AN ASSESSMENT OF THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN HEALTHCARE DELIVERY IN JOS UNIVERSITY TEACHING HOSPITAL (JUTH), PLATEAU STATE, NIGERIA

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DECLARATION

I, Alaku David DOGARA hereby declare that the Research Dissertation entitled **"an Assessment of the Use of Information and Communication Technology (ICT) in Healthcare Delivery in Jos University Teaching Hospital (JUTH), Plateau State, Nigeria",** has been written by me under the supervision of Dr. B. Tanimu and Dr. (Mrs.) E.C. Akpa, in the Department of Sociology, Faculty of Social Science, Ahmadu Bello University, Zaria. That it is a record of my own research work, and that it has not been presented in any form for another degree or diploma in any other institution. All quotations and sources of information have, to the best of my knowledge, been duly and specifically acknowledge in the references section.

_____ _____

Alaku David DOGARA **Date**

CERTIFICATION

This dissertation entitled **"an Assessment of the Use of Information and Communication Technology (ICT) in Healthcare Delivery in Jos University Teaching Hospital (JUTH), Plateau State, Nigeria",** by Alaku David DOGARA meets the regulations governing the award of Masters of Science (M.Sc.) Degree in Sociology of Ahmadu Bello University, Zaria, and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This dissertation is dedicated to my mother Mrs. Dogara Alice. Also dedicating to my siblings Mary, Daniel, Emmanuel and Ashezi Loveth, I am grateful for your prayers, support and understanding.

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ABSTRACT

Quality healthcare delivery is the product of effective and timely communication between the patient and the health professional. There is no doubt that information and communication technology (ICT) facilities enhance effective collaboration among health professionals on one hand and communication between the patient and the caregiver on the other hand. This study was therefore initiated to investigate the use of ICT in healthcare delivery in JUTH. In order to effectively understand the use of ICT in healthcare delivery, four research objectives were outlined, thus; to investigate the availability of ICT in JUTH, to examine the level of knowledge and utilization of ICT in healthcare delivery, and identify the prospects as well as the problems of ICT utilization in healthcare delivery in JUTH. The works of prominent authors including the World Health Organization (2003), Eysenbach and Wyatt (2002), were reviewed in line with the stated objectives. The structural functionalist and technological determinism theories were adopted to establish the relationship between ICT utilization and quality healthcare delivery in JUTH. Data were collected both qualitatively and quantitatively using questionnaire, in-depth interview and non-participant observation. Although 308 respondents were sampled using stratified sampling technique, the data analyzed were based on 293 questionnaires retrieved from the field and presented according to the study objectives. Ten key informants were purposively selected for the in-depth interview (IDI), an observation checklist as well as IDI guide was used to guide the research. Findings from this study shows that 97.7% of the respondents were ICT literate, although the cross tabulation on profession by ICT utilization shows that only doctors and nurses use ICT for healthcare delivery in JUTH the most. From the finding, it was identified that the major obstacles militating against effective utilization of ICT facilities for healthcare delivery in JUTH were poor maintenance culture and lack of internet access. Notwithstanding, the study established that when ICT gadgets are fully utilized for healthcare delivery, the gains will certainly outweigh the pains as ICT will reduce clinical errors, it will enhance collaboration among professionals and reduce patient waiting time and wastage. The study recommended that there should be creation of a greater awareness among the health workers and training health professionals to use the available ICT facilities as these will enhance quality healthcare delivery in the nearest future.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Quality healthcare delivery is the product of effective and timely communication between the patient and the health professional. In fact, interactions between the patient and caregiver form one of the foundations of contemporary medical ethics. Thus, given the right approach, context and implementation process, ICT-based solutions can indeed improve the quality, access and efficiency of healthcare provision (UNESCO report, 2002). The World Health Organization (2006) maintained that, ICT are important tools in enhancing quality healthcare delivery in both developed and developing nations, as ICT enable healthcare workers perform remote consultation and diagnosis, access medical information and coordinate research activities more effectively than ever before. According to World Bank (2003), ICT can provide an effective and cost-efficient channel for distribution of health and disease prevention information to the public.

Today's understanding about health is total well-being and not only to be a mere absence of disease or infirmity but the complete physical, mental and social well being of not just an individual but the society at large (WHO, 1946; Raebun and Rootman, 1998). Hence, good health is a complex state and achieving it requires much more than just one or two simple interventions, but an integrated range of preventive strategies, environmental changes, therapies and technology to diagnose and treat ill health, and provision of opportunities for those who need healthcare to access it (WHO report, 2014). Information and communication technologies have the potential to make major impact on improving the health of the members of each class in the society (Saraswati *et al*, 2013).

The World Health Organization (2010) added that utilization of information and communication technology equipment in healthcare delivery, such as electronic health records, e-consultations, e-prescriptions, tele-medicine, e-radiology, and so forth, has helped in reducing clinical errors and improves evidence-based medicine by increasing the accuracy of diagnoses and appropriateness of treatment approaches. ICT utilization also helps medical caregivers in their research and application processes as they can use the internet to identify research issues, search literature databases, seek out information on survey and clinical trials, and publish research results (Eysenbach and Wyatt, 2002).

Considering the growing importance of information and communication technology in the military, banking, education and other sectors of the economy including the health sector, the World Health Organization (2006), has carried out a number of key actions aimed at bringing the positive power of ICT on health challenges at global, regional and national levels. These include the development of an organization-wide e-health strategy and the adoption in May 2005 by the World Health Assembly (WHA) of a resolution on e-health, which called on World Health Organization to facilitate the integration of e-health in health systems and services, including the training of healthcare professionals and capacity building. Also, a number of African countries including Nigeria, Ethiopia, Senegal, Egypt and others, as part of the African Information Society Initiative (AISI) has over the past decade embarked on the development and the implementation of their ICT for Development (ICT4D) policies and plans of which e-health are among the major target (United Nations Economic Commission for Africa, 2003).

Although in Nigeria, ICT is more felt in the banking, commerce and trade sector of the economy while other sectors including agriculture, administration and the health sector

are to some extant untouched by the ICT revolution. The Nigeria Federal Ministry of Health (FMOH) created its ICT committee in 2003 with one of the goals to achieve being electronic linkage of the ministry with its hospitals, the aim was to create a Wide Local Area Network (WLAN) whereby the tertiary hospitals can all access each other, exchange information and create a reliable central database. The Nigerian Federal Ministry of Health in collaboration with the Federal Ministry of Communication Technology in 2015 led the multi-sectoral and stakeholder development of the National Health Information and Communication Technology (Health ICT) Strategic Framework which provides a vision and guide for alignment of investments in technology within the health system towards digitized health system that will help Nigeria achieve Universal Health Coverage by 2020 (FMOH, 2015).

As an important element of national security, public health not only functions to provide adequate and timely medical care but also track, monitor and control disease outbreak (Menizibeys, 2011). The potentials of ICT to transform any country's healthcare delivery are increasingly recognized by both the public and private sectors with evidence of success of e-health initiatives globally (Emmanuel, 2015). Unfortunately, in Nigeria, effective utilization of e-health has proven to be challenging most especially in the primary healthcare (PHC) delivery. This is because ICT sector has evolved faster than the policies that guide the use of ICTs for health, presenting significant challenges to projects moving towards institutionalization (FMOH, 2014). As conceived by Parsons (1951), good health and effective medical care are essential for a society's ability to function. Hence, the Federal government, healthcare provider's, significant others and the patients have responsibility to ensure a functional and reliable healthcare system through the utilization of ICT.

1.2 Statement of Research Problem

It is well established that the provision of timely information aimed at combating possible health menace among many other things is an important function of public health (Menizibeya, 2011). The World Health Organization (2010) stressed that, access, equity, quality, and cost-effectiveness are key issues facing healthcare in both developed and developing countries. Nigeria like many Sub Saharan African Countries has a high burden of disease, which is mainly characterized by communicable disease, particularly, malaria, Human Immunodeficiency Virus and Acquired Immune Deficiency Syndrome (HIV/AIDS), Sexually Transmitted Infections (STIs), and tuberculosis (TB) and high maternal, neonatal, and child morbidities and mortalities. Non-communicable diseases are also on the rise, including mental health, hypertension, diabetes and coronary heart diseases (FMOH, 2015). These poor outcomes are not only due to the high increase in the poverty level but also to the weakness in health sector, especially in the delivery of primary healthcare services (FMOH, 2010). In the same vein, the Federal Ministry of Health (2010) National Strategic Health Development Plan (NSHDP) noted:

> Nigeria is said to shoulder 10% of the global disease burden due to high disease burdens and its relative large population in the continent. The health indicators in Nigeria have remained below country targets and internationally set benchmarks. The MDGs have also recorded very slow progress over the years. Currently, the health sector is characterized by lack of effective stewardship role of government, fragmented health service delivery, inadequate and inefficient financing, weak health infrastructure, weak health information system with low quality of data and limited use and understanding of evidence in planning as well as mal-distribution of health work force with poor coordination among key players (FMOH, 2010: 18-19).

The above shows that a lot needs to be done to improve the health quality of Nigerians. As rightly observed by Mayo and Chukwuka (2013) poor medical care is dysfunctional

for society, as people who are ill face greater difficulty in becoming healthy and people who are healthy are more likely to become ill.

Studies over the years have stated that there exist a relationship between ICT utilization and quality healthcare delivery. For instance, Kumar (2012), Olorode and Oladunni (2013), Idowu *et al,* (2008), viewed healthcare delivery as intimately associated with human lives. Hence, ignoring ICT in healthcare delivery is not affordable, such that ICT has become well assimilated into the healthcare delivery that few doctors can imagine a day without using the computer or the network, stating that e-health systems in biomedical profession are very vital in promoting effective healthcare delivery in both developed and developing countries. Unfortunately, there is insufficient availability of ICT equipment in most Nigerian health institutions while most primary healthcare (PHC) facilities are in various states of disrepair, with equipment and infrastructure being either absent or obsolete, and the referral system is almost non-existent (Abdulraheem, *et al,* 2012).

The World Health Organization (2006) maintained that e-Health is not only about technology, but a means to reach a series of desired outcomes such as health workers making better treatment decisions and hospitals providing quality and safer care to patients/clients. Hence, healthcare workers need to be knowledgeable on the advance information technology, as computer literacy will enhance their proficiency. But even where there is the availability of ICT equipment in the Nigerian health institutions including the Jos university teaching hospital, the facilities are ineffectively utilized due to poor e-health knowledge by most health workers (Idowu *et al,* 2003).

Nigeria's rising information and communication technology sectors and the global proliferation of e-health are creating new opportunities to strengthen the health system

and improve the overall delivery of health services (FMOH, 2015). Based on the assessment findings by (WHO/ITU) national e-health strategy toolkit, basic ICT infrastructure (mobile phone, internet access) and working computers are in place at all the tertiary and secondary health institutions. At the primary health centers, approximately 78% of health offices surveyed reported availability of basic ICT infrastructure and 100% reported the availability of working computers, although there is the problem of steady power (electricity) supply (FMOH, 2015). However, despite efforts by the Nigerian government and many international donor agencies such as UNICEF, WHO and United States Aids for International Development (USAID) to improve the availability of ICT in Nigerian health institutions, its utilization still record low success since some of the health personnel are not properly train on the usage.

It was observed by prominent authors including Eysenbach and Wyatt (2002), WHO (2003), and the World Bank (2003) that the role of ICT in healthcare delivery which is supposed to have improved the quality of health in any country regardless of its natural endowment and economic status. Yet, the Nigerian healthcare system is performing below expectation (Menizibeya, 2011). In fact based on the overall performance of health systems around the world, Nigeria was rank 177 out of 191 countries, on its degree of responsiveness to healthcare needs (WHO, 2015). Aside from a poor number of health workers of only 4 doctors and 16 nurses per 10,000 people, this means that one doctor attends to 2,500 patients and 1 nurse to 155 patients (World Health Statistic, 2011). Most health workers prefer the manual or traditional way of patient care such as manual patient records, manual diagnosis and manual referral systems, and so forth, due to poor e-health knowledge and poor availability of clinical support facilities (most especially internet connectivity) in the country's healthcare institutions.

From the forgoing analysis, a functional healthcare system is not attainable without proper utilization of e-health. For instance, India is able to utilize ICT facilities to raise efficiency, reduce medical errors and improve disease management and is emerging as one of the best countries with standard healthcare facilities available to people across the globe (Schever, 2010). The Nigerian government can also take comparative advantage of the potentials that information and communication technology (ICT) presents in areas such tele-medicine, e-consultations, e-prescription, and so forth, in her bids to diversify her economy away from the oil sector.

It was however expected that after the Alma Ata declaration of 1978 and even the Abuja declaration of 2001 the Nigerian health sector will perform better most especially in the delivery of primary healthcare (PHC) services. Also considering the fact that the country's rising telecommunication sector is one of the largest and fastest growing telecommunication market globally (Chidozie, *et al*, 2015). Yet, the country's health sector is one of the worst in the world with poor referral systems and poor collaboration among health professionals. This can be attributed to poor policy implementation, inefficiency and poor utilization of electronic health facilities among others. This has further compounded the problem as the prospect of ICT in enhancing quality healthcare delivery in the nation's health institutions still wallow in the midst of uncertainty. In view of the numerous problems facing the Nigerian healthcare delivery with particular reference to Jos University Teaching Hospital, the study critically, examine the use of ICT in healthcare delivery in JUTH with the view of proffering plausible suggestions that will ensure quality healthcare delivery in the hospital and the country at large.

1.3 Research Questions

The study answers the following questions:

1. Are ICT facilities available in the Jos University Teaching Hospital?
2. What is the level of knowledge and utilization of ICT by the health workers in JUTH?
3. What are the problems of the utilization of ICT facilities in Jos University Teaching Hospital?
4. What are the prospects of the utilization of ICT facilities in JUTH?

1.4 Research Objectives

The specific objectives of the research are as follows:

1 To investigate the availability of ICT facilities in Jos University Teaching Hospital

2 To examine the level of knowledge and utilization of ICT by the health professionals in JUTH

3 To examine the problems of the utilization of ICT facilities in JUTH

4 To identify the prospects of the utilization of ICT facilities in JUTH

1.5 Significance of the Study

The significance of this study is that it provides empirical evidence on the roles of ICT in healthcare delivery. The research work serve as a motivation for further works by researchers in this field of study, as well as provide data available for further research and also serve as reference material to students who want to embark on a similar study.

Findings from the study contributes to existing knowledge on the role of ICT in healthcare delivery, as it reveal the factors that account for the problems with the utilization of ICT in healthcare delivery in Jos University Teaching Hospital.

Finally, its findings will contribute immensely on policy formulation, as it will enable the government and the hospital management to develop effective policy on the utilization of ICT in healthcare facilities.

1.6 Scope and Limitation of the Study

The study is limited to Jos University Teaching Hospital and not the entire health facilities in Plateau State. The study is also limited to the use of ICT in healthcare delivery and does not extent to other areas of healthcare delivery. The study also limits itself only to health professionals that are doctors, nurses, pharmacists, laboratory scientists, radiographers, ICT workers, medical social workers, health record workers, physiotherapists and not the entire health workers in Jos University Teaching Hospital.

1.7 Unit of Analysis

The unit of analysis for this study is the Jos University Teaching Hospital and all information and communication technology gadgets (including computers, MRI, echocardiography machines, internet, cell phones, X-ray machines, and so forth) in the hospital.

1.8 Unit of Response

Individual health workers (that are; doctors, nurses, ICT workers, health records workers, pharmacists, radiographers, physiotherapist, Lab. Scientists, and medical social workers) in Jos University Teaching Hospital constitute the units of response.

1.9 Variables

Like all scientific research, sociological studies search for a cause and effect relationship between two phenomena, which can be studied as independent, and dependent variables. This study has two major variables, one dependent on another. The independent variable for the study is information and communication technology (ICT) which refers to any device or system that allows the storage, retrieval, manipulation, transmission and reception of digital information (Eysenbach, 2001). The study divides ICT into availability/utilization (presence and use of ICT) and ICT literacy/utilization (ICT literacy and use of ICT).

While the dependent variable for the study is healthcare delivery. Healthcare delivery refers to services involving diagnosis, treatment, management, prevention and control of diseases, promotion, improvement, preservation, restoration, maintenance and protection of health, offered by medical and allied health professionals (Kelley and Hurst, 2006). The study divides healthcare delivery into high performance (where there is effective and efficient healthcare delivery) and low performance (where there is ineffective and inefficient healthcare delivery).

1.10 Definition of Key Terms

Clinical Errors: is a preventable adverse effect of care, whether or not it is evident or harmful to the patient. This might include an inaccurate or incomplete diagnosis or treatment of a disease, injury, syndrome, behaviour, infection, or other ailment.

Collaboration: is the process where two or more health professionals assume complementary roles and cooperatively working together, sharing responsibility for problem-solving and making decisions formulate and carry out plans for patient care.

Electronic Health (e-health): is the utilization of information and communication technology in support of health and health-related fields, including health care services; health surveillance; health literature; and health education, knowledge and research. Electronic health includes e-consultation, telemedicine, m-health, e-prescription, and so forth.

Electronic Health Record (EHR): is a digitized system for maintaining patient health information that generally includes patient presenting complaints, history of prior illnesses, prior diagnostic testing, and prior medical treatments. Electronic records are used as a substitute for the traditional paper health record.

Healthcare delivery: refers to services involving diagnosis, treatment, management, prevention and control of diseases, promotion, improvement, preservation, restoration, maintenance and protection of health, offered by medical and allied health professionals.

Health System: refers to the organization of people, institutions, and resources that deliver healthcare services to meet the health needs of the target population.

Referral: is a process in which a health worker at a one level of health system, having insufficient resources (drugs, equipment, skills) to manage a clinical condition, seeks the assistance of a better or differently resourced facility at the same or higher level to assist in, or take over the management of, the client's case.

Sick Role: is culturally accepted behaviour pattern or role that is permitted to be exhibited during illness or disability, including avoidance of sanction when absence from school or work and a submissive, dependent relationship to family, healthcare personnel, and significant others.

CHAPTER TWO

2.1 Literature Review and Theoretical Framework

This chapter is devoted to the review of literature and theoretical framework that are relevant to this research. This will give us an insight on the state of existing knowledge on the role of information and communication technology (ICT) in healthcare delivery by revealing what other scholars have written on the topic. The chapter is divided into five sections, these are; the conceptualization of ICT in health, the availability of ICT in health institutions, knowledge and utilization of ICT facilities by health professionals, problems of ICT utilization in healthcare delivery, prospects of ICT utilization in healthcare delivery, and, the theoretical framework adopted for the study.

2.2 Conceptualization of ICT in Healthcare Delivery

The utilization of Information and communication technology (ICT) in healthcare delivery is also refers to as electronic health. Electronic health (e-health) is simply the combined use of electronic information and communication technology in the health sector. It is the use of ICT in support of health and health-related fields, including health care services; health surveillance; health literature and health education, knowledge and research (FMOH, 2014; WHO, 2008; WHO, 2010).

In defining e-health, Eysenbach (2001), maintained that e-health refers to health services and information delivered or enhance through the internet and related technologies. Stressing that e-health is also a state of mind, a way of thinking, attitude, and commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology. The European Commission's e-Health Action Plan 2012-2020 define e-health as the use of ICT in health products, services and processes combined with organizational change in

healthcare systems and new skills, in order to improve health of citizens, efficiency and productivity in healthcare delivery, and the economic and social value of health.

Electronic health programmes encompass applications that directly support prevention of illness and diseases, patient diagnosis, patient management and care, etc. these applications include e-consultations, tele-referrals, forward-storage concepts (for example tele-radiology and tele-prescriptions), and electronic patient records (Nicholas, *et al*, 2013).

However, for better understanding of ICT utilization in healthcare delivery (electronic health), it is necessary to clearly define information and communication technology (ICT), healthcare delivery and consider the relationship between ICT and healthcare delivery.

2.2.1 Information and Communication Technology (ICT)

The terminology Information and Communication Technology originated mainly due to the emergence of the internet, recent innovations in the area of digital telephony, as well as innovation of different communication devices (Eysenbach, 2001). ICT is an extended term for information technology (IT) which stresses the role of unified communications and the integration of telecommunication (telephone lines and wireless signals), computers as well as necessary enterprise software, middleware, storage, and audio-visual systems which enable users to access, store, transmit, and manipulate information.

The concept information and communication technology (ICT) has numerous definitions, as the concept, methods, and applications involved in ICT are constantly evolving on an almost daily basis. In 1998, Organization for Economic Co-operation and Development (OECD) member countries agreed on the definition of the ICT sector

as a combination of manufacturing and services industries that capture transmit and display data and information electronically (OECD, 2002).

The World Bank (2003), defined ICT as communication gadgets, consists of hardware, software, networks and media for collection, storage, processing, transmission and presentation of information. ICTs cover internet services provision, information technology equipment, library and documentation centers, network based information services and other related communication activities (United Nations Economic Commission for Africa, 1999).

Similarly, Idowu, *et al*, (2003), defined ICT as one of the driving forces of globalization. ICT encompasses the broad spectrum of communication technologies from radio, film, television, press and telephone along with more participatory forms such as theater, video or storytelling, it also focuses on the electronic end of the spectrum such as e-mail, the internet, mobile phones and digital video. ICT is also seen as a tool or technology for gathering, storing, retrieving, processing, analyzing, and disseminating information electronically, also acknowledging that it has influence every aspects of human live today, most especially the health sector in both developed and developing nations.

ICT is a tool that helps in improving communication among businesses and commercial activities in different parts of the world. In fact, ICT and e-commerce have become almost synonymous terms as most commercial activities banking for instance depends largely on ICT to communicate various financial matters such as acceptance of money, producing receipts and transferring funds. However, the scope of ICT extends much beyond commerce transactions. It is widely used in military, education, agriculture, transportation, and medical arenas as well.

For this study, information and communication technology (ICT) will be define as any device or system that allows the storage, retrieval, manipulation, transmission and reception of digital information such as mobile phone, computer, cardiac monitor, X-ray, internet, ultra sound machines, microscopes, echocardiography machine, vascular ultrasound machines, and so forth.

2.2.2 Healthcare Delivery

According to Nicolini, *et al*, (2008), healthcare delivery in itself is a setting where different professional groups having differing rules, job representations, behaviours and value coverage engage in a collaborative process, with both explicit and tacit knowledge aspects, to achieve outcomes in terms of access, quality and cost. Healthcare delivery refers to services involving diagnosis, treatment, management, prevention and control of diseases, promotion, improvement, preservation, restoration, maintenance and protection of health, offered by medical and allied health professionals (Kelley and Hurst, 2006).

Healthcare delivery depends on the adequate provision of facilities and equipment, highly trained, balanced and motivated workforce, current and accurate information and technologies that enable health professionals to use information in the right time. Several researchers have noted that the transfer of knowledge among healthcare practitioners (physicians, nurses, technicians) is dependent on professional networks and communities of practice (Bordoloi, *et al*, 2012). Health service delivery also means access and use by those in need; adequate quality of care to produce health benefits; efficient use of scarce resources; and organization that can learn, adopt, and improve for the future. Organization must combine financial, physical, and human resources to deliver health services (Berman, *et al*, 2011). At the most general level, a striking

feature of the healthcare industry is the level of diversity that characterizes patient (physical traits and medical history), professional discipline (doctors, nurses, administrators, and insurers), treatment options, healthcare delivery processes, and interest of various stakeholder groups (Fichman *et al*, 2011).

Healthcare delivery in Nigeria is a concurrent responsibility of the three tiers of government in the country. However, private providers of medical healthcare have a visible role to play in healthcare delivery. The Federal government role is mostly limited to coordinate the affairs of university teaching hospital, federal medical centers (tertiary healthcare), while state government manages various general hospitals (secondary healthcare), and the local government focuses on dispensaries (primary healthcare) which are regulated by the federal government (Abbas, *et al*, 2012).

2.2.3 Nexus between ICT and Healthcare Delivery

Development of electronic applications such as e-prescription, e-consultation, e-radiology, mobile health (m-health) and so forth has brought a paradigm shift in health seeking behaviour as well as healthcare service delivery globally from manual healthcare to modern technology and the use of artificial measure to prolong life in the healthcare scenario of the entire world, and Nigeria is not an exception. Scholars over the years have maintained that the relationship between ICT and healthcare delivery is such that ignoring of ICT in medical and healthcare is not affordable. In the words of Kumar (2012), "medical and healthcare is intimately associated with human lives, ignoring of ICT in medical and healthcare is not affordable". Other studies including that of Olorode and Oladunni (2013), observed that the relationship between ICT and healthcare delivery is enormous in that ICT has become well assimilated into the healthcare delivery that few doctors can imagine a day without using the computer or

the network, stating that e-health systems in biomedical profession are very vital in promoting effective healthcare delivery.

Stressing on the relationship between ICT and healthcare delivery, Jun Lu (2013), states that the advantages of using e-health are enormous. One key example is electronic health record (EHR). Before e-health came into use, health professionals used paper-based system to record patient's health data. These paper-based systems may have errors while entering the patient records into papers. Coming to e-health, data are stored electronically and it is more simpler and efficient way of data storing. He further state that by using e-health, there are many benefits to different people such as doctors, patients, etc. for example, doctor's order can be placed electronically, which avoid wrong elucidation of hand written orders. In addition, with the help of e-health, most doctors reduce the time of locating, and reading patient health information. To the patient, they can begin to be gradually aware of the importance of self-care management.

Today's understanding about health is total well-being and not only to be a matter of the absence of disease (Raebun and Rootman, 1998). Hence, healthcare delivery is becoming more complex globally. As observed by Amatayakul (2004), many changes in healthcare structure continuously shape the industry, creating and improving job functions of health workers. In addition, factors such as technological advances, the aging population, complementary therapies, and increasing costs while having an impact on growth of the healthcare industry, stating that technological advances are improving patient care and aiding diagnostic, therapeutic, and ancillary processes. Physicians and other clinical personnel are also able to make precise and better-informed decisions due to improved diagnostic techniques such as three-dimensional ultrasounds, which allow a multidimensional and clearer viewing of internal body

structures. Clinical and ancillary personnel are able to streamline many workflow and documentation process due to the development of electronic health record.

Health workers play important roles in a nation's socio-economic and political growth. ICTs are vital tools that help them to access and use relevant information in their jobs. ICT usage can be highly effective if health workers harness the opportunities it offers to meet their needs. However, in spite of the potential contributions of ICTs to the activities of health workers, developing countries are face with some constraints, which include limits of physical access to ICTs, high cost of ICT facilities and inadequate ICT infrastructure to service the entire population (Olaktokun and Olufunke, 2009).

Fichman *et al*, in their study in (2011), acknowledge that healthcare influences the quality of our lives and how we function within the society, maintaining that healthcare mistakes have serious consequences that can affect our ability to carry out social and productive endeavours (most especially medical errors are expensive, increase patient hospital length of stay, and cost human lives). At the population level, the failure to control infectious disease can cause serious public health issues. Quality healthcare is diligently pursued and vigilantly executed, hence, information and communication technology can facilitate such pursuit by highlighting and monitoring error at various stages along the continuum of care.

Anie (2011), in his study on the impact of ICT in primary healthcare services in Niger Delta, Nigeria, discovered that ICT utilization has a positive impact on rural dwellers in respect of primary healthcare services, therefore, ICT should be seen as an indispensable tool for effective primary healthcare services. He further stated that ICT is seen as a bridge to help the rural dwellers to cross from dark ages to an era of enlightenment. As ICT, gadgets enhance their awareness on prevention and control of

endemic diseases, maternal and child health including family planning, the importance of safe water and basic sanitation, provision of essential drugs, appropriate treatment of common diseases, injuries and immunization against major infectious disease.

Similarly, Awopetu, *et al,* (2014), states that the production of quality healthcare delivery in a country is guide by the level of the ICT infrastructure. They further discovered in their study on the influence of ICT on clinical services delivery among caregivers and patients in Makurdi Metropolis that there was negative correlation between ICT usage in clinical service delivery and disease diagnosis, there was a negative correlation between ICT usage in clinical service delivery in reducing the severity of errors in disease diagnosis and prognosis. Findings from their hypothesis also show that there was a negative correlation between ICT usage in clinical service delivery in improving the quality and speed of clinical service delivery in Makurdi metropolis. Indicating that most hospitals in Makurdi metropolis hardly employ ICT in any of its clinical practices, and ICT has little or no use in disease prognosis. However, their finding showed that a lot of errors and mistakes in diagnosis, prognosis, prescription, referrals, surgery amongst others, can be avoided if ICT tools were developed into medical service within the metropolis, suggesting that government should support the development of ICTs in Nigerian hospitals. The literatures shows that there exist a positive relationship between ICT and healthcare delivery as ICT enhance work efficiency and effectiveness of health service delivery.

However, the relationship between ICT and healthcare delivery can be negative. Negative relationship between ICT and healthcare delivery exist when ICT application has no significant impute on health service delivery, rather is causes harm to both the patient and the healthcare provider. Demonstrating the negative relationship between

ICT and healthcare delivery Olorode and Oladunni (2013), stated that most of the electronic health devices are computer based, there is a danger that patients over rely on computer control equipment. If the computer network goes down, information is unavailable. This could be inconvenient or may even be life threatening. A negative relationship also exists when health workers are unaware of the importance of ICT on their profession, the unavailability or inadequate of ICTs infrastructure present another onerous challenge to the relationship between ICT and healthcare delivery.

2.2.4 ICT and Medical Errors

It is no gainsaying that health provider's work hard to provide safe and high quality care, but sometimes people are inadvertently harmed (WHO, 2016). Clinical errors have been recognized as a global challenge and much has been done to understand the causes, consequences and potential solutions to this problem (Grober and John, 2005). According to Adegboyega (2016), medical errors, include diagnosis errors, errors in administration of drugs and medication, errors in performance of surgical procedure, in the use of other types of therapy, in the use of equipment, in the interpretation of laboratory findings and error of discharge.

Clinical error have be defined as a preventable adverse effect of care, whether it is evident or harmful to the patient. This might include an inaccurate or incomplete diagnosis or treatment of a disease, injury, syndrome, behaviour, infection, or other ailment.

However, the quality of healthcare delivery depends on the integrity, reliability, and accuracy of health information (Bowman, 2013). While the adoption of electronic health systems such as electronic health record (EHR), e-prescription, e-consultation among others, promises a number of substantial health benefits, including better care

and decreased healthcare costs, there are serious unintended consequences from the implementation of these systems. For instance, poor electronic health records system design and improper use can cause EHR-related errors that jeopardize the integrity of the information in the electronic health record, leading to errors that endanger patient safety or decrease the quality of care. These unintended consequences also may increase fraud and abuse (Bowman, 2013).

It is an established fact that ICT utilization has help to address clinical challenges. For instance, ICT can help avoid illegible handwriting, can be programmed to find errors in dosage, medication name, medication interactions, and identifying allergic patients or the wrong patient, computerized records can be backed up and less likely to be lost or unavailable, computerized records can more easily be transferred (Oluwadare and Toyin, 2013).

2.3 Availability of ICT Facility in Health Centers

From time immemorial, man has been interested in trying to control diseases. In ancient times, health and illness were interpreted in cosmological and anthropological perspectives, in the course of evolution healthcare has truly undergone a momentary metamorphosis, from the initial disease control phase to the present 'Health for all' phase. Today, access to health information has become a key international development issue especially among healthcare professionals and the need to implement Health Information Technology (HIT) has become a paramount issue in healthcare systems (Ibrahim *et al, 2015*).

Efforts made by the government towards ICTs development in Nigeria include the launching of the National Telecommunication policy in September, 2000, the

development of a comprehensible Science and Technology policy in 2001, the development and launching of the National Information Technology policy in 2001, the establishment of the National Information Technology Development Agency (NTDA) in 2001, and the launching of the National Space Research and Development Satellite Systems Programs by the National Space Research and Development Agency (NASRDA) in 2001, these efforts are complementary to additional development initiatives such as the granting of license to mobile telephone networks operators beginning with MTN in 2001, and in 2010 Information and Communication Technology for Development (ICT4D) was launched (Yewane, 2016).

In the area of electronic health, the Nigerian Federal Ministry of Health created its ICT committee in 2003 with one of the goals to achieve electronic linkage of the ministry with its hospitals, as it will create a Wide Local Area Network (WLAN) whereby the tertiary hospitals can all access each other, exchange information and create reliable central database. Beginning in late 2014 and in the first half of 2015, the Nigerian Federal Ministry of Health and the Federal Ministry of Communication Technology led the multi-sectoral and stakeholder development of the National Health Information and Communication Technology (Health ICT) Strategic Framework, which provides a vision and guide for alignment of investments in technology within the health system towards digitized health system that will help Nigeria achieves Universal Health Coverage by 2020 (FMOH, 2015).

Based on the assessment findings by (WHO/ITU) national e-health strategy toolkit, basic ICT infrastructure (telephone/mobile phone, internet access) and working computers are in place at the federal and state levels. At the local government levels, approximately 78% of health offices surveyed reported availability of basic ICT

infrastructure and 100% reported the availability of working computers, although there is the problem of steady power (electricity) supply (FMOH, 2015). Idowu *et al,* (2003) reported that while ICT capabilities (personal computers, mobile phones and internet) were available in Nigerian teaching hospitals, mobile phones were spreading fast. Their findings also revealed that computers and mobile phones were used in all the teaching hospitals but not much internet connectivity was available, meaning that most of the medical experts used external (nonhospital) internet services such as cybercafés, for even rudimentary internet access, such as e-mail.

2.4 Knowledge and Use of ICT by Health Professionals

The success of ICT application in health is dependent on the level of computer use by health professionals, especially doctors (Yewande, 2016). Previous studies by Olatokun and Olufunke (2009), Idowu *et al*, (2003), and Clement (2010), highlighted the strategic disadvantages that nations, institutions, and industrial sectors would face if they did not position themselves to harness and implement ICTs as tools for leveraging their activities in the emerging global economy. In health sector for instance, the production of quality healthcare delivery in a country is guided by the level of the ICT infrastructure posed and used by that country, hence a good infrastructure is a condition for enhancing the well-being of a country (Olatokun and Olufunke, 2009).

Benson (2001) opined that computer literacy by both educated and uneducated have become the most important factor for improved standard of living. He maintained that there is no effective health education anywhere in the world without the application of information and communication technology, also, perceived ICT as an unavoidable technology for the improvement of organization, team and people in information age,

stating that computer compliance by people has become the accelerator for productivity and prosperity.

Benson, *et al,* (2015), in their study maintained that accessibility and the use of the internet-based health information are vital concepts in healthcare delivery because ICT is changing not only the way the patients get health information, but also the way they interact with their healthcare providers. They however discovered in their study that all (100%) participants were conversant with internet-based health information, which was reported to have met their basic health needs; again, all (100%) participants admitted that internet-based health information could be easily understood, and mostly sought for it to equip themselves with prior knowledge on their ailments. However, majority (97.0%) searched for internet-based health information because they reported to have lost confidence in their health providers. However, their study shows the importance of ICT as it relates to efficiency and effectiveness of healthcare delivery. The study also reveals the potential benefits of ICT literacy by both patients and healthcare providers, as it can aid patients address their health needs even when they lost confidence in their healthcare provider.

Similarly, Ibrahim, *et al,* (2015) in a study carried out at National Hospital Abuja, discovered that knowledge and utilization of ICT among health professionals were advance, in the use of electronic mail (most especially among medical lab scientists and health information professionals). They also discovered that all doctors who participated in the study possessed a laptop computer, and most health professionals have used social media and 28.6% of pharmacists have never used the internet, maintaining that ICT will improve medical care quality and ICT will enhance confidentiality of patient's health records if properly used.

On the importance of computer literacy among health workers, Ernst *et al*, (2015) investigate the role of computer literacy to nursing profession as perceived by nurses in Nnamdi Azikiwe University Teaching Hospital, Nnewi. They discovered that a large percentage of nurses in the teaching hospital (60.6%) are not computer literate and cannot handle the common computer software and operations, years of experience were insignificant with being computer literate. However, majority (96.5%) of the nurses responded positively that computer literacy is useful for monitoring patient, nursing documentation, clinical decision making, nursing diagnosis, sources of information, conducting research, management of human resources and record keeping.

The above findings have shown that the level of computer literacy among health workers is very low, and therefore affect their ability to utilize effectively ICT facilities in the discharge of their duties

2.5 Problems of ICT in Healthcare Delivery

Nigeria fall short of several health indicators with common occurrences of disrespect towards patients during treatment and unduly waiting times for non-emergency treatment among others. The lack of basic hospital amenities, prevalence of small clinic spaces and non-compliance with required sanitary standards continues to contribute to the declining quality of healthcare in Nigeria (Moyo and Chukwuka, 2013). However, it was believed that effective ICT utilization in healthcare delivery will reduce the challenges facing the Nigeria healthcare sector.

The report of the Health ICT Industry Group (2009) uphold that underinvestment in ICT has not caused all the problems in health service delivery, nor is it a panacea to address all the issues. However, the expectation that citizens have of healthcare services

continues to rise, and steps need to be taken to understand and respond to these demands. Advances in medical science, especially in the areas of diagnostics, therapeutic medicines and surgical procedures, are suggesting a future where many medical conditions will be predicted, discovered and treated at an early stage and with minimum risk and impact on the patient through the use of ICT gadgets.

O'mahony, et al, (2014) state that the introduction of information and communication technology (ICT) in an organization does not mean it will be used as intended. Users may reject it, misuse it, sabotage it or work around it, stating that worldwide, it is estimated that the majority of information technology (IT) projects in various sectors, including healthcare, have failed. The reasons to these problems are now considered more managerial than technical, with sociological, cultural and financial issues being paramount.

Globally, implementation of ICT technological development is a major factor of e-health in both developed and developing countries (Emmanuel, 2015). Contributing factors have been identified to explain the slow adoption of ICT technologies by researchers in this area include: a lack of management support, training and policies, the perceived lack of complexity and cost, sensitive nature of information and the logistics involved in the healthcare facilities, pressure for high quality care, high litigation costs and a lack of infrastructure and other resources. These factors can affect even the most technologically advanced nation, for instance Australia is among the leading countries in terms of internet infrastructure and other technological development. However, in comparism with other countries such as Finland, Canada, USA and Sweden, Australia healthcare service providers have been extremely slow to implement ICT technologies. Thus, effective implementation of ICT has made

countries such as India and Pakistan caught up with advanced healthcare system because of health tourism, and comparable to many Western healthcare organization in terms of ICT sophistication (Gururajan and Abdul, 2013).

It is well reported that there are several surrounding factors, which forcibly intervene in the ICT development and use on healthcare delivery. Akadiri, *et a.,l* (2001) noted that in spite of the potential contributions of ICT to healthcare providers, some constraints exist that prevent their widespread utilization. Some of the more obvious constraints common to developing countries include the limits of physical access to ICTs, the high cost of providing access for nations trying to balance multiple financial priorities, and the exclusion from access of large segments of the population due to inadequate infrastructure.

Muathe, *et al*, (2013), identified five factors thus; quality of ICT systems, information intensity, ICT specialization and organizational readiness are the main organizational factors determining ICT adoption among health related small and medium enterprises Nairobi, Kenya. Odusote (2010) maintained that developing countries generally find it difficult to set the required priorities to invest appropriately in the deployment of ICT facilities. Onu and Agbo (2013) submitted that in Nigeria, factors ranging from people, government and scarcity of ICT infrastructure are opposing forces, which serve as barriers to the adoption and infusion of ICT in health sector in their study on the effect of information technology policy on Nigeria health sector.

In addition, Hassan, *et al,* (2011) identified ICT literacy, infrastructure deployment, and ICT usage as some of the factors affecting the use of ICT facilities in healthcare. Results of their study showed that adoption of information technology into the mainstream of managing health system in the country is high, but the level of

awareness of the information technology policy is low. In the same vein, Olaronke, *et al*, (2013) states that there are many factors impending technical interoperability in Nigeria, including inadequate ICT facilities, erratic power supply, proliferation of incompatible e-health systems and high level of corruption.

Olorode and Oladunni (2012), acknowledge that majority of medical providers Nigeria are not ICT compliant rather, they are wallowing in their traditional method of diagnosis and treatment including research, stating unavailability of ICTs infrastructure present another onerous challenge to the effective utilization of ICT in biomedical field, these include installing, maintain and repairing including internet. Unfortunately, poor leadership in Nigeria has led to years of economic downturn affecting every aspect of social life, especially the health sector. Rather than develop quality medical service, government officials and wealthy individuals frequently seek medical treatment abroad even for the most basic healthcare needs. Analysts acknowledge that the dearth of a modern medical infrastructure in Nigeria has promoted medical tourism among the rich subset of the Nigerian population. Reasons include poor technological and funding support in developing nations, poor management capacity at all levels that hinders seamless workflow, complex milieu of healthcare service delivery, continual evolution of technology, confidentiality problems with the use of hospital information system, and poor technological background of the Nigerian society (Benson, 2011).

The Nigerian Federal Ministry of Health (FMOH, 2010) also identified inadequate and inefficient financing, lack of effective stewardship role of government, fragmented health service delivery, weak health infrastructure, weak health information system with low quality of data and limited use as the major factors affecting the nation's health sector. Similarly, the Plateau State Ministry of Health (2010) states that some of

the problems affecting health service delivery and resource for health as high cost of health services as well as staff constraints at the health facilities combine to limited access to healthcare for majority of the citizens. Data collection, collation and transmission have been inadequate and inefficient at best arising from poor IT capacity and poor logistics, hence highlighting serious gaps in the health information system.

Based on the assessment findings by (WHO/ITU) national e-health strategy toolkit, basic ICT infrastructure (telephone/mobile phone, internet access) and working computers are in place at the federal and state levels. In fact at the local government levels, approximately 78% of health offices surveyed reported availability of basic ICT infrastructure and 100% reported the availability of working computers, although there is the problem of steady power (electricity) supply (FMOH, 2015). Idowu, *et al,* (2003) also reported that while ICT capabilities (personal computers, mobile phones, and internet) were available in Nigerian teaching hospitals, mobile phones were spreading fast. Their findings also revealed that computers and mobile phones were used in all the teaching hospitals but not much internet connectivity was available, meaning that most of the medical experts used external (nonhospital) internet services such as cybercafés, for even rudimentary internet access, such as e-mail. They further explained that while just (14%) of the medical staff did not use the internet in any fashion, the vast majority (70.7%) of those using the internet did so only for e-mail and not for medical purpose.

Olaronke, *et al*, (2013) maintained that there are many factors impending technical interoperability in Nigeria including inadequate power ICT facilities, erratic power supply, proliferation of incompatible electronic health systems, high level of corruption, etc. however, if the Nigerian government and other health stakeholders address the above problems, ICT will facilitate easy access to health-related

information amongst healthcare providers. In the same vein, Onu and Agbo (2013), identify factors ranging from people, government and scarcity of ICT infrastructure are opposing forces, which serve as barriers to the adoption and infusion of ICT in health sector. In other to address the problems affecting the state of ICT in Nigeria, the government should establish an agency separately from the ministry of health and empower the agency financially to administer and fund ICT equipment and personnel in government hospital. Government should also address all issues associated with ICT development in the country.

Unfortunately, many health professionals and patients in Nigerian health institutions poorly utilize e-health facilities. The above literature shows that basic ICT facilities (computer, mobile phone, telephone and internet) are available in most Nigerian hospitals but these facilities. The problems identified are: Poor computer (ICT) literacy among healthcare providers, Poor knowledge of ICT on health policy by the public, Problems of implementation of ICT and health polices by both the federal, state and local government, Inadequate ICT infrastructure and deployment in healthcare delivery, High cost of ICT peripherals as well as Erratic power supply.

2.6 Prospects of ICT on Healthcare Delivery

Despite the challenges faced by the Nigerian health sector, advances in information and communication technology since the 1990s have created new possibilities for healthcare providers and their patients. The use of information and communication for health, today represent one of the key instruments for healthcare delivery and public health education. Efficient and robust e-health solutions have already demonstrated their value, particularly in facing new global health using computer and internet, sound and high-resolution images can be sent between two distant locations and doctors can

easily examine patients in offices and healthcare centers thousands of miles away (WHO, 2008).

As a sensitive field, medicine requires collaboration by different specialists in a particular field for more effective outcome. ICTs serve, as the tools that can simplify the numerous information and communication need for such collaboration (Lipke, 2014). ICT also provides opportunities for individuals, healthcare providers and administrators to obtain information, communicate with professionals, deliver first-line support especially where distance is a critical factor and promote preventive medicine program (Mbarika, 2004). Hence, ICT has great potentials to improve communications among healthcare professionals and between patients in Jos University Teaching Hospital with e-health services such as mobile health, telemedicine, e-prescription, tele-consultation and many others.

All across the world, government are pledging, pooling more, and more of their resources towards developing ICT tools and systems with the ultimate aim of facilitating, management, streamlining surveillance and improving healthcare through better delivery of preventive and curative services (Burney, *et al,* 2010). ICT is regard as a basic tool towards the achievement of the Millennium Development Goals (MDGs) it is the health community's common responsibility to increase the implementation of e-health particularly in developing countries (WHO, 2006). There is also an expectation from users that healthcare services will become more affordable due to technology growth, and there is increasing evidence to justify this expectation as mobile health (m-health) is becoming more prevalent in many countries. Due to this advancement, health services are now offered beyond the boundaries of traditional hospital settings.

Imouokhome and Osubor (2012), states in their study that information and communication technologies are potential tools to the Nigerian healthcare delivery. The use of mobile phones in Nigeria is a great opportunity to adopt ICT tools by medical personnel to provide health services that would trigger development and improve people's lives. Their study therefore recommended that using ICT tools should be encouraged and supported in Nigeria to improve the preventive rather than curative medical practice. However, necessary infrastructures provided by telecommunication operators in Nigeria should be fully utilized as it will significantly increase rural community access to health services at a very low cost.

The role that ICT play in improving efficiencies and effectiveness of healthcare delivery has been well established. The use of ICTs is rather limited in healthcare particularly in developing countries where healthcare systems are mainly used for storage and transportation of textual information using stand-alone computers, some of the healthcare systems that have been developed include billing, financial systems, patient registration, computer based record systems and pharmacy systems. Most of laboratory and radiology equipments are now computerized and linked through data networks and telemedicine as well, as far as improving health education is concerned, ICTs are being used for sharing documents, stimulations of health scenario planning training, interactive environments and self-managed e-learning (Rwashana and Williams 2008).

2.7 Theoretical Framework

Many aspects of the functionalist approach to sociology are similar to those of other sociological approach (structural-conflict), but with particular emphasis on function, interdependence, consensus, equilibrium and evolutionary change. The functionalist

perspective is based largely on the works of Auguste Comte, Emile Durkheim, Herbert Spencer, Talcott Parsons and Robert Merton. They begin with the assumption that society, like a biological organism, is made up of different but interrelated parts which work together to stabilize the society. By analogy, the functionalist consider each component of the human body such as the heart, kidneys, lungs, liver and brains has a particular function to perform. The body as whole cannot survive unless each of these parts does its job, and none of the parts can survive except as a part of the whole body (Babbie, 2001). The basic unit of analysis to the functionalist is society and its various parts are understood primarily in terms of their relationship to the whole (Haralambos and Holborn, 2004). According to the functionalists, most important and basic factor making for social integration is value consensus.

This theory is applicable in explaining the use of ICT in healthcare delivery in JUTH, thus; the primary function of every healthcare system is the adaptation to the environment through the organization of people (health workers), institutions, and resources in order to ensure the provision of quality healthcare services to the patient and public. As noted by the World Health Organization (2016) hospitals need to be organized around people's needs, working closely with other health and social care services and contributing to strengthening primary health care and public health services, to substantially contribute to universal health coverage. As such, the health sector helps society to adapt the environment to its own needs. Consequently, healthcare providers must adapt to their environment through effective utilization of all available facilities (including ICT equipment) that will enhance quality healthcare delivery.

The theory is also applicable to this study as it emphasizes interrelationship and the interdependent nature of the various institutions within the society. From this premise, the health sector does not exist in isolation but rather, it depends on other sectors such as economy, political and as well, the ICT sector for quality healthcare to be achieved. Hence, the federal government and the hospital management must provide adequate ICT facilities for effective service delivery. This is because if ICT is integrated into the mainstream of healthcare, it well not only enhances effectiveness and efficiency in healthcare delivery but will lead to economic development in the nation's health institution and JUTH as well.

The functionalist particularly the work of Robert K Matorn, identified manifest and latent functions, in applying this to ICT utilization in healthcare delivery in JUTH. While the manifest functions of ICT utilization is to enhance health professionals in providing efficient and effective of healthcare delivery, the latent consequences are the challenges with the use of ICT equipment in healthcare delivery such as diagnostic errors, misinterpretation of data, and so forth.

Generally, functionalism is criticized for being unable to account for social change, or for structural contradictions and conflicts since it hold that changes occur through consensus. Giddens (2009) argues that functionalist explanations may all be rewritten as historical account of individual human actions and consequences. Therefore, the structural functionalist premise alone is not enough to help achieve all objectives of this study. While it is useful in establishing the fact that for quality health in JUTH there is a need for effective utilization of ICT facilities as the health sector depends on other institutions of the society for its survival, there was the need to further deploy another theory in seeking the achievement of objective one and two of this study. It is in the

light of the above that the study therefore deploys the premise of technological determinism theory.

Thorstein Veblen (1857-1929), coined the term ‘technological determinism’. He maintained that technology in any given society defines its nature. The first major elaboration of a technological determinist view came from Karl Marx, whose theoretical framework was grounded in the perspective that changes in technology, and specifically productive technology, are the primary influence on human social relations and organizational structure, and that social relations and cultural practices ultimately revolve around the technological and economic base of a given society. The basic assumption of the theory is that technological development and innovation is the principal motor of social, economic or political change (Macmillan, 2015). Technology is viewed as the driving force of culture in a society and it determines its course of history. The theory questions the degree to which human thought or action is influenced by technological factors, also assumed that characteristics inherent in technology manage the direction of its development and set conditions for social change. Technological determinism, simply put, is the idea that technology has important effects on human lives (Paul, 2006).

Langdon Winner (1986) further provided two hypotheses for this theory:

1. The technology of a given society is a fundamental influencer of the various ways in which a society exists.
2. Changes in technology are primary and most important source that leads to changes in the society.

Technological determinism has been asserted at several levels of analysis. At the broadest level, the theory has informed many analyses of changes in socio-economic configurations; the transition from feudalism to capitalism, changing occupational and

skill structure of the labour force in the 20th century, the emergence of post-industrialism in the post World War II era, the subsequent emergence of the "information society," "post-fordism," and globalization. For some, technological progress represents the promise of the gradual emancipation of humanity from the burdens of unnecessary sickness and labour. For others, this same path represents a loss of our very humanity, ensnaring us in ever more elaborate, alienating, and dangerous technological webs.

The theory is applicable to this study as clearly, any given technology's effects depend to some extent on the social context. The context will encourage or discourage the technology's adoption, and, if the technology is adopted, the social context will have important effects on how the technology is used and thus on its ultimate impact. Hence, the availability and effective utilization of ICT equipment in healthcare delivery will enhance quality healthcare in JUTH. However, absence or ineffective utilization of the equipment will affect the quality of healthcare delivery in the hospital. This is because when health professionals are not communicating effectively, patient safety is at risk for several reason including: lack of critical information, misinterpretation of information, unclear orders, lost of paper-based patient records, undue waiting time, and poor communication creates situations where medical errors can occur.

According to McLuhan (2012) changes in modes of communication shape human life, as such, changes in mode of communication between health professionals and patients from manual health records, manual diagnosis, manual prescription, and so forth, to electronic health applications such as e-prescription, e-radiology, e-consultation and tele-medicine, and others, has transformed healthcare delivery globally. Hence poor utilization of these equipment has effects on the quality of healthcare delivery such as undue waiting time, lose of patients health record, inaccurate diagnoses, clinical errors

and other challenges of healthcare delivery in any health institution including Jos University Teaching Hospital.

Critics of technological determinism including Mackenzie and Wajcman (1997) argued that technology never forces itself on members of the society. Man creates technology and chooses to use them. He invents television and chooses to view it. There is no imposition on the part of the technology to be used rather technology requires people to participate or involve themselves at some point or another to use a car or a microwave. The choice of using technology and experiencing its effects therefore lies in the hand of a human being. However, not withstanding it will be very unreasonable for a society to prefer to choose to use manual way of doing things against the use of technology.

Despite the criticism of the two theories (that is, functionalism and technological determinism), they were able to provide explanations and establish a relationship between quality healthcare delivery and effective utilization of ICT facilities in Jos University Teaching Hospital.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter outlines the detailed procedures adopted in this research and provides explanations on how to achieve the research goals. The methodology provides a detail and comprehensive description of how the required data was collected and analyzed. The chapter however includes the study location, sources of data, sample size and sampling technique, population of the study, method of data collection, study variables, method of data analysis and ethical consideration. These are to ensure the reliability and validity of finding in the study.

3.2 Location of Study

The study was carried out in Jos University Teaching Hospital, which is located at Lamingo, Jos North local government area of Plateau State. Plateau State is one of the 36 states in Nigeria. It is in the North-central region of the country and its capital, Jos, comprises mainly three of the 17 local government areas (Jos North, Jos South and Jos East) in the state with a population of about 836,910 according to the 2006-census report of the National Population Commission (NPC).

Jos University Teaching Hospital was established in 1975, it is a tertiary health institution providing medical services, research and training of medical students. The hospital has 31 departments, 7 clinics and 11 wards with 620 beds capacity for in-patient. It has staff population of 2,094 including, medical, para-medical and auxiliary staff in both the temporary and permanent sites (Field Survey, 2017). Thus, this research was conducted in Jos University Teaching Hospital because of the high concentration of health facilities, which has attracted patients even from outside the

state seeking medical attention, also as a teaching hospital the use of sophisticated technological gadgets within the hospital ease the use of ICT in healthcare delivery. Finally, the researcher's familiarity with the area is what influenced the choice of the location.

3.3 Sources of Data

The study used both primary and secondary sources of data to gather information. While the primary data were generated from in-depth interview, questionnaires and non-participant observation conducted with selected health professionals within the hospital, the secondary data was elicited from official records and documents from the hospital and the state ministry of health.

3.4 Methods of Data Collection

For this study, the necessary data were collected through the use of quantitative (survey questionnaire) and qualitative methods (in-depth interview and non-participant observation), as the study is concerned with a relatively large population. The choice of the two methods is to ensure the reliability of the data collected.

Quantitative method emphasizes the collection of mass data principally through survey and the application of sampling in selecting the respondents (Gyong, 2013). Chava (1992) opined that a survey design provides a qualitative description of trends, attitudes, or opinions of a population by studying a sample of that population. This methodology is being considered more appropriate for this study because opinion of a large number of health workers is needed to achieve the research objectives.

Data for this study were collected using a self-administered questionnaire, which was administered to healthcare professionals that are doctors, nurses, pharmacies, medical social workers, ICT workers, health record workers, radiologist, physiotherapist and medical lab scientists, through face to face distribution. The questionnaire contains both open-ended and close-ended questions on the roles of ICT on healthcare delivery in JUTH. The open-ended questions allow the respondents to freely express themselves, while, the close-ended questions provide respondents with options from which they selected. Also, the questionnaire was sub divided into five sections: A, B, C, D, and E. Section A, of the questionnaire focused on demographic/baseline characteristics of the respondents (i.e. gender, age, highest qualification acquired, profession and rank). Section B, address questions in regards to the availability of ICT in health facilities in JUTH; Section C, focused on the level of knowledge and utilization of ICT in healthcare delivery by health workers; Section D, focused on the prospects of ICT utilization in healthcare delivery, Section E, focused on the challenges of the utilization of ICT in healthcare delivery and suggestion on ways to enhance effective ICT utilization in the healthcare delivery in the study area. The answered questionnaires were returned to the researcher through hand-to-hand collection with the assistance of the unit heads.

Qualitative method involves the documentation of real events, recording what people say, observing specific behaviours, studying written documents and examining visual images. The qualitative technique of data collection in this study was the in-depth interview (IDI) and non-participant observation. The IDI guide contain a set of questions which was directed to eight health workers (that are doctors, nurses, pharmacies, medical laboratory scientists, physiotherapist, radiologist, medical social workers, ICT workers, and health record workers, who have been in the hospital for a

minimum period of ten years). What informed the choice of these groups of health workers is the fact they are directly involved in patient care and also their work experience as well as knowledge of ICT in healthcare delivery which enabled the researcher to get in-depth information that complement the data collected through the survey questionnaire. While the observation check-list contain sets of items that were observed in the course of the study, a camera was also used to document some of these ICT equipment observed during the study in order to confirm the availability and use of the facilities, as well as the category of health workers who use these facilities in JUTH.

3.5 Population of Study

The study population comprises of all health professionals that are doctors, nurses, medical laboratory scientists, pharmacists, health record officers, radiologists, physiotherapists, hospital ICT staff and medical social workers in Jos University Teaching Hospital. What informed the choice of this population is the fact that they are directly involved in patient care.

3.6 Inclusion and Exclusion Criteria

In this study, the hospital workers that were included are the medical doctors, nurses, pharmacists, physiotherapists, radiologists, medical laboratory scientists, medical social workers, ICT staff, and health records workers. In addition, health workers who have consented or agreed to participate in the study were included.

However, health workers who do not consented or disagreed to participate in the study were excluded. Also, other hospital workers that are administrative staff, accountants, maintenance workers, security personnel, attendants, students on internship and members of National Youth Serves Corps (N.Y.S.C) were excluded in the study.

3.7 Sampling Techniques and Sampling Size

The study used both the probability and non-probability sampling techniques respectively. For probability sampling technique, the stratified and systematic sampling methods were used to select respondents for quantitative data, while the non-probability sampling technique was purposive sampling for the qualitative data. Stratified sampling is a form of sampling in which the population is divided into two or more groups/strata according to one or more common attributes. This method was considered more appropriate because it gives every member of the population equal chance of being selected and opinion of different groups of health workers was required for the study. In applying the stratified sampling technique, health professionals in Jos University Teaching Hospital were stratified into their various areas of profession as presented in table 3.7.1.

Table 3.7.1: Population of Healthcare Professionals in JUTH as at July 2017.

S/no	Staff Profession	No. of Staff
1	Doctors	467
2	Nurses	529
3	Pharmacist	30
4	Laboratory Scientist	163
5	ICT Workers	7
6	Medical Social Workers	16
7	Radiologist	20
8	Health Record Workers	84
9	Physiotherapist	19
Total		**1335**

Source: Information Unit JUTH, 2017

The Yamane (1967) formula is used to determine the sample size of this study.

$$n = \frac{N}{1 + N(e^2)}$$

Where:

"n" is the sample size

"N" is the total population

"e" is the level of precision (±5%)

$$n = \frac{1335}{1 + 1335\ (0.05)^2}$$

$$n = \frac{1335}{1 + 1335\ (0.0025)}$$

$$n = \frac{1335}{1 + 3.3375}$$

$$n = \frac{1335}{4.3375}$$

$n = 307.78$

$n = 308$

Based on the formula, the sample size for the study is 308 respondents.

Proportionate percentage formula was used across each stratum, this is to ensure that the health professionals had equal chance of participation in the study.

The formula for proportionate percentage:

$$\text{Proportionate Percentage} = \frac{\text{Sample Size}}{\text{Population}} \times 100\%$$

$$= \frac{308}{1335} \times 100\% = 23\%$$

$$= 23\%$$

Based on the formula, the proportionate percentage of the study is 23%. Furthermore, the formula was use to determine the sample size of each group of professionals according to their department in Jos University Teaching Hospital.

Table 3.7.2 the Population and Sample Size of Different Healthcare Professionals in JUTH

S/N	Departments	No. of Professionals	Sample Size (23%)
2	Anesthesia	28	6
3	Surgery	81	19
4	Community Health	28	6
5	Ophthalmology	19	4
6	Psychiatric	24	6
7	Hematology	44	10
8	Medicine	59	14
9	Obstetrics and Gynecology	68	16
10	Family Medicine	31	7
11	Pediatrics	20	5
12	Orthopedic and Trauma	29	7
13	Dental and maxillofacial	32	7
14	ENT (Ear, Nose and Throat)	28	6
15	Chemical Pathology	28	6
16	Dietetics	20	5
17	Health Records	84	19
18	ICT Unit	7	2
19	Medical Social Workers	16	4
20	Nursing Services	529	122
21	Pharmacy	30	7
22	Histopathology	38	9
23	Radiology	20	5
24	Physiotherapy	19	4
25	Microbiology	53	12
Total		**1335**	**308**

Systematic sampling technique, which is a probability sampling method, was further adopted to select respondents for the study. This technique was considered more appropriate in selecting the respondents due to the fact that the hospital system and the nature of the job of the respondents which include shifting, call duty, posting, and some professionals attending to patients or in the surgical room, thus it makes the final selection of doctors and nurses difficult in the hospital. Nevertheless, since these groups of health professionals constitute a significant number of the study population that will give adequate information for the study. Hence, the questionnaires were administered in the morning to those who were in morning shift by 8am and in the afternoon to those who were in afternoon shift by 3pm. The first professional that

resumes office was sampled, the second professional was skipped, while the third professional was sampled. Thus, the interval of one professional was observed before the next was selected, this was done until the sample size was completed.

For the qualitative method (in-depth interview), purposive sampling technique was adopted to elicit information from eight key informant. These key informants however included head of departments or health workers assign by the head of department (who were doctors, nurses, health record workers, medical laboratory scientists, physiotherapists, radiologists, ICT staff, medical social workers and pharmacist from JUTH). This category of health professionals were selected because of their knowledge and experience on the utilization of ICT in healthcare delivery in JUTH.

3.8 Methods of Data Analysis

Data collected from the field through survey questionnaire went through the process of data cleaning in order to minimize errors, coding was done. Inspection of the coded data was done to ensure coding accuracy after which the data was analyzed using statistical packages for social sciences (SPSS) version 21. Findings were presented in tables, frequencies and percentages. Furthermore, a bivariate analysis of the variables involve were done specifically, the independent variable (ICT utilization) was cross tablulated against the main dependent variable (healthcare delivery) in other to ascertain the effect of one upon the other.

For the qualitative components of the study, data from the in-depth interview and observation were presented in narrative form after it was transcribed from tape recorder and camera to a written format. Furthermore, data from the qualitative method was synergize with data obtain from quantitative method in the area where necessary, with the aim of identifying the point of convergence or divergence of the two methods.

3.9 Challenges Encountered in the Field

There was a little delay in commencing the fieldwork as the hospital ethics committee insisted that the researcher must provide the research proposal for ethical approval before the researcher could start data collection. Even after obtaining the ethical clearance, getting the number of health workers was a task as the hospital information unit does not have the number of health workers distributed among departments/units and wards. The researcher had to go to each unit/department to obtain the number of health workers.

Financially, the hospital ethical committee required the researcher to pay certain amount of money for the ethical clearance. Also, the researcher was asked to produce 12 copies of the research proposal and was made to defend the proposal before the ethical committee. However, with help from friends after some weeks the researcher was able to raise the money for the ethical clearance and produced the copies of proposal.

It was also difficult to book interview appointment with the unit heads and other key informants, due to their busy schedules. The researcher had to deal with many re-scheduling issues, as some of these appointment were booked weeks in advance.

However, despite the challenges, the researcher was able to overcome the difficulties and successfully completed the entire process of data collection.

3.10 Ethical Clearance

Approval for carrying out the research was obtained from Research and Ethics Committee of the Jos University Teaching Hospital. All participants were provided with clear information and asked if they would be willing to participate or not. Only

those who were willing to participate were involved and written consent was obtained. All information obtained for the study was treated with utmost confidentiality and the names of the respondents were not required in order to ensure anonymity.

CHAPTER FOUR

ANALYSES AND INTERPRETATION OF DATA

4.1 Introduction

This chapter is concerned with the presentation, analysis and interpretation of data gathered from the field through survey questionnaire, in-depth interview (IDI) and observation in Jos University Teaching Hospital. Although 308 respondents were sampled, the data analyzed were based on 293 questionnaires retrieved from the field and are presented according to the study objectives.

Table 4.2.1 Socio-Demographic Characteristics of Respondents

SEX	**Frequency**	**Percentage (%)**
Male	135	46.1%
Female	158	53.9%
Total	**293**	**100%**
AGE		
Below 25 years	2	0.7%
26-30	26	8.9%
31-35	41	14%
36-40	69	23.5%
41 and above	155	52.9%
Total	**293**	**100%**
MARITAL STATUS		
Single	73	24.9%
Married	201	68.6%
Widow/widower	18	6.1%
Divorce	1	0.3%
Total	**293**	**100%**
HIGHEST QUALIFICATION ACQUIRED		
No response	1	0.3%
OND	12	4.1%
MBBS/B.Sc./HND	193	65.9%
Masters	26	8.9%
PGD and above	37	12.6%
Others	24	8.2%
Total	**293**	**100%**
PROFESSION		
Doctors	104	35.5%
Nurses	113	38.6%
Laboratory Scientist	34	11.6%
Pharmacist	7	2.4%
Others	35	11.9%
Total	**293**	**100%**

Table 4.2.1 shows that among the participants, 135 (46.1%) were male and 158 (53.9%) were females. This implies that both male and female health worker were fully represented in the study. However, there were more female respondents than the male respondents. Regarding the age distribution of respondents, majority of the respondents 155 (52.9%) were forty-one years and above, followed by 69 (23.5%) were between thirty six to forty years of age, 41 (14%) of the respondents were between thirty-one and thirty-five years, 26 (8.9%) were twenty six and thirty years, while 2 (0.7%) were below twenty five years. The table also shows that majority of the respondents who participated in the study, 201 (68.6%) were married, while 73 (24.9%) were single, 18 (6.1%) of the respondents were widows/widower and one person (0.3%) was divorced. This can be attributed to the fact that majority of the respondents were within the age range 36-41years and above and it is believed that most people of this age categories were usually married. Also, regarding the religious affiliation of respondents, 266 (90.8%) of the respondents were of the Christian faith, while 26 (8.9%) practiced Islam, and only 1 (0.3%) was identified as a Traditionalist.

Concerning the academic qualification of the respondents, the table (4.2.1) shows that 193 (65.9%) of the respondents were MBBS, B.Sc. or HND graduates, 26 (8.9%) were masters degree holders, 37 (12.6%) were PGD holders, while 24 (8.2%) of the respondents posses other qualifications relevant to their areas of specialty which include PhD. The table also indicates that significant number of the health professionals who participated in the study were 113 (38.6%) nurses, closely followed were 104 (35.5%) doctors, while 34 (11.6%) were laboratory scientists, 7 (2.4%) were pharmacists, while other health professionals that are radiographers, physiotherapist, health record officers, ICT workers, and medical social workers constitute 11.9% of the

participants. This can be attributed to the fact that it is expected that majority of the health professionals in JUTH as at the time of this study were doctors and nurses.

4.3 The Availability of ICT facilities in JUTH

This section investigates the availability of ICT facilities in Jos University Teaching Hospital. The main variable of interest is the relationship between quality healthcare delivery and ICT utilization. Results of this study show that 96.1% of the respondents agreed that ICT facilities were available in JUTH. It was also observed during the study that virtually all units, clinics, departments, wards and offices in the hospital were equipped with different types of ICT facilities including computers, telephones, anesthetic machine, computerized tomography (CT) scan, magnetic resonance imaging (MRI), endoscopy, ultrasound machine, electronic stimulator, and most health workers were seen using different types of mobile phones etc.

Finding from this study indicated that 97.7% of the respondents agreed that there exist a relationship between quality healthcare delivery and the utilization of information and technology facilities. This view was corroborated by an IDI report where a Chief Radiologist stated that:

> Yes, there is a relationship between ICT and quality health service, in fact, the relationship is a positive one, this is because without equipment like CT scan, MRI, X-ray, ECG, CR, ultrasound machine, etc. some health conditions are impossible to ascertain. It also provides for faster and accurate health services. In fact, I can't imagine my profession without the help of these technologies.

Supporting this view, a Chief Nursing Officer in the medical outpatient department (MOPD) agreed that a relationship exist between ICT utilization and quality health delivery. She stated that:

> As health professionals, we depend on some of these ICT equipment in order to save the lives of our patients. So I strongly agree that there is a relationship between ICT and quality healthcare delivery. She further states in strong words: look, quality healthcare cannot be achieved without the use of ICT gadgets.

This finding shows that ICT utilization plays a significant role in the achievement of quality healthcare delivery in JUTH. Aside from the fact that ICT gadgets facilities communication among the health professionals, it enhances quality healthcare delivery and help reduce many clinical challenges such as overcrowding in the hospital, medical errors, undue waiting time, and so forth.

Table 4.3.1 Distribution of Respondent's Perception on the Relationship between ICT Utilization and Healthcare Delivery

Response	**Frequency**	**Percentage (%)**
The more the use of ICT, the better the quality of healthcare delivery	54	18.4%
ICT provides for timely and accurate diagnoses and treatment	62	21.1%
ICT facilitates communication and improve collaboration among professionals	96	32.8%
ICT enhance efficiency and reliability of health service delivery	34	11.6%
ICT enhance proper documentation and easy accessibility of information	43	14.7%
No response	4	1.4%
Total	**293**	**100%**

Table 4.3.1 presents different perceptions of respondents on the relationship between quality healthcare delivery and the utilization of ICT equipment. The table shows that 96 (32.8%) of the respondents were of the view that, the utilization of ICT equipment ease communication between the patient and caregiver, and improve collaboration among health professionals. This view was supported by a Consultant in community medicine department, who was much excited in expressing his view on the relationship between quality healthcare and ICT utilization. He stated that:

> Honestly, without good communication and collaboration among us, there will be no quality health services. In addition, ICTs enhance such collaboration and easy referrals as well. We also

> use our mobile devices for counseling sessions which makes communication with clients (patients) easier and convenient.

Again, 62 (21.1%) of the participants were of the view that ICT provides for timely and accurate diagnoses and treatment. Supporting this view, a Chief Radiologist stated that:

> ICT ensure that the true state of the patient's health is presented during investigation and results are timely. For instance, if a digitizer is made available for the radiologist, he can report the X-ray results anywhere in the hospital within minutes of investigation. Other equipment such as Endoscopy, Echo, ECG, MRI, CT uses computer and patient's results are accurate and timely.

Also, 54 (18.4%) of the respondents were of the view that the more the use of ICT, the better the quality of healthcare delivery. This view was supported by a key informant stating that *"the use of ICT enhance quality healthcare delivery"*. Specifically, a Pharmacist stated that:

> The use of ICT enhances quality health service, reports of laboratory investigations, including hematology and clinical pharmacology could be accessed in the clinics, wards and theaters without much stress. That is why our health system cannot be compared to that of the 'outside world' because we do not use such facilities here.

Another 43 (14.7%) of the respondents were of view that ICT enhance proper documentation and easy accessibility of health information. This view was corroborated by a Health Records Officer who stated that:

> When patient's medical history is properly documented, it is always very easy to retrieve patient's case files and refer the patient to the appropriate consultant for further treatment. Also, when patient's record is properly documented it avoids multiple test investigations as the information is on-line, so retrieval of previous management records is very easy.

Table 4.3.1 further indicated that 34 (11.6%) of the respondents were of the view that ICT enhance efficiency and reliability of health delivery. The IDI results also found

that all the respondents agreed to the fact that ICT enhances efficiency and reliability of healthcare delivery. Supporting this view, a Pharmacist stated:

> Using ICT in health delivery enhances reliability of services, as the health professional is very sure of the case before him.

A Medical Social Worker also supported the view when she stated that:

> ICT is very important for healthcare delivery and practice. Being able to communicate with patients and having access to information about patient care enhance efficiency and reliability. You will be able to make information available to patients themselves, because most of our patients do not feel comfortable disclosing their situations to even us – ICTs certainly helps with patient management.

The finding shows that majority of the respondents who participated in this study identified divergent views on the important roles that ICT plays in enhance quality healthcare delivery in JUTH. The implication of the finding is that ICT facilities are inevitable in every health institution and for quality health service delivery to be achieved, health professionals must effectively utilize the e-health facilities.

Table 4.3.2 Respondent's View on the Available ICT Facilities in JUTH

ICT Equipments	**Yes**	**No**	**No Response**	**Total**
Computers	286 (97.6%)	7 (2.4%)	0	**293 (100%)**
Mobile phone/Telephone	289 (98.6%)	4 (1.4%)	0	**293 (100%)**
Ultra Sounds Machines	185 (63.1%)	107 (36.6%)	1 (0.3%)	**293 (100%)**
Incubators	226 (77.1%)	31 (10.6%)	36 (12.3%)	**293 (100%)**
Echocardiography Machines	153 (52.2%)	129 (44.0%)	11 (3.8%)	**293 (100%)**
Internet	59 (20.1%)	213 (72.7%)	21 (7.2%)	**293 (100%)**
Cardiac Monitors	178 (60.8%)	107 (27.2%)	8 (2.7%)	**293 (100%)**
Defibrillator	241 (82.3%)	42 (14.3%)	10 (3.4%)	**293 (100%)**
MRI	215 (73.3%)	50 (17.1%)	28 (9.6%)	**293 (100%)**
Others (CT Scan)	267 (91.2%)	25 (8.5%)	1 (0.3%)	**293 (100%)**

Table 4.3.2 shows that majority of the respondents indicated that ICT facilities were available in JUTH. Several types of ICTs were observed to be available in the hospital these include different computers (desktops, laptops, etc.), some respondents mentioned

cell phones, iPhones, emails, and social media. Other facilities like X-ray machine, electronic stimulator, iontophoresis, and so forth. were also reported to be available in the hospital. During IDI report, the Head of Department ICT Unit stated that:

> We have more than 200 working computers including desktops and laptops, there are plans to make internet available which will connect all the staff and all units within the hospital. At present, the hospital employs the use of e-radiology and e-pharmacy. The emergency care and intensive care units are well equipped with modern facilities and theaters as well. We have CCT cameras everywhere in the hospital to monitor every activity within the hospital. We also use electronic presentations (projectors) for teaching. These are some few ICT facilities I can identify.

Contributions of other respondents varied with their job descriptions. For instance, the Health Record Officer stated that:

> The only ICT available to us are only five laptop computers and our mobile phones. Although, the 'Secret Unit' uses more sophisticated technologies for surveillance and monitoring.

It was, observed that some health record officers in the secret unit were using computers (desktop and laptop) to document patient information and several computers were seen in some card collection point within the hospital. However, it was observed throughout the study period that no patient was seen been attend to using this facilities (laptop or computer) rather, all patients were seen with cards and papers containing either their test results or prescription.

In the same vein, a Medical Social Work stated that:

> There are different types of ICT facilities in the hospital, but only laptop and desktop computers are available to us. We also use our mobile devices for making calls, checking emails and other social media.

Although this view was opposed by 4.9% of the respondents who disagreed that, there were no ICT equipment in the hospital. Confirming to this view, a Chief Laboratory Scientist in hematology department stated that:

> We don't have ICT in this department. We can only claim to have a particular gadget when it is in a proper working condition and can be used without stress. But what we have here cannot communicate with other professionals within the hospital. We need a constant electricity supply and without this ICT cannot work, so it is as good as not having the equipment at all.

However, it was observed that three working computers (desktop) were present in the department and virtually all the health workers there were seen using different types of mobile phones, which was believed that these gadgets can enhance communication with other departments within and even outside the hospital. It was also observed that during the study period, which lasted for almost two months, there was constant electricity in the hospital, which prompted a chat with the Head of Section (HOS) Electrical and Installation, who further clarified that:

> We have three source of electricity in the hospital, NESCO (Nigeria Electricity Service Company), NEPA (Jos electricity distribution company) and two (1500 KVA) Cummis generators that supply the hospital and also three standby generators (200 KVA at the admin department and 200 KVA at radiology). Some department make request for generator to be on even when there is NEPA light because equipment like MRI and CT scan don't have back-up (UPS) and light is also needed during surgery. When there is light problem within the hospital, we immediately ratify such problems. So for now I can boast that we are supplying light 24 hours in the hospital except for other reasons.

The plate below shows the generators that complement the two electricity distribution company that supply electricity to JUTH.

Plate 1: Electricity generator in JUTH

The above finding shows that basic ICT facilities (such as computers and telephone, and so forth) were available in JUTH. This can be attributed to the fact that the hospital is a tertiary health institution as well as a federal university teaching hospital, hence it is expected that sophisticated gadget will be available. It was found that there was constant electricity supply in the hospital. However, the finding also shows that some health professionals do not utilize the facilities due to the claim that the facilities were not in a proper working conditions and there was no internet connectivity to enhance communication among health professionals within the hospital.

Further investigation on the working condition of the available facilities shows that 63.4% of the respondents agreed that the ICT facilities in the hospital were in proper working condition. Supporting this claim, Assistant Director Physiotherapy during IDI insisted that virtually all ICT facilities *"electronic stimulator, X-ray machine, ECG, CT scan, etc."* in the hospital were in good working condition. He stated:

> I am confident that all the equipment in this department and the hospital are in good working condition and we make use of these facilities when the need arise. Although we do not have internet connectivity here, but we use our mobile devices to communicate with fellow professionals either through social media or we make calls. We sometimes call our clients (patients) or their guidance when the need arise.

A Consultant, a Chief Nursing Officer and a Pharmacist also shared similar view of the facilities being in a good working condition stating, *"All equipment available to us are in good working condition".* The Consultant further stated that:

> Although power supply (electricity) is, a problem but we have generator in the hospital. Aside that, all other facilities available to us are perfectly working, and we use them when the need arise without stress.

However, 32.7% of the respondents objected that the available ICT facilities in JUTH were not in a proper working condition. During IDI, a Chief Radiologist reluctantly responded to the working condition of ICT equipment in the hospital. He stated

> As you can see, I keep all the ICT gadgets aside (a desktop computer and a telephone) because they are blocking my space, the facilities are only for decoration. He lamented on the poor state of some of the facilities and emphasized that: The poor state of these facilities is as a result of poor maintenance culture and lack of vision. How can you make use of a computer without internet connections.

Supporting this claim, A Health Record Officer also insisted that the ICT facilities in the hospital were not in a proper working condition. She stated that:

> I don't know for other departments, but here in records, ICT facilities are not working at all... yes, my mobile phone and all these laptop computers are working. But proper working condition is when you can at least make 60% use of the equipments, and honestly we don't make up to 30% use of ICT here.

This view was also supported by an observation where some ICT equipment were not used due to reasons ranging from lack of internet access and lack of maintenance. The

plates below show ICT facilities that were in proper working condition and some that were not in a proper working condition.

Plate 3: Working ICT equipment

Plate 4: Abandoned ICT equipment

The implication of this finding is that the effective utilization of ICT equipment to enhance quality healthcare delivery in JUTH cannot be achieved since some of the facilities were not in proper working condition. The finding also shows that the lack of internet connectivity in the hospital hinders efficient utilization of the available ICT gadgets as they cannot be used to communicate with other health professionals within the hospital, it also affect communication between the patient and the caregiver.

Table 4.3.3 Respondent's View on how often ICT facilities were maintained in JUTH

Response	**Frequency**	**Percentage (%)**
Weekly	5	1.7%
Monthly	3	1.0%
Others (when they are faulty)	283	96.6%
No response	2	0.7%
Total	**293**	**100%**

Table 4.3.3 indicated that 283 (96.6%) of the respondents viewed that ICT facilities were maintained only when they are faulty. Report from key informants also revealed that all the respondents shared similar views on how often maintenance is carried ICT equipment in the hospital. Stating that: *"maintenance is done only when the equipment were faulty,"* supporting this view, the HOD ICT unit further stated:

> Some of the facilities were serviced on a regular basis, but general maintenance of all equipments in the hospital were done when they facilities were faulty.

Further finding on who was responsible for the provision of ICT facilities in JUTH shows that majority of the respondents 79.6% indicated that the Federal government of Nigeria provides ICT equipment in the hospital. In addition, 19.4% identified the hospital management as the provider of the equipment. This is no doubt that the federal government is responsible for the provision of facilities in the hospital because the hospital is a federal government owned tertiary health institution.

Table 4.3.4 Respondent's View on who is Responsible for the Maintenance of ICT Facilities in JUTH

Response	**Frequency**	**Percentage (%)**
Federal government	5	1.7%
Others (hospital management)	286	97.6%
No response	2	0.7%
Total	**293**	**100%**

Table 4.3.4 indicated that 286 (97.6%) respondents identified the hospital management as being responsible for the maintenance of ICT facilities in JUTH. The HOD ICT unit further stated that:

> The hospital management is responsible for the maintenance of facilities. The hospital has a 'Works Department', which is in-charge of repairs and maintenance of all equipment in the hospital. In the unit, there are electricians, computer engineers, mechanics, plumbers, etc. although sometimes we seek for experts outside the maintenance unit but it is the hospital management that takes such responsibility.

This view was supported by the HOS Electrical and Installation who said that:

> We are all professionals in this department and we are in-charge of all repairs and maintenance in this hospital, there is no fault that a gadget will develop that we can't handle in this unit. But they (hospital management) usually invite some technicians (their relations and friends) outside to come and maintain the facilities, which usually take long period of time. That is why most of these equipment are not in a good working condition.

It is a fact that for effective utilization of electronic health services, all ICT equipment must be available and should be in a proper working condition. However, the above finding shows that some ICT equipment in JUTH were poorly maintained and were not a good working condition therefore, effective utilization of these facilities in healthcare delivery in JUTH cannot be achieved since most of the facilities were poorly maintained.

Furthermore, the study also shows that 90% respondents indicated that they were not satisfied with the available of ICT infrastructure in JUTH, this view was supported by all IDI respondents. A Chief Radiologist stated that:

> I am not satisfied with the available of ICT equipment here due to lack of prompt maintenance of old facilities and we need internet connectivity. We also need the latest version of these facilities.

This finding indicated that the health professionals in JUTH are not satisfied with the available facilities in the hospital. The implication of this finding is that quality healthcare cannot be achieved through the use of ICT gadgets in JUTH, this is for the fact that workers motivation and the availability of basic tools (ICT equipment) rise efficiency and job satisfaction in every organization, which is a problem in JUTH.

Table 4.3.5: Respondent's perceptions on the State of ICT Facilities in JUTH

Response	Frequency	Percentage (%)
The available ICT facilities do not meet international standard	66	22.5%
More ICT equipment are required to give better healthcare delivery	130	44.3%
There is delay in responds to breakdown of the ICT equipment in the hospital	32	10.9%
Most of the facilities are not in good working condition	29	9.9%
Erratic power supply	11	3.8%
No enough manpower to make good use of the available equipment	14	4.8%
No response	11	3.8%
Total	**293**	**100%**

Table 4.3.5 indicated that 130 (44.3%) respondents stated that more ICT equipment are required to give better healthcare delivery in JUTH. A Chief Nursing Officer further explained that:

> I can't say the available facilities are not effective. But if it were to be that all professionals in this unit have access to m-health (mobile health) for instance, I think counseling sessions would have been made easier, more convenient, and our patients would benefit from them.

The table indicated that 66 (22.5%) respondents were of the view that the available ICT facilities in the hospital do not meet international standard. 32 (10.9%) respondents were of the view that there is delay in responds to breakdown of the ICT equipment in the hospital. Also, 29 (9.9%) of the respondents were of the view that most of the facilities were not in good working condition. 14 (4.8%) respondents were of the view that the hospital lacks enough work force to make good use of the available ICT equipment.

The findings above shows for quality healthcare to be achieved in JUTH through the utilization of e-health facilities, more ICT facilities such as constant electricity supply, modern e-health equipment and labour force are required to enhance effective use of e-

health applications and facilities such as electronic health records, e-radiology, tele-consultation, and so forth.

4.4 Level of Knowledge and Utilization of ICT in Healthcare Delivery by the Healthcare Providers

This section examined the level of ICT knowledge of the respondents and the utilization of ICT in healthcare delivery in Jos University Teaching Hospital. Findings of this study indicated that majority 97.7% of the respondents were found to be computer literate. In addition, all the respondents during in-depth interview reported to be ICT literate. This implies that almost all of the health professionals who participated in this were computer literate and understood the concept of electronic health system.

Table 4.4.1: Respondents Rating of ICT Literacy among Health Workers in JUTH

Response	Frequency	Percentage (%)
Very high	40	13.6%
High	120	41.0%
Moderate	113	38.6%
Low	3	1.0%
Very low	2	0.7%
No response	15	5.1%
Total	**293**	**100%**

Table 4.4.1 shows that 113 (38.6%) respondents rated ICT literacy to be moderate among health workers in JUTH and, 120 (41.0) of the respondents, rated ICT literacy among health workers high. This implies that a significant number of health workers in JUTH are computer literate and can effectively utilize ICT facilities in healthcare delivery. This was supported by IDI report where the HOD ICT unit stated that:

> I will rate them (health professionals) very high on ICT literacy. I believe that all health professionals in this hospital are ICT literate, in fact, even ward attendants, cleaners and security personnel can use their phones to make call. Some of them chat on whatsapp, facebook and other social media networks.

This finding can be attributed to the fact that the society is fast becoming a global village where most people are utilizing ICT gadgets for communication with family, friends and even for businesses, etc.

Further finding of this study indicated that 83.2% respondents agreed that the available ICT facilities in JUTH were used for the purpose of healthcare delivery. This view was supported by a Chief Nursing Officer who stated that:

> We used all the equipment for health purpose. I also used my handset and laptop for health purpose even when I am at home to communicate with colleagues and sometimes communicate with patients.

Although, 7.8% of the respondents disagreed that most of the facilities were not used for health purpose. Corroborating this view, most respondents during IDI lamented poor utilization of ICT facilities in healthcare delivery in JUTH. The HOD ICT Unit stated that:

> Some of the facilities are redundant and out of use due to poor maintenance. Most of the facilities are not fully utilized for health purpose that they are meant for.

This view was also supported by a Chief Laboratory Scientist who mentioned that lack of supporting gadgets (internet connection) is the reason for the poor utilization of ICT for health delivery in JUTH. He further stated that:

> Most of the facilities you see around are not efficiently utilized for the purpose that they were meant for (healthcare delivery). Instead of forwarding test results to consultants or other health professionals directly using the computer, the patient is forced to come back for his/her test results, which are paper based. These results are most times missing which is another problem to the patient. And we have computers on every desk in the hospital but we don't have other supporting gadgets that will enhance effective e-health services.

This finding implies that some of the available ICT facilities in JUTH were not efficiently utilized for healthcare delivery. This is because some facilities that will

enable effective e-health utilization (internet for instance) were reported not available in JUTH.

Table 4.4.2 Profession by How Often Respondent's Utilized ICT Equipments in Healthcare Delivery in JUTH

Profession	How Often Respondents Utilize ICT Facilities for Healthcare Delivery in JUTH				
	No response	Always	Sometimes	Not at all	Total
Doctors	9 (3.1%)	44 (15.0%)	39 (13.3%)	12 (4.0%)	**104 (35.4%)**
Nurses	2 (0.7%)	42 (14.3%)	41 (13.9%)	28 (9.6%)	**113 (38.5%)**
Lab. Scientist	5 (1.7%)	8 (2.7%)	4 (1.4%)	17 (5.8%)	**34 (11.6%)**
Pharmacists	0	7 (2.4%)	0	0	**7 (2.4%)**
Others	9 (3.1%)	10 (3.4%)	3 (1.0%)	13 (4.4%)	**35 (11.9%)**
Total					**293 (100%)**

Table 4.4.2 indicated the cross tabulation of respondents profession by how often they utilized ICT facilities in healthcare delivery found that the nurses used ICT equipment for healthcare delivery more than other health professionals in JUTH, followed by doctors. This can be attributed to the fact that both the nurses and doctors frequently interact with patients more than other professionals in the hospital and the nature of their profession involves the use of ICT gadgets such as anesthetic machine, ultrasounds machine, cardiac monitor, electronic stimulator, defibrillators, computers, mobile phones, etc. for diagnoses, treatment and consultations.

In-depth interview further shows that all respondents who were Consultant, Chief Nursing Officer, Assistant Director Physiotherapy, Chief Radiologist and a Pharmacist admitted that they always utilized ICT equipment for healthcare delivery. The Assistant Director Physiotherapy further stated that:

> I always used electronic devices for diagnoses, research on current health issues and I always used my phone to communicate with clients (patients) and other health professionals. Although we do not utilize these facilities as we ought to. Because when you talk of electronic health, it means all aspects of healthcare is involved and not only diagnoses and

> phone calls with few patients and health workers who are your friends.

While other health workers interviewed during IDI claimed that, they have never used ICT for health delivery purpose. A Medical Social Worker stated,

> I sometimes use my mobile phone to communicate with colleagues. But I have never used the computer or any ICT equipment for healthcare delivery purpose.

In the same vein, a Chief Lab Scientist stated that:

> I have never used ICT facilities to communicate with patients or other health professionals in this hospital for health purpose. Although I sometimes used electronic devices for diagnoses but my results were reported on paper.

The above findings show that not all the health professionals in JUTH utilized ICT facilities for healthcare delivery. This can be attributed to the fact that most of the ICT facilities were available to some specific health professionals that are doctors, nurses, radiologists, physiotherapists and ICT workers in JUTH, while other health workers including Medical Social Workers, Lab. Scientist, Health Record Officers, Pharmacists, etc. have limited availability of ICT facilities in JUTH. The implication of this finding is that effective utilization of ICT in healthcare delivery cannot be achieved in JUTH when some health professionals were not utilizing the facilities. This is because for efficiency to be achieved, every health worker in the hospital must always utilize the ICT facilities in other to enhance quality healthcare delivery.

Table 4.4.3: Regularity of ICT Utilization at Various Stages of Patient Care in JUTH

Response	Frequent	Not frequent	Not at all	No response	Total
Diagnoses	252(86.0%)	31(10.6%)	0	10(3.4%)	**293(100%)**
Treatment	236(80.5%)	52(17.7%)	4(1.4%)	1(0.3%)	**293(100%)**
Prescription	143(48.8%)	91(31.1%)	59(20.1%)	0	**293(100%)**
Patient record	27(9.2%)	28(9.6%)	238(81.2%)	0	**293(100%)**
Track/monitor Patients	244(83.3%)	36(12.3%)	12(4.1%)	1(0.3%)	**293(100%)**
Disease surveillance	235(80.2%)	45(15.4%)	11(3.7%)	2(0.7%)	**293(100%)**
Rehabilitation	150(51.2%)	84(28.6%)	55(18.8%)	4(1.4%)	**293(100%)**
Others (collaboration/referral)	197(67.2%)	50(17.1%)	37(12.6%)	9(3.1%)	**293(100%)**

Table 4.4.3 shows that 252 (86.0%) respondents indicated that they frequently used ICT facilities for diagnoses in JUTH. A Chief Radiologist also supported this view stating that: *"we frequently used ICT gadget (ultra sound machine, ECG, MRI, CR, CT scan, etc.) for diagnoses".* Assistant Director Physiotherapy also stated that:

> We frequently utilized these facilities (electronic stimulator, etc.) for diagnoses and almost all our equipment here are electronic devices.

An observation during the study also confirmed that ICT facilities were frequently used in radiology and physiotherapy departments respectively for diagnoses. Some of the equipment are presented below.

Plate 5: A radiologist using CT scan for diagnosis

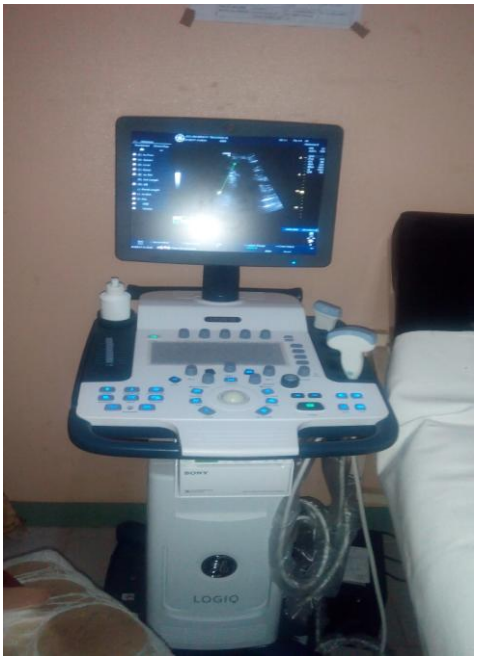


Plate 6: Ultrasounds machine

Table 4.4.3 further indicated that 236 (80.5%) respondents were of the view that ICT facilities were frequently used for treatments. 52 (17.7%) of the respondents agreed that ICT facilities were used for treatments but not frequently. This can be attributed to the fact that equipment like anesthetic machine, cardiac monitor, defibrillators, etc. were used for patient treatment.

Also, 143 (48.8%) of the respondents indicated that ICT facilities were frequently utilized for prescription in the hospital and 91 (31.1%) respondents indicated that ICT equipment were not frequently used for prescription in the hospital. Reports from IDI shows that most respondents stated that ICT facilities were used for prescription on special cases and not all patients enjoyed such services in the hospital. Supporting this view, Pharmacist stated that:

> We use ICTs for certain patients with particular or special case, especially for HIV patients. We have such patient's details in our systems, and with their patients ID, they can access us and we make prescription for them anywhere they are.

It was also observed during the study that all patients seen at the pharmacy unit were with paper based prescription and no pharmacist was seen attending to patients using the computer or any ICT gadget, although there were three desktop computers and a laptop present in the unit as at the time of this study.

Table 4.4.3 also shows that 238 (81.2%) of the respondents agreed that ICT facilities were frequently used in the hospital for patient records. 28 (9.6%) respondents agreed that ICT facilities were used in patient record but not frequent. This finding implies that most respondents claimed that ICT facilities were used for patient records in JUTH. However, report from IDI shows some disagreements on the utilization of ICT facilities for patient health records in JUTH. While the Consultant, Chief Nursing Officer, Physiotherapist, and a Chief Radiologist claimed that ICT facilities were used in recording patient's health information in the hospital. A Consultant stated:

> We utilized ICT in patient's records to document the patient's health information.

A Chief Radiologist further stated that:

> We have all details of our patient's saved in our systems here and this information can be accessed anywhere in the hospital, we also have results of patient's diagnoses on CD plates which the patient presents to the consultants for further treatment.

This view was however, rejected by other IDI respondents including the HOD ICT Unit, Medical Social Worker, Chief Lab. Scientist and Health Record Officer who stated that the hospital frequently used the traditional paper based health record system because there is no internet connection in the hospital that will enhance sharing of patient's health information between departments. The Health Record Officer also affirmed this view stating that:

> The utilization of ICT in patient record is called 'electronic health records' something that most record officers here do not know... we actually started using the electronic records system

> when we newly moved to this permanent site, but due to issues here and there including lack of internet connectivity we resolved to continue with our traditional paper-based records. Although we still document some cases in our computers but majority of patient's records in this hospital are written on papers for safekeeping and reference purpose.

Regarding this view, it was observed that only four laptop computers were present in the health record unit that was used to document patient's health information and seven desktop computers were abandoned at the health records library. While a significant number of the record officers were seen at the record's library searching for patients files and others were seen at different card collection units within the hospital issuing cards, test results and also informing the patients/significant others on how to receive care in the hospital. Although the process was observed to be very slow, as patients have to queue and wait for a very long period before the records officers could attend to them. It was also observed some cases of missing cards and misinterpretation of patient's information.

The above finding was also supported by the figure below that shows the health records library in JUTH and some health record officers searching for patient's record.

Plate 7: Health record's library

Plate 8: Health record officers Searching for patient's record

Table 4.4.3 further indicated that 244 (83.3%) of the respondent indicated that ICT facilities were frequently utilized to track and monitor patients in JUTH. 36 (12.3%) of the respondents indicated that ICT facilities were not frequently used in tracking and monitoring of patient's in the hospital. While 12 (4.1%) respondents indicated that ICT facilities were not utilized in track and monitoring patients in the hospital.

The study also revealed that 235 (80.2%) participants responded that ICT facilities were frequently utilized in disease surveillance JUTH. The result also indicated that 150 (51.2%) of the respondents indicates that ICT facilities were frequently utilized in patients rehabilitation in JUTH. The finding further indicated that 197 (67.2%) of the respondents indicates that ICT facilities were frequently utilized in other patient's patients care in the hospital including collaboration and referrals.

From the above findings, a significant number of respondents indicated that ICT facilities were frequently utilized at different stages of patients care in JUTH. However, the study also found that the ICT equipment were used only for certain special health conditions or patients. In addition, it was found that lack of internet connection hinder sharing of patient's health records between departments and health professionals in the hospital. The implication of this finding is that effective and efficient utilization of ICT in healthcare delivery cannot be achieved in JUTH because electronic healthcare delivery entails that all health professionals have access to ICT equipment and the patients as well are expected to have access to ICT facilities regardless of their health conditions or socio-economic status.

Table 4.4.4: Frequency of the Utilization of ICT Equipment in JUTH

Response	Frequent	Not frequent	Not at all	No response	Total
Computer (laptop/desktop)	248(84.6%)	41(14.0%)	4(1.4%)	0	**293(100%)**
Telephone/mobile phone	267(91.1%)	21(7.2%)	5(1.7%)	0	**293(100%)**
Internet	184(62.8%)	65(22.2%)	44(15.0%)	0	**293(100%)**
Incubators	192(65.5%)	21(7.2%)	73(24.9%)	7(2.4%)	**293(100%)**
Anesthetic Machines	230(78.5%)	36(12.3%)	12(4.1%)	15(5.1%)	**293(100%)**
Echocardiography Machines	189(64.5%)	8(2.7%)	84(28.7%)	12(4.1%)	**293(100%)**
Others (ultrasound)	272(92.8%)	15(5.1%)	3(1.0%)	3(1.0%)	**293(100%)**

Table 4.4.4 indicated that 248 (84.6%) of the respondents indicates that they frequently used the computer (desktop or laptop) in JUTH. The table also shows that 267 (91.1%) of the respondents indicates that they frequently used telephone or mobile phone in JUTH. Report from IDI also shows that all respondents agreed that telephones were frequently used in the hospital stating that: *"handset is what almost everybody has in this hospital."* Specifically, a Consultant stated that:

> I frequently used my mobile devices and laptop computer but not necessarily for healthcare delivery purpose and I believe that all health professionals have mobile phone which they used for communication.

Table 4.4.4 shows that 184 (62.8%) of the respondents indicates that they frequently used the internet in JUTH. Although IDI report revealed that most of the health workers used the internet on their mobile devices for social media and other internet access and not necessarily for the purpose of healthcare delivery in JUTH. The HOD ICT unit further stated that:

> Virtually all health professionals have different kinds of mobile device that allow them access to the internet. But we don't have internet facilities in this hospital that can allow communication between health professionals for healthcare purpose.

Table 4.4.4 also shows that a significant number of respondents indicated that they frequently used other ICT equipment such as incubators, anesthetic machine echocardiography machine, and ultrasound machine, etc. The implication is that most health workers in JUTH utilized the available ICT equipment for healthcare services in the hospital.

Further finding of this study indicated that 82.5% of the respondents agreed that the patients in JUTH accommodate the utilization of ICT facilities for healthcare delivery. In an interview with a male patient at the MOPD (medical outpatient department). He stated that:

> I would have preferred communicating with the consultant on phone or the social media or internet than coming to the hospital only for check-up. I think there are some handsets that health specialists have in developed countries, as well as their patients, with special software where the doctors can communicate with the patient from his/her home, without necessarily coming to the hospital. The problem is that there is no privacy, anybody can access your health information.

Supporting this view, a female patient at eye clinic said that she don't have a problem with health professionals using ICTs to attend to her. Stating that:

> I came to this hospital as early as 6am only to meet a long queue of patients. This is 9:25am and I am yet to see the doctor because it is not yet my turn. Assuming the hospital is using electronic health systems, I will communicate with them and know when I am supposed to come and see the doctor instead of spending the whole day here. Honestly, I do not have a problem with the hospital using ICTs to attend to my health problems. I think is a welcome development.

In-depth interview with health professionals further shows that the patients accommodate the utilization of ICT in healthcare delivery. HOD ICT Unit stated that:

> I don't think patients will reject the use of ICT facilities. For example, when we first introduced electronic payment and started using ATM machines in the hospitals, most patients and health workers count it as blessings as it reduce their stress of going up and down with money. So if we start the use of

> electronic health system, most patients will prefer using that medium instead of spending their time and money coming to the hospital every day.

A consultant further stated that:

> Yes, the patient's acceptance of ICT in healthcare is very high, although the patients usually don't have an option to what you use to administer treatment to them.

From the excerpts above, it is clear that the patients accommodate ICT utilization for healthcare delivery in JUTH. Although, the patients are usually striped of their status and in most situations do not have choice of the equipment to be used for diagnosis or treatment as the case may be. Electronic health applications and gadgets like m-health, e-pharmacy, electronic health record and so forth can enhance quality and timely healthcare delivery in JUTH.

Table 4.4.5: Respondent's view on whether ICT Utilization among Health Workers can Help Reduce Clinical Errors in JUTH

Response	Frequency	Percentage (%)
Agreed	129	44.0%
Strongly agreed	143	48.8%
Disagreed	9	3.1%
Strongly disagreed	5	1.7%
No response	7	2.4%
Total	**293**	**100%**

Table 4.4.5 indicated that 129 (44.0%) of the respondents agreed that ICT utilization can help reduce clinical errors. 143 (48.8%) of the respondents also strongly agreed that ICT utilization among health workers will reduce clinical errors in the hospital. Corroborating this view, IDI report shows that all participants strongly agreed that ICT utilization would help reduce clinical errors in the hospital. A Chief Radiologist stated that:

> ICT makes health delivery very fast which every patient need immediate attention. Do you know that many patients die because of wrong treatment procedures? But with proper

document of patient's health history you can easily prescribe and make recommendations.

Table 4.4.6: Respondent's Views on how the Use of ICT Facilities can reduce of Clinical Errors in JUTH

Response	Frequency	Percentage (%)
ICT facilitates accurate diagnoses	88	30.0%
Human errors are reduced to minimal with the use of ICT	54	18.4%
ICT help confirm the healthcare providers guess or direct the care provider	28	9.6%
ICT help to reduce time wastage	59	20.1%
Proper documentation reduce the likelihood of errors	52	17.7%
No response	12	4.1%
Total	**293**	**100%**

Table 4.4.6 shows that 88 (30.0%) respondents were of the view that ICT utilization can reduce clinical errors as it facilitates accurate diagnose. 54 (18.4%) respondents were of the view that human errors are reduced to minimal with the use of ICT. Also, 28 (9.6%) of the respondents were of the perceived that ICT help confirm the healthcare providers guess or direct the healthcare provider. The table further revealed that 59 (20.1%) of the respondents perceived that ICT help in reducing time wastage. This view was supported by a Consultant who stated that:

> Patient care is our primary goal and to be honest, there is mixed feeling among the patient due to the services that are being rendered by the hospitals. Patient has to go through long queues, some even travel from one hospital to another, which is a problem for the patient because their medical records are unmovable so they waste time and resource to conduct several tests. But you see with ICT a patient can access health care anywhere and at anytime. In fact many problems will be solved, the chance of survival will be high and there will be better service for the patient.

Table 4.4.6 also indicated that 52 (17.7%) respondents were of the view that enhances proper documentation and proper documentation reduces the likelihood of errors. A Chief Nursing Officer stated that:

> Most patients complain about time spent on queue waiting for their turn. Some complain about missing cards and files, others complain about lack of information and so on. However, this

> challenge can be reduced to the minimal when ICT equipment are effectively utilized.

A Health Record Officer further stated that:

> Patient's information at the moment is written on papers for safe keeping and reference purpose. It is a lot of work to access that kind of information because there are many of patient's files, and due to human errors, the files can be missing. There is a lot of risk involved in keeping vital information like that, although patient information is handled as discretely as possible and can only be shared if the patient permits the doctor. But with electronic health records only a tab on a button you can get the information you want.

The above finding shows that effective ICT utilization can help in reducing clinical errors. This is no doubt because clinical support tools such as electronic health records, mobile health (m-health), e-radiology has helped in reducing clinical challenges and errors as well.

4.5 Prospects of ICT Utilization in Healthcare Delivery

This section examines the respondents view on the prospects of ICT utilization in healthcare delivery in Jos University Teaching Hospital. The findings revealed that an overwhelming majority constituting 98.3% of the respondents agreed that ICT utilization in healthcare can bring about development in JUTH. Supporting this view, the HOD ICT Unit stated that:

> ICTs can contribute to the reduction of operating costs of clinical services through improvement in the way tasks are performed, by saving time and reduction in multiple handling of documents.

Supporting views, a Chief Nursing Officer stated:

> Well, utilizing ICT is a good idea and it will help the nurses and the doctors as well to perform their duties much better. Instead of the patient bringing paper notes as prescription, they can use the patient ID to check whatever information they need to know about their health. It will strengthen the organization and give more confidence to the people.

A Chief Radiologist further stated that:

> ICTs create easy access to information and information is power. The use of ICT will also boast internally generated revenue for the hospital.

Table 4.5.1: Respondent's Perception on the Aspects of Development ICT Utilization can bring in JUTH

Response	Frequency	Percentage (%)
ICT can enhance effective documentation of patients health records	101	34.5%
ICT can be used to ascertaining treatment compliance to patients	79	27.0%
ICT can be used in conducting disease surveillance	18	6.1%
ICT can be used to improve knowledge through education, training and continuing professional development	23	7.8%
It can be used to enhance quality and timely delivery of health services	64	21.8%
No response	8	2.7%
Total	**293**	**100%**

Table 4.5.1 shows the distribution of respondents perception on the aspects of development ICT utilization can bring in Jos University Teaching Hospital. 34.5% respondents perceived that ICT utilization in JUTH can enhance effective documentation of patient's health records. This corroborates with an IDI reports by Health Record Officer who stated that:

> Documentation of patient's health history is very important. Some patients can be allergic to some treatment conditions, so using ICT can ease access to a patient's information and errors can be avoided.

Table 4.5.1 shows that 79 (27.0%) respondents were of the view that effective ICT utilization can lead to the ascertainment of treatment compliance to patients in JUTH. 18 (6.1%) of the respondents viewed that ICT equipment can be used in conducting disease surveillance in JUTH. In addition, 23 (7.8%) respondents viewed that ICT can be used to improve knowledge through education, training and continuing professional development. The table further indicated that 64 (21.8%) respondents were of the view that ICT can be used to enhance quality and timely delivery of health services.

The above findings suggest that ICT facilities should be frequently utilized in the hospital to enhance rapid development not only in the aspect of healthcare delivery but socio-economic development as well. This is because effective ICT utilization has contributed to the development of many world economies for instance India, Australia, Canada, Denmark, and so on.

Table 4.5.2: Respondent's Perceptions on How ICT Utilization in Healthcare Delivery can Reduce Medical Challenges in JUTH

Response	**A F (%)**	**SA F (%)**	**D F (%)**	**SD F (%)**	**UN F (%)**	**Total**
Clinical errors	133(45.4%)	150(51.2%)	5(1.7%)	2(0.7%)	3(1.0%)	**293(100%)**
Waiting times and wastage	108(36.9%)	182(62.1%)	2(0.7%)	0	1(0.3%)	**293(100%)**
Loss of patient's medical record	124(42.3%)	167(57.0%)	1(0.3%)	1(0.3%)	0	**293(100%)**
Physical barriers (location)	181(61.8%)	108(36.9%)	3(1.0%)	1(0.3%)	0	**293(100%)**
Others (Referral)	217(74.0%)	33(11.3%)	19(6.5%)	17(5.8%)	7(2.4%)	**293(100%)**

Table 4.5.2 shows that 133 (45.4%) of the respondents agreed and 150 (51.2%) strongly agreed that ICT utilization can reduce clinical errors in JUTH. Clinical errors have been identified as one of the major challenges facing healthcare delivery worldwide however, effective utilization ICT facilities has over the years helped healthcare professionals to prevent some of these errors such as wrong diagnoses, wrong treatment procedures, undue waiting times for non-emergency cases, etc. Report from IDI further shows that all participants strongly agreed that ICT utilization would reduce clinical errors in the hospital. A Health Record Officer stated that:

> We currently have a case where two consultants were attending to a single patient because of improper documentation of the patient information. ICT utilization can help reduce this kind of challenge. There are also errors in waste disposal, errors in the diagnoses and interpretation of patient results.

Table 4.5.2 shows that 182 (62.1%) of the respondents strongly agreed that ICT utilization will reduce patient waiting time and wastage. It is facts that prompt medical

attention and care is an indicator of quality healthcare delivery of any health sector. It is also a fact that patients waiting time and wastage for non-emergency cases is among the major challenges facing healthcare delivery in Nigerian hospitals. Report from IDI revealed that most patients died because of this challenge. A Consultant further stated that:

> Every patient needs urgent care. People die of headache, you might think headache is a common sickness but in reality, what the patient might be surfing from is different. It is unfortunate that many sick people come to the hospital for help but end up dead because they could not access immediate care. We are not happy about this, but the truth is that the hospital lacks most of the facilities that will ensure quick response to both emergency and non-emergency cases.

Also, 167 (57.0%) of the respondents strongly agreed that ICT utilization can reduce loss of patient's medical records in JUTH. The table indicated that 181 (61.8%) respondents agreed that ICT utilization will reduced the challenges of physical barriers (location). The finding further shows that majority of the respondents agreed that ICT utilization will address other challenges including referrals, collaboration and communication in JUTH.

Table 4.5.3: Distribution of Respondent's views on the Potential benefits of ICT literacy among Health Workers in JUTH

Response	**Frequency**	**Percentage (%)**
It will improve efficiency and effectiveness in health delivery	102	34.8%
It will reduce clinical errors and enhance job satisfaction	40	13.7%
It will reduce waiting time and wastage	44	15.0%
It will increase access to healthcare services	31	10.6%
It will increase follow-up patient care	25	8.5%
It will enhance more timely advice and intervention	33	11.3%
No response	18	6.1%
Total	**293**	**100%**

Table 4.5.3 shows that 102 (34.8%) of the respondents perceived that ICT literacy among health workers in JUTH will improve efficiency and effectiveness in healthcare

delivery. Again, 40 (13.7%) of the respondents perceived that ICT literacy among health workers will reduce clinical errors and will enhance job satisfaction in JUTH. Also, 44 (15.0%) of the respondents perceived that ICT literacy among health workers will reduce waiting time and wastage in the hospital. The table further revealed that 31 (10.6%) of the respondents perceived that ICT literacy among health workers will increase access to healthcare services. 25 (8.5%) of the respondents perceived that ICT literacy among health workers will increase follow-up patient care and 33 (11.3%) of the respondents perceived that ICT literacy among health workers will enhance more timely advice and intervention.

The above finding clearly shows that ICT literacy among health professionals will not only improve their professional skills but it will enhance effective quality healthcare delivery and as well lead to economic growth and development of the country's health sector.

Table 4.5.4: Respondent's views on Specific Ways ICT Utilization affects Their Relationship with Other Health Workers in JUTH

Response	**Frequency**	**Percentage (%)**
It increase collaboration	187	63.8%
It facilitates communication	59	20.1%
It makes sure standard operating procedures are used	37	12.6%
No response	10	3.4%
Total	**293**	**100%**

Table 4.5.5 shows that 63.8% of the respondents indicated that ICT utilization increased their collaboration with other health professionals in JUTH. 20.1% of the respondents indicate that ICT utilization facilitates communication between workers in JUTH. In addition, 37 (12.6%) respondents indicated that ICT utilization enables them in making sure standard operating procedures were used in JUTH.

The above finding shows that ICT has the potentials to improve the quality of healthcare delivery in JUTH and the country at large. This is because the prospects of ICT in areas such as electronic health records, tele-referrals, e-consultations, e-pharmacy etc. are enormous.

4.6 Challenges of ICT Utilization in Healthcare Delivery

This section identified some of the challenges of ICT utilization in healthcare delivery in Jos University Teaching Hospital. Finding from this study indicated that 95.5% of the respondents agreed that there were errors with the utilization of ICT facilities in JUTH. Report from IDI shows that all respondents stated that utilizing ICT in healthcare delivery is not free of errors: Power surge may affect the result and human errors in its application. Errors with the utilization of the facilities

Table 4.6.1: Distribution of Respondent's views on Some Errors with the Utilization of ICT in Healthcare Delivery in JUTH

Response	Frequency	Percentage (%)
Poor knowledge of equipments	166	56.6%
When faulty, records and results can be missing (equipment failure)	43	14.7%
Misinterpretation of data	40	13.7%
Human errors	26	8.9%
No response	18	6.1%
Total	**293**	**100%**

Table 4.6.1 shows some errors with the utilization of ICT equipment in healthcare delivery in JUTH. 56.6% of the respondents perceived poor knowledge of ICT equipment by health professionals is one of the errors with ICT utilization in JUTH. 14.7% respondents identified equipment failure as another error with the utilization of ICT equipment in healthcare delivery. Equipment failure usually occurred when ICT equipment were faulty. Supporting this finding, a Chief Radiologist further stated that:

> Clinical mistakes do occur when using ICT especially when they develop faults. Most of the ICT gadgets here don't have back-ups (uninterruptible power supply), so when there is power outage, information that was not saved can be missing. When these equipment are faulty, records and results can also be missing.

Table 4.6.1 also shows that 40 (13.7%) of the respondents identified that errors occurred due to misinterpretation of data. When patient health information is misinterpreted, it leads to wrong treatment procedures and consequently endanger the life of the patient. Again, 26 (8.9%) of the respondents identified human errors as also problem with the utilization of ICT in the hospital. A Chief Nursing Officer stated:

> We are not immune to mistakes because we are normal human beings, so as long as human beings will be the ones to operate this equipment, errors are bound to occur except that the errors might be minimal compared to when the gadgets were not utilized.

From the findings above, it was revealed that there are a number of errors with the utilization of ICT in healthcare delivery. It is also evident that patient's health information using electronic health records is not safe as they can be hacked by cyber criminals. Health information can be missing due to system failure. Studies have also proved that the utilization of electronic health systems have many health hazards to both the patient and the caregiver. However, the utilization of electronic health system has helped in reducing clinical errors and enhancing evidence based medicine.

Table 4.6.2: Extent to which Respondent's agree on the following Challenges of the Utilization of ICT Equipment in Healthcare Delivery

Response	A F (%)	SA F (%)	D F (%)	SD F (%)	UN F (%)	Total
Low level of computer literacy among health professionals	176 (60.1%)	20 (6.8%)	78 (26.6%)	11 (3.8%)	8 (2.7%)	**293(100%)**
Poor knowledge of e-health by the public	185 (63.1%)	21 (7.2%)	69 (23.5%)	16 (5.5%)	2 (0.7%)	**293(100%)**
Inadequate use of ICT equipment in healthcare delivery	221 (75.4%)	56 (19.1%)	7 (2.4%)	7 (2.4%)	2 (0.7%)	**293(100%)**
Poor implementation of e-health policy	201 (68.6%)	81 (27.6%)	5 (1.7%)	4 (1.4%)	2 (0.7%)	**293(100%)**
Erratic power supply	173 (59.0%)	112 (38.2%)	6 (2.0%)	1 (0.3%)	1 (0.3%)	**293(100%)**
Inadequate ICT infrastructure and deployment in healthcare delivery	121 (41.3%)	153 (52.2%)	15 (5.1%)	3 (1.0%)	1 (0.3%)	**293(100%)**
High maintenance and service cost	178 (60.8%)	39 (13.3%)	55 (18.8%)	18 (6.1%)	3 (1.0%)	**293(100%)**

Table 4.6.2 shows the challenges of the utilization of ICT equipments for healthcare delivery in JUTH. The table shows that a significant number (60.1%) of the respondents agreed and (6.8%) strongly agreed that low level of computer literacy among health professionals was among the challenges of ICT utilization in JUTH. Although, 26.6% of the respondents disagreed and 3.8% strongly disagreed that low level of computer literacy among health professionals was a challenge with ICT utilization in JUTH. This finding is consistent with the initial findings of this study that shows 97.7% of the respondents were computer literate and table 4.4.1 where the respondents rated ICT literacy among health workers in JUTH as 38.6% Moderate, 41.0% High and 14.6% Very High respectively. However, knowledge of the computer and other ICT facilities does not mean knowledge of electronic health system. Rather, health professionals need constant training and seminars on electronic health facilities to enhance efficiency in their utilization.

Table 4.6.2 also shows that 64.1% of the respondents agreed that poor knowledge of electronic health by the public was among the challenges of ICT utilization in JUTH.

Although 23.5% respondents disagreed and 5.5% strongly disagreed that poor e-health knowledge by the public were the challenges of ICT utilization in JUTH. Supporting this view, finding from IDI report shows that majority of the participants were of the view that e-health knowledge by the public was not a challenge with ICT utilization in JUTH. A male patient further stated that:

> It is not possible that ICT literacy by the public will affect its utilization in the hospital. If the banking are effectively utilizing the ICT, I see no reason why the same people cannot utilize the same facility for their health needs.

Again, 75.4% respondents agreed and 19.1% respondents strongly agreed that inadequate utilization of ICT equipment in healthcare delivery was among the challenges of ICT utilization in JUTH. In addition, 68.6% respondents agreed and 81 (27.6%) respondents strongly agreed that poor implementation of e-health policy were the challenges of ICT utilization in JUTH.

Table 4.6.2 also shows that majority 59.0% respondents agreed and 38.2% of the respondents strongly agreed that erratic power (electricity) supply was one of the challenges of ICT utilization in JUTH. This finding is in conflict with the initial finding of this study that shows that there was constant electricity supply in the hospital. However, there is no gainsaying that electricity supply is among the major problems of the Nigerian health sector and economic development.

Table 4.6.2 further shows that 121 (41.3%) respondents agreed and 153 (52.2%) respondents strongly agreed that inadequate ICT infrastructure and deployment in healthcare delivery were the challenges of ICT utilization in JUTH. Electricity is no doubt one of the major challenges of Nigerian economic development and growth, although, report from interview sessions in this study revealed that there is constant electricity supply in JUTH. The table further shows that 178 (60.8%) respondents

agreed and 39 (13.3%) strongly agreed that high maintenance and service cost were the challenges of the utilization of ICT in JUTH.

Table 4.6.3: Respondent's Perceptions on How ICT Challenges can be addressed

Response	**Frequency**	**Percentage (%)**
Improvements of ICT facilities in JUTH	146	49.8%
Provision of more manpower and regular staff training	71	24.2%
Strong political will and commitment	17	5.8%
More enlightenment and sensitization on the use of e-health facilities	26	8.9%
Implementation of ICT for health policy	25	8.5%
No response	8	2.7%
Total	**293**	**100%**

Table 4.6.3 indicated that 49.8% of the respondents perceived that if ICT facilities in JUTH were improved, it would address health care challenges in the hospital. They held that if the Federal government and the hospital management will provide adequate ICT facilities in the hospital, healthcare service delivery will be very effective and efficient. Findings from IDI reports reveals similar pattern of response as most of the respondents identified improvement of ICT facilities in JUTH as the best measure. A Chief Lab. Scientist stated that:

> We are ICT complaints but the facilities are not fully available and functional to us. If the federal government and the hospital management can improve the availability of ICT facilities in the hospital, we will use it to the best of our ability in ensuring that quality care service delivery is achieved.

Table 4.6.3 also shows that 24.2% of the respondents perceived that provision of more health workers would address the healthcare delivery challenges in JUTH. Reports from IDI shows that some respondents, including the patients interviewed held that the hospital lacks enough health workers to actualize the effective utilization of ICT equipment in JUTH. A male patient stated that:

> The hospital management needs to employ young people who are ICT literate to complement the health workers in the hospital. Getting the gadget is very important but having competent

> personnel that will effectively manage the facilities is the most important thing to do.

A Pharmacist further stated that

> We have a reasonable number of qualified health workers in this hospital. But I think regular staff training and seminar will go a long way in addressing the issue of non utilization or poor utilization of ICT facilities in the hospital. I agree that employment of more workers who are knowledgeable on electronic health will also help because we are short of work force.

Again, table 4.6.3 indicated that 17 (5.8%) of the respondents perceived that strong political will and commitment will address the problem of healthcare delivery in JUTH. Reports from IDI revealed that majority of the respondents complained about poor funding to the hospital, because of lack of political will and commitments by the Federal government.

Table 4.6.3 also indicated that 26 (8.9%) of the respondents perceived that more enlightenment and sensitization on the use of e-health facilities will address the challenges of healthcare delivery in JUTH. Corroborating this view, a female patient stated that:

> When people are aware of the benefits of electronic health, they will patronize such services rather than passing through series of stress from card collection to administration of treatment. But most people including me are not aware of this.

Table 4.6.3 further revealed that 25 (8.5%) of the respondents perceived that implementation of ICT for health policy will address the challenges of healthcare delivery in JUTH. Information from IDI report reveals that all respondents blame the Federal government for implementing ICT policy and most of her policies on healthcare delivery. A consultant stated angrily that:

> It is very unfortunate that the Nigerian leaders don't care about the wellbeing of her citizens, we most times go on strike not because we want to surfer our patients or because we want

> money. However, all we want is patient's satisfaction and we are comfortable to do our job. Look, we are not happy that some patients run to private hospitals, some even go abroad for common laboratory test because of nasty experience they have had. Our government keeps making policies and promises but never fulfill their promises. But we will keep reminding them, by going on strikes (that is the only language all Nigerian leaders like to hear) so that issues including ICT can be addressed.

The above findings suggest that the provision of more ICT equipment and regular staff training will enhance effective utilization of ICT facilities in JUTH.

4.7 Discussions of Findings

This study shows that information and communication technology play a pivotal role in enhancing quality and effective healthcare delivery in Jos University Teaching Hospital. Evident is the fact that since the last half of the 20th century, that ICT have been incorporated in the field of engineering, banking, military, transportation, agriculture and education, etc. was able to raise efficiency and effectiveness in those fields. In healthcare delivery, ICT utilization has been able to reduce patient waiting time, reduce some clinical challenges and errors as well.

The study shows a relationship between quality healthcare and effective utilization of ICT facilities in JUTH. This corroborated a study by Olorode and Oladuni (2013), where they observed that ICT utilization in healthcare delivery is enormous in that ICT has become well assimilated into the healthcare services that few doctors cannot imagine a day without using the computer or the network, stating that e-health systems in biomedical profession are very vital in promoting effective healthcare delivery. This was also supported by Jun Lu (2013), who disclosed a relationship between quality healthcare delivery and effective utilization of ICT, stating that the advantages of using electronic healthcare are enormous ranging from electronic health records (EHR), e-

consultations, tele-referrals, and so forth. Theoretically, this finding corroborates the technological determinism theory, which asserted that changes in modes of communication shape human life, as such, changes in mode of communication between health professionals and patients from manual health records, manual diagnosis, and manual prescription, to electronic health applications such as e-prescription, e-radiology, e-consultation and tele-medicine. Hence poor utilization of these equipment has effects on the quality of healthcare delivery such as undue waiting time, lose of patients health record, inaccurate diagnoses, clinical errors and other challenges of healthcare delivery in any health institution including Jos University Teaching Hospital.

Although poor communication can lead to tragic consequences, a review of literature also shows that effective communication can lead to the following outcomes: improve information flow, more effective interventions, improved patient safety, reduce clinical errors, and so forth (WHO, 2008; Eysenbach and Wyatt, 2002; Burney *et al*, 2010). The functionalist theories established that for equilibrium to be maintained in every social system, every institution (including the health sector) must efficiently perform its function for the survival of the whole. This clearly demonstrate findings from this study that since the introduction of ICT in healthcare delivery, health workers were integrated in the utilization of e-health facilities, which has indeed enhanced effective collaboration among health professionals and also improved healthcare services, compared with the traditional health delivery systems such as manual health records, manual diagnoses, manual referrals, and so forth.

Findings on the availability of ICT in Jos University Teaching Hospital indicated that majority of the respondents (94.2%) agreed that ICT facilities were available in the hospital. Some of the facilities available in JUTH include computers, mobile phones,

electronic stimulator, computerized tomography, magnetic resonance imaging, X-ray machines, and so forth. This aligned the assessment finding by (WHO/ITU, 2015), which shows that basic ICT infrastructure and working computers were in place at all the federal teaching hospital, including state general hospitals. However, 32.7% respondents revealed that the available ICT facilities in JUTH were not in a proper working condition. This view was supported by IDI report where almost all participants stated that some of the ICT equipment in JUTH were not adequately utilized because of their bad condition. Observation during the study also confirmed that ICT facilities were present in JUTH but most of the equipment were not utilized due to poor maintenance and there was no internet connection in the hospital to enhance effective communication using these gadgets. To buttress this finding, Idowu *et al,* (2003), reported that ICT capabilities (computers, mobile phones, and so forth) were available in Nigerian teaching hospitals but not much internet connectivity was available, as such most of the professionals used external (non-hospital) internet services such as cybercafés, for even rudimentary internet access, such as email. The implication is that when some ICT facilities (internet for example) are not available, there will be inefficiency, which was the case of Jos University Teaching Hospital where some basic ICT capabilities (internet) were reported not sufficiently available in the hospital and the available ones were in poor working condition. Consequently, the insufficient availability of ICT facilities in JUTH also affects the primary goal of the institution, which is provision of quality and timely healthcare services to the public. According to UNESCO Report (2002), the primary responsibility of every health sector is the provision of quality healthcare to the public and ICT-based solutions can improve the quality, access and efficiency of healthcare provision. This finding further reiterate the theoretical postulation of the structural functionalism, which established that for

equilibrium to be maintained, all facilities (including ICT), units/wards and health professionals must contribute their functions for effective service delivery and absence of one of these (e.g. internet) affects the whole.

Regarding ICT literacy among health professionals, the study revealed that the respondents were ICT literate. Finding of this study further indicated that all the respondents were knowledgeable on the advantages of ICT literacy to their profession stating that ICT utilization can reduce medical challenges, help in disease prevention and control, reduce clinical errors and reduce waiting time. This finding corroborates the theoretical postulation of the technological determinism, which established that characteristics inherent in technology manage the direction of its development and set conditions for social change, hence, e-health utilization have lead to changes in mode of healthcare delivery. However, the study shows that some groups of health workers were not utilizing ICT facilities for the purpose of healthcare delivery in JUTH. Corroborating this finding, a cross tabulation on professionals by rate of ICT utilization in healthcare delivery further shows that nurses and doctors always utilized ICT for healthcare delivery in JUTH more than other health professionals. This finding contradicts that of Ernest *et al* (2015), who concluded that poor utilization of ICT facilities in healthcare delivery by nurses in Nnamdi Azikiwe University Teaching Hospital, Nnewi, was as a result that 60.6% of the nurses were not computer literate. However, the finding supported that of Ibrahim *et al* (2015), which revealed that all doctors in National Hospital Abuja, who participated in their study, were ICT literate and possessed personal computer/laptops and only 28% of pharmacists have never used the internet. However, most health professionals do not efficiently utilize ICT facilities for healthcare purpose in the hospital.

On the utilization of ICT in healthcare delivery in JUTH, this study revealed that there were several types of challenges and errors with utilization of ICT facilities in JUTH. Some of the errors identified were misinterpretation of data, poor knowledge of the equipment by health professionals, and health information can be missing due to equipment failure, which can seriously harm the patient and sometimes the caregiver as well. Other studies including that of Gorber and John (2005), Bowman (2013), Koide and Edward (2005), also identified some challenges and errors with the utilization of ICT in healthcare delivery.

The result of this study identified low level of computer literacy, inadequate utilization of e-health equipment; poor policy implementation, erratic power supply, high maintenance and service cost were obstacles to the utilization of ICT in healthcare delivery in JUTH. Supporting this finding, Moyo and Chukwuka (2013), stated that Nigeria fall short of several health indicators with common occurrences of disrespect towards patients during treatment and unduly long waiting times for non-emergency treatment among others, these factors are among the reason why most influential Nigerians seek medical care abroad.

Regarding the prospects of ICT utilization for healthcare delivery, finding from this study indicated that ICT utilization will increase collaboration among health workers and ICT utilization will improve efficiency and effectiveness in health delivery in JUTH. The reports also contained that ICT utilization will improve healthcare delivery through reduction of medical errors, reduction of waiting time and enhancement of accurate diagnoses. This finding is in line with the UNESCO report (2002), which states that given the right approach, context and implementation process, ICT utilization can improve quality, access and efficiency of healthcare delivery. The World

Health Organization (2008), also stated that efficient and robust e-health solutions have already demonstrated their value, particularly in facing new global health using computer and internet, sound, high-resolution images can be sent between two distant locations, and doctors can easily examine patients in offices and healthcare centers thousands of miles away.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

Finding from this study shows that ICT facilities were available in Jos University Teaching Hospital, and that there is a positive relationship between quality healthcare delivery and effective utilization of ICT facilities. The study indicated that some of the facilities were poorly utilized due to poor maintenance and lack of some basic ICT facilities such as internet, etc. this has often led to poor healthcare delivery services in the hospital.

The study revealed that ICT literacy among health professionals does not have any effect on its utilization. This is because 97.7% of the respondents were ICT literate. Only 37.2% always utilized ICT facilities for the purpose of healthcare delivery in JUTH. This finding shows that most of the health professionals were ICT literate but they do not utilize ICT facilities for patient health record, collaboration, referral, consultation, etc. and as such, the level of the workability of knowledge on ICT utilization in healthcare delivery is not felt in Jos University Teaching Hospital.

In addition, the study identified a number of challenges with effective utilization of ICT facilities in healthcare delivery in JUTH. The respondents identified lack of internet access, poor implementation of e-health policy, inadequate use of ICT equipment in healthcare delivery, and erratic power supply. Other obstacles identified by the study were poor level of awareness of e-health among the health workers and the public, poor maintenance culture, and inadequate training of health professionals on the utilization of ICT facilities. These challenges have impeded quality healthcare delivery in JUTH.

Regarding the prospects of ICT utilization for healthcare delivery, finding from this study indicated that majority of the respondents viewed that ICT utilization will increase collaboration, communication, proper documentation of patient information etc. through electronic health records, e-consultation, e-referral, e-diagnoses, and so forth, these they added will in the near future improve healthcare delivery in JUTH.

5.2 Conclusion

The finding of this study demonstrated that for quality healthcare delivery to be achieved healthcare must be safe, effective, timely, efficient, equitable, affordable and people-centered and this can only be achieved through effective utilization of ICT facilities. The study therefore concluded that communication between the patient and the caregiver, as well as collaboration among health professionals plays a pivotal role in enhancing quality healthcare, hence, internet connectivity and other electronic health applications such as e-radiology, m-health, e-prescription and so forth should be made available. The government and the management of JUTH should provide more ICT facilities and ensure that the facilities are properly maintained. On the other hand, health professionals in JUTH should always utilize the ICT equipment available in the hospital. The hospital management should ensure that there is intensive training and regular seminar on ICT utilization for all health workers in JUTH, and the general public should be sensitized on the need not to disabuse there mind from cultural sentiments against the use of technology.

5.3 Recommendations

The study recommended the following:

1. The conclusion of the study shows that ICT facilities (most especially internet connectivity) are insufficiently available in JUTH. Results of the study further

shows that the available facilities were poorly maintained, and so recommended that the federal government and the hospital management should ensure the provision of standard ICT facilities in JUTH. In addition, ICT infrastructure and support systems across the country need to be improved, in order to facilitate the transfer of information. Special attention should be given to improving basic infrastructure, such as a regular supply of electricity, hardware, appropriate software and telecommunication in general.

2. It was further revealed that the hospital workers don't always make use of ICT gadgets in the hospital, therefore the study recommends that there should be training and re-training of health professionals to support the use of ICT equipment. The hospital management should ensure that the training support is multi-faceted to cater for the specific needs of each group of health workers and department through regular workshop and seminar on ICT utilization.
3. Findings of the study shows that member of public and patient lack enlightenment and sensitization on the utilization of electronic healthcare. The study therefore recommends that there is a need for advocacy on the need to embrace health ICT among all healthcare professionals in JUTH and in Nigerian healthcare system as a whole. The public should be sensitized on the advantages of ICT utilization in healthcare delivery through the electronic and print media, especially radio and television.
4. Finally, the study established that the prospects of ICT in healthcare delivery are enormous. It further recommends that the federal, state and even the local government should be more committed to the implementation of policies that will enhance effective utilization of ICT in the Nigerian health sector towards quality healthcare delivery.

5.4 Contributions of the Study to Knowledge

This study has therefore made significant contributions to the stock of knowledge on the role of ICT in healthcare delivery as it established that:

1. The study established that ICT literacy and availability of ICT equipment alone cannot enhance quality healthcare delivery. Rather, the facilities must be in proper working condition and the professionals must be adequately trained to efficiently utilize these facilities for quality healthcare delivery.
2. The study established that Information and Communication Technology is not only limited to devices such as the internet, computers, telephone/mobile phones but extend to all electronic gadget or devices used for the purpose of healthcare delivery such as anesthetic machines, ultra sound machines, X-ray machines, electronic stimulator, MRI, etc.
3. The study established that collaboration among the health professionals and communication between the healthcare provider and patient is not effective due to poor internet connectivity in the study area.

5.5 Suggestion for Further Study

The researcher suggests that more study regarding electronic health utilization should be intensified with focus on patient and caregiver relationship using electronic health facilities.

REFERENCES

Abbas, I.I., Auta, S.Z and Na'iya, R.M (2012), Health Care Facilities Mapping and Database Creation Using GIS in Chikun Local Government, Kaduna State, Nigeria. *Global Journal of Human Social Science Geography and Environmental Geosciences* vol.12, issue.10

Abdulraheem, I.S, Olapipo, A.R and Amodu, M.O (2012), Primary Health Care Services In Nigeria: Critical Issues and Strategies for enhancing the Use by the Rural Communities *Journal of Public Health and Epidemiology* Vol. 4(1) pp. 5-13 ISSN: 2141-2316 http://www.academicjournals.org/JPHE/DOI:10.5897 (Accessed on 13/11/2016)

Adegboyega, K. (2016), the Social and Economic Context of Medical of Medical Errors in Osun State, Nigeria. A PhD Thesis Submitted to the Department of Sociology, Faculty of Social Sciences, Ahmadu Bello University Zaria.

Amatayakul, M. (2004), *Electronic Health Records: a Practical Guide for Professionals and Organizations* (2nd ed). Chicago: AHIMA

Anie, S.O (2011), Impact of Information Computer Technology on Primary Healthcare Services in Rural Communities in Niger Delta Region of Nigeria *Library Philosophy and Practice,* 2011, ISSN: 1522-0222

Akadiri, O.A, Olusanya, A.A, and Omitola, O.O (2009), Impact of Improved Telecommunication Services on Health Care Delivery in Nigerian Teaching Hospitals – A Survey of Opinions" *Journal of Information Technology Impact* Vol.9, No.3, pp 125-134

Awopetu, R.G., Anhange, S.T., and Ocheibi, V.A. (2014), Perceived Influence of Information and Communication Technology on Clinical Service Delivery Among Caregivers and Patients in Makurdi Metropolis: Research on Humanities and Social Sciences ISSN (online) 2225-0484, Vol.4, No.17 http://www.iise.org

Babbie, E (2001), *the Practice of Social Research* (9th ed) Wadsworth/Thomson Learning. Inc. USA

Benson, A.C. (2001), *Neal-Schumann Compete Internet Companion for Librarians*. New York: Neal-Schumann Publishers. pp24

Benson, M.O., Ibrahim, T.A., Patricia, P.M., Lateef, M.O., Aivonya, M.O and Deborah, I.A (2015), Knowledge, Access and Use of Internet-Based Health Information for Personal Healthcare among Employees of the Foremost Nigerian University *American Journal of Health Research* Special Issue: Health Information Technology in Developing Nations: Challenges and Prospects Health Information Technology Vol.3/ No.1-1, pp.25-31

Berman, P., Pallas, S., Smith, A.L., Curry, L. and Bradley, E.H (2011), *Improving the Delivery of Health Services: A Guide to Choosing Strategies*. HNP Discussion

Paper Series the International Bank for Reconstruction and Development and the World Bank, Washington, DC

Bordoloi, P. and Nazrul, I (2012), Knowledge Management Practices and Healthcare Delivery: *A Contingency Framework. Electronic Journal of Knowledge Management,* Vol.10, Issue.1

Bowman, S (2013), Impact of Electronic Health Record Systems on Information Integrity: Quality and Safety Implication *Online Research Journal, Perspectives in Health Information Management* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC37975(Accessed on 23/2/2017)

Burney, A., Mahmood, N. and Abbas, Z. (2010), Information and Communication Technology in Healthcare Management Systems: Prospects for Developing Countries *International journal of Computer Application* 4(2)

Chava, F.N. (1992), *Research Methods in the Social Science* 4th Ed London: J.W Arrow Smith Ltd

Chidozie, F.C, Lawal, P.O and Ajayi, O.O (2015), Deregulation of the Nigerian Telecommunication Sector: Interrogating the Nexus between Imperialism and Development *Academic Journal of Interdisciplinary studies MCSER Publishing Rome-Italy* Vol.4, No.1 E-ISSN 2281-4612

Clement, D (2010), an Analysis of the Role of ICTs to Achieving the MDGs: A Background Paper: The Division for Public Administration and Development Management of the United Nations Department of Economic and Social Affairs (UNDESA)

Commission for the European Communities (2012), "eHealth Action Plan 2012-2020: Innovative Healthcare for the 21st Century" 6 December 2012. http://ec.europa.eu/health/eheath/docs/com-2012-736en.pdf

Emmanuel, S.M (2015), Utilization of Information and Communication Technologies (ICTs) in Public Library Services in Nigeria PhD Thesis, Department of Library And Information Science University of Nigeria Nsukka

Ernest, A.E., Eze, C. and Obi, H.A (2015), Relevance of Computer Literacy to Nursing Profession As Perceived by Nurses in Nnamdi Azikiwe University Teaching Hospital, Nnewi *International Professional Nursing Journal* Vol.13, No.1

Eysenbach, G. (2001), "What is eHealth"? *Journal of Medical Internet Research*

Eysenbach, G and Wyatt, (2002), Using the Internet for Surveys and Health Research *Journal of Medical Internet Research* Vol. 4(2), pp. 8-13

Federal Ministry of Health (2014), Assessing the Enabling Environment for ICTs for Health in Nigeria: *A Review of Policies*: Prepared by the United Nations Foundation in Support of ICT4SOML

Federal Ministry of Health (2006), Department of Health Planning and Research: National Health Management Information System (NHISM) Unit Revised Policy Program and Strategic Plan of Action

Federal Ministry of Health (2015), National Health ICT Strategic Framework 2015-2020. Draft for Review

Federal Ministry of Health (2003), National Health Policy, 2004

Federal Ministry of Health (2010), National Strategic Health Development Plan (NSHDP) 2010-2015

Fichman, R.G., Rajiv, K and Ranjani, K. (2011), the Role of Information System in Health-Care: Current Research and Future Trends, *Information System Research* Vol.22, No.3, September 2011, pp.419-428 ISSN: 1047-7047

Giddens, A. (2009), *Sociology (6th ed).* USA: Polity Press

Gober, E.D and John, M.A (2005), Defining Medical Error *Canadian Journal of Surgery* Vol. 48 (1), pp. 39-44. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3211566

Gururajan, R. and Abdul, H.B (2013), *an Empirical Study to Determine Factors that Motivate and Limit the Implementation of ICT in Healthcare Environment.* School of Management and Enterprise University of Southern Queensland, Australia: West Street, Toowoomba.

Gyong, J.E (2013), the Imperative of Research to the Success of Nursing and Midwifery Education and Practice in Nigeria: *the Zaria Sociological Journal* vol.2, No.1 ISSN 2360-8552

Haralamobs, M and Holborn, M (2004), *Sociology: Themes and Perspectives (6th ed.)* Londo: Collins

Hassan, O.M., Siyanbola, W.O and Oyebisi, T.O (2011), Effect of Information Technology Policy on Nigerian Health Sector *Journal of Emerging Trends in Computing and Information Science* Vol.2, No.6, June 2011. ISSN: 2079-8407. http://www.cisjournal.org

Humphery, W.S (2000), *the Team Software Process* (MM/SE/-2000-TR-023) Software Engineering Institute, Pittburgh. Pp.36-54

Ibrahim,T.A, Adejoke, A.S, Moses, A, Tony, C.A, Ibrahim, B.Z and Muhammed, H.W (2015), ICT Knowledge, Utilization and Perception among Healthcare Providers at National Hospital Abuja, Nigeria *American Journal of Health Research,* 2015, 3(1-1): 47-53, http://www.sciencepublishgroup.com/j/ajhr

Idowu, B., Ogunbode, E. and Bimbo, I (2003), Information and Communication Technology in Nigeria: the Health Sector Experience *Journal of Information Technology Impact* Vol.3, No.2, pp. 69-76

Idowu, P., Cornford, D. and Bastin, L. (2008), Health Informatics Deployment in Nigeria *Journal of Health Informatics in Developing Countries*, 2, 15-23 from http://www.jhidc.org/index.php/jhidc/issue/view/4.

International Telecommunication Union (2008), Implementing e-Health in Development Countries: Guidance and Principles: ICT Applications and Cybersecurity Division Policies and Strategies Department (ITU), Geneva

Jun Lu, S.Z. (2013), E-health Web application Framework and Platform Based on the Cloud Technology. Msc Thesis

Kelley, E. and Hurst, J. (2006), *Health Care Quality Indicators Project Conceptual Framework Paper* Organization for Economic Co-operation and Development, (OECD Healthcare Working Papers, No.23, DELSA/HEA/WD/HWP 2006) http://www.oecd.org/dataoecd/1/36/36262363.pdf

Kumar, P. (2012), Application of Information and Communication Technology (ICT) by Medical Students: A Study of Government Medical Collage, Chandigarh, India. *International Journal of Library and Information Science* Vol.4 (3), pp.45-51, March 2012 Available at http://www.academicjournals.org/IJLIS

Lipke, L (2014), Nurses' Competence in Information and communication Technology (ICT) Usage in Patient Care: Literature Review. *Helsinki Metropolia University Of Applied Science*

Macmillan, P (2015) *Global Politics* Palgrave Macmillan. ISBN:9781137349262 OCLC:979008143

Mayo, C. and Chukwuka, M. (2013), Nigeria's Health Care Delivery: The Missing Links *Ciuci Consulting* Available at http://www.editorialciuci.us.org

Marconi, J. (2002), E-Health: Navigating the Internet for Health Information Healthcare, *Advocacy White Paper, Healthcare Information and Management Systems Society,* May 2002.

Mbarika, V.W.A (2004), Is Telemedicin the Panacea for Sub-Saharan Africa's Medical Nightmare? *Communication for the ACM*, vol.47, no.7, pp.21-24

Menizibeya, O. (2011), the Nigerian Health Care System Need for Integrating Adequate Medical Intelligence and Surveillance Systems *Journal of Pharmacy And Bio-Allied Sciences, US National Library of Medicine National Institute of Health* doi:10.4103/0975-7406.90100

Mitchell, J. (1999), *Telehealth to e-health: The Unstoppable Rise of e-health.* Canberra, Australia: Commonwealth Department of Communications, Information Technology and the Arts (DOCITA)

Muathe, S.M.A., Nelson, H.W.W. and Gorretty, A.O (2013), an Empirical Study on the

Relationship between Organizational Factors and Adoption of ICT among Health Related SMEs in Nairobi, Kenya *International Journal of Arts and Commerce* Vol.2, No.3

National Population Commission (2013), Nigeria Demographic and Health Survey Federal Republic of Nigeria, Abuja

Nicholas, R., Ann, R., Malcolm, D, and Nicole, L. (2013), Beyond the Paper Trail: Using Technology to Reduce Escalating Harms from Opioid Prescribing in Australia Australian and New Zealand Journal of Public Health Vol.37, Issue.2 https://doi.org/10.1111/1753-6405.12031

Nicolini, D., Powell, J., Conville, P. and Martinez-Solano, L. (2008), Managing Knowledge in Healthcare Sector: A Review. *International Journal of Management Reviews* 10: 245-263

Odusote, A.O (2010), ICT for Public Health Care Delivery in Nigeria: Challenges, Opportunity and Milestone, *Paper Presentation at the e-Nigeria 2010 Conference*

Olaktokun, W.M and Olufunke, C.A (2009), Information and Communication Technology Use by Reproductive Health Workers in Nigeria: State of the Art, Issues and Challenges, *An Interdisciplinary Journal on Humans in ICT Environment* Vol. 5(2), pp.181-207, Nov 2009, ISSN: 1795-6889. http://www.humanrtechnology.jyu.fi

Olaronke, I., Ishaya, G., Rhoda, I. and Janet, O. (2013), Introperability in Nigeria Healthcare System: the way forward *I.J Information Engineering and Electronic Business*.Vol.4, pp.16 http://www.mecspress.org/doi:10.5815/ijieeb.2013.04.03

Olorode, O.A and Oladunni, O.E (2013), E-health in Biomedical- its Role and Challenges In Bayelsa State, Nigeria, Africa: Proceedings of the 1st International Technology, Education and Environment Conference, African Society for Scientific Research (ASSR)

Oluwadare, C. and Toyin, A. (2013), Effects of Corruption on Health Care Processes and Outcomes in Nigeria: *The Nigerian Journal of Sociology and Anthropology.* Vol.11, No.1, ISSN: 03314111

O'Mahony, D., Wright, G., Yogeswaran, P and Govere, F. (2014), Knowledge and Attitudes of Nurses in Community Health Centers about Electronic Medical Records, *Curationis* 37(1) http://dx.doi.org/10.4102/curationis.v37i1.1150

Onu, F.U and Agbo, I.S (2013), Factors that Affects the use of ICT in Nursing Profession in Ebony State, Nigeria, *Journal of Information Engineering and Application* ISSN: 2225-0506, vol.3, no.1

Organization for Economic Co-operation and Development (2002), *the OECD Definition of the ICT Sector, Measuring the Information Economy 2002:* retrieved March, 29, 2017 http://www.oecd.org/dataoecd/34/37/2771153.pdf

Paul, S.A (2006) *Technology Determinism*. Draft Entry for the International Encyclopedia of Organization Studies. Edited by Stewart Clegg and James, R. Bailey (Sage) Downloaded from http://www-bcf.use.edu/~padler

Parsons, T. (1951), *the Social System*, Glancoe, III, the Free Press ISBN:0029241901

Raebun, J and Rootman, I. (1998), *People-Centered Health Promotion* Wiley, Chichester

Rwashana, A.s and Williams, D.W (2008), Enhancing Healthcare Delivery through ICTs: A Case Study of the Ugandan Immunization System *International Journal of Education and Development Using Information and Communication Technology (IJEDICT),* 2008, vol.4, issue.2, pp.144-158

Saraswati, M, Abhishek, K, and Kavita, C (2013), "Influence of Information and Communication Technology in Health Sectors" *international Journal of Soft Computing and Engineering (IJSCE)* ISSN: 2231-2307, Vol.3, Issue.5

Schever, A (2010), eHealth in India: Advancing on all Levels. www.m.healthcareitnews.com/n.../ehealth-india

UNESCO Report (200), the Indian Government Plans to Install online and Video-based Kiosks in 100,000 Villages, providing Agriculture Purchase Services, Education And Health Support Services

United Nations Economic Commission for Africa (2003), Africa's Information Society Initiative: An Action Framework to Build Africa's Information and Communication Infrastructure. Addis Ababa http://hdl.handle.net/10855/5225

Winner, L. (1986) *"Do Artefacts Have Politics?" The Whale and the Reactor* Chicago: University of Chicago Press.

World Health Organization (2006), Building Foundations for eHealth: Progress of Member States: *Report of the WHO Global Observatory for eHealth*. Geneva

World Health Organization (2008), Building Foundation for eHealth in Europe: *Report of the WHO Global Observatory for eHealth*

World Health Organization (1946), Constitution of the World Health Organization www.who.int-who_constitution_en

World Health Organization (2013), m-Health: New Horizons for Health through Mobile Technologies. Global Observatory for e-Health Series-Volume. World Health Organization, Geneva.

World Health Organization (2016), Medication Errors: Technical Series on Safer Primary Care ISBN 978-92-4-151164-3

World Health Organization (2010), Telemedicine Opportunities and Developments in Member States: *Report on the Second Global Survey on eHealth*: Global

World Health Organization (2014), the Health of the People: What Works: the Africa Regional Health Report 2014

World Bank (2002), Information and Communication Technology Sector Strategy Paper of the World Bank Group http://info.worldbank.org/ict/ICT-ssp.html

World Bank (2003), ICT and MDGs: A World Bank Group Perspective. Global ICT Department the World Group, Washington DC

Yewande, O.A (2016), *Evolving Usage and Access to ICTs in the Nigerian Health Care Sector: Challenges and Prospects*, a PhD Thesis Submitted to the University of Westminster http://www.westminster.ac.uk/westminsterresearch

APPENDIX I

Questionnaire for Health Workers in JUTH

Dear Respondent,

I am a postgraduate student of the Department of Sociology, Faculty of Social Sciences, Ahmadu Bello University Zaria Kaduna State. Conducting a research study on **"An Assessment of the Use of Information and Communication Technology (ICT) in Healthcare Delivery in Jos University Teaching Hospital, Plateau State, Nigeria"** This is in partial fulfillment of the requirements for the award of M.Sc. Sociology. Your confidentiality is assured as the information given will be used only for academic purpose.

Thanks for your cooperation.

Yours faithfully,

Alaku David DOGARA.

Instruction: Please you are to fill or tick this way (√) your view in the space provided; your sincerity will be highly appreciated.

SECTION A: Socio-Demographic Characteristics of Respondents

1. Sex: (a) Male [ ] (b) Female [ ]
2. Age: (a) Below 25 years [ ] (b) 26-30 [ ] (c) 31-35 [ ] (d) 36-40 [ ] (e) 41 and above [ ]
3. Marital Status:

(a) Single [ ] (b) Married [ ] (c) Widow/widower [ ] (d) Divorce [ ] (d) Separated [ ]

4. Religion: (a) Christianity [ ] (b) Islam [ ] (c) Traditional [ ]
5. Highest Qualification Acquired:

(a) OND [ ] (b) MBBS/Bsc/HND [ ] (c) Masters [ ] (d) PGD and above [ ] (e) Others (specify)…….

6. Profession: (a) Doctor [ ] (b) Nurse [ ] (c) Lab. Scientists [ ] (d) Pharmacist [ ] (e) Others (specify)……
7. Rank…….

SECTION B: the availability of ICT in health facilities in JUTH

8. Is there a relationship between quality healthcare delivery and the use of ICT? (a) Yes [ ] (b) No [ ]
9. If yes, what is the nature of the relationship? .....
…….
10. If No why? ……
……
11. Are ICT facilities available in JUTH? (a) Yes [ ] (b) No [ ]
12. Which among the following ICT facilities are available in JUTH?

(a) Computers [ ] (b) Internet [ ]
(c) Mobile phone/telephone [ ] (d) Cardiac monitor [ ]
(e) Vascular ultrasound machines [ ] (f) Defibrillators [ ]
(g) Incubators [ ] (h) MRI [ ]
(i) Echocardiography machine [ ] (j) Anesthetic machines [ ]
(k) Other ICT facilities (specify)…….

13. Are the facilities in proper working condition? (a) Yes [ ] (b) No [ ]
14. How often is maintenance carried on them? (a) Daily [ ] (b) weekly [ ] (c) Monthly [ ] (d) Yearly [ ] (e) Others, (specify)……
15. Who is responsible for the provision of ICT facilities in JUTH?

(a) Federal government [ ] (b) State government [ ] (c) Local government [ ]
(d) Private organization [ ] (e) others (specify)……

16. Who is responsible for the maintenance of ICT facilities in the JUTH?
(a) Federal government [ ] (b) State government [ ] (c) Local government [ ] (d) Private organization [ ] (e) Others (specify)……

17. Are you satisfy with the state of ICT facilities in JUTH?
(a) Yes [ ] (b) No [ ]

18. If (a) or (b), state your reasons……..

Section C: Level of Knowledge and utilization of ICT in Healthcare Delivery by the Healthcare Providers

19. Are the ICT facilities in JUTH used for the purpose of healthcare delivery?
(a) Yes [ ] (b) No [ ]

20. If No, what are they used for? .....

21. How often do you utilize ICT equipment in healthcare delivery? (a) Always [ ] (b) Sometimes [ ] (c) Not at all [ ]

At what stage of patient care delivery is ICT facility frequently used in the hospital?

S/no	Patient care delivery	Frequent	Not frequent	Not at all
21	Diagnosis			
22	Treatment			
23	Prescription			
24	Patient record			
25	Track/monitor patients			
26	Disease surveillance			
27	Rehabilitation			
28	Others			

To what extent are the following ICT facilities used by health workers in the hospital?

S/no	ICT facility	Frequent	Not frequent	Not at all
29	Computer (laptop/desktop)			
30	Telephone/mobile phone			
31	Internet			
32	Incubators			
33	Anesthetic machines			
34	Echocardiography Machines			
35	Others			

36. Do the patients accommodate the utilization of ICT for health delivery in JUTH?
(a) Yes [ ] (b) No [ ]

37. If yes, what is the level of their acceptance (a) Moderate [ ] (b) High [ ] (c) Very high [ ] (d) Low [ ] (e) Very low [ ]

38. If No, what do you think could be the reason? .....
……..……

39. Do you agree that ICT utilization among health workers can help reduce clinical errors? (a) Agreed [ ] (b) Strongly agreed [ ] (c) disagreed [ ] (d) Strongly disagreed []

40. State your reasons to question (39)……

41. Are you computer literate? (a) Yes [ ] (b) No [ ]

42. If No, why? .....

43. To what extent can you rate ICT literacy among health workers in JUTH? (a) Moderate [ ] (b) High [ ] (c) Very high [ ] (d) Low [ ] (e) Very low [ ]

44. Do you agree that all health professionals should be ICT compliant?
(a) Yes [ ] (b) No [ ]
45. If (a) or (b), what are your reasons…….....
…….....
46. Do you agree that ICT literacy among health workers can help in disease prevention and control? (a) Agreed [ ] (b) Strongly agreed [ ] (c) disagreed [ ] (d) Strongly disagreed [ ]
47. State your reasons to question (46)……...……
……
48. In what specific ways does the utilization of ICT equipment affect you in the discharge of your duties……
…….

Section D: Prospects of ICT Utilization in Healthcare Delivery

49. Do you think ICT can bring about development in JUTH? (a) Yes [ ] (b) No [ ]
50. If Yes, state these aspects of development……
……

To what extent do you agree that the utilization of ICT in health can reduce the following medical challenges in JUTH, where A= Agree, SA= Strongly Agree, D= Disagree, SD= Strongly Disagreed, and, UN= Undecided

S/no	Challenges	A	SA	D	SD	UN
51	Clinical errors					
52	Waiting times and wastage					
53	Loss of patient's medical record					
54	Physical barriers (location)					
55	Stress (Physical)					
56	Others					

57. What do you think are the potential benefits of ICT literacy among health workers?
……
……..……
58. In what specific ways does the utilization of ICT affect your relationship with other health workers.....
……

Section E: Challenges of ICT Utilization in Health Delivery

59. Are there errors associated with the utilization of ICT equipment in healthcare delivery? (a) Yes [ ] (b) No [ ]
60. If Yes, state some of these errors……
……

To what extent do you agree on the following challenges in the utilization of ICT in health delivery, where A= Agree, SA= Strongly Agree, D= Disagree, SD= Strongly Disagreed, and, UN= Undecided

S/no	Challenges	A	SA	D	SD	UN
61	Low level of computer literacy among health professionals					
62	Inadequate knowledge of e-health by the public					
63	Inadequate use of ICT equipment in healthcare delivery					
64	Inadequate implementation of e-health policy					
65	Erratic power supply					
66	Inadequate ICT infrastructure and deployment in healthcare delivery					
67	High maintenance and service cost					

68. Which of the factor above is more challenging in the utilization of ICT in healthcare delivery in JUTH? ……
69. What other challenges do you think affect the utilization of ICT in healthcare delivery in JUTH? .....
70. In your opinion, how are the challenges facing the utilization of ICT in healthcare delivery can be addressed? .....……...

THANK YOU.

APPENDIX II

In-depth Interview Guide for Health Workers in JUTH

Introduction:

I am Alaku David DOGARA, a Postgraduate student from the department of Sociology, Faculty of Social Sciences, Ahmadu Bello University Zaria Kaduna State. I am conducting a study entitled **"An Assessment of the Use of Information and Communication Technology (ICT) in Healthcare Delivery in Jos University Teaching Hospital, Plateau State, Nigeria"**. The Jos University Teaching Hospital Ethics Committee has given me approval.

Gratitude:

I thank you for giving me audience despite your busy schedule.

Study Purpose:

This study, I would want to investigate the level of knowledge and utilization of information and communication technology facilities by healthcare workers, identify the problems, and prospects with the utilization of ICT facilities in healthcare delivery in Jos University Teaching Hospital.

Obtaining Informed Consent to Tape-record the Interview:

Please, kindly permit me to record this session on a tape-recorder, please be assured that your name will not be mentioned or used in the write-up.

Questions:

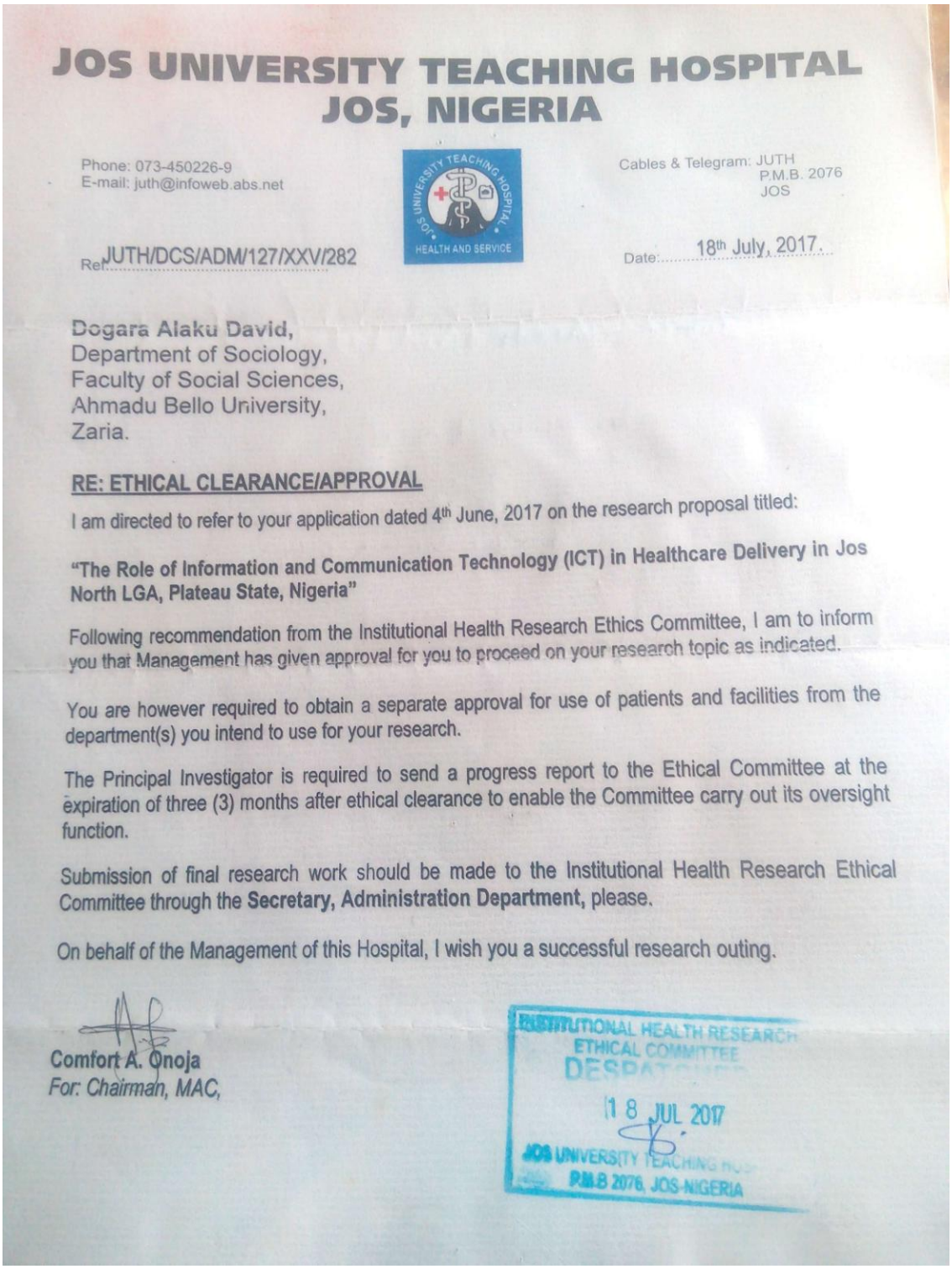
1. Please, what is your view on Information and Communication Technology (ICT) in healthcare delivery? (**Probe:** *In terms of necessity, In terms of its relevance*).
2. How can you describe the relationship between quality healthcare delivery and use of ICT? (**Probe:** *The relevance, the effectiveness and efficiency*).
3. What types of ICTs do you think can be applied in the health sector?
4. How can you assess the availability of ICT facilities in JUTH? (**Probe:** *Availability in terms of provision and maintenance*).
5. What can you say about the level of ICT knowledge by healthcare providers in JUTH? (**Probe:** *training, seminar*)
6. How often do you use ICT facilities in the discharge of your duties? (**Probe:** *type of ICT facility you use in the discharge of your duties*).
7. At what stage of patient care do you mostly use ICT equipment? (**Probe:** *how effective are these facilities to your profession*).
8. How does the use of ICT affect your relationship with other health workers in JUTH?
9. What is the level of acceptance of ICT by patients?
10. What do you think are the benefits of ICT utilization for both healthcare workers and their patients?

11. What do you think are the challenges with the utilization of ICT in healthcare delivery? (**Probe:** *Area of policy implementation, Area of staff training, job commitment, awareness, affordability, availability and other factors*).
12. Can you suggest ways in which these challenges can be addressed? (**Probe:** *Role of government, Role of individuals (patients), Role of healthcare providers and other health stakeholders*).
13. Please, what are your comments on e-health policy in Nigeria?

Thank you very much for sparing your time.

APPENDIX III

Ethical Clearance Form



JOS UNIVERSITY TEACHING HOSPITAL
JOS, NIGERIA

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Cables & Telegram: JUTH
P.M.B. 2076
JOS

Ref: JUTH/DCS/ADM/127/XXV/282

Date: 18th July, 2017.

Dogara Alaku David,
Department of Sociology,
Faculty of Social Sciences,
Ahmadu Bello University,
Zaria.

RE: ETHICAL CLEARANCE/APPROVAL

I am directed to refer to your application dated 4th June, 2017 on the research proposal titled:

"The Role of Information and Communication Technology (ICT) in Healthcare Delivery in Jos North LGA, Plateau State, Nigeria"

Following recommendation from the Institutional Health Research Ethics Committee, I am to inform you that Management has given approval for you to proceed on your research topic as indicated.

You are however required to obtain a separate approval for use of patients and facilities from the department(s) you intend to use for your research.

The Principal Investigator is required to send a progress report to the Ethical Committee at the expiration of three (3) months after ethical clearance to enable the Committee carry out its oversight function.

Submission of final research work should be made to the Institutional Health Research Ethical Committee through the **Secretary, Administration Department,** please.

On behalf of the Management of this Hospital, I wish you a successful research outing.

Comfort A. Onoja
For: Chairman, MAC,

INSTITUTIONAL HEALTH RESEARCH ETHICAL COMMITTEE
DESPATCHED
18 JUL 2017
JOS UNIVERSITY TEACHING HOSPITAL
P.M.B 2076, JOS-NIGERIA

APPENDIX IV

CONSENT FORM

My name is Alaku David DOGARA, a postgraduate student with the Department of Sociology, Faculty of Social Sciences, Ahmadu Bello University, Zaria, Kaduna State. I wish to carry out a study on **"An Assessment of the Use of Information and Communication Technology (ICT) in Healthcare Delivery in Jos University Teaching Hospital, Plateau State"** would you like to participate in the study.

Study Purpose

This study, I would want to investigate the level of knowledge and utilization of information and communication technology facilities by healthcare workers, identify the problems, and prospects with the utilization of ICT facilities in healthcare delivery in Jos University Teaching Hospital.

Study Procedure

This study will involve asking you few questions to answer and you will be required to fill in a questionnaire, also, a tape recorder will be used during the in-depth interview. Please be informed that all answers provided will be treated with utmost confidentiality.

Potential Harm, Risk or Discomfort

There will be no any harm or discomfort associated with this procedure.

Right to Refusal or Withdrawal

Your participation in this study is voluntary. If you decide to participate, you can stop at any time, even after signing the consent form or in the course of the study. There will be no consequences if you decline to participate.

Confidentiality

The result of this study will be kept confidential and used only for research purposes. Your identity shall be concealed as your name will not appear anywhere on the coded information forms. Whatever it is in our findings that could identify you will not be published except with your consent.

Statement of Consent

I (Initials)……. Have understood the questions asked and explained to me and I'm willing to participate. I agreed [ ] I decline [ ]

Signature of the Health Professional …… Date ……

Signature of Witness...……. Date ……

Signature of Investigator ……..……. Date …….

Researcher Phone Number: 07067773471

Ethics Committee Chairman's Phone Number: 0803700139

APPENDIX V

Observation Checklist

1. To observe the availability of ICT facilities (such as laptops, computers, cell phones, internet, etc.) in Wards, clinics and departments/offices in JUTH
2. Observation of electricity supply in the hospital as well as the power generating plant
3. To observe how ICT facilities are being used by health workers in JUTH
4. To observe health workers attitudes towards the use of ICT equipment
5. To observe patient's attitude towards the use of ICT equipment