IMPLEMENTATION OF ELECTRONIC HEALTH RECORDS: A COMPARATIVE STUDY IN THE PRIVATE AND PUBLIC SECTOR FOR HEALTH CARE DELIVERY IN EDO STATE

BY

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CERTIFICATION

This is to certify that this project was carried out by **Igbinazaka Ighoviano Angela** of the Institute of Public Administration and Extension service, Department of Health Planning Management, University of Benin, Benin City, Edo State, Nigeria.

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DEDICATION

This research work is dedicated to God Almighty who saw me through the period of this program and provided all resources required to complete this project.

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ABSTRACT

The Implementation of electronic health records (EHRs) has gained significance in improving healthcare delivery globally. This study aims to conduct a comparative study on the implementation of EHRs in the private and public sectors for health care delivery in Edo state, Nigeria. The general objective of this study was to assess the role and implementation of electronic health record to selected private and public sector for healthcare delivery in Edo state. The research was to explore the current state of EHR implementation in both sectors, identify the barriers and challenges faced during implementation, and analyze the impact of EHRs on healthcare quality and efficiency in Edo state. A mixed-methods research approach was employed, incorporating quantitative data collection through surveys and qualitative data collection through interviews and focus.

The findings of this study will provide valuable insights into the strengths and weaknesses of EHR implementation in the private and public sectors in Edo state and will inform policymakers and healthcare professionals on best practices and strategies to maximize the benefits of EHR adoption for improved healthcare delivery in Edo state, Nigeria. Specifically, it recommended that the selected health institutions both public and private should ensure the availability of finances, adequate staff training in the technical know-how of the

technological advancement, also be technical infrastructures and manpower like electronic record managers, ICT support staff and computer medical devices.

This research will contribute to the existing literature on EHR in the context private and public health care delivery in Edo state and Nigeria, where few research has been conducted on this topic.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Nigeria, with a population of over 210 million is the most populous country in Africa and the 32nd biggest in the world. It lies in the Gulf of Guinea in West Africa and runs a presidential system of government and Edo state is a state located in the south-south geopolitical zone of Nigeria. As of 2006 national population census, the state was ranked as the 24th populated state with over 33 state owned medical hospitals cutting across the 18 local government area of the state.

The 2006 national health policy pointed out and recognizes that the health information system is an important part and major thrust of our health system in Nigeria. This policy described and pinpoint that the state of the health system of the Nigeria population is assessed based on incomplete and scanty information. As such, the policy recommends empowering and strengthening the health information system as a management tool for informed decision making at all levels of governance. In the fast-growing world, all institutions are managed and developed through technological support and health care prioritization.

Respectable health is not only significant for individuals but also for government because it plays a fundamental role in realizing supportable financial progress and development by way of fine as effective practice of capitals. World health organization (WHO 2018) defines electronic health as "the use of information and communication technology (ICT) to improve health" decrease healthcare budgets to families, advance reasonable access to quality facilities, efficiently connect health structures with social protection agendas and increase responsibility and sustainability of health service delivery.

Today information technology (IT) has penetrated the health sector and it is now starting to have an increasing influence on both doctors and patients. Digitization is a process of representing an object, image, document or a signal (usually an analogue signal) by a discreet set of its points identified. The process of digitization having vast implication to the computing of standards as it allows information of all kinds in all forms to be carried with the same efficiency and combined. Edo is a state of more than 5 million people in the mid-western part of Nigeria West Africa. The government has set ambitious goals for development in all sectors including health. The government's approach to health care is based on an emphasis on primary health care and expansion of rural health services. One of

the major initiatives taken by different hospitals in their digitization effort is implementing Electronic Health Record system. An EHR system is defined as an electronic record of health-related information of an individual that can be shaped, collected, succeeded and checked by an authorized clinicians and staff within one health care institute.

The federal ministry of health (FMoH) of Nigeria improves the health services facilities to be modernized through different types of technology. Quality health service is essential for people's life advancement in any country. Automated health services are said to facilitate health professional because of the important role they play in enhancing the quality of health service. Health facilities are the paths for healthy people's health morals, the important façade for improving understudies' health quality and for effective facilities for developing special technical health sector increasing health value. The overall impression for EHR is to increase the quality of health service in hospitals through the establishment of satisfactory facilities and right usage of EHR for better performance and hence lead to quality health service. This study mainly emphasized on conducting comparative study on the implementation of electronic health record for the healthcare sectors performance.

1.2 Statement of the Problem

The goal of a healthcare system is to improve the health of the population in the most effective manner possible in life of a society's available resources and competing needs. The overview of ICT based creativities to convert current manual paper-based information management systems in public health societies in developing countries has usually been a challenging procedure of modification, frequently fraught through numerous context-sensitive contests and complications such as the absence of satisfactory resources and irregular infrastructural growth.

Governments and organizations around the world are mainstreaming EHRs as a tool in all sectors of health service activities. In this regard, organizations need to invest a lot of resources to use ICT as a supportive tool for effective and efficient delivery of services.

There is room for improvement while considering manual recording of patient data and E-record of same while creating a security system that protects individual records, block E-theft, virus protection software and restrict access of unauthorized individuals or groups to health data and information of patients.

1.3 Objectives of the Study

The general objective of this study was to assess the role and implementation of electronic health record to selected private and public sector for healthcare delivery in Edo state.

Specific objectives:

I. To identify the availability, efficiency, and extent of utilizing EHR in selected private and public health institutions in Edo state.
II. To assess the contribution of EHRs for quality of health services in selected private and public health institutions in Edo state.
III. To evaluate the impact of EHRs on the workflow of selected private and public health institutions in Edo state.
IV. To examine the challenges in the use of EHRs system in selected private and public health institutions in Edo state.

1.4 Research Questions

This research attempted to answer the following questions:

i. To what extent does the availability, efficiency and extent of utilizing EHRs affects selected private and public health institutions in Edo state?
ii. What are the contributions of EHR to the quality of health services in selected private and public health institutions in Edo state?
iii. What is the impact of EHR on the workflow of selected private and public health institutions in Edo state?
iv. What are the challenges facing selected private and public health institutions for using EHR system in Edo state?

Research Hypotheses

Based on the research questions and assumption, the following hypotheses was formulated for the study:

1. There is significant difference in the availability, efficiency and extent of utilizing EHRs in selected private and public health institutions in Edo state.
2. There is significant difference in the contribution of EHRs to the quality of health services in selected private and public health institutions in Edo state.

3. There is significant difference on the impact of EHRs on the workflow of selected private and public health institutions in Edo state.
4. There is significant difference on the challenges facing selected private and public health institutions for using EHR system in Edo state.

1.5 Significance of the Study

This research study would serve as a reference point for the researcher in contributing to the body of knowledge already in existence. The outcome of the research findings would be beneficial to many stakeholders such as the health maintenance organizations (HMOs), health insurance brokers, health care providers, health care professionals, patients as well as ministries, departments and agencies (MDAs) of government in the healthcare management enterprise. It will bridge the gap in understanding the principles of the practice, ethical codes of importance and forensic applications, a tendencies and innovations towards global best practice. It will accelerate appraisal of the need, usage and efficiency of EHR/EMR in the hospital and reintegrate the effective implementation and use of E-records in public and private health institutions in Edo state.

1.6 Scope of the Study

The scope of the study is a comparative study of implementation of EHR in public and private selected health institutions specifically in the three senatorial districts in Edo state Nigeria.

1.7 Limitations of the Study

The limitations of this study are mainly the Hippocratic Oath which applied to health records professionals, the confidentiality, rules of privileged communication, legal and ethical disclosures.

1.8 Basic Assumptions

It is assumed that Electronic Health Record can assist hospitals to save money by reducing duplicate tests and treatments as well as overall paperwork. It therefore lower the cost of running the hospital where it exists.

1.9 Operational Definition of Terms

Health: Wikipedia (2017) defines health as the level of functional and metabolic efficiency of a living organism.

The world health organization also defines health as a complete state of physical, social and mental well-being not just the absence of a disease or disorder.

Records: According to the oxford learner's dictionary; records are a written account of something that is kept so that it can be looked at and used in the future. In medicine, it is a chronologic written account in Stedman's medical dictionary (2000) that includes a patient's initial complaint(s) and medical history, the physician's physical findings, the results of diagnostic test and procedures and any therapeutic medications and/or procedures.

Electronic health records: EHR is defined as an electronic record of health-related information of an individual that can be shaped, collected, succeeded and checked by an authorized clinicians and staff within one health care institute.

Electronic medical records: EMR is defined as a document created, maintained and managed using electronic gadgets like computers for the purpose of storing clinically significant information, medically required for treatment of patient or health statistics.

CHAPTER TWO

REVIEW OF RELEVANT LITERATURE & THEORETICAL FRAMEWORK

2.0 Introduction

An electronic health record (EHR) is referred to as a systematized collection of patient's record and population electronically stored health information in a digital format. An EHR stores, arrange and manage a patient medical record securely in the facilities/hospitals Electronic Health Record system. These records can be shared across different health care settings and through network-connected, enterprise-wide information systems or other information networks and exchanges. EHRs may include a range of data such as demographics, medical history, medication and allergies, immunization status, laboratory test results, radiology images, vital signs, personal statistics like age and weight and billing information.

For several decades, electronic health records (EHRs) have been touted as key to increasing quality care. Electronic health records are used for other reasons than charting for patients; today, providers are using data from patient records to improve quality outcomes through their care management programs. EHR combines all patients' demographics into a large pool, and uses this information to assist with the design of "new treatments or innovation in healthcare delivery" which on the whole improves the goals in healthcare. Combining multiple types of clinical data from the system's health records has helped clinicians classify and stratify unremittingly ill patients. EHR can improve quality care by using the data and diagnostic to prevent hospitalizations among high-risk patients.

EHRs systems are designed to store data precisely and to capture the state of a patient across time. It eliminates the need to track down a patient's ----previous paper medical records and assist to certify data up-to-date, accurate and understandable. It also allows open communication between the patient and the provider and seeks to provide "privacy and security". It can reduce risk of data replication as there is only one modifiable file, which means the file is more likely to be up to date and decreases risk of lost paperwork and is cost efficient.

Electronic health records (EHR) are most times used interchangeably with electronic medical records (EMR). The former includes more health data, test results and treatments. It is also designed to share data with other electronic health records, so that other healthcare providers can access a patient's healthcare data. Whereas, the latter is a document created,

maintained and managed using electronic gadgets like computers for the purpose of storing clinically significant information, medically required for treatment of patient or health statistics. The electronic medical record replaces the paper version of a patient's medical history.

Due to the digital information being searchable and in a single file, EMRs (electronic medical records) are more effective when extracting medical data for the examination of possible trends and long-term changes in a patient. Population-based studies of medical records may also be facilitated by the widespread adoption of EHRs and EMRs. Health and medical records keeping are very confidential areas of healthcare usually called the heartbeat of a hospital involving pertinent facts of an individual's health history including all past and present medical conditions, illnesses and treatments with emphasis on the specific events affecting the patient during the current episode of care.

There are basically two types of health records namely; personal health records and public health records. Furthermore, the personal health records (PHR) is categorized into two which are first, the standalone personal health records involving patient information being filled from their own records and stored on their computer or internet. Sometimes, a standalone PHR can also accept data from an external source(s) such as providers and laboratories with a standalone PHR, patients can decide whether to share the information with providers and family members or anyone else involved in their care. In psychological medicine, this right could be undermined or demeaned by displacement, misplacement or total annihilation of patient's right.

One of the assertions is that privately owned hospitals are less likely than public hospitals to invest in an EHR. The former apparently perceive the costs of EHR implementation to outweigh the benefits. This seems remarkable given that there is a general belief that information technology increases efficiency and reduces process costs, so more than compensating for the high initial investments. It is however important to note that the literature on EHR is ambivalent when it comes to efficiency; several authors recorded a decrease in the efficiency of work practices whereas others mentioned an increase.

2.0.1 Historical Background

The historical background of Electronic Health Records (EHR) in Nigeria is relatively recent, with the country gradually adopting and implementing digital health solutions. In the 1920's, healthcare professionals have come to understand the importance of patients health records that are collected, analyzed, interpreted and carefully documented for future purposes.

Before the twentieth century patients health records were organized just to decipher medical issues rather than preventing illnesses and maintaining best possible health conditions.

The history of electronic health records began in the 1960's and can be traced back to the first major health system in Rochester Minnesota to adopt the use of EHR. Only the government in partnership with health organizations could use EHR programs because they were very expensive. At the same time, a new approach to medical records (though paper was still greatly used) began to emerge. This new approach called the "problem-oriented" patient medical record, added robust information about the patients which have metamorphosed into the electronic medical record that is in use today.

This approach became a major breakthrough in the medical record keeping owing to the previous style in which doctor's records a patients diagnosis and the treatment that follows ended there. As part of the "problem-oriented" medical record, clinician began collecting and storing data about a patient's history. In the early 2000s, Nigeria started exploring the use of health information systems to digitize patient records and improve healthcare delivery. The Federal Ministry of Health initiated the eHealth Nigeria project in 2002, aiming to leverage technology for better health outcomes. (FMoH 2002)

Various pilot projects and initiatives were launched during this time to test the feasibility and effectiveness of EHR systems in Nigerian healthcare settings. These projects focused on specific regions or healthcare facilities. (Ojo 2012). In 2010, the Federal Ministry of Health in Nigeria developed the National Health Management Information System (NHMIS) to establish a standardized health information system across the country. The NHMIS aimed to capture patient data electronically, including EHRs, to improve data collection and analysis.

The National Health Insurance Scheme (NHIS) also played a role in promoting EHR adoption. In 2012, the NHIS introduced the Health Management Information System (HMIS), which aimed to digitize patient records and enhance healthcare delivery. Nigeria has faced challenges in implementing EHR systems, including limited infrastructure, inadequate funding, and a lack of trained personnel. These challenges have slowed down the widespread adoption of EHRs in the country. (Adeleke et al, 2016). However, there have been ongoing efforts by the government, healthcare organizations, and international partners to address these challenges and promote EHR adoption. For example, the World Bank has supported projects in Nigeria to strengthen health information systems and promote digital health solutions (World Bank, 2021). As of now, EHR adoption in Nigeria is still in progress, with various healthcare facilities and organizations gradually implementing digital health solutions.

The focus is on interoperability, data security, and capacity building to ensure successful EHR implementation. (Oyewusi 2019).

The COVID-19 pandemic has also highlighted the importance of digital health solutions, including EHRs, in Nigeria and has accelerated the adoption and utilization of telemedicine and remote healthcare services. (Oyewusi et al, 2021)

Over time but particularly in the past two to three years, Health Information Technology for Economic and Clinical Health Act (HITECH) has shifted the Electronic Medical Record (EMR) paradigm entirely. The process of optimizing patient data came to focus in content as much as form. POMRs gave way to records aimed at presenting a full picture of a patient's total health: the Electronic Health Record (EHR). EHR are solely the property of the patient by legal standing which gives the patient the power to grant access to health providers who in turn allows a third party use.

The electronic health records hold important remuneration over their antecedent systems for keeping records in health information. In addition, they possess an enormous guarantee for addressing the inefficiencies in healthcare by a ramp of the sufficient data which are underutilized into assets that work synergistically to the advantage of providers, payers and patients.

2.1 LITERATURE REVIEW

2.1.1 Record keeping in healthcare delivery

The issue of record keeping in healthcare service delivery is very important as evident in the evolvement of hospital record management as a core discipline in the area of hospital management in recent times (Ajala, Awokola et al. 2015). To be useful, the record system must make it easy to access and display needed data, to analyse them, and to share them among colleagues and with secondary users of the record who are not involved in direct patient care (Berg and Toussaint, 2003). There are two major means of keeping medical records of patients in any healthcare delivery facility: the paper-based record keeping system and the electronic health record (EHR) system.

2.1.1.2 Paper-based record keeping in healthcare delivery

The traditional paper-based medical record arose in the nineteenth century as a highly personalized 'lab notebook' that clinicians could use to record their observations and plans so that they could be reminded of pertinent details when they next saw the same patient. The traditional paper-based approach to clinical documentation has become overwhelmed by

information exchange demands among health care providers, financial and legal complexities of the modern health care environment, the increasing rate of biomedical knowledge, growing chronic care needs from an aging population, and medical errors associated with handwritten notes (Chiang, Read-Brown et al. 2013). Furthermore, it comes with other challenges like; inadequate physical space to keep the cards in case of high number of patients, inconsistency in handwriting of individuals as well as vulnerability to termite attack or other attacks. Retrieval of patient information will take a longer time and patients may be privy to confidential information in situations where they must take these paper-based records from one unit of the hospital to another (Ajala, Awokola et al. 2015). Also, there are certain patients that registered with several healthcare providers and these patient records are never shared with other physicians, laboratories and hospitals. Hence information becomes fragmented causing disruption, delay and error in patient care (Overhage, Dexter et al. 2002). Patients most times do not have access to their accurate and reliable information which could be used by them to meet their need. Studies revealed that patients who understand their condition and are involved with doctors in making decisions are better able to deal with their illness or diseases (Gustafson, Hawkins et al. 1999).

2.1.1.3 Electronic health record (EHR) in healthcare delivery

There are numerous acronyms for systems handling patient data: Electronic Medical record (EMR), Electronic Patient Record (EPR), Computerized Medical Record (CMR), Computer Based Patient Record (CPR), and Electronic Health record (EHR). There are only minor differences in the meanings depending on the defining country of origin, health sector, professional discipline, and period of time (Nøhr 2006). The acronym EHR is preferred in this study. The electronic health record has been acknowledged as an important driving force for modern organizational productivity, efficiency and performance effectiveness in healthcare delivery (Lopez, 2003). The EHR can be defined as a longitudinal health record with entries by healthcare practitioners in multiple sites where care is provided. It is used primarily for purpose of setting objectives and planning patient care, documenting the delivery of care and assessing the outcomes of care. It includes information regarding patient needs during episode of care provided by different healthcare professionals (Häyrinen, Saranto et al. 2008). Functionalities of the EHR

A committee of the Institute of Medicine of the National Academies in the United States has identified a set of eight core care delivery functions that electronic health record

systems should be capable of performing in order to promote greater safety, quality and efficiency in health care delivery (IOM. 2003). They include:

Health information and data:

An EHR must contain certain data about patients as physicians and other care providers require this information to make sound clinical decisions. EHR systems with defined dataset that includes such items as, medical and nursing diagnoses, a medication list, allergies, demographics, clinical narratives, and laboratory test results, can therefore ensure improved access to at least some types of information needed by care providers when they need it (IOM. 2003).

Results management:

Computerized results can be accessed more easily by the provider at the time and place they are needed; the reduced time lag increases both efficiency and patient safety by allowing for quicker recognition and treatment of medical problems. Electronic results can also allow for better interpretation and for easier detection of anomalies (Bates, Ebell et al. 2003).

Order entry/Order management:

It allows providers to enter orders (e.g,. for drugs, laboratory tests, radiology, physical therapy) into a computer rather than doing so on paper. The use of computerized order entry, in conjunction with an electronic health record, has been shown to demonstrate a positive effect on clinician productivity (Overhage, Perkins et al. 2001). This functionality can improve workflow processes by eliminating lost orders and ambiguities caused by illegible handwriting, generating related orders automatically, monitoring for duplicate orders, and reducing the time to fill orders (Mekhjian, Kumar et al. 2002). Clinical decision support: It assists the provider in making decisions with regards to patient care through provision of the latest information about a drug, cross-referencing a patient allergy to a medication, and alerts for drug interactions and other potential patient issues that are flagged by the computer (Menachemi and Collum, 2011).

Electronic communication and connectivity:

EHR systems should enable communication among care partners, such as laboratory, pharmacy and radiology. Effective communication among health care team members and other care partners and with patients is critical to quality health care (IOM. 2003) while its lack can contribute to the occurrence of adverse events (Bates and Gawande, 2003). Patient support: EHR systems allow for patient education. Patient education has demonstrated significant effectiveness in improving control of chronic illnesses (Weingarten, Henning et al. 2002) while computer-based patient education has been found to be successful in primary care (Balas, Austin et al. 1996).

Administrative processes:

EHR systems should have electronic scheduling systems for hospital admissions, inpatient and outpatient procedures, and appointments (IOM. 2003). This will increase the efficiency of health care organizations and provide better, more timely service to patients (Woods 2001, Everett 2002). Reporting and Population Health Management: EHRs can improve reporting and surveillance by making it easier to collect standardized, systematic data in a form that can be shared across multiple health care organizations. This can assist Public health organizations to better monitor, prevent, and manage disease thereby improving population health outcomes (HealthIT 2013). In New York City, for example, public health officials designed a program that leverages EHRs to deploy public health alerts to clinicians (Lurio, Morrison et al. 2010).

Structure of EHR

According to Dickinson, Fischetti et al. (2004), every effective EHR system possess three structures: direct care functions, supportive function and Information Infrastructure.

Direct care functions of an EHR

Direct care functions are employed in the provision of care to individual patients and it is basically associated with general clinical tasks. Subsets of direct care functions include care management, clinical decision support, and operations management & communication. The principal users of these functions are expected to be authorized healthcare providers (Dickinson, Fischetti et al. 2004). The functions include diagnosis, goal setting on patient management, planning and carrying out interventions, examination and evaluation of results (Bernstein, Bruun-Rasmussen et al. 2005). It also includes alerts which prompts for contraindications and wrong prescription of medication to patients (Dickinson, Fischetti et al.

2004) as well as past medical history, referral, treatment, medication and discharge (Häyrinen, Saranto et al. 2008).

The supportive function

Supportive functions are functions that support the delivery and optimization of care, but generally do not impact the direct care of an individual patient. These functions assist with the administrative and financial requirements associated with the delivery of healthcare, provide support for medical research and public health, and improve the global quality of healthcare. The principal users of this function are the support staff but, under certain circumstances, the Healthcare providers might be expected to perform certain administrative functions (Dickinson, Fischetti et al. 2004). Examples of these support functions are optimizing patient bed assignments, provision of health guidelines and resources available, administrative and financial coding assignments, electronically query local immunization registries to ensure that a child is currently registered and determine the child's immunization status, as well as the provision of providers' location in the facility.

Information Infrastructure function

This function defines the heuristics of a system necessary for reliable, secure and interoperable computing. These functions are not involved in the provision of healthcare but are necessary to ensure that the information system provides safeguards for patient safety, privacy and information security, as well as operational efficiencies and minimum standards for interoperability. These functions are expected to be performed transparently by EHR system applications on behalf of the end users (Dickinson, Fischetti et al. 2004). The system administrator is expected to be involved in all operations related to configuring and managing the EHR system operation. The functions for this section include security, health record information and management, registry and directory services, standard terminologies and terminology services, standards-based interoperability, business rules management, workflow management (Dickinson, Fischetti et al. 2004).

2.1.2 The Hybrid Health Record System

The shift from paper to an electronic health record creates many challenges and has resulted in a transitional phase creating a "Hybrid" medical record. These challenges include workflows becoming more complicated thereby making the system costly and billings being affected due to multiple location of information (Perez 2013). However, a study noted that

the complete migration to the EHR may take many years longer as healthcare providers continue to rely heavily on paper documents as a common medium for exchange between providers in the patient care continuum (Varga 2011).

2.1.3 Evaluating an Electronic Health Record

There are different methods for evaluating EHR systems but the complexity of the systems and the environment in which they function make evaluations of EHRs complicated (Nøhr 2006). With the current increase in the use of electronic health records (referred to as Patient Care Information Systems (PCIS) by Stoop and Berg (2003) in their study), evaluating these applications has become important to ascertain if their purpose of enhanced quality and efficiency of care is being met. It is imperative to learn from the success and failures of implementing different PCISs, using different implementation methods, in different healthcare organizations in order to avoid similar pitfalls (Stoop and Berg 2003). When evaluating PCISs, it is crucial to be aware of the different priorities of the different stakeholders. While managers may want to know the organizational impact of the PCIS and whether their investment was economically worthwhile, healthcare professionals might be primarily interested in patient outcomes, workers' satisfaction, or other quality-related indicators. Patients on the other hand might be particularly interested in patient outcomes and patient satisfaction (Talmon, Enning et al. 1999). Thus, an overall 'success' measure of information systems is rarely relevant (Southon, 1999). According to Stoop and Berg (2003), evaluation of EHRs could be done along two dimensions; the domain of evaluation and the phases of evaluation. Domain refers to the different viewpoints that an evaluation can take: technical, professional, organizational, economic, ethical and legal. The authors opined that though the list is not exhaustive, it does seem to cover all evaluation items that are relevant for the organizational decision-maker. The focus of the technical domain is to assess software and hardware performance as well as stability with regards system downtime and how often they occur. The economic domain is concerned with cost-benefit analysis. It measures quantifiable costs like buying a PCIS, training personnel, maintenance etc. as well as unquantifiable cost and benefits such as improved doctor-nurse communication, reduced waiting times or changes in tasks and responsibilities of staff. The professional domain evaluates user friendliness, impact on patient outcomes and effectiveness of work. The organizational domain examines the readiness of the different stakeholders, adjustments/preparations that need to be made in advance and impact of the EHR on work processes and the organization as a whole. The ethical domain evaluates data access and

security issues while the legal domain evaluates the role electronic patient data plays in legal matters as well as the consequences of use of electronic patient data (Stoop and Berg 2003). Three phases can be distinguished: pre-implementation, during implementation and postimplementation. The aim of evaluation in the three phases is usually different. While the pre-implementation phase test for feasibility of the EHR, evaluations during the implementation phase are concerned with providing feedback to help optimize the implementation process, which is called 'formative evaluation'. An evaluation during the post-implementation phase is usually about the final outcomes or impacts of the intervention and is called 'summative evaluation' (Friedman and Wyatt 1997). Evaluation of EHRs can take a qualitative or quantitative approach depending on the moment of evaluation or the domain to be assessed. For example, quantitative research methods can be used to measure costs like reduction of administrative staff, whereas qualitative methods can be used to analyse changes in doctor-nurse communication.

2.1.4 Benefits of EHR

The advantages of EHR over paper records are divergent which have enabled its wide acceptability in industrialized nations (Black, Car et al. 2011). These include: the opportunity for healthcare organizations to improve the quality of patient care and safety, potential to reduce cost and improve efficiency of the workplace (Jha, DesRoches et al. 2009), enabled access to medical records from remote locations, improved speed and ease of retrieval of records, avenues to flag abnormal results and elimination of handwritten prescriptions which reduces the occurrence of prescription errors (Greenhalgh, Hinder et al. 2010, Ohemeng-Dapaah, Pronyk et al. 2010, Gaylin, Moiduddin et al. 2011), simultaneous access to patient records by multiple users and the ability to perform data queries to inform decision making (Black, Car et al. 2011).

2.1.4.1 Improve quality of care and patient safety

EHRs have the potential to improve quality of care, particularly when they are coupled with imbedded features such as CPOE and CDSS (Agrawal 2002). Research indicates that EHR is linked to improved outcomes including better infection control (Fitzmaurice, Adams et al. 2002), improved prescribing practices (Teich, Merchia et al. 2000) and improved disease management (Erstad 2003) in hospitals. Similarly, the EHR can specifically result in improved patient safety through the reduction in medication errors in hospitals by utilizing computerized prescription entry, predicting drug interactions and

displaying a warning for health-care provider, assisting clinicians in reconciling patient medications, and maintaining a detailed and legible medical record (Bates, Leape et al. 1998). The EHR can help clinicians identify root causes of adverse events in hospitals and outpatient settings after they occur (Bates, Evans et al. 2003). Moreover, EHR can enable providers to rapidly identify and notify individual patients about important changes in drug therapy such as those related to the Vioxx withdrawal (Jain, Atreja et al. 2005). Also, the EHR alert system ensures that proper dosage and drug utilization are administered to patients (Alpert 2016). Park, Howie-Esquivel et al. (2015) noted that the EHR had the potential to improve patient adherence to prescribed drug therapy.

2.1.4.2 Enhance Productivity and Efficiency

Implementation of EHR increases the opportunity for enhanced productivity and efficiency. For example, EHRs help to eliminate the manual task of extracting data from charts or filling out specialized datasheets. EHR use can improve medical staff relations by increasing physicians' workflow efficiency and satisfying the information needs of practicing clinicians (Chaiken 2003). The scheduling systems can greatly improve hospital and clinic efficiency and provide more timely service for patients (Alpert 2016). A study on EHR by Keenan, Nguyen et al. (2006) found improvement in daily work and enhanced patient care: (a) medication turnaround times fell from 5:28 hours to 1:51 hours; (b) radiology procedure completion times fell from 7:37 hours to 4:21 hours; and (c) lab results reporting times fell from 31:3 minutes to 23:4 minutes. In the same study, transcribing errors for orders declined, length of hospital stay decreased and transmit time of test results decreased by reducing the time taken to deliver paper versions.

2.1.4.3 Improve Care Coordination and Communication

The EHR allow a patient to be seen sequentially by different providers with up-to-date information immediately available to all providers. It gives the healthcare provider instant access to other clinicians' evaluations, as well as diagnostic tests (Alpert 2016). With an EHR, clinicians can more easily coordinate and track patient care across practices and facilities. Clinicians across specialties and disciplines also collaborate on patient outcomes as a team to ensure better care overall (Burton, Anderson et al. 2004, Alpert 2016), and specifically for chronic care management (Bodenheimer, Wagner et al. 2002, Epping-Jordan, Pruitt et al. 2004). The system also makes it possible for the services a patient needs - office visits, testing, surgery, hospital visits - to be coordinated and scheduled over the course of a

single visit, rather than time-consuming multiple visits (Alpert 2016). Additionally, the email feature built into many EHRs can result in improved communication by allowing staff the ability to message each other from any workstation (Erstad 2003). The built-in email feature also allows for real-time communication regarding shared responsibility among clinicians. This provides the ability to simultaneously accomplish tasks and may yield significant time savings (Cooper 2004).

2.1.4.4 Reduction of cost and enhanced revenue

A cost-benefit-analysis study performed by Wang, Middleton et al. (2003) over a 5-year period by aggregating data from their installed EHR, other published studies, and from expert opinion 22 demonstrated a positive return on investment with the primary areas of savings including reductions in drug expenditures, improved utilization of radiology tests, improvement in charge capture, and decreased billing errors. Similarly, another study to examine the economic effect of implementing a commercial EHR showed that the system was associated with direct reductions in spending and increases in revenue during the study period. A first-year savings of almost $1 million directly attributable to the EHR was reported. The savings were realized from reduction in transcription expenses, improved coding, elimination of need to develop new patient charts, lower space requirements and cost avoidance due to no increase in chart room full-time-employees while patient volume had doubled (Barlow, Johnson et al. 2004).

2.1.4.5 Privacy of Patient Records

The use of EHR allows for increased security of data and enhanced patients confidentiality through controlled provider access (Menachemi and Brooks 2006). Regulations for patient record privacy place stringent demands on healthcare providers to protect patient information while implementing electronic methods for sharing with other caregivers and patients. Therefore, access to patients' information is highly restricted as it allows only authorized users' access to all patient information available within an organization. Moreover, the EHR provides resilient security to protect patient record information across the entire wired and wireless environment (CISCO 2005).

2.1.4.6 Improved ability to Conduct Research

Electronically available data for EHR systems will allow for improved ability to quantitatively analyse trends and identify evidence based best practices more easily (Menachemi and Brooks 2006). For example, the data needed for a study can often be derived directly from the EHR, thus making much of what is required for research data collection simply a by-product of routine clinical record keeping. Data from EHRs could be de-identified and integrated into larger data repositories where research can be conducted to improve patient safety, medical knowledge, and public health (Aspden, Corrigan et al. 2003).

2.1.5 Challenges of EHR Implementation

The challenges experienced with EHR implementation in developed countries is somewhat different from those experienced in developing countries (Sood, Nwabueze et al. 2008). By reason of the research objectives of this study, the focus of this section will be restricted to the challenges peculiar to public hospitals in developing countries like Nigeria. The availability of EHR in Sub-Saharan Africa has increased over the last decade, but it has not been without 23 challenges (Akanbi, Ocheke et al. 2012). And while some private hospitals in Nigeria have fully functional EHRs (Akor and John-Mensah 2016), Government institutions appear to be slow in implementing EHR and other appropriate ICTs which are required to improve healthcare delivery (Akanbi, Ocheke et al. 2012, Akor and John-Mensah 2016). Government policy and strategy; lack of ICT infrastructure; lack of basic ICT skills/knowledge; poor internet connectivity; financial issues/constraints; and inadequate electric power supply were identified as the major challenges that hinder the successful implementation of EHR systems in developing countries like Nigeria.

2.1.5.1 Government Policy and Strategy

It has been suggested that government policies might constitute the major barriers hindering the adoption of electronic patient record in Nigeria (Benson 2011). A bulletin of the World Health Organization in 2008 identified the need for a robust government policy on healthcare technologies in Nigeria to facilitate the implementation of e-health initiatives (WHO 2008). Successive governments have strived to improve the health status of Nigerians through series of national developmental plans and annual budgets, however, only modest progress was made in the past (FMoH 2010). It was suggested that even the implementation of the 2001 IT policy in Nigeria did not have the desired results on the health sector (Hassan, Siyanbola et al. 2011). The current plan termed National Strategic Health Development Plan (NSHDP) 2010-2015 was prepared through an elaborate collaborative process involving all

major stakeholders and actors towards delivery on a shared results framework, to which each and every one will be held accountable for achieving the goals and targets as contained in the results framework. National Health Management Information System is one of the 8 strategic priority areas. Among other things, it aims to provide infrastructural support and ICT of health databases, strengthening of the use of information technology on Health Information Systems, establishment of public-private partnerships in the management of data warehouses as well as deployment of acquisition systems for database software at all levels. Since monitoring is imperative towards achieving these targets, a monitoring and evaluating system was proposed to provide accurate, reliable and timely information on progress made by the NSHDP and provide regular reporting on the performance indicators (FMoH 2010).

2.1.5.2 Lack of ICT Infrastructure

The ease of adoption of EHR is dependent on existing infrastructure in a hospital or healthcare organization (Ward, Jaana et al. 2006). A previous study had identified inadequate ICT infrastructure as one of the barriers for electronic health information implementation (Ouma 24 and Herselman 2009). Unlike the developed countries that boast of robust healthcare infrastructures with ample financial support from their governments, the reverse is the case in most developing countries (Sood, Nwabueze et al. 2008). Thus, limited access to computers and other ICT facilities remains a challenge to the successful implementation of EHR (Martinez, Villarroel et al. 2005).

2.1.5.3 Lack of Basic ICT Knowledge/Skills

Training is considered central to any healthcare delivery system, but little information is available on the level of training and utilization of IT among healthcare professionals in developing countries (Bello, Arogundade et al. 2004). While clinicians in developed countries are currently being trained by means of cutting-edge technologies like 3D simulations, virtual reality, and robotics, their counterparts in developing countries lack such exposure. This lack of exposure to advanced concepts in medical training tend to widen the gap between clinicians on the two sides of the divide which may reflect in the efficiency and success of EHR implementation in developing countries (Sood, Nwabueze et al. 2008). Although medical doctors in Nigeria, because of their formal training and access to personal computers & other devices, may be able to quickly adapt to the EHR system, the same cannot be said of other support staff that have had little access to computers and other ICT facilities.

2.1.5.4 Poor Internet Connectivity

Internet connectivity can transform the flow of information in the health sector through effective data management systems, picture archival, and communication systems, and is specifically important for running of radiological information systems and tele-radiology (Benson 2011). Access to the internet has dramatically improved in the last 10 years, and all countries in Africa now have direct access to the internet (Bukachi and Pakenham-Walsh 2007). But the low speed and expensive internet bandwidth in Nigeria (Osuagwu, Okide et al. 2013) will hinder the implementation of the EHR because a high bandwidth is required for transmission of large images between institutions and as well as accessing the EHR itself especially if they contain videos and images (National Research Council 2000).

2.1.5.5 Financial Issues/Constraints

The implementation of the EHR comes with huge financial responsibilities in the form of purchasing necessary software and hardware, installation, training hospital staff and maintenance which may deter governments and institutions from embarking on such projects (Martinez, Villarroel et al. 2005, Al Shorbaji 2008, Alverson, Swinfen et al. 2009, Durrani and Khoja 2009). However, as EHR technologies have become more commonplace over the past decade, the initial cost of systems has come down dramatically (Menachemi and Collum 2011). The cost of EHR adoption, implementation, and ongoing maintenance are compounded by the fact that many financial benefits of the EHR generally do not accrue to the provider (who is required to make the upfront investment) but rather to the third-party payers in the form of errors averted and improved efficiencies, which translate into reduced claims payment. This misalignment of incentives for health care organizations, along with high upfront costs, creates a barrier to adoption and implementation of an EHR, especially for smaller practices (Ibid).

2.1.5.6 Inadequate Electric Power Supply

Any country that finds it difficult to provide Uninterrupted Power Supply (UPS) to its citizens will definitely have problems with deployment of good ICT services like the EHR (Idowu, Cornford et al. 2008). An uninterrupted power supply is a prerequisite for adoption of hospital information systems (EHR) and ensures avoidance of unintended shutdowns that could lead to loss of data or permanent system damage. The power supply is erratic or non-existent in many regions of the Sub-Saharan Africa (Benson 2011). For example, only few cities and towns in Nigeria have stable and reliable electricity for ten consecutive hours a day.

This has resulted in most internet facilities in Nigeria suffering frequent downtime and equipment damage due to power interruptions (Idowu, Cornford et al. 2008).

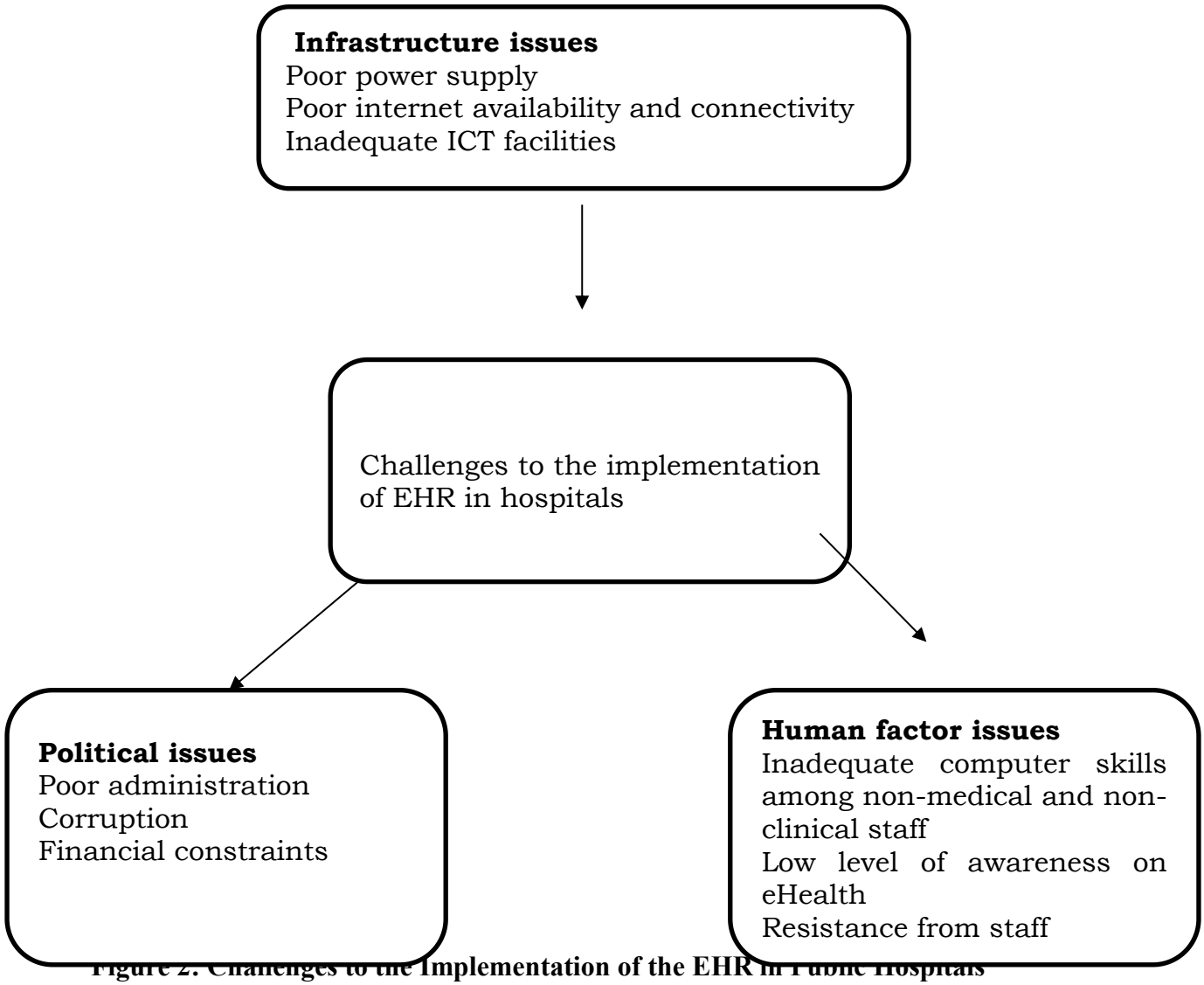

Figure 2: Challenges to the Implementation of the EHR in Public Hospitals

2.1.6 Cyber-attacks and Electronic Health Records

The increasing dependence of healthcare delivery on the internet has increased the likelihood of individuals or organizations conducting cyber- attacks through the internet that will cause physical and/or psychological harm. Cyber-terrorism is defined as the convergence of terrorism and cyberspace. It is generally understood to mean unlawful attacks against computers, networks, and the information stored therein when done to intimidate or coerce a government or its people in furtherance of political or social objections. Attacks that result in violence against persons or property, or at least cause enough harm to generate fear qualify as cyber-terrorism. Examples include attacks that lead to death or bodily injury, explosions,

plane crashes, water contamination, or severe economic loss (Harries and Yellowlees 2013). Cyber-attacks in healthcare may include bringing down a hospital computer system or publicly revealing private medical records which in turn compromises patient care and diminishes trust in the health system (Harries and Yellowlees 2013). Areas of particular concern to healthcare related facilities include the potential for cyber-terrorism-related events to erase or alter computerized medical, pharmacy, or health insurance records (Clem, Galwankar et al. 2003). The risk is more acute in larger healthcare organizations such as hospitals, which have moved away from stand-alone workstations to more tightly integrated platforms that are attached to networks. The ability to deliver healthcare would be crippled if terrorists disabled crucial parts of a nation's IT system using cyber methods to alter, delete, or steal vital health information (Harries and Yellowlees 2013). These attacks can result in substantial cost implications in the form of payment of ransoms and disruption of services. For example, the attack on the Hollywood Presbyterian Medical Center in February 2016 led to the hospital paying hackers a ransom of $17,000 in Bitcoin for the release of its electronic medical records and system. Also, on May 12, 2017, 16 hospitals in England were affected by a major cyberattack along with dozens of countries around the world, including the U.S., Russia, Ukraine, Taiwan and Spain which led to cancellation of appointments (Paul 2017). There is evidence to suggest that cyber threats are increasing, and the healthcare system is ill equipped to deal with this daunting challenge. Healthcare organizations should therefore prepare themselves by ensuring they have appropriate measures in place to secure important systems that could be potential targets for terrorists (Harries and Yellowlees 2013).

2.1.7 Usability and User Satisfaction

Usability is the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use (ISO 1998). It represents an important yet often overlooked factor impacting the adoption and appropriate utilization of electronic health record (EHR) systems (McDonnell, Werner et al. 2010). Without usable systems, doctors, medical technicians, nurses, administrative staff, consumers, and other users cannot gain the potential benefits and functions of EHR systems.

2.1.7.1 Factors that Impede Usability

The 'failure to use human factors design principles' in the design of EHR system has been identified as a major factor that impede usability and user satisfaction (Schumacher, Berkowitz et al. 2010). Some EHR users lament that health IT seems designed more for

clinical transactions than for clinical care and may not be easy to use in some care settings (Walker, Carayon et al. 2008). On the basis of field research in five health clinics, (Hollin, Griffin et al. 2012) identified eight aspects of usability relevant to EHR design. These aspects include: the nature of user-software interaction, learning ability of software, facilitation of user cognition, degree of user control and software flexibility, degree of matching of system structure and content to that of real-world tasks, design of graphics, system navigation, and editing capability and consistency among interfaces. Other factors that affect usability include; reluctance to adapt to new technology (Fitzgerald, Piris et al. 2008), perception of health workers of the degree to which telemedicine technology is easy to use (Chau and Hu, 2002), inadequate training on the use of the EHR system (AMA 2014), and lack of consistency within and across applications especially for physicians who deal with two or more EHRs (Schumacher, 2010).

2.1.7.2 Measures to increase Usability

Usable designs do not come in a flash of brilliance. Instead, they are based on systematic analysis of end-user needs, workflow development, application of design guidelines and standards, and user testing, driven by dedication to create the most usable interface possible (Schumacher 2010). Also, Schumacher, Berkowitz et al. (2010) noted that in order to increase usability and user satisfaction, the EHR system must be seen to be smarter and add to the overall intellectual value of health professionals after an encounter with a patient. Measures to ensure usability and maximum user satisfaction of EHRs include; continuous awareness and training workshops or courses concerning basic ICT skills as well as the actual usage of EHR systems (Walker, Bieber et al. 2005, AMA 2014), cultivation of a positive attitude by users towards using the technology (Chau and Hu 2002), and the development of a common style guide-designed through collaboration between physicians and vendors-so that physicians who practice in different care settings can move easily from one EHR to another (AMA 2014).

2.2 Theoretical Framework

Introduction

Information from a patient's record is critical in making health-related decisions and timely access to information in healthcare facilities are paramount to achieving efficient care delivery (Kumar 2011). The purpose of a patient record is to recall observations, to inform others, to instruct students, to gain knowledge, to monitor performance, and to justify

interventions (Reiser 1991). However, observational studies of physicians' use of the paper-based record find logistical, organizational, and other practical limitations reduce the effectiveness of the traditional records for storing and organizing an ever-increasing number of diverse data (Tang and McDonald 2006). An electronic health record (EHR) is designed to overcome many of these limitations, as well as to provide additional benefits that cannot be attained by a static view of events (Ibid). This section gives an overview of the theories that underscore the study, as it reviews EHR as an Information Infrastructure and as an actor in the Actor-Network Theory. It then proceeds to evaluate the two ways of record keeping in healthcare facilities: paper-based system and electronic health record system. An in-depth exploration of the EHR was presented which highlighted the structure, benefits and challenges associated with its implementation. The section concludes with a summary and the rationale for the present study.

This study is predicated on the concept of Information Infrastructure (II) and the Actor Network Theory (ANT). Bowker, Baker et al. (2010) stated that when dealing with information infrastructures, we need to look to the whole array of organizational forms, practices, and institutions that accompany, make possible, and inflect the development of new technology, their related practices, and their distributions. They noted further that people, routines, forms, and classification systems are as integral to information handling as computers, Ethernet cables, and web protocols. Moreover, they explained that the boundary between technological and organizational means of information processing is both diffuse and mobile and can be shifted in either direction because technological mechanisms can only substitute for human and organizational ones when the latter are prepared to support such substitution (Ibid). It can be deduced that the successful implementation of the EHR in a public and private healthcare facility therefore depends on both the system and the people (organization) that will be involved in its implementation and use. Monteiro (2000) described the development, introduction and use of II as an involved socio-technical process of negotiation where non-technical issues sometimes get dressed up in technical disguise therefore requiring an analytical vehicle like the ANT to unravel issues related to the 'management' of such processes. He stated further that "ANT provides an effective platform from which to critically assess and unravel a set of problematic set of explicit and implicit assumptions made from the management perspective on information infrastructure" (Ibid). In a similar vein, McMaster, Vidgen et al. (1997) opined that since the nature of EHR implementation is a political-negotiating process, ANT provides an analytical framework for studying power processes within a socio-technical context. They argued further that ANT

distances itself from the view that technologies are stable entities that are passed from community to community and then put into use; rather ANT pays attention to the diverse interplay between human and non-human actors (Ibid). Similarly, Tatnall and Gilding (1999) contended that the ANT can be useful for studies of information systems in situations where interactions of the social, technological and political are regarded as particularly important. From the foregoing, ANT is also suitable to study the prospects and challenges of implementing an EHR in a Nigeria secondary Healthcare facility because it helps explore how actor networks are formed, hold together, or fall apart (McMaster, Vidgen et al. 1997). The researcher therefore chose the concept of II and ANT because they complement each other well and provide a good theoretical basis for the study (Gammon, Johannsen et al. 2008). Also, these theories have previously been adopted to determine the relationship between information systems and organizational issues (Hanseth and Monteiro 1998).

2.2.1 The concept of information infrastructure

The term information Infrastructure (II) gained its rhetorical thrust from visions initiated by the Bill Clinton administration in the United States (1993-2001) which was followed up by the European Union's plan for Pan European II. These visions were seen as means to launching the information society (Hanseth and Monteiro 1998). Hanseth (2002) defined II as "an awesome shared, evolving, open, standardized, and heterogeneous installed base" while Pironti (2006) defined it as all of the people, processes, procedures, tools, facilities, and technology which supports the creation, use, transport, storage, and destruction of information. An information infrastructure that is non-local and distributed, like the EHR, will encompass multiple actors that may have different needs and interests that may not be aligned. For information infrastructure to work, some working resolution between the multiple local interests and the over-arching or "global" interests of the network as a whole needs to be found (Star and Ruhleder 1996). A key characteristic of II is that infrastructures evolve and grow slowly over time where the existing infrastructure- the installed base- strongly influences how it can be improved. The installed base should therefore be seen both as a material to be shaped (improved and extended) at the same time as it is an actor that often appears to live a life of its own outside the control of designers and users (Hanseth 2002). In the process, the infrastructure shapes and is shaped by the work practice in an on-going co-construction process between technical and social elements. Installation of new infrastructure like the EHR in a Nigerian secondary healthcare facility therefore requires that we put existing infrastructure into consideration in such a way that it develops through

extending and improving the installed base. This will include also the social aspect (users) because the social and the technical aspects interoperate (Hanseth and Monteiro 1998). To build (or grow) infrastructures is a challenging endeavour for several reasons: IIs expand through integrating previously separate systems, however, integration is not only a technical concern of achieving interoperability, rather a process embedding political and institutional interests. For instance, in the context of implementing an EHR in a Nigerian Secondary Healthcare setting, a number of heterogeneous actors, including developers, the government, and users', are involved with diverging interests, which requires ongoing political negotiations (Sahay, Monteiro et al. 2009). It is worthy of note that infrastructure development is characterized by uncertainty. It is basically an open process due to the many interdependencies that need to be dealt with. Furthermore, unintended side effects and the participating actors' reflexivity can add to the complexity (Hanseth and Ciborra 2007). It has also been noted that the success and failure of an EHR depends on the designreality gap that exists between 'current realities' and 'design conceptions of the EHR' (Heeks 2006). A successful implementation of the EHR in a Nigerian secondary Healthcare facility hinges on how effectively the above issues are dealt with.

Functions/Characteristics of Information Infrastructure

According to Hanseth and Monteiro (1998), II possesses some functions or characteristics that make them different from other information systems. These functions are: enabling, shared, open, socio-technical, heterogeneous and installed base.

The Enabling Function of II

The enabling function of IIs means it is designed to support a wide range of activities and intended to open-up a field of new activities, not just improving or automating something existing (Hanseth and Monteiro 1998). The EHR in a Nigerian Secondary Healthcare facility should be designed to surpass the single function of automation of health records but should support new field of activities like access to patient records across organizations. This will make service delivery easier when a patient seeks healthcare service in a different hospital.

The Shared Function of II

II allow for sharing of information by the members of a community in the sense that it is the one and same single object (EHR) used by all of them to achieve the same goal. Although it may appear differently, the components are interdependent. Due to this shared

function, II are irreducible. This implies that all the various users use the infrastructure as the system cannot be split into separate parts used by different groups independently (Hanseth and Monteiro 1998). This shared function of IIs was explained by Schneider and Wagner (1993) who stated that an EHR system in a hospital supports collaborative work by enlarging and enriching the area of shared information, providing actors with an overview of information distributed over space and time, supporting the negotiation of norms and rules, facilitating the coordination of effort, and helping to establish a certain degree of discipline and rigor. The EHR in the Nigerian Secondary Healthcare facilities should facilitate data sharing among the healthcare personnel in the facility, make it possible for them to access the health information of patients per time and should make it possible for the various healthcare workers to achieve a desired goal.

The Open Function of II

Where systems are defined as open, it means that inputs and outputs can pass through their borders and interfaces. IIs are open in the sense that there are no limits for the number of users, stakeholders, vendors involved, nodes in the network and other technological components, application areas or network operators. It does not mean that everything is included in every II but does imply that one cannot draw a strict boundary between what is on one side of the II and what is on the other side. The openness of IIs also means that they are dynamic and always shifting, thus there is need for every II to be flexible to some extent in order to enjoy stability over a period of time (Hanseth and Monteiro 1998). When implementing the EHR in a Secondary Healthcare facility, it should be borne in mind that it is open to various users, it will involve both human and non-human actors and it should be designed in such a way as to adapt to future changes.

The Socio-Technical Network Function of II

IIs as socio-technical networks emphasize both the technological aspect of the infrastructure and the social dynamics that are brought to bear on the infrastructure from the organization, its members and the community at large. IIs will not work without the support people and the users using it properly (Hanseth and Monteiro 1998). As technology defines every organization, so are they too in turn redefined by the organization (Hughes 1994). Technology and organization cannot be separated but are co-constructed. In effect, implementation of the EHR must be considered as a process in which both technology and organization are transformed in unpredictable ways through interlocking, and where it is

problematic to single out critical success and failure factors (Berg 2001). Likewise, organizational impact cannot be measured by standards such as support/non-support, because entirely new effects arise, which are not easily evaluated. Therefore, design and implementation cannot be pre-planned and centrally orchestrated, but must be seen as processes of experimentation, political negotiation and inventiveness (Berg and Toussaint 2003). Therefore, the users and other social elements should be considered as imperative to the successful implementation of the EHR in a Nigerian Secondary Healthcare facility and not just the technology (EHR) alone. Coiera (2003) buttressed this fact when he observed that the triumph of any system (EHR in this regard) in healthcare delivery is partly determined by how well the users are able to interact with the system.

The heterogeneous function of II

IIs are heterogeneous because of their socio-technical nature; encompassing technological components, humans, organizations, and institutions. They will only work well with proper support and usage by the users. IIs thus constitute ecology of networks by connecting various components into an interdependent network. IIs are also heterogeneous in the sense that the seemingly same function might be implemented in several different ways (Hanseth and Monteiro 1998). Implementation of the EHR in a Nigerian Secondary Healthcare facility should take into consideration the needs of all the users. II as an Installed base IIs are never designed from scratch, but they develop through the evolution of an installed base (Hanseth and Monteiro 1998). Hanseth and Lyytinen (2010) define an installed base as the existing "set of ICT capabilities and their users, operations, and design communities", and it also encompasses existing institutional and organizational components (Lanzara 2014). The installed base serves as the foundation for any change or development and can be both enabling and constraining (Aanestad, Grisot et al. 2017). In a Public or Private Healthcare facility for example, an installed base may encompass existing patients record systems, various groups of professionals as users (nurses, clinicians), dispensing practices, regulations etc. Aanestad, Grisot et al. (2017) argues that implementation of a project like the EHR in a public or private Healthcare facility will be shaped by the existing installed base: the organizational, institutional, regulatory, sociotechnical arrangements that are already in place. Thus, the implementation of the EHR in the facility should be seen as replacing or substituting an existing infrastructure (paper-based record system). Therefore, the successful implementations depend on how well it can be incorporated into or as a replacement part of the existing system (Hanseth 2002).

2.2.2 The Actor Network Theory (ANT)

The increasing scale of computerization of modern healthcare highlights the need for a more sophisticated view of relationships between humans and objects as technologies become ever more complex (Cresswell, Worth et al. 2010). The ANT was elaborated chiefly by Michel Callon, Bruno Latour, and John Law. It is concerned with the creation and maintenance of coextensive networks of human and nonhuman elements which, in the case of information technology, include people, organizations, software, computer and communications hardware, and infrastructure standards (Walsham 1997). The ANT treats the social and technical aspects of a system as inseparable, and argues that people and artefacts should be analyzed with the same conceptual apparatus. This point was further buttressed by Latour (1996) who opined that the two systems (social and technical) are now coextensive. The Actor-Network Theory (ANT) is an increasingly influential approach to understand humans and their interactions with inanimate objects. The ANT is of the view that technology emerged from social interests and thus has the potential to shape social interactions (Prout 1996). It has been suggested that the ANT can be helpful in investigating technology implementations in healthcare settings. The theory is useful in helping to appreciate the complexity of reality (including the complexity of organizations) and the active role of technology in this context (Cresswell, Worth et al. 2010). ANT helps to conceptualize how different realities are experienced and enacted by different actors, resulting in a more nuanced picture of dynamic relationships between different actors without neglecting their inter-relatedness. This is important when considering the fast-moving and ever-changing area of healthcare itself, and particularly so in relation to government-led change initiatives and resulting changes in power relationships (Robertson, Cresswell et al. 2010). This knowledge can contribute to a more holistic appreciation of the complexity of technology introduction in healthcare settings. It can also prove practically useful in providing a theoretically informed approach to sampling (by drawing on informants that are related to the technology in question) and analysis (by providing a conceptual tool and vocabulary that can form the basis for interpretations) (Cresswell, Worth et al. 2010). There are two central attributes of the ANT: translation and inscription.

<u>Translation</u>

Translation involves associating "heterogeneous entities" to form an actor-world through assigning, to each, "an identity, interests, a role to play, a course of action to follow, and projects to carry out" (Callon 1986; 24). It involves reconciling the different meanings the actors hold of a given phenomenon. During translation, actors interact with each other to work out a scenario of how the system will work and will be used. In implementing an EHR, it is imperative to ascertain the interests of all the actors, and possibly manoeuvre the interests of others, in other to forestall any hindrances. According to Callon (1986), the process of translation occurs in four steps: problematization, interessement, enrolment and mobilization. During the first stage called problematization, a focal actor identifies other actors that have goals and interests consistent with its own and establishes itself as an obligatory passage point which is a mechanism that has to be passed by all the actors in order to satisfy the interests that have been attributed to them by the focal factor. In other words, the focal actor frames a problem or an opportunity and attempts to persuade other actors in the network that the problem/opportunity is worthy of having resources dedicated to it. The second moment of translation is intressement, which means the process of persuading the other actors to accept the definitions initially provided by the focal actor. At the enrolment stage, the other actors in the network put into action the roles defined for them during the problematization stage. Latour (1987) suggests five strategies for enrolment (1) cater for others' interests; (2) convince others that their usual ways are cut off; (3) to seduce them through a detour; (4) reshuffle interests and goals and (5) becoming indispensable to others. In the mobilization stage, the main actor assumes a spokesperson role for passive network actors and seeks to mobilize them to action. This stage is about stabilizing the network by making durable and irreversible relations (Callon 1986; 24). Inscription The notion of inscription refers to the way technical artefacts embody patterns of use (Monteiro 2000). Inscription is the process whereby translation of one's interests is embodied into technical artefacts. That is, a translation presupposes a material into which it is inscribed: text, software, skill, etc. The inscription includes program of action for the users, and it defines roles to be played by users and the system (Monteiro 2000). When a program of action is inscribed into a piece of technology, the technology becomes an actor imposing its inscribed program of action on its users. There are four interesting aspects of the notion of inscriptions: (1) What is inscribed: which anticipations of use are envisioned; (2) how are these anticipations inscribed: what is the materials for inscriptions; (3) who inscribes them; and (4) the strength of the inscriptions: how much effort does it take to oppose an inscription. The strength of inscriptions, whether

they must be followed or whether they can be avoided, depends on the irreversibility of the actor network into which they are inscribed (Monteiro 2000).

One of the prominent theoretical frameworks in the field of Electronic Health Records (EHR) implementation is the Technology Acceptance Model (TAM). TAM was initially proposed by Davis in 1989 and has been widely used to understand the factors influencing the adoption and use of technology in various contexts, including healthcare.

According to TAM, the acceptance and use of technology are influenced by two primary factors: perceived usefulness and perceived ease of use. Perceived usefulness refers to the extent to which individuals believe that using the technology will enhance their job performance or productivity. Perceived ease of use refers to the degree to which individuals believe that using the technology will be effortless and free from complexity. Several scholars have applied TAM to study EHR implementation and adoption. For example, (Venkatesh et al. 2003) conducted a study to assess the acceptance and use of EHR systems among healthcare professionals. They found that perceived usefulness and perceived ease of use significantly influenced the intention to use EHR systems.

Another theoretical framework that has been applied in the context of EHR implementation is the Unified Theory of Acceptance and Use of Technology (UTAUT). UTAUT was developed by (Venkatesh et al. 2003) and integrates various theories to explain technology adoption. UTAUT identifies four key factors that influence technology acceptance: performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy refers to the degree to which individuals believe that using the technology will improve their job performance. Effort expectancy refers to the perceived ease of use of the technology. Social influence refers to the influence of others' opinions and recommendations on the individual's intention to use the technology. Facilitating conditions refer to the availability of resources and support for using the technology. Several studies have applied UTAUT to examine EHR adoption and implementation. For instance, (Holden et al. 2012) used UTAUT to assess the factors influencing the adoption of EHR systems in primary care practices. They found that performance expectancy, effort expectancy, and facilitating conditions significantly influenced the intention to adopt EHR systems.

These are just a couple of examples of theoretical frameworks that have been applied in the context of EHR implementation. Other frameworks and models, such as the Socio-Technical Systems Theory, Organizational Change Theory, and Human-Computer Interaction

Theory, have also been utilized by scholars to understand and analyze the complexities of EHR implementation in different healthcare settings.

In Nigeria, the theoretical framework on EHR implementation aims to leverage technology to improve healthcare delivery, enhance data-driven decision-making, and ultimately improve health outcomes for the Nigerian population. There exist some fundamental basic principles which the theoretical frameworks are primarily based on and they are briefly listed and explained below as follows;

1. Health Information System (HIS) Framework: The Nigerian EHR implementation framework emphasizes the integration of EHR within the existing Health Information System. It focuses on aligning EHR with other health information systems, including health facility management systems, laboratory information systems, and pharmacy systems, to ensure seamless data exchange and interoperability.

2. Standards and Interoperability: The framework emphasizes the use of standardized data elements, terminologies, and coding systems to ensure data consistency and interoperability across different healthcare settings. It promotes the adoption of international standards such as HL7 (Health Level Seven) and SNOMED CT (Systematized Nomenclature of Medicine Clinical Terms) to facilitate data sharing and exchange.

3. Governance and Policy: The framework recognizes the importance of strong governance and policy frameworks to guide EHR implementation. It emphasizes the need for clear roles and responsibilities, data privacy and security regulations, and ethical considerations to ensure the appropriate collection, storage, and use of health data.

4. Capacity Building and Training: The framework highlights the importance of capacity building and training programs for healthcare professionals involved in EHR implementation. It focuses on enhancing their knowledge and skills in EHR use, data management, and data analytics to maximize the benefits of EHR adoption.

5. Infrastructure and Technology: The framework acknowledges the significance of robust IT infrastructure and technology systems to support EHR implementation. It emphasizes the need for reliable internet connectivity, secure data centers, and appropriate hardware and software solutions to ensure the availability, accessibility, and security of electronic health records.

6. Stakeholder Engagement and Collaboration: The framework recognizes the importance of engaging and collaborating with various stakeholders, including healthcare providers, policymakers, regulators, patients, and technology vendors. It promotes a participatory approach to EHR implementation, involving stakeholders in decision-making, system design, and evaluation processes to ensure a user-centered and sustainable EHR system.

Keshavjee et al. (2006) and Holbrook et al. (2003) describe a framework which consists of success factors operational over a three-phase implementation period, namely: pre-implementation, implementation and post-implementation phases which has some semblance with the WHO's Electronic Health Record Manual for developing countries (Keshavjee et al., 2006; Holbrook et al., 2003; World Health Organization, 2003).

In addition, Wickramasinghe and Schaffer (2010) developed an e-health preparedness grid to assist governments and/or organizations how best to become prepared and ready to move forward in their specific e-health solution and thus ensure a successful and satisfactory result.

However, irrespective of what framework is used for EHR implementation, the following have been the most prominent features of many implementations, according to (Keshavjee et al., 2006):

1) EHR implementations proceed gradually over time,

2) Implementations involve people, processes and technology,

3) Implementations are prone to failure if there is poor governance and leadership,

4) Negotiation and dialogue between different stakeholders and between stakeholders and technology is quite prominent,

5) EHR implementations are dynamic processes which evolve as learning occurs and new problems and opportunities are discovered,

6) Technology reliability and usability play important roles.

In Keshavjee et al. (2006) framework, factors can overlap from one phase to another. These factors (People, Process and Technology) interact in the three phases of implementation.

Pre – Implementation Phase

The pre-implementation phase consists of the following components:

- Governance

This involves management activities and should involve members of the administration, health information management, potential users from the medical and nursing services, representatives from the financial and IT services and all other stakeholders in order to identify the current situation, anticipate and address likely problems and assess the readiness of users for the proposed changes.

- Project Management Leadership

The two distinct roles of a Project Manager and a Project Champion are necessary to ensure the project is delivered on time, budget and to specification and that it easily gets acceptability by the end users.

- Stakeholder Involvement

Early involvement of stakeholders will help to build up the requirements of end users and help reduce resistance to change. It will also help identify the pressing issues that have to be addressed prior to implementation, as well as identify the expectations and align them to realities of funding, manpower and technology.

Care must however be taken to ensure that all concerns are captured within a realistic scope and not allow changing user requirements to derail implementation.

- Self-Benefits

The perceive benefits of EHR should be identified and communicated to stakeholders as much as possible.

- Software Selection

Before selecting the necessary software, it is important to address the requirements of a nationwide EHR. The team responsible for selecting the EHR needs to determine whether they want to build their own EHR system, buy or lease one from a reputable vendor. Building one's own system could be time-consuming and expensive but should enable the organization to design one to meet their specific needs. The factors to consider in selecting an EHR include cost, user friendliness, information integration capacity, and vendor issues such as maturity and viability. A well-defined selection process, which should involve an iterative sequence of review of EHR specifications and features, live product demonstrations, site

visits, and negotiations with vendors, increases the chance of success (Holbrook et al., 2003). Leasing an EHR system would enable access to software applications that are managed off-site. While the initial costs of leasing an EHR system might be lower than buying or building one, it may prove more costly over a long period of time. A thorough cost-benefit analysis should therefore be conducted to compare the following three options:

1) Purchase off-the-shelf software.

2) Lease software through subscription.

3) Develop and build bespoke software.

- Pre-Load Integration

The aim is to have the EHR integrate with existing systems or have the old data loaded into the new system. Integration provides access to existing data and increases accuracy and system efficiency. It is important to decide how to manage the old data at this stage.

- Usability Factors

EHR usability issues involve hardware and software usability. Hardware usability is concerned with issues such as location of workstations, use of tablets and other form factors which fit into the clinician's workspace, workflows, speed of processing, etc. Software usability on the other hand involves user interfaces and how software design supports clinical workflows and work processes.

Implementation Phase

Implementation could either be full or phased.

The readiness of the site and of all users to accept change and the availability of funds for implementation are two of the issues that determine which implementation option to adopt. In an environment with a strong technical infrastructure like a telecommunication infrastructure with fully trained manpower and functional systems, the tendency may be for full implementation where data for all active patients must be uploaded immediately before going live.

A phased implementation which involves implementing one unit at a time is preferred for resource constrained areas where the resources to tackle all the issues that implementation will raise are not readily available. This gives room to manage changes in small units and

transfer lessons learnt to other units. However, initial challenges can offer critics of the system a talking point; affect sustained funding and cooperation of other units.

- Workflow Redesign

Critical to successful implementation is the fitness of staff and physician workflow to that of the EHR functional and usability design constrictions or flexibilities. If the fit is poor, implementation can fail.

- Training

Familiarization and training of primary users on the EHR should be both initial and on-going.

Training, however, should commence with the more interested and skilled users who will subsequently be used to motivate the others and developed to "super users" to handle most basic hardware and software problems locally.

Implementation

- Assistance and Support

Any successful implementation requires a strong vendor partnership. The vendor should be responsive and the system flexible enough to allow addressing any system improvements and/or modifications as identified by clinicians or primary users.

- Feedback and Dialogue

Opportunities for interaction with other users will create a forum for discussing some of the challenges with the new system and create new knowledge that can be shared to improve user satisfaction.

- Privacy and Confidentiality

EHR implementation must meet confidentiality requirements, especially when web-based record systems are used. Confidentiality can be achieved through the use of standardized data exchange protocols, access control, system integrity, network security, clear data ownership, user profiles and audit trails.

Post-Implementation Phase

In order to sustain the gains of the pre-implementation and implementation phases the use of support and user groups, as well as the judicious use of incentives to encourage the adoption to manage changes in small units and transfer lessons learnt to other units. However, initial challenges can offer critics of the system a talking point; affect sustained funding and cooperation of other units.

In dealing with the complexity of EHR implementation in hospitals, it is helpful to know which factors are seen as important in the literature and to capture the existing knowledge on EHR implementation in hospitals. As such, the objective of this research is to identify, categorize, and analyze the existing findings in the literature on EHR implementation processes in hospitals. This could contribute to greater insight into the underlying patterns and complex relationships involved in EHR implementation and could identify ways to tackle EHR implementation problems. In other words, this study focusses on the identification of factors that determine the progress of EHR implementation in hospitals. The motives behind implementing EHRs in hospitals and the effects on performance of implemented EHR systems are beyond the scope of this paper.

Summary of the Chapter

This chapter commenced with the literature review which identified some challenges with the traditional paper-based records in healthcare delivery which the electronic health records helps to address. The literature highlighted some benefits of the electronic health records which include improved quality of care, enhanced productivity and efficiency among other things. It also indicated that the implementation of the EHR is dependent upon human, organisational and technological factors which vary in developed and developing countries although some of the challenges are common to both.

The chapter progressed with an introduction of the theories relevant to the implementation of the EHR in a public Hospital in Nigeria. This includes the Information Infrastructure theory which views the EHR as an Information Infrastructure as well as the Actor-Network Theory which require that all actors that will be involved in its implementation be identified and their interests taken into consideration to ensure a successful implementation.

To this end, evaluation of the EHR at various levels of implementation (pre-implementation, implementation and post-implementation stages) is recommended to

minimise failure rates associated with the process. Evaluation of implemented EHR systems or feasibility studies on the prospects and challenges of implementing an EHR in a Nigerian public hospital are lacking. Hence, this study seeks to explore the prospects and challenges that may be associated with implementing the EHR system in a public and private healthcare facility in Edo state, Nigeria.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter provides an overview of the research methodology employed in this study. It outlines the research design, sample selection, data collection methods, and data analysis techniques. The rationale behind the chosen methodology is explained, along with ethical considerations.

The instrument procedures and analysis of data used in this study is discussed under subsections:

1.1 Design of the Study
1.2 Population for the Study
1.3 Study Setting
1.4 Study Subjects
1.5 Sample Size and Sample Technique
1.6 Method of Data Collection (Instrumentation)
1.7 Validity and Reliability of Research Instrument
1.8 Administration of Instrument
1.9 Method of Data Analysis
1.10 Ethical Considerations

3.1 Design of the Study

The design of the study is to evaluate the implementation of electronic health record in public and private health institution in the three senatorial districts of Edo state and a descriptive survey design was employed.

3.2 Population For The Study

The population for the study comprises of three public hospitals with a population of 1800 and three private hospitals with a population of 970 all including doctors, nurses, administrative staff, laboratory physicians and front desk workers.

Table 3.1

Public Hospital	1800
Private Hospital	970

Source: Field Survey, 2023

Table 3.2

Three Senatorial District	Public	Private
Edo South	958	405
Edo Central	350	209
Edo North	492	356
Total	**1800**	**970**

Source: Field Survey, 2023

3.3 Study Setting

The study setting for this research project is Edo state, Nigeria. Specifically, this research work involved gathering data and conducting the study in the three senatorial district including Edo south, Edo central and Edo north of the state on six health institutions operating in this geographical boundary.

Fig.1: Map of Edo State showing the three senatorial districts and their various Local Government Areas

3.4 Study Subjects

The subjects of the study are the doctors, nurses, administrative personnel, laboratory technicians, front desk attendants, pharmacist and some patients as well who directly are involved in the use of the electronic health records.

3.5 Sample Size and Sample Technique

Out of the total population, a sample size of 120 respondents was drawn for this study with 70 respondents representing the public hospitals and 50 respondents representing the private hospitals respectively.

A simple random sampling technique was used after carefully gathering the list of all the public and private hospitals in each of the three senatorial districts of Edo state and this technique enabled the researcher to pick Oredo from the Edo south senatorial district, from Edo central, Esan North-East and from Edo North, Etsako-west respectively.

Table 3.3

Three Senatorial District	Public	Private
Edo South	28	22
Edo Central	19	15
Edo North	23	13
Total	**70**	**50**

3.6 Method of Data Collection (Instrumentation)

A pretest, semi structured and self-administered questionnaire was used to obtain quantitative data. The findings from previous studies in similar settings guided the development of the data colletion tool.

The research questionnaire is designed using the Yes and No format. This adopted format was particularly useful in preventing the respondents to the questionnaire from being non-committal in their answers/responses.

For the qualitative strand, data were collected using the tested In-depth interview (IDI) guide. Both face-to-face and telephone formats was utilized, data was collected via phone conversations (because of time constraints for the completion of this study and the very poor state of the roads to the Edo Central and Edo North Senatorial areas). The interviews also focused on the same issues addressed by the questions but this time it provided deeper insight into the issues in a rather flexible manner using open-ended questions (See Appendix I and Appendix II for the structured questionnaire and interview schedule respectively).

3.7 Validity and Reliability of Research Instrument

The questionnaire was subjected to thorough examination by the research supervisor to ensure its validity. The test-retest reliability was measured by Pearson correlation coefficient (r = 0.86%). Minor revisions were made to the questionnaire based on the findings of the pilot test. The statistician assisted with the final questionnaire. The questionnaire included different sections, such as socio-demographic characteristics, patients and staffs' awareness, efficiency, availability and utilizations of EHRs, contribution to quality healthcare delivery, workflow and productivity of healthcare services and challenges affecting the implementation of EHRs in public and private hospitals.

The validity strategy for the guide was by member checking and each IDI data was transcribed verbatim and coded accurately to ensure reliability of the data. Accurate

recording of the research procedure overtime for easy tracking ensured confirmability of the findings.

3.8 Administration of Instrument

The questionnaire administration and the interviews were carried out by the researcher with the help of a research assistant (who assisted in taking notes and recording the interview sessions and administering some questionnaires). This made for first hand and the comprehensive documentation of the data provided by the respondents.

3.9 Method of Data Analysis

A content analysis approach was used in analysing the qualitative data. The researcher interviewed the respondents with the help of an assistant who took down notes and transcript of the audio recordings which were coded and subjected to content analysis with the aim of identifying common themes. This content analysis (S. Elo 2007) allows for the making of replicable and valid inferences from data to their context, with the purpose of providing knowledge, new insights, a representation of facts and practical guide to action.

3.10 Ethical Considerations

The researcher obtained informed consent and the nature and purpose of the study were explained to the respondent. All participants were assured of confidentiality and anonymity of the information provided.

Also, the ethical guidelines set out by the research department of the University of Benin was strictly adhered to by the researcher of this study.

CHAPTER FOUR

PRESENTATION & ANALYSIS OF RESEARCH FINDINGS

This chapter presents the analyses of data collected from the respondents through questionnaire and interview. A total of 120 questionnaire were distributed but only 110 were duly filled and returned. This analysis therefore is based on the questionnaires that were duly filled and retrieved.

Moreso 10 persons were interviewed, and the respondents' responses were analyzed and presented as well.

Analysis of Results

The responses obtained from the retrieved questionnaires were tabulated by the researcher in a chronological order and these questions were analyzed for further investigation on the itemized hypotheses.

SECTION A

Table 4.2.1: Distribution of Respondents by Gender

Gender	No. of Respondents	Percentage (%)
Male	47	42.72
Female	63	57.27
Total	**110**	**100**

Table 4.2.1 shows that 47 respondents (42.72%) are males, and 63 respondents (57.27%) are females.

Table 4.2.2: Category of Respondents

Category	No of respondents	Percentage (%)
Public	57	51.82

Private	53	48.18
Total	**110**	**100**

Table 4.2.2 shows that 57 respondents (51.82%) are public staffs, and 53 respondents (48.18%) are private staffs.

SECTION B

Opinion of the Respondents on Question 1 on the Questionnaire

Table 4.2.3: The availability efficiency and extent of utilizing EHR enhance healthcare delivery in Edo State

Option	**Public**	**Private**	**Total**	**Percentage (%)**
SA	35	25	60	54.55
A	20	10	30	27.27
D	10	5	15	13.64
SD	5	-	5	4.54
Total	**70**	**40**	**110**	**100**

Table 4.2.3 shows that 60 respondents representing (54.55%) strongly agreed that the availability efficiency and extent of utilizing EHR enhance healthcare delivery while 30 respondents (27.27%) agreed with the above view, 15 respondents (13.64%) disagreed and lastly 5 respondents (4.54%) strongly disagreed.

Table 4.2.4: The use of EHR system affects the efficiency of health institutions

Option	**Public**	**Private**	**Total**	**Percentage (%)**
SA	40	20	60	54.55
A	15	15	30	27.27
D	10	5	15	13.63
SD	5	-	5	4.55

Total	**70**	**40**	**110**	**100**

Table 4.2.4 shows that 60 respondents representing (54.55%) strongly agreed that the use of EHR system affects the efficiency of health institutions while 30 respondents (27.27%) agreed with the above view, 15 respondents (13.63%) disagreed and lastly 5 respondents (4.55%) strongly disagreed that the use of EHR system affects the efficiency of health institutions.

Table 4.2.5: Implementation of EHR impacts the efficiency of healthcare delivery

Option	**Public**	**Private**	**Total**	**Percentage (%)**
SA	36	15	51	46.37
A	33	17	50	45.45
D	1	6	7	6.37
SD	-	2	2	1.81
Total	**70**	**40**	**110**	**100**

Table 4.2.5 shows that 51 respondents representing (46.37%) indicated strongly that the implementation of EHR impacts the efficiency of healthcare delivery while 50 respondents (45.45%) agreed also with the above view, 7 respondents (6.37%) disagreed and lastly 2 respondents (1.81%) strongly disagreed.

Opinion of the Respondents on Question 4 on the Questionnaire

Table 4.2.6: The EHR contribute to the quality of healthcare delivery

Option	**Public**	**Private**	**Total**	**Percentage (%)**
SA	38	23	61	55.45
A	30	14	44	40
D	2	2	4	3.64

SD	-	1	1	0.91
Total	**70**	**40**	**110**	**100**

Table 4.2.6 shows that 61 respondents representing (55.45%) strongly agreed that the EHR contribute to the quality of healthcare delivery while 44 respondents (40%) agreed with the above view, 4 respondents (3.64%) disagreed and lastly 1 respondent (0.91%) strongly disagreed that EHR contribute to the quality of healthcare delivery.

Table 4.2.7: EHR system does not improve patient safety and quality of care

Option	**Public**	**Private**	**Total**	**Percentage (%)**
SA	5	5	10	9.09
A	5	5	10	9.09
D	20	15	35	31.82
SD	40	15	55	50
Total	**70**	**40**	**110**	**100**

Based on the table above (4.2.7), 55 respondents representing (50%) strongly disagreed that the EHR system does not improves patient safety and quality of care while 35 respondents (31.82%) agreed with the above view, 10 respondents (9.09%) disagreed and lastly 10 respondents (9.09%) strongly disagreed to that view.

Opinion of the Respondents on Question 6 on the Questionnaire

Table 4.2.8: The EHR system affect the workflow and productivity of healthcare providers

Option	**Public**	**Private**	**Total**	**Percentage (%)**
SA	40	30	70	63.64
A	25	10	35	31.82
D	5	-	5	4.54
SD	-	-	-	-
Total	**70**	**40**	**110**	**100**

Table 4.2.8 shows that 70 respondents (63.64%) strongly agreed with the above view, 35 respondents (31.82%) agreed, and 5 respondents (4.54%) disagreed that the EHR system affect the workflow and productivity of healthcare providers.

Table 4.2.9: EHR system does not enhance data accuracy and accessibility

Option	**Public**	**Private**	**Total**	**Percentage (%)**
SA	5	4	9	8.18
A	5	6	11	10
D	15	8	23	20.91
SD	45	22	67	60.91
Total	**70**	**40**	**110**	**100**

From table 4.2.9, 9 respondents representing (8.18%) strongly held the view that EHR system enhances data accuracy and accessibility, 11 respondents (10%) agreed with the above view, but 23 respondents (20.91%) disagreed and 67 respondents (60.91%) strongly disagreed to that notion.

Table 4.2.10: The implementation of EHR does not result in saving cost

Option	**Public**	**Private**	**Total**	**Percentage (%)**
SA	10	-	10	9.1
A	10	-	10	9.1
D	25	15	40	36.36
SD	25	25	50	45.45
Total	**70**	**40**	**110**	**100**

Table 4.2.10 shows that 10 respondents representing (9.1%) strongly agreed that the implementation of EHR does not results in saving cost, 10 respondents (9.1%) agreed with the view, 40 respondents (36.36%) disagreed, and 50 respondents (45.45%) strongly disagreed.

Table 4.2.11: EHR system integrates with other healthcare systems and external stakeholders

Option	**Public**	**Private**	**Total**	**Percentage (%)**
SA	15	12	27	24.55
A	15	12	27	24.55
D	20	8	28	25.45
SD	20	8	28	25.45
Total	**70**	**40**	**110**	**100**

Table 4.2.11 shows that 27 respondents representing (24.55%) strongly agreed that EHR system integrates with other healthcare systems and external stakeholders, 27 respondents (24.55%) also agreed to that fact, but 28 respondents (25.45%) disagreed and 28 other respondents (25.45%) strongly disagreed.

Table 4.2.12: EHR system impacts patient's engagement and communication

Option	**Public**	**Private**	**Total**	**Percentage (%)**
SA	32	18	50	45.45
A	28	12	40	36.36
D	8	7	15	13.64
SD	2	3	5	4.55
Total	**70**	**40**	**110**	**100**

Table 4.2.12 shows that 50 respondents representing (45.45%) strongly agreed that EHR system impacts patient's engagement and communication, 40 respondents (36.36%) agreed with the view, 15 respondents (13.64%) disagreed and 5 respondents (4.55%) strongly disagreed to that notion.

Opinion of the Respondents on Question 11 on the Questionnaire

Table 4.2.13: The challenges facing EHR affect the implementation of EHR system

Option	**Public**	**Private**	**Total**	**Percentage (%)**
SA	40	20	60	54.54
A	20	15	35	31.82
D	5	5	10	9.10
SD	5	-	5	4.54
Total	**70**	**40**	**110**	**100**

Table 4.2.13 shows that 60 respondents representing (54.54%) strongly agreed that the challenges facing EHR affect the implementation of EHR system, and 35 respondents (31.82%) agreed with the above view, but 10 respondents (9.10%) disagreed and lastly 5 respondents (4.54%) strongly disagreed completely that the challenges facing EHR affect the implementation of the system.

4.3 Hypotheses Testing

In chapter one, four hypotheses were stated to act as a guide for this study. These hypotheses are thereby tested for acceptance or rejection within the limit permitted by the data collected via the questionnaire

Decision Rule

Under the hypotheses testing, it is pertinent to state the criteria upon which decision on whether to accept or reject hypotheses will be based.

The decision rule thus: when the value of chi-square calculated is greater than the value of chi-square (x2) obtained from the statistical table, then the null hypotheses (Ho) is rejected and the alternative hypotheses (H1) is accepted vice versa.

Hypotheses One

Ho1: There is significant difference between the availability, efficiency and extent of utilization of EHRs in selected private and public health institutions.

Responses to statement 1 is directed to hypotheses one

Table 4.3.1: (a) Frequency Observed

Option	**Public**	**Private**	**Total**	**Percentage (%)**
SA	35	25	60	54.55
A	20	10	30	27.27
D	10	5	15	13.64
SD	5	-	5	4.54
Total	**70**	**40**	**110**	**100**

Table 4.3.1: (b) Frequency Observed

Option	**Public**	**Private**	**Total**
SA	38.18	21.82	60
A	19.09	10.91	30
D	9.55	5.41	15
SD	3.18	1.82	5

Expected frequency = $\frac{R \times C}{G}$

Where R = row total

C = column total

G = grand total

Table 4.3.1 (c): Analysis of chi-square

Fo	**Fe**	**Fo -Fe**	**(Fo -Fe)2**	**$\frac{(Fo -Fe)2}{Fe}$**
35	38.18	-3.18	10.11	0.265
25	21.82	3.18	10.11	0.463
20	19.09	0.91	0.83	0.043
10	10.91	-0.91	0.83	0.076
10	9.55	0.45	0.20	0.021
5	5.41	-0.45	0.20	0.037
5	3.18	1.82	3.31	1.041
-	1.82	-1.82	3.31	1.819

Recall x^2 formula

$$x^2 = \sum \frac{(Fo -Fe)^2}{Fe}$$

$$= 3.765$$

Degree of freedom

Df = (r-1)(c-1)

= (4-1)(2-1)

= (3)(1)

= 3

At 0.05 level of significance and a df at 3, the critical value $x^2 = 7.815$

Decision Rule Applied

Since the value of chi-square calculated is higher than the value of x2 obtained from the statistical table i.e., (3.765 < 7.815).

Therefore, the researcher accepted the hypotheses which states that "there is significant difference between the availability, efficiency and extent of utilization of EHRs in selected private and public health institutions.

Hypotheses Two

Ho2: There is significant difference in the contribution of EHRs to the quality of health services in selected private and public health institutions.

Responses to statement 4 in table 4.2.6 above is directed to hypotheses two

Table 4.3.2: (a) Frequency Observed

Option	**Public**	**Private**	**Total**	**Percentage (%)**
SA	38	23	61	55.45
A	30	14	44	40
D	2	2	4	3.64
SD	-	1	1	0.91
Total	**70**	**40**	**110**	**100**

Table 4.3.2: (b) frequency expected

Option	**Public**	**Private**	**Total**
SA	38.82	22.18	61
A	28	16	44
D	2.54	1.46	4
SD	0.64	0.36	1

Expected frequency = $\frac{R \times C}{G}$

Where R = row total

C = column total

G = grand total

Table 4.3.2: (c) Analysis of chi-square

Fo	**Fe**	**Fo -Fe**	**(Fo -Fe)2**	**$\frac{(Fo -Fe)2}{Fe}$**
38	38.82	-0.82	0.67	0.017
23	22.18	0.82	0.67	0.030
30	28	2	4	0.143
14	16	-2	4	0.250
2	2.54	-0.54	0.29	0.114
2	1.46	0.54	0.29	0.199
-	0.64	-0.64	0.41	0.641
1	0.36	0.64	0.41	1.139

Recall x^2 formula

$$x^2 = \sum \frac{(Fo -Fe)^2}{Fe}$$

$$=2.533$$

Degree of freedom

$$Df = (r-1)(c-1)$$

$$= (4-1)(2-1)$$

$$= (3)(1)$$

$$= 3$$

At 0.05 level of significance and a df at 3, the critical value $x^2 = 7.815$

Decision Rule Applied

Since the value of chi-square calculated is lower than the value of x^2 obtained from the statistical table i.e., (2.533 < 7.815).

Therefore, the researcher accepted the hypotheses which states that "there is significant difference in the contribution of EHRs to the quality of health services in selected private and public health institutions.

Hypotheses Three

Ho3: There is significant difference on the impact of EHRs on the workflow of selected private and public health institutions

Responses to statement 6 in table 4.2.8 above is directed to hypotheses three

Table 4.3.3: (a) Frequency Observed

Option	**Public**	**Private**	**Total**	**Percentage (%)**
SA	40	30	70	63.64
A	25	10	35	31.82
D	5	-	5	4.54
SD	-	-	-	-
Total	**70**	**40**	**110**	**100**

Table 4.3.3: (b) Frequency Observed

Option	**Public**	**Private**	**Total**
SA	44.54	25.46	70
A	22.28	12.72	35
D	3.18	1.82	5
SD	-	-	-

Expected frequency = $\frac{R \times C}{G}$

Where R = row total

C = column total

G = grand total

Table 4.3.3: (c) Analysis of chi-square

Fo	**Fe**	**Fo -Fe**	**(Fo -Fe)2**	**$\frac{(Fo - Fe)2}{Fe}$**
40	44.54	-4.54	20.1	0.463
30	25.46	4.54	20.61	0.810
25	22.28	2.72	7.40	0.332
10	12.72	-2.72	7.40	0.582
5	3.18	1.82	3.31	1.041
-	1.82	-1.82	3.31	1.819
-	-	-	-	-
-	-	-	-	-

Recall x^2 formula

$$x^2 = \sum \frac{(Fo - Fe)^2}{Fe}$$

$$= 5.047$$

Degree of freedom

Df = (r-1)(c-1)

= (4-1)(2-1)

= (3)(1)

= 3

At 0.05 level of significance and a df at 3, the critical value $x^2 = 7.815$

Decision Rule Applied

Since the value of chi-square calculated is lower than the value of x^2 obtained from the statistical table i.e., (5.047 < 7.815).

Therefore, the researcher accepted the hypotheses which states that "there is significant difference on the impact of EHRs on the workflow of selected private and public health institutions.

Hypotheses Four

Ho4: There is significant difference on the challenges facing selected private and public health institutions for using EHR system

Responses to statement 11 in table 4.2.13 above is directed to hypotheses four

Table 4.3.4: (a) Frequency Observed

Option	**Public**	**Private**	**Total**	**Percentage (%)**
SA	40	20	60	54.54
A	20	15	35	31.82
D	5	5	10	9.10
SD	5	-	5	4.54
Total	**70**	**40**	**110**	**100**

Table 4.3.4: (b) Frequency Observed

Option	**Public**	**Private**	**Total**
SA	38.18	21.82	60
A	22.27	12.73	35
D	6.37	3.63	10
SD	3.18	1.82	5

Expected frequency = $\frac{R \times C}{G}$

Where R = row total

C = column total

G = grand total

Table 4.3.4: (c) Analysis of chi-square

Fo	**Fe**	**Fo -Fe**	**(Fo -Fe)2**	**$\frac{(Fo -Fe)2}{Fe}$**
40	38.18	1.82	3.31	0.0827
20	21.82	-1.82	3.31	0.152
20	22.27	-2.27	5.15	0.231
15	12.73	2.27	5.15	0.405
5	6.37	-1.37	1.88	0.300
5	3.63	1.37	1.88	0.518
5	3.18	1.82	3.31	1.041
-	1.82	-1.82	3.31	1.819

Recall x^2 formula

$$x^2 = \sum \frac{(Fo -Fe)^2}{Fe}$$

$$= 4.553$$

Degree of freedom

$$Df = (r-1)(c-1)$$

$$= (4-1)(2-1)$$

$$= (3)(1)$$

$$= 3$$

At 0.05 level of significance and a df at 3, the critical value $x^2 = 7.815$

Decision Rule Applied

Since the value of chi-square calculated is lower than the value of x^2 obtained from the statistical table i.e., (4.553 < 7.815).

Therefore, the researcher accepted the hypotheses which states that "there is significant difference on the challenges facing selected private and public health institutions for using EHR system.

RESPONSES FROM INTERVIEW QUESTIONNAIRES

4.4 Availability, Efficiency, and extent of Utilization

Most of the respondents posited the availability of the electronic health records and how efficient it has been over the paper record in which utilization of the system will improve on health care delivery in the state. One of the nurses specifically mentioned in her responses

"With the availability of electronic records patients can have their vitals done in less time on arrival from the front desk after making the necessary payments and cleared all thanks to the efficient technological innovation and the utilization of personnel manpower who are working in the hospital"

4.5 Contribution to the quality of healthcare delivery

Some respondents reiterated that the electronic health record have contributed immensely to the quality of healthcare delivery in the state in the light of advancement in technology and meeting up with the standards of healthcare in other part of the country and the larger societies. One of the doctors explained that

"Back then a patients file has to pulled up from the records department which in some cases some pages of the medical history may be torn, incomplete or even missing due to mismanagement or proper stalking of files"

"We have been able to ensure that the medical records of patients are updated every time they visit the facility, and this has helped us in delivering quality healthcare to them"

Another respondent who happens to have used the electronic health record system mentioned that,

"In my 25 years of service in this health sector, the last six years has been the most interesting part of my profession because my job has been made easy using the electronic heath record system"

"It has saved our management so much cost in terms of paper recording which are not durable and easily transferrable"

4.6. Knowledge of the Electronic Health Records among the respondents

All the respondents had some idea of what an electronic health record is. The most common definition/meaning assigned to the EHR among the respondents was:

"Electronic Health Record is such that the patient's medical records are kept by electronic means on the computer system, with a kind of central database, whereby clinicians from their different offices can assess it."

From the views of the doctors, some of the benefits that can be derived from the EHR include:

"It can enhance service delivery by shortening patient waiting time."

"Enhance confidentiality and security of patient data because unauthorized personnel sometimes withdraw folders when in transit and sometimes in the record room."

"Prevents loss of data. Sometimes folders are misplaced when files move between units in the event of a patient receiving care in two or more units."

It was necessary to ask this question because a good understanding of the system will give the respondents an idea of what is required for a successful implementation. This will also create an enabling environment for the respondents in identifying factors that could be challenges or prospects to the implementation of the system in their respective facilities vis-à-vis the current state of infrastructural resources or otherwise.

4.7 Prospects to the implementation of the EHR

The discussions revealed two prospects that will facilitate the implementation of the system in a Public and Private hospital; willingness of the doctors to adopt the EHR system and awareness of computer use among the doctors.

4.7.1. Doctors Willingness to Adopt the EHR System

The doctors were eager to have this system implemented because they felt it would help them serve patients better. Some of them were also of the view that a lot of persons are presently more oriented in technological advancement, and it will be easy to convince their colleagues to embrace the system. The doctors were also willing to recommend its implementation in their hospital. This was aptly put by one of the doctors who when asked if he would recommend the implementation of the EHR, responded thus.

"I will recommend EHR anytime any day. Everyone will love what will make his/her work easier. It will also help address the issue of loss of patients' file, damage to cards resulting from exposure to moisture, and difficulty in retrieving patient file in the event when a patient loses his/her personal card which is needed to trace their hospital file as this can be traced in an EHR by searching the system using the patients name".

4.7.2. Awareness of Computers among the Doctors

All respondents had good awareness of computer use and some of them have had various forms of training on the use of the electronic health record and the use of telemedicine applications like videoconferencing.

4.8 Challenges to the Implementation of the Electronic Health Record

The challenges highlighted by some of the respondents will be presented along three themes. They are infrastructure issues, human factors issues and political issues.

4.8.1 Infrastructure Issues

4.8.1.1 Poor power supply

Some of the public hospitals used for this study are presently experiencing poor and erratic power supply. The towns could sometimes be without power for days and thus rely on generators or solar energy as an alternative source of power supply. One of the respondents noted that in a bid to reduce the overhead costs of running the generators, during the nights, patients on admission are sometimes moved to a smaller ward which can be powered using a

small generator or covered by the solar energy while other units of the hospital are without power.

4.8.1.2 Poor internet connectivity and availability.

The availability and internet connectivity in the towns is poor and epileptic. One participant noted that *"sometimes the mobile network data disappears for up to two days*". He added that *"the poor internet connectivity and penetration in sub-urban towns where public hospitals are located might be a problem if network is needed for the EHR system to run".*

4.8.1.3 Inadequate ICT equipment

In one of the centers, a respondent pragmatically stated that only the secretary to the hospital had a computer in his office which serves the entire hospital. The lack of relevant hardware will be a challenge to the implementation of the electronic health record.

4.8.2 Human Factors Issues

4.8.2.1 Inadequate Computer Skill among Non-medical and Non-clinical staff

Many non-medical and non-clinical healthcare workers in the hospitals lack the basic knowledge to operate and use a computer properly. Implementing the system may mean bringing in qualified people which will lead to loss of jobs for the previous staff, most of whom may not be able to acquire the necessary skills to use the new system.

4.8.2.2 Low Level of Awareness on eHealth

Telemedicine is not generally accepted yet. Most healthcare workers, especially in the records department are not yet aware of the possibility of storing patient information in electronic format while some are yet to come to terms with the use of computers in healthcare

delivery. This is due to dearth of qualified manpower in the records section of public hospitals.

4.8.2.3 Resistance from Staff

Staff of the hospital who feel they could lose their jobs may resist the implementation and create bottlenecks. The workforce in the records section for example may be reduced and staff who feel their jobs are threatened will most likely kick against implementation. Besides, the staff who may be affected will do all it takes, such as using their unions to lobby the government in a bid to frustrate the implementation.

4.8.3 Political Issues

4.8.3.1 Poor Administration

Government politicians who run and take decisions on budgetary allocations are most times not in tune with advancement in healthcare and often time require skilled advisers to recommend and drive for the implementation of such innovative ideas.

4.8.3.2 Corruption

The respondents acknowledged corruption as one of the key challenges in the implementation process. It demonstrates most times in the form of non-execution of awarded contracts or supply of sub-standard equipment. Other times, in their bid to make profit, the contractors cut corners and deliver outdated equipment to the hospitals thus making the hospital a dumping ground. This equipment breakdowns within a few months of installation leading to increase to overhead maintenance.

4.8.3.3 Financial Constraints

This was identified as one of the major challenges as public hospitals, and indeed all government hospitals are grossly underfunded. The scarce resources have resulted in the incapability of upholding maintenance structure for the existing infrastructure and equally investing in new ones.

4.9 Recommendations/Suggestions from the Respondents

A respondent suggested that to overcome the challenge of lack of government initiative, only qualified and visionary people should be appointed into offices. He gave an analogy to buttress his point:

"When the president and health minister are positively disposed to a program, it will aid development as available resources can be re-directed. For example, the former minister's interest in Tuberculosis (TB) led to the diversion of resources to innovative ideas aimed at eradicating the disease. The Minister for health declared the year 2017 "the year of accelerated development in TB". Lots of resources were channeled to the TB programme like the mobile diagnostic van inaugurated last week in addition to looking for shorter treatment regimen from 18 months to 9 months. The TB programme is so dear to the minister's heart, and he has ensured the directing of resources to it. The key to the successful implementation of any programme is to appoint the right policy makers because they are the ones that matter. From experience, it is only programmes that get to the right policy makers that see the light of day. The policy makers should be able to present the programmes clearly to the politicians regarding what they stand to gain in terms of political goodwill from the public. No matter how beneficial a program is, it will not receive support from the politicians unless it is communicated to them in a way they can understand."

Another respondent was of the view that whenever the will is there, there is a always a way. He opined that *"even if the current budgetary provision to the facility is insufficient, it might be possible to redirect funds to the project if the management of the healthcare facility are willing to "*. He added that *"if people put in all it takes to do whatever they want to do, it*

can be done. It may be difficult but not impossible". He suggested that *"the system be test run using a target hospital"*.

The results which emanated from the pilot study could be a catalyst to advocate for attitudinal change and a change of mindset for those who do not believe the system will work.

Another respondent recommended that those in charge of running the hospitals should be educated on the significance and merits of such form of record keeping. This may spur them to redirect funds into implementing the system. It was also suggested that the staff involved in the current manual entry be trained on the electronic health record system to mitigate the possible scenario of resistance.

4.10 Summary of findings

Findings from the informal phone conversations showed that the doctors are computer literate and were willing to adopt the electronic health record system. These two variables are prospects that will facilitate the implementation of the electronic health records in a General Hospital setting. Infrastructure issues like poor power supply, political issues like poor administration and human factors issues like inadequate computer skill among the non-medical and nonclinical staff were the three major categories of barriers and challenges in the way of successful implementation of EHRs in both the public and private hospitals. The respondents noted that a strong initiative on the part of the management board of the hospital (and to some extent the State Governments who owns the public hospitals) was the remedy to overcoming the myriad of challenges truncating the implementation of the EHR system.

CHAPTER FIVE

SUMMARY, CONCLUSION & RECOMMENDATIONS

5.1 SUMMARY

This study was carried out mainly to comparatively assess the implementation of electronic health record system in public and private health institutions. To do this, questionnaires and interviews were used. The result of the analysis using quantitative data analysis revealed that there is significant difference in the availability efficiency and extent to utilization of the EHR system in public and private health institutions. It also revealed that there is significant difference in the contribution of the EHR system to the quality of healthcare delivery which also has impacted the workflow and productivity of healthcare providers in the public and private hospitals. Furthermore, the results showed that there is significant difference in the challenges facing the public and private health institutions in using EHR systems.

The results of the qualitative data analysis showed that most public and private health institutions staffs both medical and para-medicals are aware of the use of EHR and attested to the efficiency and utilization of the system and how significantly the implementation has contributed to the quality of healthcare delivery and also increased the productivity and workflow of the management in terms of cost saving, enhance service delivery by shortening patient waiting time, enhance confidentiality and security of patient data because unauthorized personnel sometimes withdraw folders when in transit and sometimes in the

record room, prevents loss of data and lots more benefits. Finally, the challenges facing the use of EHR were analyzed ranging from poor power supply, inadequate ICT facilities poor internet availability and connectivity which are considered infrastructure issues, political issues which includes; corruption, financial constraints and most importantly human issues including resistance from staff to adopt the innovation and awareness to eHealth.

The result of this study revealed that private institutions health professionals are satisfied with the facilities in their hospitals electronic medical record rather than the public health professionals. Therefore, private sector health professionals are better than public sector health professionals in terms of the use of electronic health record resources. On the other hand, higher percentage of the health professional's agreed that electronic health records resources utilization and availability of the electronic health records system and adequate resources play an important role to achieve better performance in both private and public health institutions. The result of this study also revealed that the health professional's performance of private health institutions is better than health professional's performance of public institutions because of electronic health records system and effective utilization of resources available in their health institutions.

5.2 CONCLUSION

This research analysis has helped to confirm the authenticity of the data provided by the respondents that there are indeed significant differences in the implementation of EHR in both public and private health institutions. The goal of a healthcare system is to improve the health of the population in the most effective manner possible in life of a society's available resources and competing needs. The overview of ICT based creativities to convert current manual paper-based information management systems in public health societies in developing countries has usually been a challenging procedure of modification, frequently fraught through numerous context-sensitive contests and complications such as the absence

of satisfactory resources and irregular infrastructural growth. Governments and organizations around the world are mainstreaming EHRs as a tool in all sectors of health service activities.

Hence, the implementation of EHR in public health institutions has appeared to be a bottle-neck owing to the findings from the study carried out especially in the less urban areas and rural places compared to the private sector where the provisions of the basic facilities needed to adequately implement the use of EHR seems to be achievable.

Therefore, organizations and especially the government need to invest a lot of resources to use ICT as a supportive tool for effective and efficient delivery of services. There is room for improvement while considering manual recording of patient data and E-record of same while creating a security system that protects individual records, block E-theft, virus protection software and restrict access of unauthorized individuals or groups to health data and information of patients.

5.3 RECOMMENDATIONS

This study recommended that the selected health institutions both public and private should ensure the availability of finances, adequate staff training in the technical know-how of the technological advancement.

There should also be technical infrastructures and manpower like electronic record managers, ICT support staff and computer medical devices.

There is a need for stakeholders to harness information generated from the database provided from patient's medical record in order to able to track the quality of healthcare delivery system.

There is an urgent need for concerted effort between government policy makers and private investors in partnership with international organizations to implement the recommendations provided here in for a better accessible and affordable EHR for the populace in promoting substantial and quality healthcare delivery system.

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APPENDIX

QUESTIONNAIRE

Institute of Public Administration and
Extension Service
University of Benin, Benin City
Edo state

Dear respondents,

I am a student of University of Benin, Institute of Public Administration and Extension Services. I am embarking on a study which is aimed at *assessing the role and implementation of electronic health records in the public and private hospitals in Edo state.*

Please, kindly answer the questions below with much honesty. I promise that your responses will not be disclosed to anybody.

Thanks for your anticipated cooperation and understanding.

Yours faithfully,

Igbinazaka Angela

Institute of Public Administration and
Extension Service
University of Benin, Benin City
Edo state
12th August 2023

The Chairman,
Committee for Ethics,
Edo Specialist Hospital,
Benin city

Dear Sir/Ma,

REQUEST LETTER FOR ETHICAL CONSENT

I am a student of University of Benin, Institute of Public Administration and Extension Services. I am embarking on a study which is aimed at *assessing the role and implementation of electronic health records in the public and private hospitals in Edo state.*

Please, kindly grant me permission to interview the staffs and patients in your health institution to enable have my primary source of data for the research work in view. I promise to keep all information gathered in this regard confidential and the safety of your institutions image.

Thanks for your anticipated cooperation and understanding.

Yours faithfully,

Igbinazaka Angela

Institute of Public Administration and
Extension Service
University of Benin, Benin City
Edo state
12th August 2023

The Chairman,
Committee for Ethics,
Lily Hospital,
Boundary road, off Airport Road,
Benin city

Dear Sir/Ma,

REQUEST LETTER FOR ETHICAL CONSENT

I am a student of University of Benin, Institute of Public Administration and Extension Services. I am embarking on a study which is aimed at *assessing the role and implementation of electronic health records in the public and private hospitals in Edo state.*

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Thanks for your anticipated cooperation and understanding.

Yours faithfully,

Igbinazaka Angela

Institute of Public Administration and
Extension Service
University of Benin, Benin City
Edo state
12th August 2023

The Chairman,
Committee for Ethics,
Central Hospital,
Auchi
Edo state,

Dear Sir/Ma,

REQUEST LETTER FOR ETHICAL CONSENT

I am a student of University of Benin, Institute of Public Administration and Extension Services. I am embarking on a study which is aimed at *assessing the role and implementation of electronic health records in the public and private hospitals in Edo state.*

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Thanks for your anticipated cooperation and understanding.

Yours faithfully,

Igbinazaka Angela

Institute of Public Administration and
Extension Service
University of Benin, Benin City
Edo state
12th August 2023

The Chairman,
Committee for Ethics,
Central Hospital,
Uromi,
Edo State.

Dear Sir/Ma,

REQUEST LETTER FOR ETHICAL CONSENT

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Thanks for your anticipated cooperation and understanding.

Yours faithfully,

Igbinazaka Angela

Institute of Public Administration and
Extension Service
University of Benin, Benin City
Edo state
12th August 2023

The Chairman,
Committee for Ethics,
St Camilus Hospital,
Uromi, Edo State.

Dear Sir/Ma,

REQUEST LETTER FOR ETHICAL CONSENT

I am a student of University of Benin, Institute of Public Administration and Extension Services. I am embarking on a study which is aimed at *assessing the role and implementation of electronic health records in the public and private hospitals in Edo state.*

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Thanks for your anticipated cooperation and understanding.

Yours faithfully,

Igbinazaka Angela

INTERVIEW QUESTIONS

SECTION A

Fill in this blank space where required to indicate your response and kindly give your responses based on your knowledge on the subject matter.

Age: _____

Sex: _____

Position: _____

Year of Service: _____

Location: _____

SECTION B

MANAGERS AND FRONTLINE USERS OF EHR

a. Are you currently using an EHR system? If yes, in your opinion what are the main challenges faced in implementing the EHR system?
b. How long has your hospital been using EHR and how would you rate the overall implementation process of EHR in your hospital?
c. What were the main reasons for implementing EHR in your hospital?
d. What challenges did your hospital face during the implementation of EHR?
e. How well were the staffs trained to effectively use the EHR system?
f. Do you think that using EHR system affects the efficiency of your hospital?
g. How has the EHR system affected the workflow and productivity of healthcare providers in your hospital?
h. Has the implementation of EHR resulted in cost savings for your hospital?
i. How well does the EHR system integrated with other healthcare systems and external stakeholders?
j. What are the long-term financial implications of EHR implementation in public and private hospitals including costs and return on investment?

PATIENTS PERCEPTION ON THE EHR SYSTEM IN THE QUALITY OF HEALTH SERVICES

1. Are you familiar with Electronic Health Records (EHR) system?
2. Have you assessed health care in a public/private health institution? If yes, what do you consider as the difference in implementation strategy of EHR between public and private hospitals?
3. In your opinion, how has the EHR system impacted engagement and communication in assessing quality health care?
4. How has the EHR system improved patient safety and quality of care?

TECHNICAL AND ADMINISTRATIVE STAFF PERFORMANCE IN IMPLEMENTING EHR

i. Have you encountered any technical issues or downtime with the EHR system? If yes, how were they resolved?
ii. Do you think EHR implementation is an advanced technology that can be adopted in both public/private health institution?
iii. What are the cost implications of implementing EHR in every fragment of the hospital?
iv. Have you noticed any improvement in data accuracy and accessibility since implementing EHR?
v. What is the future for EHR development and enhancement in your hospital?
vi. What are the privacy and security concerns associated with EHR implementation in public and private hospitals and how do they differ?

QUESTIONNAIRE

SECTION A

Fill in this blank space by ticking (√) against your answers where required to indicate your response.

Age: _____

Sex: _____

Position: _____

Year of Service: _____

Location: _____

Public ( ) **Private** ( )

Note: Tick either

SA - Strongly Agreed

A - Agreed

D - Disagreed

SD - Strongly Disagreed

SECTION B

S/N	Statement	SA	A	D	SD
1	The availability efficiency and extent of utilizing of EHR enhance healthcare delivery in Edo State				
2	The use of EHR system affects the efficiency of health institutions				
3	Implementation of EHR impacts the efficiency of healthcare delivery				
4	The EHR contribute to the quality of healthcare delivery				
5	EHR system improves does not patient safety and quality of care				
6	The EHR system affect the workflow and productivity of healthcare providers				
7	EHR system does not enhance data accuracy and accessibility				
8	The implementation of EHR does not result in saving cost				
9	EHR system integrates with other healthcare systems and external stakeholders				
10	EHR system impacts patient's engagement and communication				
11	The challenges facing EHR affect the implementation of EHR system				