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EXAMINING THE POSITION OF NIGERIA HEALTHCARE SECTOR IN TECHNOLOGICAL ADVANCEMENTS

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Work Authorship Declaration

I declare to be the author of this work, which is unique and unprecedented. Authors and works consulted are properly cited in the text and are included in the listing of references.

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ABSTRACT

Healthcare delivery services in Nigeria has not gained enough attention in the adoption of advanced medical technology. This void can be traced back to the underutilization of modern diagnostic tools in healthcare institutions at all the levels of healthcare delivery in the country. We present the challenges facing the implementation from the patient side and healthcare institution is driven by the high cost of medical services, distance to a well-equipped health facility, attitude of health workers, inadequate financial allocation and resources to hospitals, inadequate training and exposure of technology trends to the medical staffs at colleges or the healthcare management bodies. This study main aim is to bridge this gap by examining the position of Nigeria healthcare sector in technological advancements and presenting more scientific and technological evidence to improve care standards at a Nigerian hospital. The study utilized a quantitative technique to collect and analyze data. Digital self-reporting scale questionnaire was intended to gather pertinent information regarding the key variables. The questionnaire included, but not be limited to, questions concerning healthcare satisfaction, technology use, the professionality of the medical personnel, motivational factors, cost of healthcare. ANOVA was employed to design the key consideration from the dependent and independent variables, between group and within group variance and consistency and significance difference. The study's findings emphasize the transformative part of advanced medical innovations like telemedicine and clinical decision support systems in upgrading healthcare quality and productivity. These innovations have illustrated their potential to move forward patient results, organized healthcare delivery, and support therapeutic experts in making informed choices.

Keywords: Nigeria healthcare sector, medical technologies and healthcare services, technological advancement in Nigeria healthcare sector

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Resumo

A tecnologia médica melhorou o processo e a qualidade da prestação de cuidados de saúde em todo o mundo. A adoção de dispositivos vestíveis, ferramentas e softwares digitais, tecnologias médicas avançadas estão a melhorar a monitorização remota de pacientes e o diagnóstico e tratamento eficaz de doenças em tempo real. Tem sido feito um grande esforço para avançar o sistema de saúde da Nigéria para acompanhar a tendência atual na adoção tecnológica a nível global. As instituições de saúde da Nigéria estão divididas em três níveis: Cuidados de Saúde Primários (nível local/comunitário), Instalações de Cuidados de Saúde Secundários (nível estadual), Cuidados de Saúde Terciários (nível do Governo Federal), e todos estão preenchidos com profissionais médicos especializados e competentes que trabalham como consultores governamentais ou consultores privados. Estes três níveis de cuidados de saúde dependem de dotações orçamentais governamentais, incluindo receitas fiscais gerais, seguros de saúde dos setores social e privado, financiamento externo de doadores e despesas privadas do próprio bolso (OOP), o que causa problemas de subfinanciamento e fornecimento inadequado de recursos médicos, porque o tipo de serviços de saúde prestados não é o mesmo, mas a alocação do orçamento para cada um é inadequada. A questão do subfinanciamento é um importante fator causal na adoção de algumas tecnologias médicas nas instalações de saúde da Nigéria, e o pagamento médico do próprio bolso também está a contribuir para o nível de pobreza dos agregados familiares que, após pagarem as contas médicas, não conseguem pagar as despesas domésticas. A adoção de tecnologias e ferramentas digitais nas instituições de saúde da Nigéria é muito essencial no diagnóstico e tratamento de doenças por médicos e enfermeiros, portanto, é significativo que as competências e conhecimentos sejam grandemente melhorados e promovam a colaboração entre profissionais de saúde e organizações. Esta melhoria no conhecimento técnico é necessária para utilizar dispositivos desde simples termómetros a operações complexas como ressonância magnética (MRIs), inaladores inteligentes, cirurgia robótica, sensores cerebrais sem fios, órgãos artificiais, dispositivos vestíveis de saúde, medicina de precisão, realidade virtual, tele saúde e repetições palindrómicas curtas agrupadas regularmente (CRISPR) à medida que a indústria da saúde muda (Adebara et al., 2017). No entanto, existe um vazio substancial na utilização destas modernas ferramentas de diagnóstico nos três níveis das instalações de saúde presentes na Nigéria. Este estudo visa colmatar esta lacuna examinando a posição do setor de saúde da Nigéria no avanço tecnológico. Para reposicionar o setor da saúde

no mundo tecnologicamente avançado e para superar os crescentes desafios enfrentados com tecnologia subdesenvolvida para tratamentos especializados, a literatura existente é revista, enquanto se revela uma visão do setor da saúde da Nigéria. Principais causas como orçamentos severamente subfinanciados, setores de saúde mal reestruturados (durante anos) pelos órgãos governamentais necessários, pessoal qualificado limitado, para mencionar alguns, tiveram impactos negativos no setor de saúde da Nigéria, no seu sistema de saúde e, consequentemente, no avanço da tecnologia na saúde. Os objetivos-chave para alcançar o propósito acima mencionado são a identificação dos fatores que afetam o desempenho do setor de saúde da Nigéria, as principais questões do avanço tecnológico e, por último, investigar quais são as soluções lógicas e viáveis para estas causas e para revitalizar o setor de saúde da Nigéria no Avanço Tecnológico.

Estas tecnologias de saúde emergentes não podem ser totalmente exploradas sem força de trabalho clínica, formuladores de políticas de saúde, órgãos de gestão, formação padrão para profissionais médicos que atendem às necessidades, demandas, serviços de serviços de saúde eficazes e resposta terapêutica para continuar a transformar o sistema de saúde da Nigéria. O estudo utilizou uma técnica quantitativa para recolher e analisar dados. Um questionário digital de autoavaliação foi destinado a recolher informações pertinentes sobre as variáveis-chave. O questionário incluía questões sobre satisfação com os cuidados de saúde, uso de tecnologia, profissionalismo do pessoal médico, fatores motivacionais, custo dos cuidados de saúde. Estatísticas descritivas e medidas de tendências centrais foram utilizadas para resumir dados demográficos e categorizar variáveis, enquanto tabelas e gráficos visualizaram os dados e destacaram as principais descobertas. A ANOVA foi empregada para desenhar as considerações-chave das variáveis dependentes e independentes, entre a variância do grupo e dentro do grupo e a diferença de consistência e significância. Após a análise inicial, o teste LSD (Least Significance Difference), que é um teste Post-Hoc realizado para encontrar padrões que não foram especificados antes da recolha de dados, foi utilizado para encontrar a significância estatística nas disparidades, ou seja, quais pontuações médias de grupo são diferentes umas das outras. Os resultados do estudo enfatizam a parte transformadora das inovações médicas avançadas, como a telemedicina e os sistemas de apoio à decisão clínica, na atualização da qualidade e produtividade dos cuidados de saúde. Estas inovações ilustraram o seu potencial para avançar os resultados dos pacientes, a prestação de cuidados de saúde organizados e o apoio a

especialistas terapêuticos na tomada de decisões informadas. A investigação mostra que as ferramentas digitais e os equipamentos tecnológicos nos diferentes tipos de hospitais têm disponibilidade significativa e diferem em graus. A tecnologia digital mais frequentemente empregada para monitorização de pacientes foi a telemedicina, seguida pela tecnologia de código de barras e gestão de nutrição. Melhorou a monitorização incorreta e o diagnóstico errado de pacientes. A escassez de equipamentos essenciais como incubadoras, ferramentas de imagem digital e autoclaves, apesar da prevalência relativa de máquinas de anestesia, dispositivos EKG/ECG e monitores de pacientes ao comparar hospitais de ensino com hospitais privados, de maternidade e gerais, mostrou maior uso de tecnologia nos primeiros. Estas tecnologias melhoram a satisfação do paciente, os resultados terapêuticos e a precisão diagnóstica. De modo semelhante, o uso de tecnologia no atendimento às necessidades médicas dos pacientes melhorou o desempenho profissional e o conhecimento profissional de médicos e enfermeiros, também reduziu a ansiedade no local de trabalho e aumentou a autoeficácia. As soluções lógicas e viáveis demonstradas para abordar os desafios que limitam a disponibilidade máxima e a adoção de equipamentos médicos digitais e tecnológicos nas instituições de saúde da Nigéria são a necessidade de diretrizes completas para navegar na adoção de tecnologia, avaliações de prontidão antes de adotar novas tecnologias, monitorização de tendências de mercado e teste de tecnologias emergentes, a fim de abordar estas questões. Também deve ser dado apoio notável à educação das pessoas sobre segurança do paciente e à introdução de profissionais estrangeiros para desenvolver tecnologias médicas de ponta. A investigação futura é capacitada para investigar os impactos socioeconómicos destes avanços tecnológicos e pesquisar a sustentabilidade a longo prazo das mediações propostas, fornecendo uma compreensão mais abrangente dos seus benefícios e sugestões para o quadro de cuidados de saúde da Nigéria. O investigador recomenda que as soluções de saúde sejam melhoradas pelo estabelecimento de tendências de mercado e pela provisão de uma estrutura aberta para a adoção de tecnologia médica. As agências governamentais devem dar prioridade a equipamentos hospitalares modernos e seguros de saúde a preços razoáveis para empresários e artesãos para melhorar os serviços e reduzir as taxas de mortalidade. Finalmente, para realizar plenamente o potencial das tecnologias médicas, as instituições de saúde e as universidades devem avaliar a competência tecnológica dos estudantes de medicina, ao mesmo tempo que enfrentam as barreiras culturais que impedem a digitalização dos cuidados de saúde da Nigéria.

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ABBREVIATIONS LIST

GDP	Gross Domestic Product
EU	European Union
SDGs	Sustainable Development Goals
CBO	Community Based Organization
FBO	Faith Based Organization
FMOH	Federal Ministry of Health
SMOH	State Ministry of Health
RMFC	Revenue Mobilization Fiscal Commission
PHC	Primary Health Center
NHIS	National Health Insurance
OOP	Out of Pocket
MRIs	Magnetic Resonance Imaging
UCH	University College Hospital
LAUTECH	Ladoke Akintola University of Technology

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CHAPTER ONE

INTRODUCTION

Health is an asset with instrumental and intrinsic value that all individuals possess. The term "healthcare industry" refers to a body of health care institutions established with the aim to improve the health of populations through services, technologies, professionals, and resources (Nwankwo, 2015). According to (Britannica, 2021), there are various levels of health institutions attached to the care and services provided to patients. In Nigeria, the health care industry has sub divided into Primary Healthcare Centre, Secondary Healthcare Centre and Tertiary Healthcare Centre. These three tiers healthcare institutions are not accountable to one another.

Primary Healthcare facilities are established in the local government level to serve and provide minor healthcare services to the population within the region such as malaria, immunization, minor injuries, minor infections. This tier is the community entry point into the country healthcare system. The secondary healthcare facilities provide specialist treatment and support to patients who are struggling with more severe or complex health conditions requiring the service of specialized doctors and other health professionals in the hospital. Some of these healthcare services provided in secondary hospitals are also in tertiary/teaching hospitals e.g. planned operations, obstetricians, dermatologists, pediatricians and gynecologists. The tertiary healthcare facilities in Nigeria can be at regional or national level are such like teaching hospitals, specialist hospitals either governmentally owned to provide advanced and complex diagnostics, procedures and treatments performed by medical specialists in state-of-the-art facilities (Oladejo et al., 2015). As such, consultants in tertiary care centers have access to more specialized equipment and expertise. They majorly perform specialized treatment, neurosurgery, transplant, fertility treatments, cancer management, cardiac surgery, plastic surgery, treatment for severe burns, advanced neonatology services and others to mention a few (Cote et al., 2015).

The services of medical laboratory is very essential in the diagnosis and treatment of illnesses by doctors and nurses therefore it is significant for their skills and knowledge to be greatly improved with the use of technological innovation (Oleribe et al., 2018). The advancement in using digital application and tools fundamentally improves healthcare delivery services and

foster collaboration between healthcare professionals, and organizations (Laurenza et al., 2018).

Healthcare equipment encompasses anything from simplistic thermometers to complex techniques. Hospitals tend to have a department for biomedical to conduct both corrective and expected preventive maintenance as medical technology is rapidly changing to improve healthcare (Hedberg, 2018). These technologies are dynamic, and their purpose of uses varies base on the types of hospital. This causes a wide number of areas of specialty for technicians to practice and stay up to date with their skills. It sometimes poses a daunting challenge for the technicians to keep up to date with their area of expertise in Nigeria because of the inadequate training resources (Oyekale, 2017). This shows that Nigerian hospitals need to be well-informed in implementing healthcare technologies requiring the government to have the requisite funding for this situation; technology skills among staff must be envisaged so that the essence of incorporating strategic technology plans in healthcare service quality operations can be well understood; consider healthcare professionals' attitudes and intentions regarding using technology (Koce, 2019, Hedberg, 2018).

Many of the smart medical devices and technologies have been designed and developed to enhance prompt and continuous assessment of patient's health status and applicable healthcare sub-systems. In the last decade, the wearable sensors, have attracted a lot of attention mostly in the healthcare field. Wearables devices are mostly used for therapeutic functions such as heart rate, blood pressure, body temperature, respiration rate, and body motion (Majumder et al., 2017). However, due to many diseases and impairments, patient monitoring continuity for prompt medical intervention and delivery is pivotal (Mohammadzadeh, et al., 2020). Technological advancement in Nigeria healthcare industry will create a positive influence on the quality of healthcare services provided to patient and as such positioning Nigeria and her healthcare sector in the limelight of globalization thereby reducing the number of Nigerians travelling to a variety of less and developed countries for healthcare treatments that can be received in the country if the health system is not underfunded and under-utilized. One out of many relevance of technical advancement to medical doctors, surgeons, nurses, laboratory scientists and technologists, gynecologists, physiotherapists to mention a few is that it provides limitless opportunities for effective discharge of duties and access to vital information in addressing human health problems, diagnosing diseases and ailments to the point of curing them, patients healing processes, post treatment observations (Ajayi, et al, 2008). The relevance of high technologies in contemporary healthcare delivery services cannot be underscored (Moshood et al., 2022).

1.1 Aims and Objectives

Aims

This study aims to examine the position of Nigeria's healthcare sector in technological advancement. To reposition the healthcare sector in the technological advanced world, and to beat rising challenges faced with under-advanced technology for specialized treatments, existing literatures are reviewed, while an insight into the Nigeria's health sector is unfolded. Major causatives such as severely underfunded budgets, poorly restructured health sectors (for years) by the necessary governmental bodies, limited skilled personnel, to mention a few, have had negative impacts on Nigeria's health sector, her healthcare system, and consequently advancement in technology in healthcare.

Objectives

1-To identify main factors affecting performance of Nigeria health sector

2-To understand main issues of technological advancement in Nigeria health sector.

3- To deduce logical and viable solutions to these causatives and to revive Nigeria health sector in Technological Advancement

1.2 Hypotheses of test

There is no significant difference in technology usage among different kinds of hospitals in Nigeria's health sector

1.3 Problem Statement

The provision of quality healthcare services lies not only on the professionalism of medical practitioners but also the effectiveness of medical technology, the use of technical devices during an emergency and routine care. Healthcare delivery services in Nigeria has not gained enough attention in the adoption of advanced medical technology to standardized hospitals' care. All types of healthcare institutions have a defined role to play at providing for the health needs of the populace but for multifarious reasons, they are not truly at the centers of excellence because of the increased need for support with patients and technical advancement. There is also a substantial void in the in utilizing modern diagnostic tools in healthcare institutions at all levels. This study aims to bridge this gap by examining the position of Nigeria healthcare sector in technological advancements and presenting more scientific and technological evidence to improve care standards at a Nigerian hospital.

1.4 Significance of study

This study is relevant to refined the healthcare system in Nigeria, to simplify the complexities facing the emerging trends in medical technology advancement. It is vital for related governmental institutions trusted with the management of health institutions to fundamentally changes the way healthcare processes are handled and balance the cost of medical services patients for with quality and effective diagnostic tools. It is significant in limiting brain drain of medical professionals who are often forced seek advanced medical education and suitable job opportunities outside the country. It significantly allows decision making process in hospitals among other healthcare providers, to develop their individual set of decision criteria for strategic technology planning with respect to their particular environment

1.5 Scope of study

The study focuses on the status of medical technologies used in Nigeria hospital to how it affects directly or indirectly the medical care services given to patients. After the end result, the researcher aims to relate its effect to how it causes medical tourism because literally, the main reason people are travelling abroad to seek medical care lies on misdiagnosis and the poor state of diagnostic technologies in Nigeria hospitals to provide effective medical care. As such, this research is a comprehensive study of all levels of healthcare institution in Nigeria examining their status in technological advancement.

1.6 Organization of Study

This research paper is made up of five main sections. Chapter One presented relevant information on the background of the Study, research questions, aims, and objectives and explained the scope, significance, and justification. Chapter two reviewed the summary, contribution and description of existing literatures within the research study. Chapter three provided geographical information and detailed information on the study area, research design used, and the statistical analysis used to measure the objectives of study. Chapter four present findings and results from the statistical analysis carried out. Chapter five discussed the summary of the findings in chapter four, the conclusion of result and the researcher presented recommendations that can be adopted for future use.

CHAPTER TWO

LITERATURE REVIEW

2.1 HEALTHCARE SYSTEM IN AFRICA

According to United Nations, healthcare system is referred to as a structure or medical professionals, health organizations, institutions, and medical resources put together to improve the healthcare system (African Region Health Report, 2013:106). From the various attempt to compare the efficiency of healthcare systems amongst different, variables such as the proportion of total health expenditures on the gross domestic product (GDP), the number of physicians, nurses and number hospital facilities per 1000 patient were used as variables to weigh the inefficiency of national healthcare systems in African countries using the data envelopment analysis (DEA). It was stated to be difficult to measure the impact of health services on health status, because these countries have different healthcare system due to the variation and differences in socioeconomic resources, sociodemographic, environmental and lifestyle factors (Asandului et al, 2014). Senegal, Tanzania and Niger Republic were referenced as the countries with inefficient healthcare system with the number of a nurse per 100 people and has significantly affected the inefficiency of national healthcare systems while Egypt and Morocco were referenced to be efficient with certain level of development in their healthcare institutions, systems and structures, also they have minimal challenged in the supply and access to medical resources (Sun et al., 2017).

In order to increase productivity and improve the healthcare services provided in these countries, the governments emphasized on the introduction of technological revolution in the health care sector (Nwankwo, 2015). This has helped to facilitate the development and adoption of relevant innovations needed for tackling challenges such as medical human capital shortages, medical supply and facility shortages, weak infrastructure and logistics, poor patient experience, efficiency of care, and organizational effectiveness (Novignon et al., 2019). Thus, comparison of the healthcare system functions between African countries is a pathway to determine if a healthcare system is achieving the desired results, a healthcare system that cannot meet social expectations does not achieve the desired results and therefore cannot fully contribute to the health of a society (OECD, 2019).

In the European Union (EU) member states, the organization of health care systems differ considerably between member countries stemming from political, historical, cultural and

socio-economic sector well as the allocation of funds and human resources. Finland, Greece, Ireland, Italy, Sweden, Spain, United Kingdom, Denmark, and Portugal have their major forms of healthcare finance through taxation while Austria, Belgium, France, Germany, Luxembourg, Netherlands have their major forms of healthcare finance through social insurance (Reibling, 2010). The healthcare institutions operate with social insurance may be independent of the government. However, the traditional social insurance systems used for sickness funds are being merged and controlled by the central government in an attempt to maintain the relative advantages of each system (Reibling, 2010). Also, the demand for healthcare services amongst the member states is growing as a result of ageing populations and rising public expectations thereby causing challenges in delivering equal, efficient and high-quality health services at affordable because the demand for healthcare services is beginning to exceed the available medical resources (Thompson et al., 2009).

The improvement in Nigeria healthcare system will not only benefit the nationals but also to be extended to the neighboring nations considering its large and mobile population but the nation is faced with inability to control her population growth and improve healthcare security of the citizens. The country did not achieve any of the health-related Millennium Development Goals (MDGs) over the past three decades for the majority of its population, and progress towards health-related Sustainable Development Goal (SDG) targets has not been at its best (Kruk et al., 2018). Any downfall in the efficiency of a healthcare system is influenced by socio-economic status of the country i.e the gross domestic product (GDP) per capita and income inequality (Greene, 2004). The Sub-Saharan African countries have relatively weak healthcare systems because of the inability to achieve technological advancements. As a result, the but only three countries: Botswana in 2015, Rwanda in 2014 and 2015, and Tanzania in 2015 has been identified to have better healthcare system compared to others (Bryan et al., 2010). The life expectancy in the Sub-Saharan African countries is based on the indicator of healthcare system performance which shows the impact of governance measures, i.e., the rule of law and government efficacy on public expenditure on health. This indicated that the volume of resources invested in healthcare systems is not as important as the efficient management of the said resources in Sub-Saharan countries (Gearhart, 2016).

2.2 NIGERIA HEALTHCARE SYSTEM

A healthcare system can be defined as a system of various health professional department, institutions, and resources that deliver healthcare services to meet the health needs of the target populations (Frenk, 2010). The Nigerian healthcare system can be said to be non-active with the occurrence of fragmentation of healthcare service, insufficiency of drug supplies, inadequate and low-quality infrastructure, lack of coordination on policy implementations, inequity in healthcare resources distribution that is tilted towards the provision of quality healthcare (National Health conference, 2009). Therefore, to reconstruct the system will require strong policies, committed leadership, adequate financing, essential healthcare supplies including medical products and technologies; quality service delivery that meets patient healthcare needs and a formidable human resource for health. Also, the healthcare system requires the provision of invaluable tools for doctors, nurses, pharmacists, and laboratory scientists to achieve this transformation (World Health Organization, 2010a).

Nigeria healthcare system is wide and heterogeneous in nature. All healthcare delivery organizations can be categorized under public, private for-profit, community-based organization (CBO), faith-based organization (FBO), and traditional healthcare providers (FMOH, 2009). The private sector accounts for 38% of all registered facilities in the country, of which 25% are at the secondary care level, while 75% are primary care (FMOH, 2009). The public health sector is built on the basis of the three-tier government structure in Nigeria which are local, state and federal government (FMOH, 2009). The local government is solely responsible for primary healthcare. This is the foundation of the entire healthcare system, it is the ladder to enter into the healthcare system. It is found at the local community level and in charge of services community sanitization, family planning, prevention of infectious diseases through immunization, health education, provision of essential care, and pre-referral care (FMOH, 2011). On the other hand, the state provides laboratory and medical care such as gynecology, pediatrics, obstetrics and minor surgeries at the secondary level mainly through the general hospitals which also serve as referral points for patients from primary healthcare centers (FMOH, 2011). Lastly, the tertiary facilities (Specialist hospitals) either owned by private body, FBO or government is the highest level of care in Nigeria. It is solely controlled by the FMOH. They also serve as the last point of referral from the primary and secondary healthcare facilities.

The medical professionals are engaged in trainings, workshops or academic consultations through the teaching hospitals (FMOH, 2009). Nigeria has a population of over 215 million

people therefore making it the largest country in Africa. The financial allocation and expenditure of the government and health regulatory bodies on health, healthcare system, healthcare services is considerably low compared to the contributions made by private bodies. Despite Nigeria being the country with the highest economy in Africa and being blessed with large variety of human and natural resources, (3.5%) of her Growth is allocated to the health sector, which is considerably below the average spending on healthcare among African countries (WHO, 2011).

It is needless to make comparison with other African countries like South Africa which proposed a health budget of R205.446 billion ($17.1 billion) in 2018 representing $299 per head when compared to its population of 57 million. Nigeria's GDP is USD2070, lower to the average of USD2561 at the regional level and USD10599 at global level, this has left the healthcare system to be severely underfunded and caused inadequate distribution of healthcare facilities in the country (Welcome, 2011). In the 2018 budget, 1800-naira equivalent to ($5) was allocated per head for healthcare funding, from the 340 billion health budget. This confirms the report that six percent (6%) of Nigeria households have access to healthcare spending with higher rates in rural areas than in urban zones (https://businessday.ng/exclusives/article/the-numbers-that-tell-how-bad-nigerias-healthcare-system-is).

2.2.1 Nigeria Healthcare Services

The healthcare services delivered across multiple healthcare delivery organizations in Nigeria consist of private sector, the three tiers of government. Nevertheless, the presence of multiple healthcare governance bodies in Nigeria does not translate to adequate health facilities and quality healthcare services in both rural and urban zones (Nwankwo, 2015). The most common barriers to accessing health services by Nigeria population are the insufficient medical resources, limited funding, high cost of medical services, distance to the health facility, and the attitude of health workers, incessant industrial action in all cadres of health care providers (Adedini et al., 2014). As for the privately owned healthcare facilities, they are mainly set-up and equipped to maximize profit therefore situated serve the population in the urban cities.

This healthcare system is poorly integrated causing the healthcare services they rendered not to extend to all geographical zones in the country and across socio-economic groups. While there is low adherence to clinical guidelines, there is a disproportionate level of competence in the diagnosis and management of clinical illnesses. The State Ministries of Health (SMOH)

made it compulsory for all healthcare facilities to be licensed and comply with the standards of a well-qualified medical center (Oyibocha et al, 2014). This will enable the regulatory body to effectively monitoring quality of services provided. The number of medical staff in a facility determines a lot on the level of competency amongst the medical workers. For instance, in facilities where the quality of healthcare services is high, there is appropriate distribution of medical staffs to patients (Amedari & Ejidike, 2021).

The inadequacy of medical staff and equipment's, unprofessional conduct of medical staff, the ambiguity of standards and procedures, the insufficient application health guidelines and regulations has led to some people seeking care outside the country, or bypassing the primary and secondary health facilities to seek health care at tertiary health institutions (Omoleke & Taleat, 2017). Furthermore, due to unregulated cost of healthcare services such as medication cost, charge of in-bed patients, extensive care and others provided in hospitals, 15% or rural population go for alternative traditional healthcare providers leaving the rich to afford such luxury care (FMOH, 2011).

The provision of standard healthcare services in hospitals, clinics, diagnostic and treatment centers across countries, is determined whether they are established through joint ventures, regional networks of healthcare providers or alliances and management tie-ups between healthcare organizations. Such arrangements may involve acquisition of facilities, management contracts, and licensing arrangements with some degree of local participation to ensure access to certified and adequately trained local persons and to ensure local contacts and commitment (Scott-Emuakpor, 2010). The growing trend towards commercial presence in health services is evident from the many regional health care networks and chains that have been formed in recent years. For instance, the Singapore based Parkway Group has acquired hospitals in Asia and Britain and has created an international chain of hospitals, Gleneagles International, through joint ventures with partners in Malaysia, Indonesia, Sri Lanka, India, and the UK called the (The Raffles Medical Group). It has also set up a dental surgery chain through joint ventures in South East Asia. The aim of such companies is to develop an integrated network of health care companies offering a range of high quality and cost-effective health services (Chanda, 2017).

This trend has been facilitated by the opening up of foreign direct investment (FDI) in healthcare and with more and more governments encouraging private sector participation in the provision of health services (Glinos et.al., 2010). Some private for-profit specialized hospitals, surgical centers, public teaching hospital are entering into contract-based medical

professional recruitment with foreign surgeons, specialized doctors to provide medical standard and quality treatment to patients.

2.2.2 Nigeria Healthcare Financing and Governorship

The governance structure of the Nigerian Health System shows that healthcare is financed by both the public and private sectors. The funding of the public healthcare sector by the federal government using a quota system and also population size. This has for many years contributed less than 20% of total health financing in the country, while out-of-pocket financing has been constantly higher than 67% of total healthcare financing (Olaniyan and Oburota, 2019). This account for unequal access to healthcare as the poor will be unable to meet healthcare needs, and where they meet these needs, it will be done at great 'displacement effects' of other essential household needs (Ichoku, *et.al.,* 2009). The National Health Insurance Scheme was created 1999 and have enrolled only 30 of the population, mainly, federal civil servants with less than 2% of women aged 15- 49 is being insured. This disbursement of funds is spread across the three levels of healthcare facilities: tertiary, secondary and primary (FMOH, 2009).

The allocation of 3.5% of the GDP to healthcare is compounded by corruption and poor management of healthcare systems at all levels, particularly in the public health sector, which results in a lack of responsibility for the limited health funding. It should be mentioned that, even with the current 60% of the population living in poverty in Nigeria, household out-of-pocket health expenses account for 80% of all health financing in the country (World Bank, 2010). The private sector is made up of non-governmental organization, private for-profit providers, community-based organization and religious and traditional care givers. Thus, the inability to pay for health services provided by the private-for profit increases the inequities in utilization of health care services because the population (predominantly rural) patronizes private for-profit healthcare providers (FMOH, 2009). The healthcare budget for the year 2018 had a significant boost from the allocation from the Ministry of Health and the release of NGN55.15 billion by the National Assembly for the implementation of the National Health Act which was passed in 2014. Furthermore, in 2019 and 2020, the health budget declined below 5% which reflects a reduction in health expenditure compared to years before. If the Abuja declaration of 2001 was implemented, additional allocations of NGN 4.99 trillion, approximately 13billion USD should have been allocated between 2014 and 2020 to the health care system (Adebisi, et al., 2020). This inadequate budgetary allocation has affected capital expenditure which is a large determinant of the development of any health system.

Therefore, it would be highly considerate for the government to multiply the annual health expenditure per capita to $168 or perhaps even triple it to $252, while dramatically increasing the use of public expenditure and reducing out-of-pocket medical payment by citizens. These means an investment of 10–15% of total GDP over the decades relating to ₦152 trillion GDP in 2020 (Varrella, 2020).

2.2.3 Sources of healthcare financing in Nigeria

Healthcare financing involves the strategies used by a country in generating, allocating and utilizing funds for healthcare purposes (Olakunde, 2012). A critical determinant of universal coverage is the strategy used by a country in financing her healthcare system. This is because whether healthcare services are affordable or not to those who need them is a function of the country's health care financing (Uzochukwu *et.al.*,2015). The most common mechanisms used in financing healthcare in Nigeria are tax-based financing, out-of-pocket payments, donor funding and health insurance (social and private) (Olakunde, 2012).

Tax Revenue

A healthcare financing system where government revenue dominates other financing mechanisms is referred to as the tax-based system. Funds are usually generated through taxation or other government revenues. Although the Nigerian government generates revenue through taxation, the bulk of the revenue is derived from the sale of oil and gas (Ichoku & Okoli, 2015). The health system is generally funded from the federation account to the states and local governments, both of which generate about 20% internal revenue from taxes, levies and rates. However, the federally generated revenue which is shared according to a formula fixed by the Revenue Mobilization and Fiscal Commission (RMFC) forms the majority of the funds for the other tiers of government (World Bank, 2010). Since states and local governments are closer to Primary Health Care PHC, they are expected to provide adequate funding for PHC, but owing to their low internal revenue generation capacities, most of them still largely depend on the allocation from the federal government. States and local governments are not required to provide budget and expenditure reports to the federal government (Olakunde, 2012). This shows that the federal government does not play a supervisory role in ensuring that healthcare funds are properly expended in states and local governments for the purpose they are meant.

Out-of-pocket payments

Out-of-pocket health payments is another form of private health financing. This refers to payment for health services at the point of seeking care. In 2007, percentage of private health expenditure increased from 92.5% to 95.9%. This is regarded as one of the highest in the world (Onwujekwe, *et al.,* 2010). This shows that out-of-pocket payment is the dominant means financing health care services in Nigeria. OOP health payments have the potential to make a household reach poverty and is very risky to the nation development status. It is unfavorable when a particular household cannot purchase home essential supplies because they made out-of -pocket health payments (Ngcamphalala & Ataguba, 2018). Out-of-pocket spending on healthcare has become a policy concern for three reasons; first; households may be made poor as a result of out-of- pocket payment for healthcare at point of service, second; households facing these health expenses may cut back on other essential household needs such as food and clothing, third; households may choose to forgo necessary healthcare services rather than face the unfavorable financial consequences, thus, creating a vicious cycle of ill health, disability and poverty (Elgazzar, *et.al.,* 2010).

Most studies in Nigeria have shown that out-of-pocket expenditure really does exert impoverishing effect on households and also intensify the poverty situation of already poor households, while others as a result of paying out-of-pocket for healthcare prefer not to seek care at all, since they cannot afford the cost (Olaniyan & Oburota, 2019). The dominance of out-of-pocket health financing in the Nigerian Health System is thus, responsible for the unequal access to healthcare in the country and constituted about 62% of health care financing in Nigeria (FMOH, 2011).

Social Health Insurance

By pooling, the financial resources are no longer tied to particular contributor. The essence of "health insurance" is the pooling of funds and spreading the risk for illness and financing. The various types of resources pooling mechanism are social insurance (such as the National Health Insurance Scheme (NHIS), Private insurance and community-based insurance scheme (Olakunde,2012).

a) National Health Insurance Scheme (NHIS): is a corporate body established under act 35 of 1999 by the federal government of Nigeria to improve the health of all Nigerian at an affordable cost (Obansa & Orimisan, 2013). At present, the program covers only federal government employee. Contributions are earnings related and currently represent 15% basic salary. The employer is to pay 10% while the employee will only contribute 5% of basic

salary to enjoy the benefit package (National Bureau of Statistics, 2010). The contributions made by/for an insured person entitled him or herself, a spouse and four children under the age of 18 years to full health benefit.

There are health maintenance organizations that ensure that the affiliated providers provide health care services to the contributor who registers with their organizations through their employer or directly as the case may be (Eboh et al., 2016). Health care providers under this program are either paid by capitation or fee-for-services. In addition, the limitation of the National Health Insurance Scheme (NHIS) to the working elite increases the spending on health from the majority of the population not covered by the scheme (Obansa & Orimisan, 2013).

b) Community Based Health Insurance (CBHI) is a non-profit mechanism whereby households in a community (the population in a village, district or other geographical area, or a social-economic or ethnic population group) finance or co-finance the current and/or capital costs associated with a given set of health services (Adinma & Adinma, 2010). This method of health insurance enhances resources mobilization amongst the community resident in order to effectively utilize the health service been provided, quality of life, reduce out-of-pocket (OOP) payments and reduce reliance on potentially harmful coping responses such as borrowing or selling assets (Yilma, 2015 Some of the forms of CBHI are mutual health organizations, medical aid societies and micro-insurance schemes. All of these forms are voluntary and apply the basic principle of risk sharing but however in Nigeria, their schemes have been affected by low enrolment rates, limited resource mobilization and poor sustainability (De Allegri et al., 2009).

c) Private health insurance is funded through direct and voluntary pre-payments by insured members. It may also be in the form of servicing of medical retainership in which workers and specified dependents obtain medical treatment in designated hospitals at the expense of their employers. In Nigeria, approximately one million individuals hold private insurance, that is, around 0.8% of the population. However, the private health sector is expanding across the country (Lawanson, 2014). Private health insurance in one way might reduce the out-of-pocket (OOP) expenditure and evolve in the long run towards a broader social health insurance system unless majority of the people is covered by the social health insurance or tax based financial health systems, there is a need to have appropriate regulation of private health insurance schemes to ensure the basic principles of solidarity, and control of exclusion (Puteh & Almualm, 2017).

Donor Funding

This refers to financial assistance given to developing countries to support socioeconomic and health development (Olakunde, 2012). Between 1999-2007, it was estimated to be USD337.31 - USD676.04million (yearly). These represent USD2.335 and USD4.674 per capita. These are very low figures compared to the Sub-Saharan African average of USD28 per capita. In 2003, the contribution of development aid to healthcare financing in Nigeria was estimated as N27.87 billion. This increased by 29% to N36.04 billion in 2004 and by just 1% to N36.30 billion in 2005 This is to say that donor agencies assistance to the Nigerian health system as a percentage of total health expenditure has been declining. The National Planning Commission has the statutory responsibility of coordinating the use of external development assistance at all level of government (Federal, State and Local government) (So At the state level, the Ministry of Finance, Economic Development and Planning form the pivot for coordinating external assistance to the state and local government areas. The capacity to coordinate however varies greatly among states. Other challenges with donor funding in Nigeria include the following: high cost of technical assistance, donor-driven approach to aid delivery, proliferation of aid agencies, uneven spread of donors' activities, institutional weaknesses, and problem of counterpart funding (Olakunde, 2012). Assistance from donor agencies had always been received with suspicion of ulterior motives on the part of the donors; nevertheless, it is an important source of financing healthcare in developing countries such as Nigeria (Omotosho, 2017).

2.2.4 Policies of Healthcare System in Nigeria

Over the years the Nigerian government has put in place various policies and plans to address healthcare financing (Uzochukwu, *et al.,* 2015).

National Health Policy

The main thrust of the National Health Policy is to expand financial options for health care and strengthen the contribution of private sector and pre-payment-based approaches for financing (National Health Policy, 2004). Engage communities and households in community-based schemes for financing Primary Health Care (PHC) services in Nigeria, increase government funding to international standards, prioritization of PHC and rural poor in funds allocation, increasing allocative efficiency by redistributing resource allocation between levels of care to ensure adequate allocation to preventive and promotive care (Odeyemi & Nixon, 2013).

National Health Financing Policy

This policy seeks to promote equity and access to quality and affordable healthcare and to bring about a high level of efficiency and accountability in the health system through developing a fair and sustainable financing system (Zaman & Hossain, 2017). However, the revenue mobilization and pooling strategies aimed at increasing the fiscal space for healthcare financing as embedded in this policy was also stipulated (Uzochukwu *et al.*, 2015). Additionally, the policy wasn't concise about the methods of how finances are to be distributed and used in the health sector which has greatly caused mismanagement of limited financial resources available to the health sector in Nigeria (Ichoku & Okoli, 2015). Several stakeholders and investing partners in health has independently financed their correspondents in a way that is not in accordance with government policy causing duplication of efforts and over utilizing of scarce resources. The gap that Nigeria is not exploiting other sources of health financing aside tax revenue and private funding is not helping the growth of healthcare and healthcare institutions (Zaman & Hossain, 2017).

2.3 TECHNOLOGICAL ADVANCEMENT & ADOPTION IN NIGERIA HELATHCARE SYSTEM

The technical knowledge required to use the new trending medical technology and equipment is changing as a result of certain changes in careers, general qualifications, and specializations staff and firms possess. The career knowledge, patient care abilities, how medical technologies influence professionals' perceptions, workplace experiences, and institutional challenges are valuable indicators that will guide hospital management when recruiting healthcare professionals in the future as the workplace evolves and changes (Bahrami et al., 2019). Technological advancement in the health sector has made living healthily easier as well as complicated. The use of technology in medicine shouldn't be a thing of fashion, healthcare facilities management should refrain from purchasing medical equipment that are not absolutely necessary. The adoption of advanced technology in the medical profession has enhanced the treatment and management of new or existing diseases by using trending surgical techniques, diagnostic and therapeutic equipment (Thimbleby, 2013). However, the use of the technologies is at a cost, not all level of healthcare facilities can purchase them and put them into use (Yegon, 2012).

The medical facilities in both secondary and tertiary level (Private and Public) of Nigeria healthcare system have remarkably responded to these new technologies and adopted them in

the provision of global standard healthcare services that should be incorporated into these new technologies (Wei et al., 2017). The emerging healthcare technologies cannot be fully exploited without clinical workforce, health policymakers, management bodies, standard training for medical professionals attending to the needs, demands, services of effective healthcare services and therapeutic response. This will keep transforming Nigeria's healthcare system. The development of medical technologies stimulates healthcare services in the areas of disease prevention, diagnosis, recuperation, enhancing patient quality of life, reducing rates of affliction, and ensuring the best outcomes for society (Ilyas, 2008). However, this introduction of advanced medical technology has additionally created rivalry between pharmaceutical and medical equipment manufacturers, who compete to innovate and deliver expensive products to the healthcare sector in that may not be suitable for patient care.

Medical technology is a competitive market, and each manufacturing company develops at a high rate. However, different companies' equipment are not designed in the same manner to each other maintenance (Hedberg, 2018). The type of healthcare technology used includes devices from simple thermometers to complex operations such as magnetic resonance imaging (MRIs), smart inhalers, robotic surgery, wireless brain sensors, artificial organs, health wearables, precision medicine, virtual reality, telehealth, and clustered regularly short palindromic (CRISPR) (Adebara *et al.*, 2017). The focus of biomedical engineers in producing wearable sensors, medical technologies is to provide effective solutions to quality of health care delivery and real-time monitoring of patient's health remotely. Medical professionals need to keep up their knowledge on the use of these technologies as they are advancing. These equipment, tools, and wearables need to be employed carefully to perform the treatment they are designed for. As the years pass by and technology advances to change, there is no recognition of what improvements will be attained next (Javaid, 2023).

Alongside healthcare services, the practice of "technological innovation" has thrived in the medical sector, incorporating new equipment, tools, and software's to healthcare design (Saidi et al, 2017). The prevalence of innovation in medical labs and surgical hubs in all kinds of healthcare-related organizations has led to the widespread adoption of user-friendly or human-centered design techniques and tools. The need to take inventive and practical approaches to handling complications in the design process is still something that needs to be addressed (Mann et al., 2019). Although modern innovations constitute to the foundation of contemporary healthcare and have the potential to significantly enhance patient outcomes, they are also the primary driver of increasing expenditures on healthcare (Halaweh, 2013).

Healthcare delivery organizations and healthcare providers must create their own decision criteria to strategically select the medical technology brand. Making timely decisions about new technologies before conclusive evidence of their clinical efficacy and economic benefit poses a difficulty for decision-makers when it comes to technology adoption (Sadiku, 2019).

The impact of digitalization on clinicians to carry out patient care has gained momentum in recent years and has greatly improve the delivery of health care services and increase operational efficiency (Wosny et al, 2023). However, for medical professionals to follow trends as technology changes, a comprehensive understanding of the well-being, emotions, behaviors, and cognitive process of the clinicians must be monitored. Technically, to facilitate technological improvements and improve patient recovering abilities, the experience, and collaboration across other medical departments have been developed (Safi et al, 2018). Health technologies comprise of all the devices, medicines, vaccines, processes, procedures, and systems designed to streamline healthcare operations, lower costs, and enhance quality of care. Technology drives healthcare more than any other force (Yap et al., 2017). It is drastically changing and improving healthcare, from anesthetics and antibiotics to MRI scanners and radiotherapy. This technology-driven progress in healthcare is often called Health 2.0. It is well known that hospitals adopt new technologies that enhance their service capabilities and enable them to attract and retain physicians who use the technologies (Sadiku, 2019).

i. 3D Printing

Also known as additive manufacturing (AM) or rapid prototyping (RP) was invented by Charles Hull in the early 1980s. It is a technology perfectly tailored for the healthcare industry and offers a range of precision healthcare solutions, including tissue and organ fabrication, creation of customized prosthetics, implants, and anatomical models, drug delivery, and testing, as well as in clinical practice. Benefits of 3DP in healthcare include the customization and personalization of medical products, drugs, and equipment; cost-effectiveness; increased productivity; the democratization of design and manufacturing; and enhanced collaboration. Hospitals could potentially create items on demand, and this would significantly alter the healthcare supply chain (Sadiku, 2019).

ii. X-ray

This is a type of electric radiation called radioactivity. X-rays are used to capture an image of something internally that adds large electromagnetic energy emissions of short wavelengths that can travel through objects (Gyebo et al., 2022). The doctor takes a picture of the body's

interior to consider why patients have internally fractured bones, especially with pregnant women (Adebara et al., 2017).

iii. Smart inhalers

An inhaler is the basic medication method for asthma, and 90 percent of patients would find it effective if used properly. However, the research shows that only about 50 % of patients are in charge of their condition, and as many as 94% do not use inhalers correctly. A tiny computer is attached to the inhaler with details of each impact date and period and whether it has been properly monitored (Adebara et al., 2017). These data are then transmitted to the patient's smartphones to aid with monitoring and maintaining their well-being. Clinical tests verified that the use of the smart inhaler system performed less relieving medication and had more days without relievers (Gyebo et al., 2022).

iv. Magnetic resonance imaging (MRIs)

Magnetic resonance imaging (MRIs) offers a body picture that uses solid electromagnet and radio waves. Contrasting other diagnostic imaging tests (computed tomography and X-ray), an MRI scan may provide precision cartilage and nerve roots to the tissues, tendons, and ligaments. An MRI helps a doctor diagnose an accident or disorder, and it may observe how stable people respond to treatment. MRIs can be applied in multiple areas of the patient's body. It is useful for displaying soft tissues and delicate organs (Adebara et al., 2017).

v. Robotic Surgery

In minimally invasive systems and assistance, robotic surgery is used to aid with accuracy, versatility and control. Doctors can perform very complex procedures, which are very demanding and difficult, through robotic surgery. As technology develops, it can be mixed with augmented reality to enable doctors to observe essential supplementary information on a patient in real-time while still working. However, discovery supports the concern that it will ultimately replace human surgeons, but it is possible to be utilized only to support and improve a doctor's practice (Adebara et al., 2017).

vi. Wireless Brain Sensors

Medical improvements have allowed doctors and scientists to cooperate and build bioresorbable electronics which can be installed in the brain and dissolve when they are no longer required. This medical equipment will help doctors in regulating the pressure and temperature inside the brain. Since the sensors can dissolve, they decrease the requirement for further operations (Gyebo et al, 2022).

vii. Artificial Organs

The scientists are capable of creating blood vessels, artificial ovaries, and pancreas. These synthetic organs then develop inside a patient's body to replace the original damaged one. The capacity to provide artificial organs that are not refused by the body's immune system could be innovative, protecting millions of patients who depend on life-saving transplantations every year (Adebara et al., 2017).

viii. Health Wearables

The market for wearable devices has increased since their introduction in the past few years, since the announcement of Bluetooth in 2000. People nowadays utilize their phone to trace everything from their activities, heartbeat and physical health, to their sleeping patterns. The elevation of this wearable technology is connected to increasing chronic diseases like diabetes and cardiovascular diseases, and it is proposed to fight these diseases by encouraging patients to control and improve their fitness (Adebara et al., 2017).

As the years move on, technology in medicine and pharmaceuticals will proceed to increase. People are living longer, and some diseases are considered incurable. New medical discoveries have high breakdown rates because of the inequalities of the technology accessible such as exhaustion tubes, mechanical relays, and other nonsolid state devices (Hedberg, 2018). Additionally, there are no laws and guidelines to control production methods or facilities control. This has generated inequalities in security, performance, and protection (Chang & Hsieh, 2020).

CHAPTER THREE

METHODOLOGY

This chapter covers the research design and methodologies of the study that will be adopted for the case study areas to examining the position of Nigeria healthcare sector in technological advancements. It explains each component of the research design in depth, including the questionnaire design, sampling, questionnaire administration, the methods, procedures, and techniques of data analysis, and limitations. Each component is critical for assuring the study's findings' validity and reliability and provides a clear and detailed explanation of how the research questions will be answered.

3.1 Research Design

Research design is a vital component of a research study as it provides the framework for the collection and interpretation of data, and affects the validity and reliability of the results. In this context, quantitative method is employed to give objectively analyzable numerical data and produce generalizable conclusions on the key variables. This study adopted a quantitative research design which consist of using primary method of collection and quantitative statistical techniques to analyze data. Results are represented using descriptive statistics method such as tables, & chart.

3.2 Study Area

The study area in this Chapter refers to the geographical location the researcher has chosen for the study. The study area is the setting in which the research will take place, and is usually defined based on the research questions and objectives. Hospitals of insight are University College Hospital- UCH (Oyo State), LAUTECH Teaching Hospital, Ogbomoso (Oyo State), Nassarawa State General Hospital (Nassarawa), Adeoyo Specialized Maternity hospital (Oyo State), His Mercy Specialized Hospital (Lagos)

3.3 Sampling Size and Procedure

The study population is a crucial aspect of the methodology, as it determines the scope, statistical analysis and the generalizability of the findings. The sample of respondents for data collection includes medical personnel from the selected study areas. A convenience sampling was employed to collect data from the sample leveraging existing digital networks such as WhatsApp groups, emails, & google drive. In this study, a total of 185 respondents was

calculated as sample size for data collection from five hospitals: Lautech Teaching Hospital, Adeoyo Maternity Hospital, University College Hospital (UCH), Nassarawa State General Hospital, and His Mercy Specialized Hospital.

3.4 Data Collection

This study utilized primary method of data collection using digital questionnaire (Google form) as instrument to collect data on the key variables from respondents. The questionnaire was designed in Likert scale to convey their level of agreement or disagreement with the questions been asked. The questionnaire was distributed electronically using the direct link to different digital platforms such as whatsapp group page, E-mails of the respondents. Instructions on how to access and fill out the online questionnaire was stated on the introduction ensuring that they comprehend its purpose and the significance of their responses likewise the anonymity and confidentiality of their responses. This technique is convenient because respondents can respond at their own pace and from any Internet-connected location. In addition, it facilitates efficient data collection and eliminates the need for manual data entry.

3.5 Method of Data Analysis

To ensure accurate and reliable analysis, the data derived from the surveys was filtered to arrange the values and delete the inconsistent values before encoding into statistical software and assigned numerical values. ANOVA (One-way Analysis of variance) was employed to perform comparative analysis in technological adoption and performance across different healthcare levels in Nigeria. In using ANOVA statistical technique for this study, it is suitable to design the key consideration from the dependent and independent variables, between group and within group variance and consistency. After the initial analysis, LSD test (Least Significance Difference) which is a Post-Hoc test performed to find patterns that were not specified before the data was collected was used to find the statistical significance in disparities i.e which group means score are different from each other. Frequencies and Counts are used to summarize demographic data and categorical variables. Mean, Median and Mode are used to summarize the central position of data, while standard variation is used to understand the spread of data across the case study areas. Bar charts, Tables, was used to visualize the data and highlight key findings.

3.6 Reliability and Validity

The reliability test carried in all three scales demonstrated excellent reliability, with Cronbach's Alpha values significantly exceeding the commonly accepted threshold of 0.70. This indicates that the items within each scale are well-aligned and provide consistent measurements. The first scale indicates that the items collectively provide a stable measure of the underlying construct they were designed to assess. The second scale showed a remarkably high reliability score with a strong agreement between the items, reflecting robust consistency and the third scale displayed that the items effectively measure the intended construct with minimal random error, ensuring that the scale is dependable for further analysis.

3.7 Ethical Consideration

The researchers ensured that this study is guided by ethical considerations and data collection was carried out in a responsible, respectful, and professional manner while also protecting the rights of study participants. In complying with the ethical standards, a there was an introduction part on the questionnaire introducing the researcher and also stating the privacy policy covering data and Information collected. To assure data quality, participants was given sufficient amount of time to finish the survey. Prior notice was sent to the administrator to have access to the participant and determine the most convenient time for data collection.

CHAPTER FOUR

RESULTS & DISCUSSION

This chapter shows analysis of data sets from responses from the healthcare workers pertaining to the knowledge and usage of the medical technologies to improve and deliver effective healthcare services. Out of 185 questionnaires distributed, 182 data was retrieved from respondents and analyzed descriptive and inferential statistics. It also contains discussion of the different sections of result and the significance of the analysis tested.

4.1 Demographic Information of Study Participants

Table 1. Socio-economic profile and area of professional domain of respondents

Variables	Frequency	Percentage (%)
Gender		
Male	74	40.7
Female	108	59
Age		
≤25	17	9
26 to 30	17	9
31 to 35	26	14
36 to 40	35	19
41 to 45	28	15.4
46 to 50	20	11
≥ 51	39	21.4
Mean age	40 years	
Years of experience in the hospital		
1-5	49	27
6 -10	47	26
11-25	60	33
Above 26	26	14
Kind of hospital		
General Hospital	28	15.2
Maternity hospital	16	8.8

Private hospital	58	31.9
Specialized	11	6
Teaching hospital	69	38
Profession of Respondents		
Nurse	76	42
Doctors	58	32
Others	48	26.3
Area of Professional Domain		
General Practice	24	11.7
Nursing	14	3.2
Anesthesia	9	4.7
Midwifery	9	3.7
Pediatrician	9	3.0
Emergency Nursing	7	3.6
Neurology	7	2.7
Others	103	56.6

This reveals the demographic profile of respondents such as gender and age distribution, the types of hospital they work and area of professional domain. The females (59.3%) occupied larger respondents than male respondents (40.7%). Responders with age 51 and above has higher rating of (21.4%), followed with those between the ages of 36 and 40 (19.2%). The mean age was 40.2 years, calculated using midpoints of age groups, with assumptions made for the open-ended categories (≤25 and ≥51). Approximately 33% have ≤13 years of working experience, while the other experience levels are evenly represented. Maternity and specialized hospitals are under-represented in the sample, with teaching hospitals accounting for 37.9% and private hospitals for 31.9%. This distribution highlights the study's varied professional backgrounds

4.2 Examining the Position of Nigeria Healthcare Sector in Technological Advancements.

Table 2. Primary factors contributing to the performance of healthcare delivery

Variables	Mean Score	Standard Deviation (SD)
Insufficient healthcare	4.05	1.89
Political issues	4.86	1.56
Insufficient funding	5.04	1.47
Inadequate educational experience	3.51	1.85
Inadequate medical professionals	4.12	1.76
Insufficient medical resources	4.83	1.62
Unorganized management board	4.44	1.63
Foreign medical care	4.14	1.74
High cost of medical treatment and lack of health insurance for non-government workers	4.72	1.6

The performance in Nigeria's health sector are multifaceted, as reflected in the descriptive analysis by a number of difficulties, such as a lack of finance (the largest at 34.1%), political problems (26.4%), brain drain (20.3%), and lack of medical resources (30.2%). These make it challenging to get high-quality care from qualified medical professionals. The problem is made worse by inadequate management, exorbitant medical expenses, and a lack of insurance; therefore, immediate funding, governance changes, and capacity building are needed.

Table 3. Experiences Using Medical Technologies for Medical Procedures

Item	Mean score	SD
The quality of healthcare services improved with the use of specialized medical technologies	5.51	1.73
The level of technological effectiveness and efficiency in meeting patient's healthcare services needs	5.43	1.71

The percentages reveal the significant impacts that the medical professionals have while experiencing the use of specialized medical technologies which has influenced the quality of

care and the efficiency of meeting patients' needs. The result recorded a high rating of 35%-28% as “Extremely /Advanced”, while a smaller but notable portion of respondents rated these items as "Minimal" or "Basic" (10.4%–13.7%) and 2.7% showing “Nothing at all. These findings underscore the transformative role of medical technologies in enhancing healthcare quality and efficiency and the variability in responses highlights the need for more equitable access to technology and greater investments in training and infrastructure.

Table 4. The Available Technologies used to Improve the Covering Abilities of The Patient

Technology	***Frequency***	***Percentage (%)***
Anesthesia Machines	93	51
EKG/ECG	88	48
Patient Monitors	85	46.7
Ventilators	76	41.76
Defibrillators	67	36.81
Foetal Heart Monitor	78	42.86
Others	217	120.32

Table 5: The Available Digital Tools used to Improve Patient Recovery Process

Digital tools	**Mean Score**	**Standard Deviation**
Telemedicine	4.92	1.42
Barcode Technology	4.57	1.50
Radio Frequency Identification	4.46	1.48
Clinical Decision Support Systems	4.82	1.37
Dietary Management	5.04	1.33

Table 4 and 5 show a mixed result in the widespread of digital tools and medical technologies within the Nigerian healthcare system utilized for diagnosis, treatment and improve patients' recovery process. This indicate that there is variability in integrating technological advancement into Nigeria healthcare practices. The former shows the frequency of the available technological equipment used for diagnosis and treatment while the later shows the technological applications/tools for monitoring recovery process

Table 6. How Medical Technologies Influence Professionals' Perceptions Regarding Career Knowledge, Workplace Experiences, Patient Care, And Institutional Challenges.

Variables	Mean	Standard Deviation (SD)
The extent of current medical technologies impacted your career knowledge and work performance?	5.33	1.64
The extent of the presence of advanced medical technology reducing anxiety and increasing self-efficacy while at work?	5.11	1.66
The use of medical technologies in the hospital has the potential to improve diagnosis and medical exploitation	3.15	1.54
The extent of medical technologies has changed the way you provide care to patients and collaborate with medical staff	5.12	1.63
Healthcare institutions are faced with difficulty in recruiting experienced and specialized medical professionals	3.61	1.78

The analysis highlights the significant impact of medical technologies on career knowledge, workplace confidence, patient care, and collaboration, with many respondents noting improved efficiency and reduced anxiety. However, gaps remain in their diagnostic applications and recruitment of skilled professionals. Addressing these challenges through investments in technology, training, and workforce development is essential to maximize their potential

Table 7. Logical And Viable Solutions to Address Causative Factors and Revive Nigeria's Health Sector Through Technological Advancement

Variables	Mean	Std. Dev.
Readiness assessment for healthcare workers and managers on technological adoption	5.13	1.59
Guidelines to address challenges in technological innovation adoption	5.22	1.49
Conducting market trends and exploring new medical technology	5.24	1.64
Raising awareness and improving patient safety during medical treatments	5.02	1.61
Inviting foreign experts to set up advanced technologies and provide training	4.51	1.78

This table identifies viable solutions for addressing technological deficiencies in Nigeria's health sector and proposes strategies for leveraging technological advancements to improve performance and growth.

4.3 Inferential Analysis

Ho1: There is no significant difference in technology usage among different kinds of hospitals in Nigeria's health sector

Table 8. One-Way Analysis of Variance Showing Difference Between the Usage of Technology in the Different Types of Healthcare Institutions

ANOVA

Technology Usage

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3121.307	4	780.327	4.361	.002
Within Groups	31671.072	177	178.933		
Total	34792.379	181			

One-way analysis of variance was conducted to examine if there is a significance difference in technology usage among the kinds of hospitals in Nigeria's health system. The p-value (.002), which, indicates that there are significant variations in the groups' use of technology. This result reveals a statistically significant difference in technology usage among different kinds of hospitals in Nigeria's health sector and it is doubtful that these variations are the result of coincidence**.**

4.3.1 Table 9. Post Hoc Analysis Showing Technology Usage Among Hospital Kinds

Hospital Type Comparison	Mean Difference (I-J)	Significance (p-value)	Confidence Interval (Lower, Upper)
Teaching vs. General	-7.19*	0.017	(-13.11, -1.28)
Teaching vs. Maternity	-8.36*	0.026	(-15.68, -1.03)
Teaching vs. Private	-6.71*	0.005	(-11.41, -2.01)
Teaching vs. Specialized	5.66	0.194	(-2.91, 14.23)
General vs. Specialized	12.85*	0.008	(3.45, 22.24)
Maternity vs. Specialized	14.02*	0.008	(3.68, 24.36)
Private vs. Specialized	12.37*	0.005	(3.69, 21.05)

. The mean difference is significant at the 0.05 level.

The post hoc analysis using the LSD method reveals significant differences in technology usage across various types of hospitals. Teaching hospitals show higher technology usage compared to general hospitals, maternity hospitals, and private hospitals respectively. However, there is no significant difference in technology usage between teaching hospitals and specialized hospitals. Specialized hospitals, on the other hand, exhibit significantly lower technology usage compared to general hospitals, maternity hospitals, and private hospitals.

4.4 Discussion

The findings of this study highlight that insufficient funding (mean = 5.04), political instability (mean = 4.86), and inadequate medical resources (mean = 4.83) are the most significant barriers to healthcare sector performance which corresponds to Amedari & Ejidike, (2021) study on improving access, quality and efficiency in health care delivery in

Nigeria where underfunding and weak health system governance are major hindrance to quality healthcare system in Nigeria. The challenges facing Nigeria healthcare facilities is not limited to financial inadequacy but also poor infrastructure, insufficient medical supplies, and low wages, which are the main driver for brain drain and workforce shortages of medical professionals Adedini et al (2014). The significant percentage of healthcare professionals having "extremely advanced" (35%) or "advanced" (28%) experience with advanced technologies revealed the consistency of the study on transformative potential of diagnostic tools to improve patient recovering outcomes and technology for treatment and healthcare delivery. However, approximately 12% of respondents reported having minimal experience, which highlights the disparity in technology distribution between urban and rural areas. This underscores the need for targeted investments in underserved regions and enhanced exposure to these technologies among medical professionals (Wosny, 2023). As the technology advances, medical professionals are expected to keep themselves up to date with the trend and upgrade their user proficiency to the new trends. Otherwise, it will be increasingly difficult to maintain healthcare services, as suggested in the studies of Oyekale, (2017).

The finding shows that technological equipment such as anesthesia machines (51%), EKG/ECG (48%), and patient monitors (46.7%) are moderately available in the healthcare facilities which is remarkably adapting their healthcare service to incorporate these technologies corresponding to Sadiku et al, (2019) noting that these types of emerging technologies that are moderately available are standard in improving patient outcomes but becomes challenging if it cannot be fully exploited by necessary clinical team to shape the therapeutic response which clinical workforce healthcare in Nigeria healthcare institutions have been able to utilize to provide effective healthcare services. The high mean scores of telemedicine (4.92) and clinical decision support systems (4.82) demonstrate their crucial role in enhancing remote healthcare delivery and decision-making. This mirror the conclusions of Mikkola et al., (2020), who implied that the increasing adoption of telemedicine is relevant in filling the gaps of location barrier to improve patient management, enhanced clarity between patients and their doctors/care giver and allows patient to communicate their experiential feedback These communications enabled patients in healthcare access. For instance, during the COVID-19 pandemic where digital technology was majorly the methods of care delivery.

Medical technologies significantly impact medical professionals career knowledge and workplace performance, reduce workplace anxiety and improve patient care with the mean score of (5.33, 5.11, and 5.12) respectively. This mirrored with the study Moshood et al, (2022) on technology and digital tools as approaches and interventions in reducing stress and

brain drain among clinicians. The diagnostic potential of the available technologies in the revealing cases show the mean of 3.15 which means that using medical technologies as not been fully utilized, reflecting a need for focused training and capacity building to maximize the utilization of these technologies corresponding with Safi et al, (2018) stating that improvement in individual practices through psychoeducation, interpersonal communication, and mindfulness meditation will enhance the well-being, emotions, and behaviors of medical professionals. From the highlights of the logical and viable solutions for addressing technological gaps and improving sector performance, the top rated response believe that inviting foreign experts to set up and train personnel on advanced technologies and the need to conduct readiness assessments for workers and managers before adopting new technologies which will help in examining the workforce's capability to embrace change, identify gaps in skills or infrastructure, and ensure a smoother transition to advanced systems from the recommendation of Al-Maroof, (2021) that the identification of the technical, social, and cultural readiness of user's and acceptance of technology is significant to operational efficiency, the second most significant is monitoring market trends from manufacturers of technologies/devices or pharmaceutical resources this is because going further in digital world, it is widely envisaged that customed medical devices will be manufactured to specialized patient's disease and it is very importance to build foreign partnership and a developing workforce and creative minds amongst professionals to meet innovation which showcase the recommendation of Thimbleby, (2013) that identified developing guidelines for technological innovation for strengthening health systems in developing and low -income countries for the economic benefits of it not only because it makes people well but rather it can find ways of making money and reinvesting it. The results indicate significant differences in technology usage among hospital types, with teaching hospitals exhibiting higher usage than general, maternity, and private hospitals corresponding to Scott-Emuakpor (2010), who noted that teaching hospitals, due to their affiliation with academic institutions, tend to have better funding and access to advanced technologies. However, the low technology usage in specialized hospitals observed in this study contradicts expectations and stem from poor management or limited funding, as suggested Onwujekwe, (2020). These findings underscore the need for targeted interventions to improve technological integration in the various hospital types where deficiencies are evident, particularly in specialized and smaller healthcare facilities.

CHAPTER FIVE

CONCLUSION & RECOMMENDATION

Firstly, the research question one identified the factors affecting performance of Nigeria health sector meeting the previous defined objectives where insufficient funding ranked the highest as the major cause. Secondly, the descriptive statistics result in the table 3 and 4 which shows the disparity in the level of experience of medical professionals in using advanced technologies based on the kind of hospital they work and also the types of available technologies, it revealed that because of the insufficient funding identified in objective one, the hospitals that are close to the citizens are underutilized and also majority of the technical know-how medical professionals work in private and teaching hospital where healthcare services are expensive for the average citizen. This met the objective two which aim to understand main issues of technological advancement in Nigeria health sector. Lastly, the third objectives which aim to deduce logical and viable solutions to these causatives and to revive Nigeria health sector in Technological Advancement was revealed in the where conducting readiness assessments, developing robust guidelines, staying informed on market trends, promoting patient safety, and leveraging foreign expertise are all critical steps toward achieving technological transformation.

5.1 Conclusion

From the aim of the study to examine the position of Nigeria's healthcare sector in technological advancement, the research findings emphasized the transformative role of technology in improving healthcare quality, efficiency, and accessibility in Nigeria. However, realizing its full potential requires addressing systemic barriers, such as insufficient funding, poor governance, and limited technological infrastructure. Policymakers must prioritize investments in healthcare technologies, promote partnerships with global health organizations, and ensure equitable access to innovations. The adoption of digital tools for patient health monitoring must be highly encouraged amongst patient's and provided technical guidelines and monitoring are available form medical professional. This finding was consistent with other study (Moshood et al., 2022) that demonstrated that new technological innovation in healthcare will expedite new health treatment methods and meet the needs of patients. This study put technological innovation and digitalization at the core of the government's medical technology policy and also as factors to increasing the expertise of healthcare workers.

5.2 Limitations

There was limited record on the number of hospitals particularly the one's that engage in specialized treatment or have and have gained recognition for expertise in medical treatment for both home and international patient based on their available medical technologies. However, the physical structure of some of the case study used posed a challenge of justifying if they will be fit for the study objectives. Also, some of the respondents didn't participate in the study which limited the number of case study intended to use. Additionally, future research should explore the socio-economic impacts of technological advancements in healthcare and assess the long-term sustainability of proposed interventions.

5.3 Value of work

In analyzing the innovative advancement of Nigeria's healthcare sector, this study has revealed critical viable impacts that bridge both hypothesis and real-world application. By analyzing the current state of innovative appropriation across various types of healthcare facilities, the research highlights basic disparities and the multifaceted challenges faced by the sector, such as inadequately financing, political issues, and inadequate resources. The study's findings emphasize the transformative part of advanced medical innovations like telemedicine and clinical decision support systems in upgrading healthcare quality and productivity. These innovations have illustrated their potential to move forward patient results, organized healthcare delivery, and support therapeutic experts in making informed choices. Moreover, the research gives significant proposals for focused on investments in innovation and foundation, especially in underserved regions. It moreover underscores the need of persistent training and capacity building for healthcare specialists to successfully utilize modern innovations. Tending to these viable challenges can lead to more impartial access to quality healthcare and contribute to the generally enhancement of the sector. Future research is empowered to investigate the socio-economic impacts of these technological advancements and survey the long-term sustainability of the proposed mediations, giving a more all-encompassing understanding of their benefits and suggestions for Nigeria's healthcare framework.

5.4 Recommendations

1. Provision of a transparent framework on the adoption and integration of medical technologies for healthcare institutions and establishing global and local market trends for these institutions will enhance their adoption of trending and effective solutions to healthcare
2. The government and related management bodies should see to the adoption of trending technologically advanced equipment in general hospitals and maternity centers and also make provision of affordable health insurance plans for entrepreneurs and artisans. This will improve healthcare services for middle level citizens and facilitate the treatment of difficult and complicated disease, as well as reducing infants and maternal mortality. Additionally, expanding the implementation of digital tools for patient monitoring and recovering system should be prioritized for investment to support healthcare professionals in making informed clinical decisions.
3. The healthcare institutions, medical colleges and universities needs to incorporate both readiness evaluations of medical students on technological advancements and ensure their capability in utilizing new technologies effectively. Healthcare institutions in Nigeria and the Ministry of health needs to address cultural factors hindering the optimization of Nigeria healthcare sector in the digital world and incorporate readiness evaluation of medical professionals to the current trends to realize the full potential of medical technologies and deliver enhanced patient care.

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APPENDIX A
QUESTIONNAIRE

EXAMINING THE POSITION OF NIGERIA HEALTHCARE SECTOR IN TECHNOLOGICAL ADVANCEMENTS

Dear respondent, I am interested in examining the position of Nigeria healthcare sector in Technological advancement. I am a master's student of the Department of Management, Faculty of Economics, University of Algarve, Portugal. This research is carried out as the partial fulfillment of Masters of Management Degree. Please assist by answering the following questions as honestly as possible. The information you give will be treated confidentially and used solely for this study. There is no need for you to disclose y our name otherwise you specifically wish to do so.

SECTION 1: DEMOGRAPHICS OF RESPONDENTS

Gender	**Yes**	**No**
Male		
Female		
Prefer not to say		
Profession of respondents		
Doctor		
Nurse		
Other		
Age		
≤25		
26 to 30		
31 to 35		
36 to 40		
41 to 45		
46 to 50		
≥ 51		
Type of hospital		
Teaching hospital		
General hospital		
Maternity hospital		
Private hospital		
Specialized		
Years of experience		
1-5		
6-10		

11-25		
Above 26		

What is /are your area of professional domain? *

SECTION B

We aim to understand your perception about the following factors. Please rate according to your understanding, the extent to which the following factors affect the performance of Nigeria healthcare sector.

Please rate according to your understanding, the extent to which the following factors affect the performance of Nigeria's healthcare sector. (*Mark only one oval per row)*

	0=nothing at all	1	2	3	4	5	6=extremely
Insufficient healthcare institutions							
Political issues							
Insufficient funding							
Inadequate educational experience							
Inadequate medical professionals							
Insufficient medical resources							
Unorganized management board							
Foreign medical care							

High cost of medical treatment and there is no health insurance coverage for non-governmental workers							

Rate the use of medical technologies for medical procedures (Mark only one oval per row

	0=nothing at all	1	2	3	4	5	6=extremely
Has the quality of healthcare services improved with the use of specialized medical technologies at your workplace?							
How effective and efficient are medical technologies in meeting patients' healthcare needs based on your experience?							

SECTION C

In this section we aim to understand the available technological advancement in Nigeria health sector

Which of the following medical technology is available and in your opinion, to what extent are these available technologies used to improve the recovering abilities of the patient? (*Mark only one oval per row)*

	0=nothing at all	1	2	3	4	5	6=Extremely
CRISPR							
Defibrillator							
Anesthesia Machines							
Patient Monitors							
EKG/ECG Machines							

Foetal Heart monitor							
Electrosurgical Units							
Ventillator							
3D Printing							

Telemedicine							
Bar code Technology							
Radio Frequency Distributio n							
Clinica l decisio n suppor t system s							
Dietary management							

We would like to evaluate your perception regarding the following aspects (mark only one oval per row

	0=nothin g at all	1	2	3	4	5	6=extremely
The current medical technologies impacted your career knowledge and work performance							
Does advanced medical technology reduce anxiety and boost self-efficacy at work?							

The use of medical technologies in the hospital has the potential for misdiagnosis and medical exploitation							
Advancements in medical technology have transformed patient care and staff collaboration							

SECTION D

Finally, in this section we would like to deduce logical and viable solutions to these causatives and to revive Nigeria health sector in Technological Advancement

What logical and viable solutions can be proposed to address the causative factors and revive Nigeria's health sector through technological advancement?(*Tick all that apply)*

	0=nothing at all	1	2	3	4	5	6=extremely
Healthcare institutions should assess the readiness of workers and managers for technological adoption							
Guidelines must be provided to address challenges in adopting technological innovation in healthcare							
Market trends on new medical technology should be conducted and explore ways to experiment with it							

The healthcare institution I work at can raise awareness and share ideas to improve safety during treatment							
Foreign experts will be invited to train staff and implement advanced hospital technology							

APPENDIX B

GANTT DIAGRAM

ACTIVITY	JULY	August-September	October	October-November	December	January-March	
Submission of final thesis proposal							
Literature Review							
Materials and Methodolgy							
Data Collection							
Result Analysis							
First Submission of Chapter 1-4 for review							
Proof reading and editing							
Submission to supervisor for verification							
Conclusion & Recommendation							
Final submission of dissertation							

APPENDIX C: Additional Tables

Profession of Respondents

S/N	Profession of respondents	Frequency	Percent
1	Biochemist	1	0.5
2	CHES	1	0.5
3	Chew	1	0.5
4	Clergy	1	0.5
5	Community Health Officer	1	0.5
6	Consultant	7	3.8
7	Corper	1	0.5
8	Dentist	1	0.5
9	Doctor	58	31.9
10	Geologist	1	0.5
11	Health Assistant	1	0.5
11	Health Information manager	2	1.1
12	Health Record Officer	3	1.5
13	lab technician	5	2.6
14	health technician	2	1.1
15	lad scientist	2	1.1

16	Management	1	0.5
17	Maternity healthcare assistant	1	0.5
18	Medical laboratory scientist	2	1
19	Medical student	4	2.1
20	Nurse	76	41.8
21	Pediatrician	1	0.5
22	Paramedics	1	0.5
23	Pharmacist	2	1
24	Pharmacology	1	0.5
25	Physiotherapist	1	0.5
26	Public health	1	0.5
27	Public servant	1	0.5
28	Self-employed	1	0.5
29	Tutor	1	0.5
	Total	182	100

4.6 Area of Professional domain of Respondents

S/N	What is your area of professional domain?	Frequency	%
1	Admin	1	0.5
3	Anesthesia	9	4.7

4	Biochemist	1	0.5
5	Blood Sample analysis	1	0.5
6	Cardiology	3	1.6
7	Care of in and out patient	4	0.5
8	Clinical Nursing, Surgery department	1	0.5
13	Dietician	2	1
14	Emergency Nursing	7	3.6
17	Family Medicine	3	1.6
18	Fertility Nursing	1	0.5
20	General Nursing	14	3.2
21	General physiotherapist	1	0.5
22	General practice	24	11.7
23	Geologist	1	0.5
24	Geriatrics	2	1.1
26	Hematology	1	0.5
27	Health counseling	1	0.5
29	Health record	5	1.5
30	ICU	5	1.6
31	Immunology	2	1.1
35	Maternal/ fetal care	7	1.6
37	Medical lab scientists	5	1
39	Medical Microbiology	1	0.5

40	Medical Student	1	0.5
41	Medical-surgical	1	0.5
42	Medicine, Endocrinology, Diabetology and Metabolism	1	0.5
43	Mid-Wifery	9	3.7
44	Nephrology	2	1
46	Neurology	7	2.7
52	Obstetrics and Gynecology	9	1
53	Ophthalmology	3	1
54	Oral & Maxillofacial Surgery	4	0.5
55	Organ Transplant	1	0.5
56	Orthopedic	1	0.5
57	Otaryngologist	1	0.5
58	Pediatrician	9	3
59	Paramedics	3	1.6
61	Public Health Educator	7	0.5
62	Pharmacologist	1	0.5
63	pharmacy	2	0.5
65	Physician Assistant	1	0.5
66	Physician/consultant	1	0.5
67	Physiology	3	1.1
68	Physiotherapy	2	1

69	Polyvalent nursing	2	1
70	Preventive	1	0.5
72	Psychology and Counselling	3	0.5
77	Research	1	0.5
79	Surgery	3	1.1
80	Teaching, health care, health promoter	1	0.5
82	Theatre, public health, midwifery.	2	0.5
	Total	182	100