *The Lancet*; 386 (9993): 569-624.

Medical and Dental Council of Nigeria. www.mdcnigeria.org

Merton, R. K., Fiske, M., & Kendall, P. L. (1956). *The focused interview*. Glencoe, IL: Free Press.

Mills, E. J., Schabas, W. A., Volmink, J., Walker, R., Ford, N., Katabira, E., ... & Montaner, J. (2008). Should active recruitment of health workers from sub-Saharan Africa be viewed as a crime?. *The Lancet*, *371*(9613), 685-688.

Mills, E.J., Kanters, S., Hagopian, A., Bansback, N., Nachega, J., Alberton, M., Au-Yeung, C.G, Mtambo, A., Bourgeault, I.L., Luboga, S., Hogg, R.S., & Ford, N., (2011). The financial cost of doctors emigrating from sub- Saharan Africa: human capital analysis. British Medical Journal, 343, d7031.

Minbaeva, D. B. (2018). Building credible human capital analytics for organizational competitive advantage. *Human Resource Management*, 57(3), 701-713.

Mintzberg, H. (1978). Patterns in strategy formation. *Management Sciences*, 24, 934-948.

Mintzberg, H. (1994). The fall and rise of strategic planning. *Harvard Business Review*, 72, 107-114.

Mizbah, G. (1965). International Medicine: A medical holiday in Nigeria. Canadian Medical Association Journal, 92, 620-622. Retrieved February 23, 2020 from https://europepmc.org/backend/ptpmcrender.fcgi?accid=PMC1928207&blobtype=pdf

Mohrman, S. A., Lawler, E. E., & Associates (2011). Useful Research: Advancing Theory and Practice. San Francisco, CA: Berrett-Koehler.

Moore, J. N., McDiarmid, A. J., Johnston, P. W., & Cleland J. A. (2017). Identifying and exploring factors influencing career choice, recruitment and retention of anaesthesia trainees in the UK. *Postgraduate Medical Journal*, 93, 61-66.

Morgan, M. (1995). The Epstein-Macintosh-Oxford (EMO) inhaler. *Anaesthesia*, 50, 239-242

Morris, M. (2002). Participatory action research: A guide to becoming a researcher for social change. Ottawa, ON: Canadian Research Institute for the Advancement of Women.

Morriss, W., Ottaway, A., Milenovic, M., Gore-Booth, J., Haylock-Loor, C., Onajin-Obembe, B., Barreiro, G., & Mellin-Olsen, J. (2019). A global anaesthesia training framework. *Anesthesia & Analgesia*, 128(2), 383-387.

Muhammed, K. A., Umeh, K. N., Nasir, S. M., & Suleiman, I. H. (2013). Understanding the Barriers to the Utilization of Primary Health Care in a Low-Income Setting: Implications for Health Policy and Planning. *Journal of public health in Africa*, *4*(2), e13. https://doi.org/10.4081/jphia.2013.e13

Mullan, F. (2005). The metrics of the physician brain drain. *New England journal of medicine*, *353*(17), 1810-1818.

Mullan, F., & Frehywot, S. (2007). Non-physician clinicians in 47 sub-Saharan African Countries. *Lancet* 370, 2158-2163.

Muula, A. S. (2005). Is there any solution to the "brain drain" of health professionals and knowledge from Africa? *Croatian Medical Journal*, 46(1), 21-29.

Mwachaka, M. P., & Mbugua, P. E. (2010). Specialty preferences among medical students in a Kenyan university. *The Pan African Medical Journal*, 5: 18.

Najib, M., Abdullah, S., Narresh, S., & Juni, M. H. (2019). Brain-drain phenomenon among healthcare workers. *International Journal of Public Health and Clinical Sciences*, *6*(3), 90-103.

Nancarrow S. A. (2015). Six principles to enhance health workforce flexibility. Human resources for health, 13, 9. https://doi.org/10.1186/1478-4491-13-9

National Orthopaedic Hospital, Igbobi, Lagos (NOHIL) 2019. Retrieved from https://www.nohlagos.org.ng/about.html

National Postgraduate Medical College of Nigeria. Establishment and Functions. Retrieved August 17, 2019 from https://npmcn.edu.ng/about-us/establishment-and-functions/

Neville, B. (1989). Education psyche: Emotion, imagination, and the unconscious in learning. North Blackburn, Victoria, Australis: Collins Dove.

Nickols, F. W. (2000). The knowledge in knowledge management. In Cortada, J.W. & Woods, J.A. (Eds) The knowledge management yearbook 2000-2001 (pp. 12-21). Boston, MA: Butterworth-Heinemann.

Nielsen, J. C. R. & Repstad, P. (1993). From nearness to distance—And back: On analysing your own organization. Copenhagen Business School, Institute of Organizational and Industrial Sociology, Papers in Organization, No. 14.

Nigerian Health Watch (2020). Courage in The Midst Of Fear; How Kano Contained Its Current Lassa Fever Outbreak. Retrieved on February 21, 2020 from https://nigeriahealthwatch.com/courage-in-the-midst-of-fear-how-kano-contained-its-current-lassa-fever-outbreak/#.XlAb3mhKjIU

Nigerian Society of Anaesthetists Directory, 2016 – Personal file.

Nigerian Society of Anaesthetist Directory 2016. A compilation by the 2014 to 2016 National Executive.

Norland, M., Moran, T., & Kotschwar, B. (2016). Is gender diversity profitable? Evidence from a global survey. SSRN Electronic Journal.

Nwashilli, N. J., Okobia, N. M., Osime, O. C., & Agbugui, O. J. (2017). The pattern and outcome of surgical acute abdomen at a Nigerian tertiary hospital. *Nigerian Journal of Surgical Sciences*, 27, 51-56.

Nyamai, K., Ng'ang'a, P., & Mutisya, R. (2013). Impact of clinical officer anaesthetists training programme at the Kenya Medical Training College, Nakuru, on trainee satisfaction, quality of practice, and cadre shortfall alleviation. *East African Medical Journal*, 90(7), 226-234.

Odor, P. M., Neun, M., Bampoe, S., Clark, S., Heaton, D., Hoogenboom, E. M., Brown, M., Patel, A., & Kamming, D. (2020). Anaesthesia and COVID-19: infection control. *BJA: British Journal of Anaesthesia*, Advance online publication. https://doi.org/10.1016/j.bja.2020.03.025

Ogundele, O.J., Pavlova, M. & Groot, W. (2018). Examining trends in inequality in the use of reproductive health care services in Ghana and Nigeria. *BMC Pregnancy Childbirth* **18,** 492. https://doi.org/10.1186/s12884-018-2102-9

Ojo, O. D., Ugochukwu, N. O. A., & Obinna, E. J. (2011). Understanding the escalation of brain drain in Nigeria from poor leadership point of view. *Mediterranean Journal of Social Sciences*, 2 (3), 434-453.

Okeke, E. N. (2014). Do higher salaries lower physician migration? *Health Policy and Planning*, 29(5), 603-614.

Olaniyan, D. A., & Okemakinde, T (2008). Human capital theory: implications for educational development. *Pakistan Journal of Social Sciences*, 5(5), 479-483.

Oleribe, O.O., Momoh, J., Uzochukwu, B.S.C., Mbofana, F., Adebiyi, A., Barbera, T., Williams, R., Taylor-Robinson, S.D. (2019). Identifying Key Challenges Facing Healthcare Systems In Africa And Potential Solutions. *International Journal of General Medicine*, 12, 395-403 https://doi.org/10.2147/IJGM.S223882

Omigbodun, A. (2012). The membership certification of the West African College of Surgeons and its relevance to the needs of the West African sub-region. Journal of the West African College of Surgeons, 2(3), 83–87.

Omoruan, A. I., Bamidele, A. P., & Phillips, O. F. (2009). Social health insurance and sustainable healthcare reform in Nigeria. *Ethno-Medicine*, 3(2), 105-110.

Omuta, G. E. D., Onokerhoraye, A. G., Okonofua, F., Obanovwe, G., Isah, E., Chiwuzie, J., Okoro, F., Onojeta, F., Omoraka, F., Eregare, J., & Akpomera, E. (2014). Perspectives on Primary Health Care in Nigeria: past Present and Future. Centre for Population and Environmental Development (CPED) Monograph Series No 10; TTI/IDRC.

Onajin-Obembe, B. (2008). Gravimetric intravenous anaesthesia: a practical solution. *West African Journal of Medicine*, 27 (4), 271-272.

Onajin-Obembe, B. O. I., & Alagbe-Briggs, O.T (2015). Who wants to be an Anaesthesiologist? *International Journal of Educational Research and Reviews*, 3(2): 073-077. Retrieved from http://internationalscholarsjournals.org/download.php?id=479897370969928691.pdf &type=application/pdf&op=1

Onajin-Obembe, B. (2019). Anaesthesia in Nigeria: Past, Present and Future. World Anaesthesia News; 19(2): 15-17.

Onwujekwe, O., Hanson, K., & Uzochukwu, B. (2012). Examining inequities in incidence of catastrophic health expenditures on different healthcare services and health facilities in Nigeria, PLoS One; 7: e40811. doi: 10.1371/journal.pone.0040811

Onyeka, T.C., & Ewuzie, N.P. (2010). Choice of Future Career amongst Medical Students in Enugu, Nigeria: Implications for Anaesthesia. Nigerian Journal of Surgery, 16 (1-2), 9-12. doi: 10.4314/njs.v16i1-2.70780

Onyekwulu, F. A., Nwosu, A. D. G., & Ajuzieogu, V. O. (2014). Anaesthesia manpower need in Nigeria. *Orient Journal of Medicine*, 26(3-4), 83-87.

Ooms, G., Brolan, C., Eggermont, N., Eide, A., Flores, W., Forman, L., Friedman, E. A., Gebauer, T., Gostin, L. O., Hill, P. S., Hussain, S., McKee, M., Mulumba, M., Siddiqui, F., Sridhar, D., Van Leemput, L., Waris, A., & Jahn, A. (2013). Universal health coverage anchored in the right to health. *Bulletin of the World Health Organization*, *91*(1), 2–2A. https://doi.org/10.2471/BLT.12.115808

Osinaike, B., Ayandipo, O., Onyeka, T., Alagbe-Briggs, O., Mohammed, A., Oyedepo, O., Nuhu, A., Asudo, F., Akanmu, O., Nwokorie, C., Mohammed, A., Edubio, M., Izuora, K., Mohammed, R., Nweze, O., Efu, M., Eguma, S., Jasper, A., Ewah, R., Akhideno, I., Nnaji, C., Ado, S., Ogboli-Nwasor, E., Atiku, M., Salisu, I., Adinoyi, Y., Agu, E., Desalu, I., Samuel, L., Olorode, Y., Fatungase, O., Akinwunmi, O., Faponle, F., Idowu, O., Isamade, E., Aliyu, A., Buba, S., Hamza, G., Onajin-Obembe, B., Amanor-Boadu, S.; Nigerian Surgical Outcomes Study Investigators.et al. (2019).

Nigerian surgical outcomes – Report of a 7-day prospective cohort study and external validation of the African surgical outcomes study surgical risk calculator. *International Journal of Surgery*, 68, 148-156.

Ossai, EN., Uwakwe, KA., Anyanwagu, U. C., Ibiok, N. C., Azuogu, B. N., & Ekeke, N. (2016). Specialty preferences among final year medical students in medical schools of southeast Nigeria: need for career guidance. *BMC Medical Education*, 16(1), 259. doi: 10.1186/s12909-016-0781-3.

Ottaway, A. J., & Kabongo, L. (2017). Prospective observational study of intraoperative anesthetic events in district hospitals in Namibia. *Anesthesia and Analgesia*. 126, 1.

Ouma, P. O., Maina, J., Thuranira, P. N., Macharia, P. M., Alegana, V. A., English, M., ... & Snow, R. W. (2018). Access to emergency hospital care provided by the public sector in sub-Saharan Africa in 2015: a geocoded inventory and spatial analysis. *The Lancet Global Health*, *6*(3), e342-e350.

Overseas News (1967). The Society of Anaesthetists of West Africa. *Anaesthesia*, 22 (4), 717-718. Retrieved February 21, 2020 from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1365-2044.1967.tb10193.x

Pacqué-Margolis, S., Muntifering, C., Ng, C., & Noronha, S., (2011). IntraHealth International. Population growth and the global health workforce crisis. Washington: United States Agency for International Development.

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research. *Administration and policy in mental health*, 42(5), 533–544. doi:10.1007/s10488-013-0528-y

Palinkas, L. A., Aarons, G. A., Horwitz, S., Chamberlain, P., Hurlburt, M., & Landsverk, J. (2011). Mixed method designs in implementation research. *Administration and Policy Mental Health*, 38(1), 44-53.

Pálsdóttir, B., Barry, J., Bruno, A., Barr, H., Clithero, A., Cobb, N., ... & Strasser, R. (2016). Training for impact: the socio-economic impact of a fit for purpose health workforce on communities. Human Resources for Health, 14(1), 1-9.

Pandey, I. M. (2004). Governance of Higher Education Institutions. *Vikalpa*, 29 (2), 79-84.

Pasban, M., & Nojedeh, S. H. (2016). A review of the role of human capital in the organization. *Procedia-Social and Behavioral Sciences*, 230, 249-253.

Penoyar, T., Cohen, H., Kibatala, P., Magoda, A., Saguti, G., Noel, L., … Cherian, M. (2012). Emergency and surgery services of primary hospitals in the United Republic of Tanzania. *BMJ open*, *2*(1), e000369. doi:10.1136/bmjopen-2011-000369

Perkins, D. (1995). Outsmarting IQ: The emerging science of learnable intelligence. New York: Free Press.

Petroze, R. T., Nzayisenga, A., Rusanganwa, V., Ntakiyiruta, G., & Calland, J. F. (2012). Comprehensive national analysis of emergency and essential surgical capacity in Rwanda. *The British Journal of Surgery*, 99(3), 436–443. doi:10.1002/bjs.7816

Pillay, H., Boulton-Lewis, G., Wilss, L., & Rhodes, S. (2003). Older and younger workers' conceptions of work and learning at work: A challenge to emerging work practices. *Journal of Education and Work*, 16(4), 427-444.

Pleasants, N. (1996). Nothing is Concealed: De-centering Tacit Knowledge and Rules from Social Theory. *Journal for Theory of Social Behavior*, 26(3), 233-255.

Poduval, J. (2015). Optimizing Medicine Residency Training Programme. IGI Global.

Polanyi, M. (1966). The Tacit Dimension. New York Doubleday.

Porter, M. E. (1985). The Competitive Advantage: Creating and Sustaining Superior Performance. NY: Free Press.

Porter, M.E. (1986). Competitive Strategy. Harvard Business School Press.

Porter, M.E. (1996). What is strategy? *Harvard Business Review*, 96 (6): 61-78.

Price, R., Makasa, E. & Hollands, M. (2015). World Health Assembly Resolution WHA68.15: "Strengthening Emergency and Essential Surgical Care and Anesthesia as a Component of Universal Health Coverage"—Addressing the Public Health Gaps Arising from Lack of Safe, Affordable and Accessible Surgical and Anesthetic Services. *World J Surg* **39,** 2115–2125. https://doi.org/10.1007/s00268-015-3153-y

Proctor, E. K., Landsverk, J., Aarons, G., Chambers, D., Glisson, C., & Mittman, B. (2009). Implementation research in mental health services: an emerging science with conceptual, methodological, and training challenges. Administration and Policy in Mental Health. 2009, 36(1), 24-34.

Psacharopoulos, G. & Woodhall, M. (1997). Education for development. An analysis of investment choice. New York, Oxford University Press.

Quintal, C (2019). Evolution of catastrophic health expenditure in a high income country: incidence versus inequalities. International Journal for Equity in Health 18, 145. https://doi.org/10.1186/s12939-019-1044-9

Rasak-Oyadiran, O. The First Hospital in Nigeria. Last retrieved December 24, 2019 from https://the234project.com/history/nigeria/the-first-hospital-in-nigeria/

Raelin, J. A. (2008). Work-based learning: Bridging knowledge and action in the workplace. Jossy – Bass, San Francisco.

Reason, P., & Torbert, W. (2001). "The Action Turn: Toward a Transformational Social Science: A Further Look at the Scientific Merits of Action Research", *Concepts and Transformation,* 6 (1), 1-37.

Reason, P., & Bradbury, H. (2001). Handbook of action research : participative inquiry and practice. Sage.

Reason, P., & Bradbury, H. (2008). The SAGE Handbook of Action Research (2nd Edition), London: Sage.

Record, R., & Mohiddin, A. (2006). An economic perspective on Malawi's medical brain drain. Global health, 18(2), 12.

Reshamwalla, S., Gobeze, A.A., Ghosh, S., Grimes, C., & Lavy, C. (2012). Snapshot of Surgical Activity in Rural Ethiopia: Is Enough Being Done?. World J Surg 36, 1049–1055. https://doi.org/10.1007/s00268-012-1511-6

Roberts, A. (2009). Encouraging reflective practice in periods of professional workplace experience: the development of a conceptual model. Reflective Practice, 10(5), 633-644.

Robinson, D. H., & Toledo, A. H. (2012). Historical development of modern anesthesia. *Journal of Investigative Surgery*, 25(3),141-149.

Rodnick, J. E. (2006). Africa: some thoughts on the medical brain drain. *Family medicine*, *38*(1), 62–63.

Rowe, W. (2001). Creating Wealth in Organizations: The Role of Strategic Leadership. *The Academy of Management Executive* (1993-2005), 15(1), 81-94. Retrieved from http://www.jstor.org/stable/4165712.

Rybnicek, R., & Königsgruber, R. (2019). What makes industry–university collaboration succeeds? A systematic review of the literature. Journal of Business Economics, 89, 221-250

Ryle, G, (1945). Knowing How and Knowing That. Aristotelian Society Proceedings; 46, 1-16.

Rynes, S. L., & Gulik, T. L. (2007). The very separate worlds of academic and practitioner publications in human resource management: Implications for evidenced-based management. Academy of Management Journal, 50, 987-1008.

Saintonge, D. (2009). The helpless learner: a pilot study in clinical students. Medical Teacher, 20 (6): 583 -586.

Sajjad, M., & Mahboob, U. (2015). Improving Workplace-Based Learning for Undergraduate Medical Students. Pakistan journal of medical sciences, 31(5), 1272–1274. https://doi.org/10.12669/pjms.315.7687.

Sakamota, A & Powers, P. A. (1995). Education and the dual labour market for Japanese men in America. *Sociology Review*, 60 (2), 222-246.

Salacuse, J. S. (2006). Leading Leaders. How to manage smart, talented, rich and powerful people. American Management Association, New York.

Salari, P., Di Giorgio, L., Ilinca, S., & Chuma, J. (2019). The catastrophic and impoverishing effects of out-of-pocket healthcare payments in Kenya, 2018. BMJ global health, 4(6), e001809. https://doi.org/10.1136/bmjgh-2019-001809

Saluja, S., Rudolfson, N., Massenburg, B. B., Meara J. G., Shrime M. G. (2020). The impact of physician migration on mortality in low and middle- income countries: an economic modelling study. British Medical Journal Global Health, 5:e001535. doi:10.1136/ bmjgh-2019-001535

Saunders, M., Lewis, P., & Thornhill, A. (2012). Research Methods for Business Students (6th ed), Pearson Education Limited.

Savedoff, W. D., de Ferranti, D., Smith, A. L., & Fan, V. (2012). Political and economic aspects of the transition to universal health coverage. *Lancet (London, England)*, *380*(9845), 924–932. https://doi.org/10.1016/S0140-6736(12)61083-6

Savin-Baden, M., & Wimpenny, K. (2007). Exploring and implementing participatory action research. Journal of Geography in Higher Education, 31(2), 331-343.

Schoemaker, P.J.H., Krupp, S., & Howland, S. (2013). Strategic leadership: the essential skills. *Harvard Business Review*, January to February 1-5.

Schon, D. (1983). The reflective practitioner: How professionals think in action. New York: Basic Books.

Schram, R. A. (1971). History of Nigerian Health Care Services. Ibadan University Press, Ibadan.

Schumann, M., Maaz, A. & Peters, H. (2019). Doctors on the move: a qualitative study on the driving factors in a group of Egyptian physicians migrating to Germany. *Global Health* **15,** 2 (2019). https://doi.org/10.1186/s12992-018-0434-x

Schultz, T. W. (1971). Investment in Human Capital. New York. The Free Press.

Scott-Emuakpor, A. (2010). The evolution of health care systems in Nigeria: Which way forward in the twenty-first century. Nigerian Medical Journal, 51, 53-65.

Seagraves, L., Osborne, M., Neal, P., Dockrell, R., Hartshorn, C., & Boyd, A. (1996). Learning in smaller companies (LISC). Final report. University of Stirling: Educational Policy and Development.

Selenger, D. (1997). Participatory action research and social change. New York: Cornell University.

Serpa, S., Ferreira, C. M., Santos, A. I., & Teixeira, R. (2018). Participatory Action Research in Higher Education Training. *International Journal of Social Science Studies*, *6*(6), 1-7.

Senge, M. P, (2006). The Fifth Discipline: The art and practice of the learning organisation. Random House Business Books.

Serour, G. I. (2009). Healthcare workers and the brain drain. International Journal of Gynecology and Obstetrics, 106 (2), 175-178. https://doi.org/10.1016/j.ijgo.2009.03.035

Selvarajan, T. T., Ramamoorthy, N., Flood, P. C., Guthrie, J. P., MacCurtain, S., & Liu, W. (2007). The role of human capital philosophy in promoting firm innovativeness and performance: Test of a causal model. *International Journal of Human Resource Management*, 18(8), 1456-1470. https://doi.org/10.1080/09585190701502588

Shani, A. B., & Pasmore, W. A. (2010[1985]). Organization inquiry: Towards a new model of the action research process, In D. Coghlan and AB Shani (eds), Fundamentals of Organizational Development, Vol 1 (pp. 249-260). London: SAGE.

Sheikh, A., Naqvi, S. H., Sheikh, K., Naqvi, S. H., & Bandukda, M. Y. (2012). Physician migration at its roots: a study on the factors contributing towards a career choice abroad among students at a medical school in Pakistan. *Globalization and health*, *8*, 43. https://doi.org/10.1186/1744-8603-8-43

Sherman, L., Clement, P. T., Cherian, M. N., Ndayimirije, N., Noel, L., Dahn, B., … Kushner, A. L. (2011). Implementing Liberia's poverty reduction strategy: An assessment of emergency and essential surgical care. Archives of surgery, 146(1), 35–39. doi:10.1001/archsurg.2010.285

Shrime, M. G., Dare, A. J., Alkire, B. C., O'Neill, K., & Meara, J. G. (2015). Catastrophic expenditure to pay for surgery worldwide: a modelling study. *Lancet Global Health*, 3 Suppl 2: S38-44.

Siankam, B. (2011). Fuga de cerebros en el sector médico del África subsahariana: explorando la utilidad d'un marco de validez eco-psicopolítica para la investigación sobre la migración médica. *Psychosocial Intervention*, *20*(3), 295-307.

Siegel, D. (1999). The developing mind: Toward a neurobiology of interpersonal experience. New York: W.W. Norton.

Simini B. (2000). Anaesthetist: the wrong name for the right doctor. *Lancet (London, England)*, *355*(9218), 1892. https://doi.org/10.1016/S0140-6736(05)73340-7

Sodiechowska, P., & Maisch, M. (2006). Work-based learning: in search of an effective model, *Educational Action Research*, 14(2), 267-286, doi:10.1080/09650790600718217

Soyannwo, O. A., & Elegbe, E. O. (1999). Anaesthetic manpower development in West Africa. *African Journal of Medical Sciences,* 28(3-4), 163-165.

Soyannwo, O.A., & Elegbe, E. O. (2000). Anaesthetic Manpower in West Africa – which way forward? *World Anaesthesia and WFSA News*, 4 (2): 1. Retrieved December 16,

2018 from https://www.aagbi.org/sites/default/files/WA4.2Sept2000_1.pdf

Spender JC (2014), Business Strategy: Managing Uncertainty, Opportunity and Enterprise. pp. 23. Oxford University Press.

Spender JC, Strong BA (2014). Strategic Conversations. Creating and directing the entrepreneurial workforce, Cambridge University Press

Sternberg, R. (1997). Successful intelligence: How practical and creative intelligence determines success in life. New York: Plume.

Stetson, J.B. (1968). A simple improvement in the EMO vaporizer. *British Journal of Anaesthesia*, 40, 65.

Stewart, D. W., & Shamdasani, P. N. (2014). *Focus Groups.* London: SAGE.

Stilwell, B., Diallo, K., Zurn, P., Vujicic, M., Adams, O., & Poz, M. D. (2004). Migration of healthcare workers from developing countries: strategic approaches to its management. Bulletin of the World Health Organization, 82, 595-600.

Story, J. S. P (2011). A development approach to global leadership. International Journal of Leadership Studies 6(3), 375-389.

Streck, D. R. (2014). Knowledge and transformative social action: The encounter of selected traditions of participatory (action) research. Globalisation, Societies and Education, 12(4), 457-473. http://dx.doi.org/10.1080/14767724.2014.901907.

Streubert, H. J, & Carpenter, D. R (2011). Qualitative research in nursing. Advancing the humanistic imperative (5th ed.). Philadelphia: Lippincott, Williams, & Wilkins.

Stringer, E. T, (2013). Action Research: A Handbook for Practitioners (4th ed). Thousand Oaks, CA: Sage.

Strode, A. (2015). Participatory action research for development of prospective teachers' professionality during their pedagogical practice. *Discourse and Communication for Sustainable Education*, 4(1), 80-90.

Suciu, Ş. M., Popescu, C. A., Ciumageanu, M. D., & Buzoianu, A. D. (2017). Physician migration at its roots: a study on the emigration preferences and plans among medical students in Romania. *Human resources for health*, *15*(1), 6. https://doi.org/10.1186/s12960-017-0181-8

Tankwanchi, A. B. S., Özden, Ç., & Vermund, S. H. (2013). Physician emigration from sub-Saharan Africa to the United States: analysis of the 2011 AMA physician masterfile. *PLoS Medicine*, *10*(9), e1001513. https://doi.org/10.1371/journal.pmed.1001513

Tankwanchi, A.B.S., Vermund, S. H., Perkins, D. D. (2015). Monitoring Sub-Saharan African Physician Migration and Recruitment Post-Adoption of the WHO Code of

Practice: Temporal and Geographic Patterns in the United States. PLoS ONE 10(4): e0124734. https://doi.org/10.1371/journal.pone.0124734

Tankwanchi, A.B.S. (2018). Oppression, liberation, wellbeing, and ecology: organizing metaphors for understanding health workforce migration and other social determinants of health. Global Health 14, 8. https://doi.org/10.1186/s12992-018-0397-y

Tawfik L, Kinoti SN (2003). The impact of HIV/AIDS on the health workforce in sub-Saharan Africa. Support for Analysis and Research in Africa Project (SARA). Washington, DC: USAID, 2003.

Thomas, K. J. A. (2016). Highly skilled migration from Africa to the US: Exit mechanisms, demographic determinants, and the role of socioeconomic trends. *Population Research and Policy Review,* 35 (6), 825-849.

Tilley, H (2016). Medicine, empires and ethics in Colonial Africa. *AMA J Ethics,* 18(7):743-753. doi: 10.1001/journalofethics.2016.18.7.mhst1-1607.

The Royal College of Anaesthetists (2016): Medical workforce census report 2015. In. London: Royal College of Anaesthetists.

The World Bank in Nigeria. Retrieved August 7, 2019 from https://www.worldbank.org/en/country/nigeria/overview.

Toledo, P., Duce, L., Adams, J., Ross, V. H., Thompson, K. M., Wong, C. A, (2017). Diversity in the American Society of Anaesthesiologists Leadership. *Anesthesia and Analgesia*, 124(5), 1611-1616.

Torbert, W. R. and Associates (2004). Action Inquiry. San Francisco, CA: Berrett-Koehler.

Truché, P., Shoman, H., Reddy, C.L., Jumbam, D. T., Ashby, J., Mazhiqi, A., Wurdeman, T., Ameh, E. A., Smith, M., Lugazia, E., Makasa, E., Park, K. B. Meara, J. G. (2020). Globalization of national surgical, obstetric and anesthesia plans: the critical link between health policy and action in global surgery. *Global Health* **16,** 1 (2020). https://doi.org/10.1186/s12992-019-0531-5

Uche, E. (2019). Development Plans and Policies in Nigeria: Observed Impediments and Practical Best Alternatives. International Journal of Research and Scientific Innovation, 6 (7), 27-36.

Uma, B. R., & Hanji, A. S. (2013). "Anaesthesia and Anaesthesiologists: How Famous are We among the General Population?"- A Survey. *Journal of clinical and diagnostic research : JCDR*, *7*(12), 2898–2900. https://doi.org/10.7860/JCDR/2013/7084.3788

University College Hospital, Ibadan. Brief History. Retrieved February 20, 2020. https://uch-ibadan.org.ng/brief-history/

University College Hospital Clinical Departments. Anaesthesia Department. Retrieved August 18, 2019 from https://uch-ibadan.org.ng/clinical-2/

United Nations. Gender Equality: Sustainable Development Goal 5. Retrieved December 3, 2019 from https://www.un.org/sustainabledevelopment/blog/2019/03/gender-equality-sustainable-development-goal-5/

United Nations (2013). A/67/L.36. Agenda item 123: global health and foreign policy. In: General Assembly of the United Nations [Internet]. Sixty-seventh United Nations General Assembly, New York, 3–11 September 2012, official documents. Geneva: UNGA; 2013. Available from: http://daccess-dds-ny.un.org/doc/UNDOC/LTD/N12/630/51/PDF/N1263051.pdf?OpenElement

United Nations (2019). Retrieved March 8, 2019 from http://www.un.org/en/sections/issues-depth/population/

United Nations, Department of Economic and Social Affairs, Population Division. World Population Prospects: The 2019 Revision. Retrieved July 1, 2019 from https://population.un.org/wpp/DataQuery/

University of Nigeria Teaching Hospital (2010). Post Basic Nursing Anaesthetist Programme. Retrieved August 18, 2019 from http://www.unthenugu.com.ng/education_training/specialised_education/post_anaesthtist.html

University Project Lagos. Retrieved August 11, 2019 from http://www.anesthesia.webservices.utoronto.ca/Assets/Anesthesia+Digital+Assets/Anesthesia/Anesthesia+Digital+Assets/history/earlylagos.pdf

Van der Heijden K (1997). Scenarios, Strategies and the Strategy Process, Nijenrode University Press, The Netherlands, 1997.

van der Togt, J., & Rasmussen, T. H. (2017). Toward evidence-based HR. *Journal of Organizational Effectiveness, People and Performance,* 4(2), 127-132.

Vaughan, K. A., & Johnson, W. D. (2019). Progress and challenges in global surgical and anaesthesia care and safety: proceedings of the SAFE-T Summit 2018. *Update in Anaesthesia*, 33, 13-15.

Vygotsky, L. (1978). Mind in Society. Cambridge, MA: Harvard University Press.

Wakatsuki, S., Tanaka, P., Vinagre, R., Marty, A., Thomsen, J., & Macario, A. (2018). What Makes for Good Anesthesia Teaching by Faculty in the Operating Room? The Perspective of Anesthesiology Residents. *Cureus*, *10*(5), e2563. https://doi.org/10.7759/cureus.2563

Walker, I. A., Wilson, I. H. (2008). Anaesthesia in developing countries – a risk for patients. *Lancet*; 371: 968-9 doi: 10.1016/S0140-6736(08)60432-8 pmid: 18358913.

Walker, I.A., Bashford, T., Fitzgerald, Wilson, I. H. (2014). Improving Anesthesia Safety in Low-Income Regions of the World. *Current Anesthesiology Report* **4,** 90–99. https://doi.org/10.1007/s40140-014-0056-7

Wanderer, J.P., & Nathan, N. (2018). Global Access to Safe Anesthesia: Addressing the Gap, *Anesthesia & Analgesia*, 126 (4), 1101. doi: 10.1213/ANE.0000000000002881

Wasserman, I. C., & Kram, K. E. (2009). Metaphors of identity and professional practice: Enacting the scholar-practitioner role: An exploration of narratives, Journal of Applied Behavioral Science, 45(1), 12-38.

Welcome, M. O. (2011). The Nigerian health care system: Need for integrating adequate medical intelligence and surveillance systems. Journal of pharmacy & bioallied sciences, 3(4), 470-478. doi:10.4103/0975-7406.90100

West African College of Surgeons. College History. Retrieved August 17, 2019 from http://www.wacscoac.org/index.php/about-us/college-history

William, L. L (2015). Changing Trends in the U.S. Anesthesiology Workforce, with a Focus on Geographic Regions and Gender. *Anesthesiology* 2015;123(5):983-985.

Wood Library Museum. The Epstein-Macintosh-Oxford inhaler. Retrieved February 14, 2020 from https://www.woodlibrarymuseum.org/museum/item/1050/epstein-macintosh-oxford-inhaler

World Bank. Birth Rate, Crude per 1000 people. Retrieved August 6, 2019 from https://data.worldbank.org/indicator/SP.DYN.CBRT.IN?locations=NG

World Bank. GNI per capita, Atlas method (current US$). Retrieved from https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?contextual=default&locations=US-GH-NG-GB&year_high_desc=false

World Bank. Physicians (per 1,000 people). World Health Organization's Global Health Workforce Statistics, OECD, supplemented by country data. Retrieved June 21, 2020 from https://data.worldbank.org/indicator/SH.MED.PHYS.ZS

World Federation Societies of Anaesthesiologists. Retrieved January 4, 2019 from https://www.wfsahq.org/

World Health Organization (2003) The world health report 2003: shaping the future. Retrieved from http://www.who.int/whr/2003/en/whr03_en.pdf.

World Health Organization (2006). Working together for health: The World Health Report 2006. Retrieved March 5, 2019 from http://www.who.int/whr/2006/whr06_en.pdf

World Health Organization: Global Health Workforce Alliance (2008). Nigeria Profile. Retrieved from https://www.who.int/workforcealliance/countries/nga/en/

World Health Organization (2010). The WHO global code of practice on the international recruitment of health personnel. Retrieved from http://www.who.int/hrh/migration/code/code_en.pdf.

World Health Organization (2010). Health systems financing: the path to universal coverage. The world health report. Retrieved February 19, 2020 from http:// whqlibdoc.who.int/whr/2010/9789241564021_eng.pdf

World Health Organization (2015), Sixty-eighth World Health Assembly. WHA68.15. Strengthening Emergency and Essential Surgical Care and Anaesthesia as a Component of Universal Health Coverage. WHO, Geneva.

World Health Organisation (2016). Global strategy on human resources for health: Workforce 2030. Retrieved January 4, 2019 from http://www.who.int/hrh/resources/pub_globstrathrh-2030/en/

World Health Organization. Regional Office for Africa. (2016). Atlas of African health statistics 2016: health situation analysis of the African Region. World Health Organization. Regional Office for Africa. https://apps.who.int/iris/handle/10665/206547

World Health Organization (2016). Nigeria. In: Global Health Workforce Alliance (GHWA). Retrieved from https://www.who.int/workforcealliance/countries/nga/en/

World Health Organization. Global Health Observatory (2017). Density of doctors, nurses and midwives in the 49 priority countries. Retrieved August 18, 2019 from https://www.who.int/hrh/fig_density.pdf

World Health Organization. Global Health Observatory data repository: health financing. Nigeria, Current health expenditure (CHE) as percentage of gross domestic product (GDP) (%), 2015. Retrieved August 18, 2019 from http://apps.who.int/gho/data/node.main.GHEDCHEGDPSHA2011?lang=en

World Health Organisation (2018). Global reference list of 100 core health indicators (plus health-related SDGs). https://rho.emro.who.int/sites/default/files/PDFs/2018-Core-indicators-metadata.pdf

World Health Organisation (2020). Lassa Fever – Nigeria. Retrieved February 21, 2020 from https://www.who.int/csr/don/20-february-2020-lassa-fever-nigeria/en/

Wyszewianski, L. (1986). Financially catastrophic and high-cost cases: definitions, distinctions, and their implication for policy formulation. *Inquiry*, 23(4), 382–394.

Yardley, S., Teunissen, P. M., & Dornan, T. (2012) Experiential learning: Transforming theory into practice, Medical Teacher, 34:2, 161-164, DOI: 10.3109/0142159X.2012.643264

Yawe, K. D. T. (2018). West African College of Surgeons and its role in Global Surgery. Bulletin of the American College of Surgeons, 103, 5, 61- 62.

Young, L. E. (2013). Participatory action research. A new science for nursing? In C.T. Beck. (Ed.), Routledge international handbook of qualitative nursing research (pp. 319-330). London: Routledge.

Yukl, G. (2006). Leadership in organizations (6th ed.) Upper Saddle River, New Jersey: Pearson/Prentice Hall.

Zavras, D., Zavras, A. I., Kyriopoulos, I. I., & Kyriopoulos, J. (2016). Economic crisis, austerity and unmet healthcare needs: the case of Greece. *BMC health services research*, *16*, 309. https://doi.org/10.1186/s12913-016-1557-5

Zellmer-Bruth, M., & Gibson, C. (2006). Multinational Organizational Context: Implications for team learning and performance. Academy of Management Journal, 49(3), 501-518.

Zorab, J. S.M (1976). The World Federation of Societies of Anaesthesiologists (WFSA). *Anaesthesia*, 31, 285-292.

Zuber-Skerritt, O., & Farquhar, M. (2002). Action learning, action research and process management (ALARPM): A personal history. The Learning Organization, 9(3), 102-113.

Zurn, P., Dal Poz, M. R., Stilwell, B., & Adams, O. (2004). Imbalance in the health workforce. *Human resources for health*, *2*(1), 13. https://doi.org/10.1186/1478-4491-2-13

Appendices

Appendix A: Incorporated Trustees of the Nigerian Society of Anaesthetists on 12th July 2000:

1. Dr. Olufemi Babatunde Ogunnaike
2. Dr. Mathias Onyebuchi Obiaya
3. Dr (Mrs) Olusola Temitayo Kushimo
4. Dr (Mrs) Olaitan Alice Soyannwo
5. Dr (Mrs) Nosa Philomena Edomwonyi
6. Dr. Olaniyi Olajide Oladapo
7. Dr (Mrs) Adesuwa Safu Lawani-Osunde (Trustee removed on 11th October 2018 following her demise on 1st February 2014.

Appendix B: The 35 Fellows in Anaesthesia of the National Postgraduate Medical College (NPMC)

Dr O. O. Akinyemi	Dr J. A. O. Magbabeola
Dr V. O. Akinshete	Dr Ben Mengot
Dr S. G Akpan	Dr P. O. Nwachukwu
Dr J. E. Anwan	Dr F. N. Obiakpani
Dr M.A. Aziz	Dr M. O. Obiaya
Dr A. Dosunmu	Dr C. O. Odugbesan
Dr P. M. Edwards	Dr S. A. Oduntan
Dr E. O. Elegbe	Dr O. B. Ogunnaike
Dr J. G. Emery	Dr W. G. Ogunyemi
Dr C. I. Emmanuel	Dr J. A. Omojasola
Dr E. E. Ene	Dr A. O. Oyegunle
Dr T. I. Ezi-Ashi	Dr M. S. Shashgiri
Dr C. E. Famewo	Dr J. A. O. Shodipo
Dr. D .J. O. ffoulkes Crabbe	Dr J. B. A. Shomolu
Dr W.V.M. Fowler	Dr P. T. Shotunbi
Dr A. Gupter	Dr N. A. Thomas
Dr O. Kushimo	Dr S. O. Ukponwan
	Dr B. U. Umeh.

Appendix C: The West African College of Surgeons Diploma in Anaesthesia at the FMC Abuja.

DIPLOMA IN ANAESTHESIA
Federal Medical Centre, Abuja / West African College of Surgeons.

OBJECTIVES OF THE PROGRAMME

1. To train medical doctors towards the Diploma in Anaesthesia of the West African College of Surgeons.
2. To provide the much-needed manpower in FCT Abuja and its environs as well as encourage Physicians into the anaesthesia specialty.
3. To improve anaesthetic service and enhance the practice of all aspect of surgery in Abuja and the Northern States of Nigeria.

CRITERIA FOR ENTRY

a. Candidates must be physicians with a primary medical qualification such as MBBS or MBChB acceptable for registration by the Medical and Dental Council of Nigeria.
b. Candidates must have completed a one-year rotation internship and a one-year National Youth Service Corp.

DURATION

The program will last for 18 months during which clinical skills are gained and the WACS diploma examination is taken.

SYLLABUS

A structured educational program for candidates consists of lectures and seminars based on the syllabus for the Faculty of Anaesthesia of the West African College of Surgeons. This includes:

a. Medicine for Anaesthetists.
b. Drugs in Anaesthetic Practice.
c. Techniques of Anaesthesia.
d. Anaesthesia in remote areas and with limited resources.

CLINICAL ANAESTHESIA

Candidates will work as members of a team and undertake elective and emergency theatre sessions, rotate around the major specialties of anaesthesia and undertake pre- and post-operative ward rounds. They will also attend all academic seminars and make presentations as requested by the Consultant.

General Surgery/ Urology	-	560 hours
Gynaecology	-	560 hours
Obstetrics & Emergency Surgery	-	1,840 hours
Ophthalmology	-	160 hours
ENT/ Dental	-	160 hours
Paediatric Surgery	-	360 hours

Skills to be demonstrated at the end of the training include:

i. Ability to manage a patient pre-, intra- and post- operatively using conventional techniques.
ii. Ability to use regional anaesthesia and intravenous anaesthesia confidently.
iii. Ability to pioneer a new department of anaesthesia in a Secondary level hospital as well as maintain acceptable standards of practice.
iv. Ability to judge limitations so as not to take unnecessary risk and refer appropriately.
v. Ability to take up other medical responsibility apart from anaesthesia if necessary.
vi. A logbook of at least 400 cases managed in the areas designated above with an application for the diploma in anaesthesia examination must be submitted to the West African College of Surgeons.

ASSESSMENT

After satisfactorily completing the programme the candidates will sit for a mock examination and then proceed for the Diploma in Anaesthesia Examination.
This consist of:

1. Written paper in basic sciences and Principles and practice of Anaesthesia.
2. Orals.

A successful candidate must pass overall i.e. in the Principles and practice as well as the orals.

Successful candidates will be awarded the Diploma in Anaesthesia (DA WACS).

Forms for the Training Programme and further information can be obtained from the Department of Anaesthesia, Federal Medical Centre, Abuja.

Course Fees: To be announced by the Management of FMC, Abuja.