UNIVERSITY OF CAPE COAST

EXAMINING THE APPLICATION OF INFORMATION AND

COMMUNICATIONS TECHNOLOGY IN HEALTHCARE AT THE

UNIVERSITY OF CAPE COAST HOSPITAL

EMMANUEL AWUDI

2014

UNIVERSITY OF CAPE COAST

INFORMATION AND COMMUNICATIONS TECHNOLOGY IN

HEALTHCARE AT THE UNIVERSITY OF CAPE COAST HOSPITAL

BY

EMMANUEL AWUDI

THESIS SUBMITTED TO THE INSTITUTE FOR DEVELOPMENT STUDIES,

FACULTY OF SOCIAL SCIENCES, UNIVERSITY OF CAPE COAST IN

PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF

MASTER OF PHILOSOPHY DEGREE IN DEVELOPMENT STUDIES

JANUARY, 2014

# CHAPTER ONE

# INTRODUCTION

## Background to the study

The provision of quality, adequate, accessible, and affordable healthcare is one of the most important indicators of development (Kocher, 1973). To achieve this, good healthcare facilities must be integral part of health systems and must be provided for the proper functioning of the health systems. Similarly, Sen (2002), stated that health is one of the most important conditions of human life, and a critically significant constituent of human capabilities which is necessary for the development of every country.

In the 1990s, the United Nations (UN) recognized the importance of health in development. So in a period when overall official development assistance declined, development assistance to health rose in real terms. World Bank lending approach towards healthcare increased, with a doubling of the share of International Development Association disbursements going to health (Organisation for Economic Cooperation and Development, 2000).

Again, in the year 2000, the UN mandated member countries to work towards achieving eight key development goals, popularly called Millennium Development Goals (MDGs) by 2015 (Morton, 2008). Based on the importance that the UN places on healthcare, three out of the eight MDGs lay emphasis on

1

quality healthcare delivery which is critical to sustainable development of every country. Quality healthcare must lead to a reduction in maternal mortality, a reduction in infant mortality and the eradication of certain diseases such as malaria, tuberculosis, and most importantly, HIV/AIDS. Keeping with World Health Oganisation's 1946 definition of health as a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity, it will be expedient to say that almost all of the MDGs have some association with health (WHO, 1946). Quality healthcare has been identified as very vital to the development of every country and health experts are working very hard to achieve that.

In its recommendations, the Institute of Medicine (IOM) identified Information and Communication Technology (ICT) as one of the four critical forces that could significantly improve healthcare quality and safety and reduce medical errors (IOM, 2001). In a similar statement, an American President, George Bush in a state address in 2004 stated that by computerizing health records, physicians can avoid dangerous medical mistakes, reduce costs, and improve care (Amatayakul, 2004). Before the use of computers in healthcare can become beneficial, there is the need to put certain things in place. This includes building the capacities of physicians in order for them to be able to use the computers effectively. This is because there is a positive association between a physician's computer skills, as rated by patients, and the patients' satisfaction with the computer's effect on the visit (Gregory, Garrison, Matthew, Bernard, Norman & Rasmussen, 2002).

2

The use of information and communications technology has been integrated into virtually every facet of commerce, education, governance, health and civic activities in developed countries (Morton, 2008). This is in line with modernization theory which states that, for any society to develop, that society must change from the use of simple traditional tools to the application advanced scientific knowledge (Smelser, 1969). Therfore, for every society to develop, it must change from traditional ways of doing things and must become modern, and traditions must give way to modern ways of doing things (Parsons, 1967). There are two types of societies; traditional society in which cohesion is based on mechanical solidarity based on traditions, norms, values and beliefs, and a modern society in which cohesion is based on organic society based on complex nature of interactions (Durkheim, 1984, cited in Webster, 1984).

The role of ICT in health has been summed up in the Alma-Ata declaration in 1978. It was an acknowledged fact that Information and Communication Technology can provide a direct benefit to health primarily by increasing access to medical and health care (International institute for communication and development, 2003). The health sector has always relied on technologies for a very long time. According to WHO (2004), technologies form the backbone of the services to prevent, diagnose, and treat illness and disease. ICTs are only one category of the vast array of technologies that may be of use. Given the right policies, organization, resources, and institutions, ICTs can be powerful tools in the hands of those working to improve healthcare (Daly, 2003).

3

Advances in information and communications technology in the last quarter of the $20^{th}$ century have led to the ability to more accurately predict individual health risks (Watson, 2003), to better understand basic physiologic and pathologic processes (Laufman, 2002), and to diagnose through new imaging and scanning technologies. Such technological developments, however, demand that practitioners, managers, and policymakers are more responsible in assessing the appropriateness of new technologies (Hofmann, 2002). Now, the computer has joined the airplane as the tool of choice to bring modern health care to remote rural hospitals. Using mobile phones and computers, consultants can advise doctors in rural hospitals through audio and video links on how to handle difficult medical cases. Computers, have become extremely important technological tools that can be used to strengthen health systems, advance health services, and widely share and exchange health information.

According to Okyere (2000), the potential use of ICT as a means to improve the quality of health services is widely acknowledged and health institutions are striving to identify ways to deliver their services more efficiently and effectively. ICT has the potential to radically change the way health services are delivered to patients and improve the quality of health services by providing easy access to health information. One way in which ICT can be used to improve healthcare delivery is the computer-based patient's records (CBR) which has been explained as the process of storing, managing and retrieving the records of patients at the hospitals through the use of computers (Morton, 2008). This system (computerization of health records), can help to transfer a patient's healthcare

information between organizations, allowing stakeholders in the patient's healthcare to access this information remotely which allows for continuity of care between different healthcare facilities in order to reduce medical errors.

The Ghana government through the MOH launched a programme dubbed "ICT for Development" (ICT4D) in 2005 (Ministry of Health, 2005). This programme was to integrate and deploy ICT in healthcare delivery with targets for health education, training and preventive detection, to support the dissemination of preventive information for the general public, in particular for HIV/AIDS, to utilize ICT as a tool for linking healthcare professionals and enhancing health administration, improving cost effectiveness and planning, management and administration. It was also to provide telemedicine network throughout the country to enable exchange of diagnostic and therapeutic medical information between patients and doctors without either of them having to travel (Ministry of Health, 2005). This can even provide assistance to individuals who feel reluctant to go to hospitals to seek medical care and tend to delay medical treatment as explained in Suchman's (1965), stages of illness and medical care. In particular, ICT applications are used for family planning/reproductive health efforts that can to lead to the achievement of MDG4 (reduce child mortality), MDG5 (improve maternal health), and MDG6 (combat malaria, tuberculosis and HIV/AIDS).

Abdulai (2009), in a related development found out that as of July 2008, there was only one hospital (Korle-bu) in Ghana that was using a computer based system for transmitting laboratory results within the various units in the laboratory to the laboratory's reception, where they were printed out for patients.

5

This was limited to only the laboratory, but wards, pharmacy and physicians' offices were not linked so they still did medical prescriptions on paper. In 2011, the University of Cape Coast hospital introduced computer-based patient's records at every department of the hospital to take care of the health needs of the university community.

**Statement of the problem**

The development of a nation is not only dependent on gross domestic product (GDP) or the per capita income of the country but also on other social services such as improvement in healthcare delivery. Availability and accessibility of quality health services can make economic development sustainable (Baidoo, 2009). Though the importance of quality, accessible and affordable healthcare is vital to the attainment of sustainable development, this improvement has not been achieved yet. The health sector is still bedeviled with lots of problems which include infant mortality, maternal mortality, and the spread of malaria, tuberculosis, and HIV/AIDS. Medical errors are also common in the health sector, especially, in developing countries. For example, the Daily Graphic on May 5, 2006 reported that, three doctors at Korle-Bu were sued for performing wrong surgery on a patient's wrong leg.

Also, improvements in the quality of healthcare have not been universal. For example, maternal and infant mortalities are still high in certain parts of Africa, and out of the 30million people living with HIV, almost 70% of them are found in Africa (Morison, 2012). Statistics show that the doctor-patient ratio in

Ghana is 1:13,000, which is far below the World Health Organization (WHO) global standard pegged at 1:5,000 (Ghana Health Service, (2007).

Many authorities have stated that the use of ICT can help to improve health services because most of the manual jobs that must be done by the health workers would have been taken care of using ICT equipment. In a recommendation of the IOM, ICT was seen as a useful tool to help correct most of the anomalies in the health systems (IOM, 2000). On October 4, 2011, the president of Ghana Telecom University College (GTUC), Osei Darkwa (2000), said Ghana needs to deploy a comprehensive ICT strategy to address challenges in the health sector to enable the country attain the Millennium Development Goals on health by 2015 (GNA, 2011). This has made the MOH to be more concerned about the quality of healthcare delivery, but improvements in the quality desired have been slow (Doyle & Haran, 2000).

Ghana launched ICT4Development in the health sector in 2004 which seeks to integrate ICT into healthcare to help in the achievement of the MDGs by 2015. In 2011, the University of Cape Coast hospital introduced the computer-based patients' records for transmitting health records from records section to consulting rooms, from consulting rooms to laboratories and pharmacy and to the wards. It is also serve the purpose of record keeping, data collection, management and administration at the hospital. This is envisaged to reduce the amount of productive times that patient's spend at the hospital, and to reduce some medical errors. Before the introduction of the ICT facility at the hospital, records were kept by on papers which would have to be transported from one department to

another manually. Since the inception of the computer-based health records at the hospital, much research has not been done to assess the impact of this ICT facility on healthcare. It was against this backdrop that this research work was conducted to assess the impact of the computer-based patient's records on healthcare at the hospital.

**Objectives of the study**

The general objective of this study was to examine the use of ICT in healthcare delivery at the University of Cape Coat Hospital. The specific objectives were to:

1. Examine the impact of ICT on out-patients' waiting time at the University of Cape Coast Hospital.

2. Examine the impact of ICT on medical errors at the University of Cape Coast Hospital.

3. Explore other usefulness of ICT tools in healthcare delivery at the hospital

4. Explore the challenges that have come as a result of the use of ICT facilities in healthcare.

5. Make recommendations to policy makers in the formulation of sustainable ICT programmes for healthcare delivery in the country.

**Research questions**

1. What are the impacts of ICT on out-patients' waiting time at the University of Cape Coast hospital?

2. What is the impact of the computerization of health records help to reduce medical errors at the University of Cape Coast Hospital?

3. In which other ways can ICT tools be useful in healthcare at the University of Cape Coast hospital?

4. What are the challenges of using ICT in healthcare at the hospital?

**Scope of the study**

Quality healthcare has been seen as a necessary tool for sustainable development in the world. It was on this backdrop that this study sought to explore how computer-based health records can help to improve the quality of healthcare delivery at University of Cape Coast hospital. The work also sought to assess the impacts of the computer-based patient's records in healthcare at the University of Cape Coast hospital since its inception in 2011 with reference to medical errors, and the impacts on out patients' waiting time. The ICT tools available at the hospital were also assessed and the challenges that have come up as a result of the use of the computer-based health record would also be explored. Finally, recommendations were made to the stakeholders in health services on how to reap the full benefits of the use of ICT in healthcare.

9

**Significance of the study**

This study was envisaged to assist the university hospital authorities to access the impact of the computerization of patients' record and other ICT tools on healthcare at the hospital. It is also expects to provide useful to the ministry of health on ways in which ICT can be used to improve healthcare deliver in Ghana. It will add to the available literature on the role of ICT in healthcare delivery;

**Organization of the study**

This study is made up of five chapters. Chapter one gives an introduction to the study. This includes background to the study, statement of the problem, objectives of the study, research questions/hypothesis, and significance of the study. The scope of the study and the organisation of the study were also discussed. In chapter two, relevant literatures related to this study were reviewed. This was further discussed under the sub-headings; theoretical review, conceptual review, empirical review and lessons learnt. Chapter three discusses the methodology employed in the study. The research design and study design for the study were both explained and the instruments used for the data collection were also stated. In chapter four, the data collected was analysed and discussed. In chapter five, the conclusion, and summary were made, and the recommendations to the problems identified were stated. Areas which the study could not cover were also stated for further studies.

## CHAPTER TWO

## REVIEW OF RELATED LITERATURE

**Introduction**

It is important to review literature in every research to find out what other authors have done in the relevant field and also to relate this to the research work. This chapter reviews literatures that were found relevant to this study.

**Theoretical, conceptual and empirical perspectives**

Different theories have been used to examine how the spread of technology in the 21$^{st}$ century has impacted healthcare delivery and some were found relevant to this study. The relevant theories reviewed in this study included the modernization theory, technology acceptance model, the innovation diffusion theory and the actor-network theory. Other concepts and empirical evidences relating to the study were reviewed.

**Modernization theory**

Modernization theory came into prominence in the 1950s and early 1960s as an approach to development and social issues. It offers an account of the common features of the process of development drawing on the ideas and analysis of early social thinkers. The historical events that paved the way for the modernization theory are the World War II and the rise of the US as a super power with the implementation of the Marshall plan to reconstruct war-torn Europe (Webster, 1984).

11

According to the modernization theory, society must change from the use of simple traditional tools to the application of advanced scientific knowledge (Smelser, 1969). Thus, for a society to develop, it must change from traditional ways of doing things and must become modern, and traditions must give way to modern ways of doing things (Parsons, 1967). According to Durkheim (1984), cited in Webster (1984), there are two types of societies; traditional society in which cohesion is based on mechanical solidarity based on traditions, norms, values and beliefs, and a modern society in which cohesion is based on organic society based on complex nature of interactions. The implication of this is that society moves from a less complex to a more complex situation. From traditional to modern society which is less rigid and allows for more scope for individual expressions.

Weber (1971) states that the explanation for the expansion of the economies of the Western Europe was the existence of a cultural process peculiar to western. Most of the modernization theorists espoused that in modern societies, people still have traditions but are not slaves to such traditions and will challenge any aspect that get to the way of their progress. Members in modern society are not fatalistic but forward looking and innovative and they are ready to overcome obstacles they find on their way which reflect a strong entrepreneurial spirit of a rational scientific approach to the world. The concept of modernization denotes a total transformation of a traditional pre-modern society into a type of technology associated with social organisation that development is the transformation of a traditional society into a modern society. Though, modernization theory has been

12

widely criticized that there is no evidence to show that traditional and modern societies are mutually exclusive, it still remains a blue-print relevant to the industrialization of the third world societies.

The health sector has always relied on technologies for a very long time now to prevent, diagnose, and treat illnesses and diseases WHO (2004). If the right policies are established in health organization and institutions, ICTs can be powerful tools in improving healthcare (Daly, 2003). There have been advances in ICTs in this last quarter of the 20th century and has led to the ability to more accurately profile individual health risks (Watson, 2003). Such technological developments, however, demand that practitioners, managers, and policymakers are more responsible in assessing the appropriateness of new technologies (Hofmann, 2002).

**Technology Acceptance Model (TAM)**

The technology acceptance model is an information system and a behavioural theory that models how users accept and use technology. This theory models the acceptability of a technology based on two behavioural premises; the perceived usefulness and the perceived ease of use of the technology (Morton, 2008). The TAM focuses on factors which determine users' behavioural intentions toward using a new computer technology. Specifically, the TAM theorizes that a user's intention to utilize a new information system may be influenced by his or her perceptions as to whether the system will be useful and easy to use. TAM hypothesizes that a user's intended behaviour predicts actual system use (Davis, 1989).

13

During the implementation of a new technology, what is common on the minds of those implementing it is the success of this implementation. Key measure of how successful the implementation of a technology is its acceptability (Obstfelder, Engeseth & Wynn, 2007). TAM has been useful in predicting how acceptable a technology will be. While the TAM examines factors influencing a person's intention to adopt a system initially, it does not consider reasons why an individual might later discontinue use, or reject a system once it has been adopted. Because healthcare providers will not get a second chance to make a first impression in implementing a new CBR application, an understanding of the socio-technical reasons why a system may succeed or fail is crucial (Lorenzi & Riley, 2000). Therefore, this study draws upon these theories to create a foundation for studying physician acceptance of CBR applications. The TAM focuses on factors which determine users' behavioural intentions toward using a new computer technology.

TAM has come under some criticisms, notably from one of the early proponents of the theory (Bagozzi, 2007). Perceptions will always remain perceptions, and perceptions can sometimes be difficult to decipher. A meaningful way forward for TAM will be usefulness and ease of use rather than perceived usefulness and perceived ease of use of the technology. Due to these criticisms, other researchers, like Venkatesh, Morris & Davis (2003), have worked to broaden the scope of TAM and this has led to the development of another theory known as the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris & Davis, 2003). Venkatesh, Morris & Davis (2003) have

14

sought to address the perceived inadequacy and simplistic nature of TAM. UTAUT has added four dimensions (performance expectancy, effort expectancy, social influence, and facilitating conditions) to help broaden the understanding of determinants of usage intention and behavior posited in TAM.

The Unified Theory of Acceptance and use of Technology (UTAUT) explains user intentions to apply an information system and subsequent usage behaviour. According to Venkatesh, Morris, and Davis (2003), the theory consist of four key constructs namely, performance expectancy, effort expectancy, social influence, and facilitating conditions that are direct determinants of usage intention and behaviour (dependent factors). Independent factors such as gender, age, experience and voluntariness of users also affect the use of ICT in healthcare (Bagozzi, 2007). This theory seeks to eliminate the inadequacies in TAM. Thus, any research to determine the use of technology must go beyond the perception of people which is difficult to tell.

**Diffusion of Innovations Theory (DIT)**

While not specific to information technology, Diffusion of Innovations (DIT) research examines the social processes surrounding changes that occur when an innovation a new idea, practice or object is introduced into an organization (Rogers, 2003). A computerized patient's record will certainly introduce more than a new computer application to its users, as it will impact workflow and practice patterns by requiring clinicians to perform familiar, often well embedded tasks in a different manner (Lorenzi & Riley, 2000). Healthcare systems are very complex social systems and are comprised of individuals with

15

varying backgrounds, experiences and values. Diffusion of Innovations research examines which social characteristics impact an individual's decision to adopt or reject a new innovation and classifies adopters into categories based upon these characteristics. Adopter categories include: innovators, early adopters, early majority, late majority and laggards (Rogers, 2003).

Diffusion of Innovations research examines how new innovations affect social change within a community. It provides a broad framework for this particular study by providing an avenue for studying who the various adopters and non-adopters may be, as well as the reasons for adopting or rejecting the computer-based patients' record system. Diffusion of Innovations theory also explores the factors supporting initial adoption of an innovation, as well as ongoing sustained use.

Theoretical models such as Rogers' Diffusion of Innovation (Rogers, 1995) are often employed. However, the adoption/diffusion approach has also been criticized for its limited vision of what influence adoption and diffusion processes of complex innovations such as ICTs (Lehoux, Battista, & Lance, 2000)

**Actor-Network Theory (ANT)**

In order to evaluate the effectiveness of information and communication technology interventions in healthcare, a deeper understanding of the characteristics and properties of this technology is essential. Actor-network theory (ANT) is one of the theories that can explain these complexities. ANT emerged in the mid-1980s, primarily with the work of Bruno Latour, Michel Callon, and John Law (Monteiro, 2000). Actor-network is defined as the act linked together with all

of its influencing factors to produce a network. An actor-network links together both technical and non-technical elements (Monteiro, 2000). The basic concept of this theory is that any network is heterogeneous in nature consisting of human, non-human, technical, non-technical, society, surrounded by environment and other networks; all the participants of this network are named as "actor". It points out dependencies and interoperability among heterogeneous elements that contribute to understanding the complex healthcare system in the context of this study. Monteiro (2000) continues that if information infrastructure is a socio-technical process of negotiation, then ANT is sensitizing vehicle and which gives the flexible level of analysis of information infrastructure. ANT can be positioned within the wider backdrop of conceptualizations of society and technology. ANT describes how, where and to what extent technology influences human behaviour and ANT represents one framework within this restricting/enabling regime. In the convincing process of actor-network, actor, who has interests, tries to convince other actors in such a way to create an alignment of the other actors' interests with their own interests. When this convincing process becomes effective, it creates an actor-network. But in turn, each of these elements is part of another actor-network (Sahay & Walsham, 1997). The important components for information infrastructure in this study are computer-based patient's record system software, Internet connectivity, Computers, Networking, telephones and Organizational aspects (process of dependencies and interaction between different actors).

Actor-network theory has become widely known in recent years, and a substantial number of researchers are making explicit use of the theory in their

research work (Sahay & Walsham, 1997). According to Sahay and Walsham (1997), Actor-network is a heterogeneous network of aligned interests, including people, organizations and standards. ANT is located within a broader strand of critical thinking rounding information systems and information technology (Monteiro, 2000).

Concepts that were dealt with in this work included the use of ICT equipment, waiting time, and medical errors.

**Use of ICT equipment in healthcare**

According to WHO (2006), Africa suffers 24% of the world's total burden of disease but has only 3percent of the world's total health workforce. Sub-Saharan Africa is estimated to have only 145,000 physicians to serve a population of 821 million. Africa's poorest countries face even greater workforce shortages. Statistics show that the doctor-patient ratio in Ghana is 1:13683, which is far below the World Health Organization (WHO) global standard pegged at 1:5,000 (Ghana Health Service, (2007). With this acute shortage of health workers, it is believed that ICT can help lessen the burden of health workers in most health centres. Though, the role ICTs play in improving the efficiencies and effectiveness of healthcare delivery has been well established in the more developed and industrialized parts of the world, however, the same is not true for developing countries in general especially, countries in Africa.

In 2007, European Commission released a report on e-Health practices in member countries. According to this report Finland is one of the frontrunners in

ICT use among general practitioners, ranking third in overall comparison. Only Denmark and the Netherlands have more advanced use of e-Health in Europe. Finland does well both in the field of infrastructure and the use of ICT in health care purposes. Hundred percent of the GPs in Finland have computers and internet access, compared to the European averages of 87 and 69 per cent, respectively (Atkinson & Castro, 2008). As for the electronic data storage, 100 per cent of Finnish general practitioners store electronically at least one type of patient data. Finland is above the EU-27 average in all but one of the observed data types, including among others the electronic storing of medication, lab results, symptoms and radiological images. ICT is also used for communication purposes more actively than on average, 90 per cent of the general practitioners using networks to receive laboratory results and 55 per cent exchanging data with other health care providers.

In the year 2003, US expenditure on health rose more extensively as compared to other developed countries. Anderson, Frogner, Johns, and Reinhardt, (2006) have explained the relatively poor productivity and high spending of the US health care with service use, administrative complexity, population age, threat of malpractice litigation, defensive medicine, and the lack of waiting lists and with the "most compelling explanation": high prices. The US as of 2003, was lagging a dozen years behind other industrialized countries in health information technology adaption, and this could explain at least part of the high cost of health expenditure. As of 2005, most of the medical records were still stored on paper and it is widely believed that if an electronic medical record (EMR) system was

broadly adopted in the US, it would lead to significant health care savings, reduce medical errors and improve health. Hillestad, Bigelow, Bower, Girosi, Meili, Scoville, et al. (2005) estimate that if an EMR system was adopted on the national level, over fifteen years the cumulative savings from hospital systems could be almost $371 billion and from physician practices $142 billion. Many commentators have questioned these estimates because of adequate savings demonstrations. Walker (2005), stresses the contribution and importance of EMR in the health care transformation, but is skeptical about the financial estimations and calls for real-world demonstrations of cost-effective improvements in care Hillestad, Bigelow, Bower, Girosi, Meili, Scoville et al., 2005).

A 1998 review of literature on the impact of 68 ICT-based clinical decision support systems showed a beneficial impact on processes of care in 43 out of 65 studies and a positive impact on patient outcomes in 6 out of 14 studies (Hunt, Haynes, & Hanna, 1998). The advantages of computer-based patient's records can be broadly classified into 4 categories: Clinical, Workflow, Administrative and Cost effectiveness (Mildon & Cohen, 2001). Clinically, the most important feature of computer-based patient's records is the accessibility to patient's information from any department and at any time within the network. Computer-based patient's records system saves time of patients to access their records easily without them wasting much time at the record section for time to be saved for other activities.

Workflow benefits from computer-based patient's records system are many (Essex, 2000). This system enables record transfer, supports continuing

20

collaborative care and case management within the hospital, allows automatic reports, supports selective retrieval of information and by automation possibilities of misplacement and loss of records are eliminated. Administrative benefits include knowing when a patients was admitted, in which ward, and under whose consultation, how many different laboratory examinations were done, how many cross consultations were done to tracking the patient which again reduce errors by making flow of information automated. Staff from finance department can handle insurance and financial aspects more efficiently. Greenberg (2005), among other authors, explored the relevance of ICT to the health sector. Among some of the benefits they stated were the provision of more efficient methods of healthcare, access to patient's information to everyone, as well as facilitating the management and transfer of knowledge at the health sector.

Consequently, electronic data storage and data sharing across providers have probably received the most attention. It has been stated that shifting from paper-based storage to electronic-based storage is associated with remarkable cost-savings (Hillestad, Bigelow, Bower, Girosi, Meili, Scoville, et al., 2005) and faster access to information, which results in improved efficiency. Also unnecessary tests can be avoided, when information can be easily found from the data base by different users. Electronic process also enables storing bigger quantities of medical data (Haux, 2006). This is essential as the amount and complexity of health-related information and knowledge constantly increases and has already made information processing a major component of any health organization. Having national health records can improve health care processes as

different providers can access the same information fast and the duplication of tests could be prevented. In the European Union the long term goal is to have a system where all the clinicians in Europe can access health records from all countries (Andersen, 2006). This would improve conditions for treatment as the patient as well as the health care professional mobility is expected to increase (European Commission, 2004).Without electronic records and communication technologies having wide databases would practically be impossible.

Another of group of communication technology facilities includes traditional telephone conversations, e-mails and videoconferencing. Modern communication technologies enable real-time communication and make more frequent monitoring possible. Efficient communication plays a major role in adjusting care and preventing serious problems as interventions can be done faster. Medical data can be transferred electronically in seconds and thus enables faster reaction to changes in patients' conditions (Detmer, & Friedman, 1994). Self-care and education, successful management of chronic disease care are facilitated considerably by active involvement of the patient in his or her own treatment procedure. There is also increasing willingness from the patient side to be integrated in their own health care process, and health consumers are actively searching information independently. The involvement is usually realized by patient education and information about his or her disease (Asmar & Zanchetti, 2000) and information and communications technology can provide effective methods for patient participation.

According to Haux (2006), another category of ICT equipment include medical devices for self-monitoring as well as interactive websites for education on the diseases. One example of self-monitoring equipment is software that accepts and analyzes data from blood glucose meters of people living with diabetes. As for interactive websites, especially in the United States there are many firms mostly insurers that maintain websites to help people with chronic diseases. Moving towards more self-care and patient and health consumer inclusion is largely associated with new ICT technologies and has been noted by other commentators as well (Haux, 2006).

According to Abdulai (2009), during a study at the Records Department of Korle-Bu Teaching Hospital, the personnel there had to temporarily suspend work for about half an hour, because they had run out of billing sheets. Paper and pen is undoubtedly the most familiar tool for data capturing in Ghanaian hospitals. Physicians in Ghana have earned notoriety for ineligible writing, especially when it comes to prescriptions (Abdulai, 2009). This according to Abdulai (2009), may be as result of their desire to attend to as many patients as possible in a day, and thus compromises the legibility of their prescriptions. Though, the hand writings of physicians can be read by well trained pharmacists, there are lots of untrained pharmacists in Ghana who cannot read these writings and in the process, administer the wrong drug or dosage to a patient.

The uncoordinated nature of data collection and poor communication among those who collect and manage data seriously hampers effective data collection and management at hospitals. In a study by Abdulai (2009) at the

23

Korle-Bu teaching hospital, it was noticed that there was this confusion of where some patients' folders were being kept at any given time. Usually all National Health Insurance Scheme (NHIS) patients' folders are kept at the Records Department after the patients have been through the care procedure; at specified intervals though, the NHIS Claims Processing Unit comes for some of the folders to work on. These folders are returned to the Records Department after processing, but due to poor communication structure between these two units, personnel at the Records Department may not be aware where those folders are. They spend fruitless time and effort trying to retrieve these folders should patients turn up for it during this period; the personnel will after several failed attempts either tell the patient the folder is missing, or she should go and check that up from the NHIS Claims Processing Unit.

The solution usually is the creation of another folder for the client provided they still have a facility attendance card issued in triplicate by the NHIS Metro Office. If the patient has exhausted all three Health Facility Attendance cards, then they are asked to go to the NHIS office (Abdulai, 2009). Due to these problems that health workers and the patients as well go through, proponent of ICT in health posit that, the use of ICT will help in bridging the wide gap that had been created by the use of the pen and paper records in healthcare.

**Computerization of Health Records and Waiting Time**

Waiting time has been defined as the total time from registration until consultation with a doctor. There are two waiting times, the first is time taken to

see a doctor and the second is time to obtain medicine (Jamaiah, Sharif & Sukeri, 2003). Long waiting times have been found to have a lot of implications on the quality of healthcare and there are a lot of factors that account for this.

Currently, most healthcare providers use paper-based records to record a patient's receipt of health care services especially, in developing countries. The use of such records leads to the inadequate documentation of the care-giving process, a severe disruption in the flow of patient related information, and a substantial delay in the delivery of health care services Skuse (2004). Advanced information technologies such as computer-based patient records, portable computers, electronic health records and expert information systems alter this situation by providing clinicians with real-time access to patient information at the point of care (Ajeet, 2003). The laboratories and other units could benefit tremendously from electronic record keeping. According to Abdulai (2009), a greater amount of time is used for writing the patient report and entering this in records book after the test is completed. This leads to the wasting of substantial amount of time at the hospital.

On the effect of long waiting time at the hospitals, a publication by Thatcher (2005) in Highland Medical Research Journal, states that the problem with long waiting time for service has been identified as a reason people avoid presenting themselves for medical care in Africa. Thatcher then found out that long waiting times at hospitals are mostly due to staff shortages, misfiling of cards, and doctors' delay in starting consultations and simultaneous break times.

25

**Impact of Computerized Health Records on Medical Errors**

Medical errors are inevitable in complex health care environments. Although healthcare organisations regularly provide patients affected by medical errors and their families with counseling afterwards, the impact of errors on physicians can sometimes be overlooked. In a study by Waterman, Garbutt, Hazel, Dunagan, Levinson, Fraser et al., (2007), the impact of medical errors on physicians was examined. Some of the impacts as reported by the physicians themselves included increased anxiety about future errors, loss of confidence, sleeping difficulties, reduced job satisfaction and harm to their reputation following the errors.

A study conducted by the Institute of Medicine to access the impact of medical errors on patients, showed that close to 98,000 people die in US hospitals annually due to medical errors (IOM, 2001). Medical errors are very common especially in developing countries. In Ghana, the Daily Graphic on May 5, 2006 reported that, three doctors at Korle-Bu were sued for performing wrong surgery on a patient's wrong leg. In a recommendation by the IOM (2001), it was suggested that the use of ICT tools in healthcare help in reducing medical errors in the health system.

Health workers are professionals who care and provide comfort to patients but could also be responsible for the mistakes that harm or further complicate the situation of the very patients they are curing. Akouko (2007) states that there is a significant number of mistakes that occurred in the healthcare system in Ghana which include doctors' illegible handwritings, wrong interpretation and wrong

26

labeling but the records are not straight and for that matter little effort has been done resulting in aggravating the situation.

In a related development, Wilson (2001) stated that the frequent changes in prescribed medications during hospitalization combined with erroneous discharge letters further add to the problem of medical errors. Wilson (2001) continues that strong punitive action subjected to offenders in a clinical process or medical practices will result in the non-reporting of incidents and shortcomings. This will be as a result of fear of being reprimanded. This culture of fear militates against the improvement process of an institution. Quality improvement and for that matter safety, can be assured if there is a strong culture of free reporting of adverse events and medical errors and the subsequent assessment of the situation leading to new strategies. A safety strategy formulated as a result of a medical error reported will act as a searchlight to the incident and subsequent possible occurrences. But with advanced use of ICT, prescriptions are entered by doctors which are assessed directly by the pharmacists. Thus, the issue with doctors' illegible handwritings can be eliminated completely.

**Other Usefulness of ICT in Healthcare**

Apart from being useful in minimizing medical errors and waiting time, ICT tools can be very useful in healthcare delivery. According to Daly (2003), given the right policies, organisation, resources and institutions, ICTs can be powerful tools in the hands of those working to improve health. Some authorities including the Institute of Medicine have stated how the use of ICT can help improve the quality of healthcare which in a way can help to increase life

27

expectancy. Some ICT tools that can be used to improve the healthcare system have been identified. Some of these tools that are commonly used in developing countries include the telephone and email among health practitioners. A study by Micevska (2005), identified a strong correlation between the use of the telephone and an increased demand for health services in Bangladesh, and Peru. The analysis at the household level shows that a basic telephone service offers opportunities in delivering timely information on health services to households with relatively greater demand for this type of information. Health workers will be able to track and monitor their clients using mobile phones.

Besides, creating an up to date database of health information, health workers can track infectious diseases in remote areas, coordinate medical supplies and make better decisions based on more accurate information using the mobile phones (Anon, 2005). In Egypt, mobile phones have been used to promote maternal and child health. Home delivery was discussed by mobile phone users in rural areas and the phones used to mobilise assistance or transport to qualified health workers if deliveries proved problematic (Anon, 2005). Other studies describe how mobile phones are being used in South Africa by 80 counsellors to support people living with HIV to follow the treatment plan for their anti-retroviral drugs and how text messages are helping TB patients to remember to take their drugs (Skuse, 2004).

Also, there is a wealth of experience of radio health initiatives described by Gumucio (2002), cited in infoDev (2006). Case studies of interactive radio instruction in the Dominican Republic, Zambia, and Guinea, show that this use of

28

a previously one-way technology can effectively reach hard-to-reach populations and result in high learning gains and decreased inequality (Bosch, Rhodes & Kariuki, 2002). In relation to the use of the radio, Skuse (2004) points to the contribution of community, national and international radio to health programmes in the developing countries and describes it as a strategic tool for human development and poverty reduction.

Another popular ICT tool for the improvement of healthcare is telemedicine which involves the use of modern information technology, especially two-way interactive audio/video communications, computers, and telemetry, to deliver health services to patients in remote areas, and to facilitate information exchange between primary care physicians and specialists at some distances from each other (Bashshur, Sanders & Shannon, 1997). According to the International Telecommunication Union (ITU, 2005), telemedicine is a powerful tool for improving health care delivery, and it has been successfully implemented in pilot projects in many countries. Telemedicine piloting is well advanced in Latin America, with a number of case studies that contain learning that can be informative for scaling up projects. These include the use of distance education to encourage breastfeeding (de Ornes, 2002 cited in infoDev, 2006), and the use of telemedicine in rural areas to improve maternal health (Martinez, 2005, cited in infoDev, 2006).

In fact, there are some special benefits of telemedicine services such as, better access to health care, easy access to information, justified communication between care-givers and patients, easy to continue education regarding disease for

29

patients and professionals, and reduced treatment (Norris, 2002). Telemedicine is the delivery of healthcare services, by healthcare professionals using information and communication technologies for the exchange of vital information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interest of advancing the health of individuals and their communities (WHO, 2006).

Most developed countries are now using computer-based patient's records in healthcare delivery. Computer-based patient's records is any information relating to the past, present or future physical and mental health, or condition of an individual which resides in electronic system(s) used to capture, transmit, receive, store, retrieve, link, and manipulate multimedia data for the primary purpose of providing health care and health-related services (Murphy, 1999). In Ghana, the MOH's launched programme dubbed ICT4health envisioned the use of radio, audio and video health transmission initiative to disseminate health information to the portion of the population that are illiterate, who live in rural areas, and other people who may benefit from the targeted specialized health information (MOH, 2005). Radio remains a central medium for health education, health promotion and participatory health communication in developing countries. A major future trend is the convergence of radio with internet based communications. Newer ICTs add to radio the potential to develop a stronger feedback loop, with listeners engaging with the broadcasters in a range of new

30

innovative ways, such as increased phone-ins due to mobile telephony, through email infoDev (2006).

Ready access to health information

Godlee, Pakenham-Walsh, Ncayiyana, Cohen, and Packer (2004), in a work on access to health information, concluded that universal access to information for health professionals is a prerequisite for meeting the Millennium Development Goals and achieving Health for All. Lack of access to information remains a major barrier to knowledge-based health care in developing countries (Godlee, Pakenham-Walsh, Ncayiyana, Cohen & Packer, 2004).

In Bangladesh, a project with a different level of scale was developed to register, schedule and track immunization of children. Based in the city of Rajashahi, a computerized system was introduced to replace a manual record keeping system. Over a period of three years, the new system was able to increase immunization rates from around 40percent to over 80percent. It reduced the time health workers spent searching records; it made it easier for managerial staff to supervise the immunization system and monitor performance; it improved immunization protection for children and ultimately their health, a positive benefit for the families reached by the system (Ahmed, 2004).

The health sector is an information intensive sector, and access to information is very critical to its success and improving quality of care. A project of improving access to health information was launched in the University of

31

Kansas Medical School. Through this project health workers have at their disposal timely and reliable health information which was able to improve drastically, the quality of healthcare in the country (Teresa & Gayle, 2007).

With cooperation, appropriate use of technology, and financial and political commitment, access to relevant, reliable information for healthcare workers can be improved in developing countries. Lack of access to basic information should not be allowed to continue to harm the professional development of healthcare workers and, the health of their patients (Cohen, Forbes, & Garraway, 1996). A World Bank report (2002), estimates that 100,000 deaths could have been avoided each year if reproductive health information like family planning were accessible to women who said they wanted no more children to enable them prevent pregnancies. It must be noted that ICTs can facilitate the extension of access to health care from the urban to rural areas, helping to connect people to advice and information. This includes people being able to access their own health care information, and health care workers who are in the more remote settings being able to link with colleagues who have access to better facilities and information sources to get advice and support infoDev (2006).

ICT tools and the Security of Health Information

A person's health information is important information in the life of the individual and must be kept secret so that only people who are concerned in the healthcare of the individual have access to that information (WHO, 2008). Data collected from individuals in particular should be stored in a secured place, since

32

it contains certain vital information from that individual. The current situation of paper documentation makes consumers and policy makers share concern about the privacy and confidentiality of health data (National Academies Press, 2001).

Hunter (2003), in a study on patients' attitudes to electronic medical records, also confirmed that though, some patients do not have any firm idea of any security measures that were used to protect electronic personal health information from being accessed by just anyone, they commented that no system was foolproof. A review and reference source on personal data protection regulation was published by the Pan American Health Organization shows that reliability, security, and privacy are accomplished by the implementation of a number of preventive and protective policies, tools, and actions that address the areas of physical protection, data integrity, access to information resources, and protection against unauthorized disclosure of information (Rodriguez, Wilson, & Schanz, 2001).

Importance of ICT to the Health Worker

Studies done in India and Pakistan indicated that they have advanced in using ICT to improve data storage, treatment and collaboration among physicians, (Mujahid, 2002). The importance of ICT has made WHO to enjoin all member countries to strengthen their access to health information through an improved system by managing information and making it available to the people who need them. According to WHO (2004), ICT form the backbone of the services to

prevent, diagnose and treat illness and disease. The report continues that ICT can be used in modernizing the Health Sector in every country (WHO, 2004).

Studies have confirmed that integrating the use of ICTs into existing health systems has helped to improve the delivery of health care in a number of ways (Rodriguez, 2000a, 2000b; & Pan American Health Organization, 2001). The contribution of ICT to the development of quality health care cannot be underestimated because it plays a major role by ensuring that it eliminates loss of case files, effective communication between medical personnel, reduces storage space to the barest minimum, easier transmission of data from the point of generation to policy makers, rapid transmission of data from source of generation to health policy makers (Makinde, 2008).

Despite its numerous benefits, electronic health records system has been criticized extensively. A study of the effect of computerized guidelines for managing heart disease in primary healthcare found that sophisticated reminders from an electronic health records system failed to improve adherence to accepted practice guidelines or outcomes for patients with heart disease (Tierney, Overhage & Murray, 2003). Another empirical evidence by the Department of Veterans Affairs hospital, the test site for a new computer software programme, reported surgery delays and other problems with its new computer system (De La Garza, 2004). According to Papazafeiropoulou and Gandecha (2007), one major problem associated with sharing electronic health records is that patients may not be able to predict who might need to see their data. The computer-based health record presents security treats to patient's records especially, in the area of electronic

34

health records. Access to patient's information, records, and protection against unauthorized disclosure of information cannot be assured (InfoDev, 2006).

Furthermore, the issues regarding manpower and skills for the successful implementation of any ICT in health programme has been very much mentioned by some authors. According to Monteiro (2000), before any programme can be successfully implemented, there is the need to train and retrain the key actors in the field in order for the smooth running of the programme. ICT for health is a very complex programme and it behooves all health professionals to be trained in how to handle all tools related to the use of ICT for health.

A study by MOH in 2005 revealed that the shortage of IT professionals with the appropriate IT skills poses the most significant challenge to the effective implementation of an ICT policy in Ghana. Similarly, Baron, Fabens, Schiffman, and Wolf (2005) said that some physicians may have insufficient computer skills or lack the basic knowledge and training necessary to use computers effectively. Ash, Anderson, Gorman, Zielstorff, Norcross, and Pettit, (2000) also lamented that a number of programmes and systems have failed because inadequate training given to the professionals.

Training must be designed to meet the needs of physicians; therefore, it is critical to get strong support of physician leadership of participation in training (Lorenzi & Riley, 2000). In most cases, physicians prefer to be trained one-on-one by other experienced physicians (Johnson, 2001). Training programmes should educate people on how to use the system, plus address attitudes and build enthusiasm for doing so (Lorenzi & Riley, 2000). For training to be beneficial,

appropriate techniques, timing and high-quality training materials are required for successful system implementation (Greenhalgh, Robert, MacFarlane, Bate, & Kyriakidou, 2004).

**Challenges with the Use of ICT in Healthcare**

Wilson and Wong (2000) warned that, it was important to ensure that; computerization of health information systems does not dominate the health information system reform improvement process. This is because majority of health information users in developing countries have no access to computer technology, thus the development and improvement of manual systems for collection, analysis, and use of data should be the primary focus. In support, Lippeveld (2001) said that introducing ICT into the health sectors was not necessarily the silver bullet that creates effectiveness and efficiency in health service because lack of appropriate trained staff and hardware and software problems sometimes result in the decay of expensive computer equipment, without gains in decision making.

Also the fear of change itself was naturally not exclusively related to changes initiated by ICT. The uncertainty inherent in any change makes many employees feel uncomfortable (Monteiro, 2000). The amount of information regarding aims and purposes joined with the introduction of ICT implementations was an important factor in this connection. The more the information is relevant, the less the risk of uncertainty among employees (Danish Technological Institute, 1997). The fear that there could be dismissal or changes within the organization

would let some workers have dislikes for the introduction of new things and therefore will see it as not important.

It is an undeniable fact that the costs of implementing ICT go beyond purchasing the technology to providing training and systems support, which are very crucial for its success. Deriving benefit from ICT generally requires changing work processes, which can be more challenging than the purchase and installation of the technology itself (First Consulting Group, 2003). New applications must also integrate with existing systems, which makes implementation more complex and can further increase costs. The introduction of such technologies brings the challenge of training of professionals to handle some of this equipment (InfoDev, 2006). A study by the MOH shows that in Ghana, there are relatively few ICT professionals as compared to the western nations which might make the implementation of ICT in healthcare difficulty (MOH, 2005).

According to Morrissey (2004), while many factors push hospitals to invest in ICT, others pose barriers. Investment in ICT is costly and must compete with other priorities, including investment in technologies with more direct application to clinical care and greater certainty for increased revenues, such as new imaging equipment. Morrissey (2004) continues that availability of capital for investment in ICT depends, on hospitals' ability to access capital in general, which may be easier for some hospitals but not others. Cost poses a serious barrier to adoption of ICT in healthcare in the developing world. The costs of

37

implementation and ongoing maintenance vary by the size of the hospital, as well as by the functions to be installed. For example, First Consulting Group in the USA stated that a full clinical ICT system that includes the use of computer-based patient's records will cost tens of millions of dollars (First Consulting Group, 2003).

In addition to the costs of ICT, hospitals may perceive lack of reimbursement for specific ICT investments as a barrier. According to First Consulting Group (2003), there is little investment in ICTs for health in most developing countries. The picture is one of fragmentation, with many different varieties of ICT being acquired from different donors. Very few government-run health services have properly functioning ICTs within them, and there is no reliable infrastructure to enable inter-organizational transfers of information. However, technologies must be integrated into health services that will help meet basic needs if they are to be considered to be essential investments (WHO, 2006).

With connectivity, there are issues such as the lack of an enabling telecom policy and regulatory environment; access to electricity, solar power options, UPS back-ups, insufficient infrastructure, connectivity access and high costs. An analysis of connectivity access in the world shows a very low figure in Africa as compared to the rest of the world. As of 2004, the main telephone lines per 100 persons in Africa are 3.1 as compared to 40.9 in Europe. Internet users per 100 persons are 2.6 compared to 31.1 in Europe (Allotey, 2005). Thus, in the wake of

full implementation of an electronic health records in Africa, only few people will have access.

Some other challenges are problems with human resource, start-up capital and above all, lack of facilities to ensure its implementation (Allotey, 2005). One of the biggest problems with the health sector is the slow pace of upgrading existing knowledge of workers. In a similar statement, Sandford (1992), asserted that the current health information system may not be the silver bullet that solves the problems at the health sector because the computerized systems are bedeviled with the lack of appropriate trained staff and hardware and software maintenance problems in the developing world.

Generally, ICT experts are in short supply and one would not expect them to move from the urban to the rural. This has posed a serious challenge for hospitals and health centres in rural areas that may want to ICT. A study revealed that there was lack of continuity of national staff for managing the system (Lippeveld & Sapirie, 2000). An impressive base of such skilled human resource is not available in many of the developing nations, characterized by poor literacy levels. This was truer of sub-Saharan Africa. Also, the attrition rate of technically skilled persons was high and such developing countries suffer from high levels of brain-drain as well. In the context of brain-drain in the IT sector, India deserves a special mention (Srivastava, 2007).

Financial constraints have been seen as one of the challenges to the use of ICT in healthcare delivery. Most ICT projects are capital intensive which will not

allow hospitals and health centres to go into such a project. Lack of financial support and sustainability, with appreciably low health sector spending, poorer nations understandably do not have the same level of financial support to ICT in health as the richer nations (Allotey, 2005). Several major innovative initiatives may die an unknown death for lack of fund support towards up scaling and mainstreaming.

This was one of the key reasons why very few IT projects in the development sector prove to be financially sustainable in the long run (Srivastava, 2007). In East Asia, investment in ICTs for health was less advanced than what might be expected, due to institutional, cultural and financial factors (Holiday & Tam, 2004). The financial factor was common to other regions and the effective use of ICTs in health will need resourcing at a higher level than was currently the case. There was the need to find ways to blend private and public resource that contributed to the development of improved publicly accessible knowledge. During their meeting in April in Cuba the Group of 77, the largest formal coalition of developing countries within the United Nations, asked that efforts be undertaken to ensure that their countries would not be left behind by the rapid development of the internet (Cohen, Forbes, & Garraway, 1996).

InfoDev (2005), argues that certain things must be put in place in order for the CBR to work effectively. They concluded that opportunities do exist for the use of ICTs in the health sector of developing countries. However, a number of issues must be carefully considered in each intervention and setting as follows:

40

First of all, the question that needs to be answered is to what extent are the health sector structure and the national regulatory framework conducive to problem-oriented, interdisciplinary, rapid-response collaborative technical work and to implementing the political, regulatory, and managerial tasks required to address multifaceted and complex technological problems? If the use of ICT in the health sector can become very effective, there is the need for proper and appropriate regulatory frameworks to be established (infoDev, 2005).

According to infoDev (2005), other things that must be done for a successful implementation of ICT in the health sector include the setting up of goals, action plans and potential outcomes and benefits must be clearly defined. The mechanisms for coordinating action led by the public sector in a way that links public, private, and social efforts, and engages with diverse stakeholders to speed the development and use of priority ICT solutions must be properly formulated. Also, the affordability of the whole programme must be taking into considerations and the format for measuring output and progress must be defined. Lastly the mechanisms for developing the capacity of health workers, other intermediaries and community members to make the most effective use of the ICTs available and to develop content that is relevant, applicable, and culturally appropriate should also be considered. In so doing, the full benefit in the use of ICT in health care can be realized (Infodev 2006).

In a study by Gregory, Garrison, Matthew, Bernard, Norman and Rasmussen (2002), published in the Family Medicine magazine, 304 patients

were involved in answering questionnaires on the topic the 'effect of computer use by physicians on patient satisfaction at a family medicine clinic". The results revealed that computer had an overall positive impact on the quality of care provided. There was a positive association between a physician's computer skills, as rated by patients, and the patients' satisfaction with the computer's effect on the visit. ICTs are not only limited to the transfer of information, because ICT can be used to promote better health behaviour, improve decision-making, promote information exchange among peers, self care and enhance the effectiveness of health institutions. According to Kimambo (2008), public health decision-making depends on the timely availability of sound data. Reports indicate that, data flow to most health institutions does not flow on time. Making most decisions to be taken before the information comes (Morton, 2008).

Gregory, Garrison, Matthew, Bernard and Norman in Rasmussen (2002) published a study in family medicine journal on 21$^{st}$ Century health care: the effect of computer use by physicians on patient satisfaction at a family medicine clinic. The study sought to examine patients' views on computer use and its effect on patients' satisfaction in a family medicine clinic before and after the implementation of an electronic environment. The study used cross-sectional design a survey was mailed to 140 patients who had been evaluated at the clinic for hypertension, and high blood pressure. The survey assessed patients' overall satisfaction with health care received at the clinic and their opinions about how their physician's computer usage affected their visits. In their analysis, they used

correlation to find out the association between physicians' computer skills and patients' satisfaction with the computer's effect on the visit.

The result from the survey indicated that a majority of the patients thought that the computer had an overall positive impact on the quality of care provided. There was a positive association between physician computer skills, as rated by patients, and the patients' satisfaction with the computer's effect on the visit. The study concluded that physician competence with computers plays an important role in patient satisfaction and that computers can be integrated into the office visit without a detrimental effect on patient satisfaction. Surprisingly, patient familiarity with computers was shown to have a slight negative correlation with patient satisfaction.

In a review of the real benefit of the use of ICT in healthcare delivery, Ahmed (2004), used the case study design to evaluate a computerized information system which was developed in 2001 by the Department of Public Health in Rajshahi City Corporation in Bangladesh, to register, schedule and track immunization of children. According to Ahmed, this was developed to replace the manual record keeping, which led to problems including relatively limited ability to identify new-born children, since many births remained unregistered. It was also relatively poor at tracking the four different vaccine doses that were required at the four different points of time for each child. Over a period of three years, the new system was able to increase immunization rates from around 40percent to over 8 percent. The systems main contribution was helping in the planning and

execution of effective immunization at an operational level: providing a back-up even if parents forget their children's vaccination date; guiding health workers towards those who need their doses; and potentially reducing vaccine wastage.

According to Ahmed (2004), paper work was reduced, helping release time of health workers for more productive activities. There was also the benefit of bringing a greater number of mothers and young babies into regular contact with health workers (Ahmed, 2004). Ahmed stated that a critical element of the success of this intervention was that it was designed to meet the interests and needs and provide tangible benefits to a number of different stakeholders. It reduced the time health workers spent searching records; it made it easier for managerial staff to supervise the immunization system and monitor performance; it improved immunization protection for children and ultimately their health, a positive benefit for the families reached by the system.

Though, Ahmed (2004), provided some empirical evidence for the success of the computerized system of immunization in Bangladesh, the instruments, sample and the methods of collecting the data for the research were not spelt out. Secondly, this is a case study which cannot be generalized to what is happening elsewhere, though, the researcher sought to generalize the findings.

On the issue of the effect of long waiting time at the hospital, a publication by Thatcher (2005), in the Highland Medical Research Journal, states that the problem with long waiting time for services has been identified as a reason people avoid presenting themselves for medical care in African countries. Examination

44

of causes for long out-patient waiting time and the effect of the measures to reduce waiting time, a cross-sectional design was used to collect data from the Outpatient department of the Jos University Teaching Hospital. In its analysis, the study found out that, a total of 248 minutes were used by patients from record section through to the pharmacy. The study stated that, waiting time becomes longer if a patient is asked to go for a test at the laboratory.

Long waiting times were judged to result primarily from staff shortages, misfiling of cards, and doctors' delay in starting consultations, and simultaneous break times (Thatcher, 2005). Strategies were introduced to correct this anomaly which included additional employment and reallocation of staff, training of medical records staff, recording times on outpatient cards, and scheduling follow-up visits for less busy times. Five years after the intervention, a survey by Thatcher (2005) showed that the mean out-patient waiting time spent at the hospital was 184 minutes. Lessons learned showed that in-house training of records staff had little long-term impact on reducing the time patients waited to collect their cards. Increased staffing and coordinating staff strength to correspond to times of peak patient load had the greatest effect in reducing outpatient waiting time. Constructive use of patient waiting time may provide greater patient satisfaction. Monitoring patient waiting time can be feasibly implemented to measure performance of health systems and provides a basis for allocating resources (Thatcher, 2005).

Though, the computerization of health records was gaining grounds in the early 2000s in the developed countries, it was not common in developing

countries. Abdullah (2005) conducted a study in one of the teaching hospitals in Kuala Lumpur, Malaysia on out-patients' waiting time. The study defined waiting time as the length of time from when a patient entered the outpatient clinic to the time the patient actually received his or her prescription. The study designs used were exploratory and evaluative. The study involved 112 patients, four doctors, five nurses and seven administrative staffs who were selected using the random and the purposive sampling approaches. The instruments used in the study were questionnaires for hospital staffs, interview guide for patients and personal observation was also done. Data were analysed using the six sigma approach. The study then identified three main factors that contribute to excessive patient's waiting time, namely: the registration time, insufficient number of counter service staff and insufficient number of doctors. These findings were represented as in Figure 1.
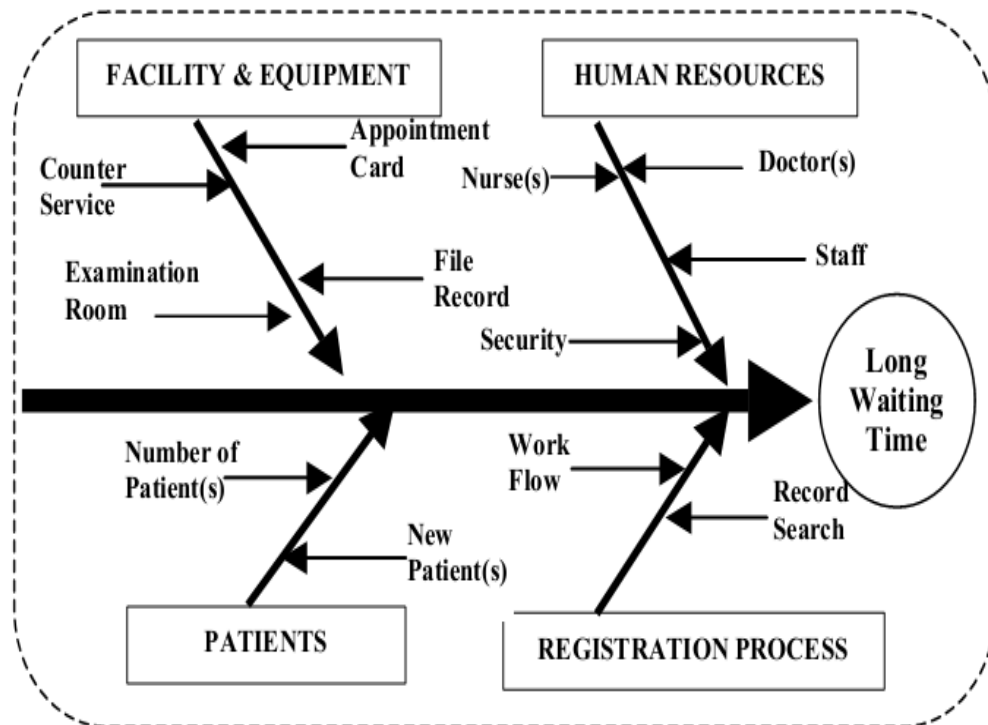
**Figure 1: Cause of long out-patient waiting time**

Source: Abdullah, (2005)

The study revealed that most of the respondents (49.1%) said they spend four to five hours in hospital as waiting time. Abdullah's work revealed that the usage of computers will optimize the number of patients per hour. The study concluded that long waiting time affects patient's satisfaction towards the service offered. Through the six sigma approach used, the main factors leading to long waiting time are identified as registration time, number of doctors and staff at the counter. The research stated that insufficient number of doctors would increase patients' waiting time. Disproportionate number of doctors and patients would cause a bottleneck in the queue for service.

47

The study continued that the main cause of the long waiting time in hospitals is the registration. Improper record management and poor filling system affect the search time leading to a longer waiting time for patients (Abdullah, 2005). Though, Abdullah stated that computers can be used to maximize the number of patient's per hour, it was not clear how the use of computers can help to minimize waiting time in healthcare.

Yeboah (2008) conducted a study on the role of information and communication technology in health information system of the Afigya-Sekyere District in Ghana. The study design was descriptive and cross-sectional, using questionnaires, key informant interview schedule, and focused-group discussion guide to gather data from 60 respondents (health workers) who were purposively sampled. However, the study revealed that majority of the health workers in the Afigya-Sekyere District still use manual methods of keeping health information. Majority of the workers agitated for the computerization of the health sector which means most of the respondents preferred the use of computers to the manual form of storing data. However, the study found out that nearly 45percent of the health workers had only middle school leaving certificate which made them have difficulties in accessing information using the computerized system. The problems realized from the study include untrained staff, lack of infrastructure and challenges in the use of ICT facilities in the health information system (Yeboah, 2008).

48

However, the use of only sixty respondents for a quantitative study was not appropriate and the sampling methods were not appropriate for this study.

Morton (2008) used the Technology Acceptance Model (TAM) for a case study of factors affecting physicians' attitude in using and accepting electronic health record in southeastern United States. The study distributed an online survey to 802 faculty, fellow and resident physicians in the southeastern United States. Using correlation for the analysis of data, the study revealed that the factors contributing to physicians' acceptance of innovation include management support, physician involvement in selection and implementation, perception of EHR's impact on physician autonomy, doctor-patient relationship, perceived ease of use and perceived usefulness. Furthermore, Morton (2008) stated that adequate training was not a significant predictor of attitudes. Morton's study sort the response of 802 respondents but the response rate was 29.8percent meaning 239 respondents out of the total of 802 thus, making it difficult to generalize the study.

Abdul (2008) conducted a study on the topic; 'the challenges, problems and strategies of electronic medical record (EMR) implementation: a case study of an eye hospital in India'. This study was conducted in a developing country since most researches on the topic have been done in developed countries (Abdul, 2008). The study design used for the study was qualitative and interpretive involving the use of observation and interviews as data collection methods for the research to collect data from twenty one participants.

The results from the study indicate that the interest of managers for the use of EMR was to save time, space and resources while maintaining the medical records. The stakeholders were focusing on challenges like changing the mindset of end-users, providing various options of training and creating understanding between IT and health staffs. Health staff was interested in an EMR system, as it provides accessibility to patient information instantly and acts as a good source for research. However, there was a struggle on the part of the staff to get an extra time to get trained after their routine work they had problems with data entry, and some were not used to computers (Abdul, 2008).

Turkson (2009) in a study aimed at examining patients' perceptions on the quality of healthcare delivery at the district level in rural Ghana, used Komenda-Edina-Eguafo-Abrem District as a case study. Questionnaires and focus-group discussion guides were used for 803 patients who were purposively selected and interviewed after visits to the health facilities. From the results, it was realized that average waiting time for seeking medical help was one hour. Some of the complaints of the respondents included poor attitudes of some health workers at the hospital, long waiting times and lack of ambulances at the facilities as being detrimental to effective delivery to quality healthcare. Though, Turkson's study revealed interesting issues concerning client satisfaction at the health facilities in the district, no references were made to the issues that contribute to the client satisfaction at the health facilities.

Adullai (2009) conducted a study on the readiness of developing countries to accept the use of electronic health records in hospitals, using Ghanaian hospitals as a case study. The data collection methods employed in the research were observation, interviews, and documentary reviews to collect data from 112 respondents and the thematic approach was used to analysed the data. In the study, three theories were employed namely; Technology Acceptance Model (TAM), Actor Network Theory (ANT), and Computer Supported Cooperative Work (CSCW). These theories were used to discuss the acceptance of new technologies in a developing country like Ghana.

The study stated that some advantages that could be derived from the use of electronic health records in Ghana includes a reduction in waiting times for patients, reduction in cost of the hospital's operations, improvement in interdepartmental communications and collaboration, provision of opportunity for sharing best practices among physicians within Ghanaian hospitals, and enhancement of better resources allocation (Adulai, 2009). However, the study identified some factors that could impede the implementation of the EHR in Ghana. Notable among these factors are the initial huge start-up capital, poor computer skills of healthcare professionals, poor maintenance culture, and people embedding political meanings into the system.

Conversely, the use of case study as a research design for the study is inappropriate because the study does not lend itself to a case study. Also, Abdulai's perception that, this study is the first of its kind might be a wrong

perception. For example Yeboah conducted a study in Afigya Sekyere District in Ghana on the role of information and communication technology in health information system and this study was done in 2008 before Abdulai's study was done in 2009.

**Conceptual Framework**

The conceptual framework provides links between the various variables underpinning the adoption of Information and Communication Technology in the health sector. These variables, as presented in Figure 2 show a typical research into the adoption of ICT in healthcare delivery. The main variables, presented include waiting time, medical errors, benefits of using ICTs and the challenges that are likely to come as a result of using ICTs in healthcare.

The conceptual framework presents the needs in healthcare system which necessitated the adoption of ICT. These needs included long waiting times, medical errors, insecurity of patients' information and the difficulty in accessing patients' records. These needs necessitated researches into the finding a lasting solution to these problems. Recommendations led to the adoption of ICT in the health sector to help in the storage, retrieval, and dissemination of information. In the adopting such technologies, time must be made available to train and retrain actors in the field on the importance and use of ICT in healthcare. The conceptual framework suggests that training and education of the actors (health workers) would lead to the proper use of the ICT tools in healthcare delivery. There was the

52

need for a partnership between experts in the field of information and communication technology to find lasting solutions to the problems identified.

The conceptual framework shows that after a successful implementation of the technology in the health sector, some benefits are going to be less waiting times to access medical care, and less medical errors. Some other benefits that are likely to be derived include the easy access to patients' health records and this will also help to provide adequate security to patients' information. The continuous use of the ICT tools in the health sector leads to the actors factoring the lessons they learned into recommendations for further researches to be conducted into the use of ICT tools in healthcare delivery. During its usage, challenges that are likely to be encountered (lessons learnt) are also factored in, in order to provide feedback to the partners/stakeholders through researches periodically.

After a cursory study of the conceptual framework from PAHO (2001), it was realized that all the variables in the diagram are in a way linked to the objectives of this study. Thus, a careful analysis leads to the adoption of this conceptual framework for this study was shown in Figure 2.
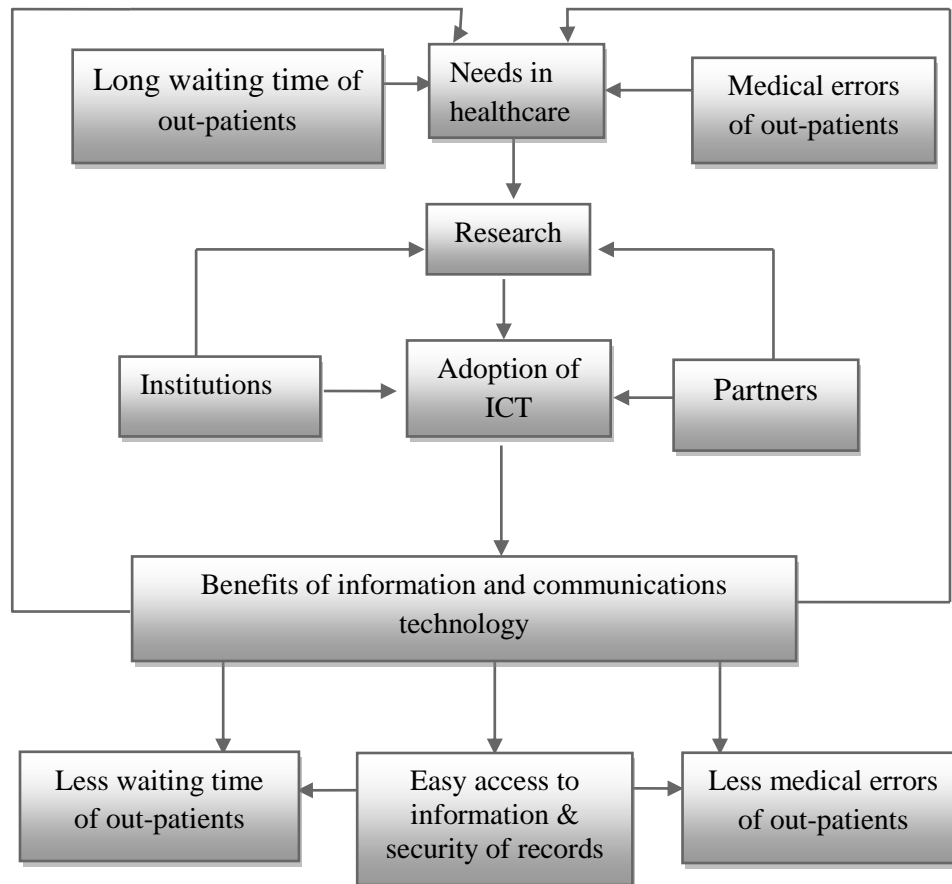
**Figure 2: Conceptual framework**

**Source:  Adapted from PAHO (2001)**

54

# CHAPTER THREE

# METHODOLOGY

## Introduction

It is necessary for a researcher to design a methodology for a study. This chapter discusses the methodology that was used to conduct this study. This includes the research design, the population, sample, and sampling procedure. The data collection method was also stated including the instruments for collecting the data which were both primary and secondary. The methods that were used to analysed the data has also been discussed in this chapter and how the findings were presented.

## Study organization

The organization studied was the University of Cape Coast Hospital in Cape Coast, Ghana. The management of the hospital is the Director of health, administrator. As at the time of data collection, the records section, consulting rooms, and the pharmacy had access to the computerized system which were linked to the office of the Director of health at the hospital. There was one ICT specialist who had been trained to find solutions to any problem related to the ICT programme.

**Study design**

The design used for this study was descriptive which employed both quantitative and qualitative techniques to obtain information from respondents on the current state of healthcare at the University of Cape Coast Hospital after the introduction of the CBR. Amedahe (2002) sees descriptive survey as one which is concerned with the conditions or relationships that exist such as practices and attitudes, opinions that are held, processes that are going on or trends that are developed. Best (1970) observes that descriptive research is concerned with conditions or  relationships that exist, practices that prevail, beliefs, points of views or attitudes that exist, practices that are going on and effects that are developing.

Descriptive research is concerned with how things are related to some preceding events that has influenced or affected present condition. According to Best (1970), researchers of this sort focus on individuals, groups, institutions, methods, and materials, in order to describe, compare, contrast, classify, analyze and interpret the state of having existence and occurrence.  This design was appropriate for this study because the study needed data to describe the changes that have occurred as a result of the introduction of the CBR at the University of Cape Coast Hospital.

56

**Population**

Apart from the Central Regional Hospital which is a referal hospital, Cape Coast has two tertiary hospitals including the University of Cape Coast Hospital, the Metropolitan Hospital. The University of Cape Coast Hospital was established by the University of Cape Coast with the initial vision to take care of the health needs of the university community. Due to the changing trends, its services have been extended to Cape Coast Metropolis and its environs. The population for this study included the staff of the University of Cape Coast Hospital and the those who patronize the services of the hospital who come from both the university and the outside community. These included health workers included doctors, nurses, laboratory technicians, administrators, pharmacists and those working at the records section yielding a total population of health workers 120. The out-patients that attended the hospital in the year 2012 were said to be 50,000 (UCC Hospital annual report, 2011) and an average daily attendance of 175.

**Study population**

Table 1 shows the number of respondents who were selected for this study. Though, the study sought to use 124 respondents, 100 responses were received at the end of the data collection.

57

**Table 1: Number of respondents**

| Category | Expected respondents | Number of actual respondents |
|---|---|---|
| Pharmacists | 4 | 4 |
| Nurses | 30 | 28 |
| Staff at records | 4 | 4 |
| Doctors | 6 | 4 |
| Out-patients | 80 | 60 |
| Total | 124 | 100 |

Source: Field data, 2013

From Table 1, though, the study sought to use 44 health workers but had responses from 40 workers, representing 93.0percent response rates for the health workers. Also, responses were expected from 80 out-patients, but only 60 of them were interviewed bringing the response rate to 75percent. This was due to the fact that though some out-patients were ready to grant interviews, they were either called to see the doctor at the time of the interview or had finished consulting and left the hospital. In all, a total of 100 respondents were used instead of 124 bringing the total response rate to 80.6percent.

Two reasons accounted for the sixty out-patients though the number should have been more than the sixty. First of all, this study is mainly qualitative

which sought to use the views of the health workers in drawing conclusions on the use of ICT at the hospital. Thus, the number of out-patients interviewed does not actually have any impact on the implementation of the ICT tools at the hospital but the views of the health workers mattered most in the research process.

**Sampling procedure**

Sampling is the process of selecting units from a population interest so that by studying the sample we may fairly generalize our result back to the population from which they were chosen (Trochin, 2006). Sampling enables the researcher to study a relatively small part of the population and yet obtain data that is representative of the whole population.

For the purpose of this study, the respondents were put into categories which included doctors, nurses, administrators, pharmacists, personnel at record section and out-patients. The purposive sampling approach was used to sample the administrator at the hospital and his assistance. The lottery method was then used to sample six doctors, twenty nurses, and four workers at the record section and four pharmacists. The names of the doctors were written and shuffled out of the total number of doctors, six were selected. The same method was used in selecting the nurses, pharmacists and the staff of the record section. The accidental sampling was used to select sixty out-patients who visited the hospital.

**Sources of data**

Data were collected from both primary and secondary sources. Primary data were collected from the research participants using interview schedule and interview guide. The interview guide was used to collect data from the health workers and the out-patients, while the interview guide was used to collect data from the key informants. Secondary data was collected by reviewing past studies done at the hospital and other health records.

**Data collection methods**

The term data collection is used to explain the process of preparing and collecting data for a study, which provides essential basis for the study (Saundars, Lewis, & Thornhill, 2000). The methods used in collecting data for this study were key informant interviewing, interviewing and review of secondary data/documents. Key informant interviewing was used because it was the only appropriate method to get information from key informants such as the administrator, doctors and some nurses. The out-patients were interviewed because some had low educational background could not answer questionnaires.

**Data collection instruments**

For the purpose of this research, three instruments were used for this study. The key informant interview guide was used to collect data from the health personnel while the interview schedule was used to collect data from the out-

patients. Analysis of secondary documents was also done to compare present information to what has been documented by the hospital authorities.

Patton (1990), among others, argues that the adoption of multiple instruments/methods of data collection help to overcome flaws inherent in the use of one method which helps to provide cross-data validity checks that using more than one data gathering method enables the researcher to look at the phenomenon of interest in different ways. Again using more than one method of data gathering allows the findings to be corroborated or questioned by comparing it with data from another method. It also assists in the triangulation of data (Sarantakos, 2005).

**Pre-testing**

Before the data for this study were collected, a preliminary study was conducted at the Metropolitan hospital in Cape Coast to test the instruments that were used for the study. One key informant, the administrator was interviewed, and one worker from each department of the hospital and five out-patients were interviewed. These include one person each from the administration, a doctor, a nurse, a pharmacist, and one person from the record section.

After the data collection, analysis was done to determine the validity of the instruments used. All items on the instruments that were faulty and ambiguous were reconstructed in order to make them effective and all ethical issues in the study were also addressed. Interviewees also made suggestions which were also

61

factored into the construction of the final instrument. In all two days was used for the pre-test.

**Ethical issues**

Due to the fact that the study was conducted at hospital where vital documents and information were handled, the certain ethical issues were considered. First of all, names of participants were not mentioned anywhere in the work. Also, folders of patients were not handled by the researcher so that certain vital data about the patients would not be seen. Besides, participants were well informed about the study and what it sought to achieve at the end before the interviews were conducted on theme.

**Field work**

An introductory letter was first sent to the hospital administration which the hospital authorities responded to the following day. The three key informants for the study were interviewed and then the researcher proceeded to interview the doctors, nurses, administrators, workers from the record section and the pharmacists. Three weeks were used in interviewing the health workers. The researcher continued to interview the out-patients that attended the hospital within the days the data were collected which was done within two weeks. In all, data were collected for the study within five weeks.

**Data analysis**

According to Sarantakos (2005), the analysis of data allows the researcher to manipulate information collected during the study in order to assess and evaluate the findings and arrive at some valid, meaningful and relevant conclusions.

After cleaning and editing the data collected, the qualitative data was analysed using the thematic approach. Themes were identified in the responses provided and the results presented. SPSS version 16 and Microsoft excel were used to analyze the quantitative data.

## CHAPTER FOUR

## RESULTS AND DISCUSSION

### Introduction

This chapter presents the findings and discussion of data collected from the field. Data was collected with interview guide and interview schedule from health workers comprising the administrators, pharmacists, doctors, nurses and personnel from the record section at the University of Cape Coast Hospital. Data was also gathered through review of documents to enable a comparison between data collected with the use of various instruments.

### Background characteristics of respondents

The background characteristics of the respondents were examined and these characteristics include the sex, age, and the highest levels of education of the respondents.

A total of 100 respondents were selected for the study. These comprised 36 males and 64 females. Table 2 shows the sex distribution of the respondents.

64

**Table 2: Sex distribution of health workers and out-patients**

| Category | Males | Females | Total |
|---|---|---|---|
| Pharmacists | 2 | 2 | 4 |
| Nurses | 5 | 23 | 28 |
| Doctors | 3 | 1 | 4 |
| Staff at records | 2 | 2 | 4 |
| Out-patients | 24 | 36 | 60 |
| Total | 34 | 64 | 100 |

Source: Field data, 2013

The age of an individual has been said to have an impact on the persons' interest in the use of computer applications. Therefore, the respondents in this study were asked to indicate their age interval.

The age distribution of health workers was separated from that of the out-patients in order to compare the age distribution of heath workers with their interest in the use of computer at the hospital. Table 3 shows the age distribution of the health workers who formed part of the sample.

**Table 3: Age distribution of health workers**

| Age | Number | Percentage (%) |
|-----|--------|----------------|
| 21-30 | 8 | 20.0 |
| 31-40 | 18 | 45.0 |
| 41-50 | 10 | 25.5 |
| 50+ | 4 | 10.0 |
| Total | 40 | 100 |

Source: Field data, 2013

A look at the results in Table 3, indicates that out of the 40 respondents who were health workers, 20.0% fell within the age range of 21-30, while 45.0%) of them fell within the age range of 31-40. Ten of them (25.5%) fell within the age range of 41-50 age group and (10.0%) were above age 50. A follow up question was asked to determine the interest of the health workers in the use ICT in healthcare. From the information gathered, it was realized that those who were above age 50 had the least interest in the use of the computerized health records and would only like to use them because management requires them to do so. According to key informants, most of the health workers have not been trained to handle the ICT equipment especially, those who were above age 50 and this may be a contributory factor for them not having much interest in the ICT programme. On the other hand, most of the respondents who were below the age of 50 had

66

more interest in the use of the computerized health records this may be due to the fact that most of the health workers who were below age 50 had ICT training as part of their training in college while others took the interest to do private ICT courses.

In the same way, data on the age distribution of out-patients were collected and this is presented in Table 4.

**Table 4: Age distribution of out-patients**

| Age | Number | Percentage (%) |
|-----|--------|----------------|
| 21-30 | 23 | 38.3 |
| 31-40 | 18 | 30.0 |
| 41-50 | 15 | 25.0 |
| 50+ | 4 | 6.7 |
| Total | 60 | 100 |

Source: Field data, 2013

From Table 4, it is clear that most of the respondents who were selected accidentally were between the ages of 21 and 30 while only 4 of them were above 45years because those who were below age 45 knew at least something about the computerization of health records at the hospital.

67

As compared to the respondents who are the out-patients, all the health workers who were involved in this study had an educational level of either diploma or degree. However, the level of education of the health workers was not found to have any association with the use of ICT tools in the work place. On the other hand, the levels of education of the out-patients differed from patient to patient. Table 5 shows the level of education of the out-patients.

**Table 5: Highest levels of education of out-patients**

| Level of education | Number of respondents | Percentage |
|---|---|---|
| MSLC/JHS | 12 | 20.0 |
| SHS/O'level | 22 | 36.7 |
| Diploma/degree | 26 | 43.3 |
| Total | 60 | 100 |

Source: Field data, 2013

Table 5 shows that, 43.3percent of the total respondents had diploma/degree while 36.7 percent of them had education up to the SHS/O'level. The rest were either Middle School or JHS graduates. The different levels of education in Table 5, shows that the University of Cape Coast hospital is patronized by the residents of the University and those outside the university community.

68

**Out-patients' awareness of the use of ICT at the hospital**

From the interviewed granted, it was clear that some of the out-patients interviewed did not know about the use of Information and Communication Technology facilities at the University of Cape Coast Hospital for health care. The data in Table 6 shows cross-tabulation of the highest levels of education and the awareness of out-patients on the use of ICT facilities for health care at the hospital.

**Table 6: Levels of education and the awareness of ICT usage**

| Levels of education | Yes | % | No | % |
|---|---|---|---|---|
| MSLC/JHS | 3 | 5.0 | 9 | 15.0 |
| SHS/O'level | 18 | 30.0 | 4 | 6.7 |
| Diploma/degree | 23 | 38.3 | 3 | 5.0 |
| Total | 43 | 73.3 | 17 | 26.7 |

Source: Field data, 2012

From Table 6, it was clear that most of the respondents who were MSLC/JHS graduates were not aware of the use of ICT in healthcare at the University of Cape Coast Hospital. This category of respondents represented 15.0% of the entire sample of respondents who were out-patients. On the contrary, only 5.0% of the respondents who were diploma/degree graduates were

not aware of the use of ICT in health care at the University of Cape Coast Hospital. On the whole, 73.3% of the out-patients interviewed were aware of the use of ICT while 26.7% out-patients said they were not aware of the computerization of health records at the hospital. The out-patients added that even though they were aware of the computerization of health records, they did not see doctors entering out-patients' records on the computers. The researcher went further to make inquiries from the doctors and the response given showed that some doctors enter these records after close of work due to the hectic nature of work they do when the number of out-patients increased in the mornings.

**Computerized health records and out-patient waiting time**

The objective sought to explain whether the introduction of the computerized health records has helped to reduce waiting times at the hospital.

The use of information and communication technology facilities in health care is expected, if properly used to bring a reduction in out-patient waiting time at the hospitals. A study conducted by Ajeet (2003) to examine the real impact of the use of ICT tools on health revealed that advanced information technologies such as computer-based patient records, portable computers, electronic health records and expert information systems alter the situation of disruption in the flow of patient related information and delays in the delivery of health services. Ajeet (2003) continued that in addition to containing costs, advanced information technologies furnish health care providers with the opportunity to improve patient

70

care by streamlining clinical processes and creating a seamless flow of information.

Before the advent of information and communications technology in health services, the University of Cape Coast Hospital depended exclusively on the use of the manual system (paper and folder records). However, the use of the paper-based records led to the inadequate documentation of the care-giving process, a severe disruption in the flow of patient related information, and a substantial delay in the delivery of health services. It was found out that delays started from the out-patient department (OPD) and continued through the consulting rooms to the pharmacy. Out-patients lamented that they are delayed extensively if they were asked to do laboratory test. A patient interviewed said she always prayed that doctors would not ask her to do laboratory test any time she visited the hospital because it delayed her so much at the hospital. According to the out-patients interviewed, another department that took a significant amount of time was the pharmacy. The out-patients said they took long hours to wait at the pharmacy to be called to come for their drugs. This confirms the findings of Thatcher (2005) that the two departments that cause delay at hospital were the laboratory and the pharmacy.

In examining the causes of long waiting time at the hospital, respondents were asked to state the causes of the long waiting time. Prominent among the causes included inadequate human resources at the various departments of the hospital. Data gathered from the administrators interviewed showed that the

71

doctor patient ratio at the University of Cape Coast hospital was 1:5200 a ratio which a little lower than the global average of 1:5000 (WHO, 2006). Though, higher than the doctor patient ratio in the entire country, (1:13000), these human resources were inadequate in meeting the growing challenges in the healthcare system at the hospital. During the study, it was realized from the interviews granted to the out-patients that long waiting times cause some out-patients not to present themselves for medical care and they rather resorted to self medication because they wanted to save time for other activities in the day. As out-patients piled up at the hospital and waiting time continued to increase, out-patients became impatient to the health workers while the health workers also became intolerant of the out-patients and this mounted up tension at the hospital.

Another cause of long out-patient waiting time at the hospital was difficulty in retrieving out-patients' folders or out-patients' records from the records section. During the study, some of the staff at record section narrated their ordeal that sometimes new folders were created for some out-patients due to the fact that it was difficult to locate their files. In others words, new folders were created because their folders were missing on the shelves. The implication is that a patient that has misplaced his/her hospital card was given a new card and folder.

Inability of out-patients to provide appropriate and adequate information about themselves and their ailments was also cited by the staffs at the records section, nurses and the doctors as one of the major factors of which led long out-patient waiting time at the hospital. The staff at the records section stated that

72

some out-patients even failed to provide the right information that would enable the health workers to locate their folders easily. This wasted much of the patient's own time and the time of the health workers. This problem was largely due to ignorance or inadequate information on the part of the out-patients.

In the quest to examine the effect of long waiting time at the hospital, respondents stated that long waiting time caused their situations to worson sometimes. This finding confirms the finding of Thatcher (2005), that long waiting time at health centres led to "short-term mortality" of out-patients at health centres. This, Thatcher (2005) said was due to the fact that the patient's condition got worse if not attended to as early as possible.

During the study, out-patients stated that long waiting time made them lose interest in going to seek medical care from health centres. Thus, they avoided presenting themselves for medical care by resulting to self medication or bought drugs from way-side drug dealers. This confirms Thatcher's (2005), assertion that the problem of long waiting time for services at health centres has been identified as a reason for which people avoid presenting themselves for medical care in African countries.

The study also sought to analyse the impact of the computerized patient records on out-patient waiting time at the hospital. All out-patients interviewed indicated that ICT has helped to reduce waiting time at the hospital. They stated analysis of the responses of out-patients indicated that before the introduction of CBR at the hospital, the average waiting time was 3hours but has reduced to

2hours. When the key informants were asked to explain how the use of CBR has helped to reduce waiting times, they stated that it helped in locating patients' folders easily especially, when a patient's folder had been misplaced. There may not be any need to prepare another folder for such a patient. Thus, patients' information was retrieved easily with the use of the computerized health record system in health care.

The health workers interviewed also stated that the use of the computerized health record system led to easy and fast access to patients' health records. It also led to easy information flow from one department of the hospital to another. The records of the patient could be assessed at the record section, through the consulting room and to the pharmacy. It was also stated by the key informants that the use of the ICT tools in the health care led to easy access to statistics on attendance at the hospital. Management of organisations depends on accurate statistical data to take vital decisions. In the likely situation where it becomes easier getting data, work of management is made simpler and easier.

A similar study conducted by Ahmed (2004) on an ICT in healthcare project in Bangladesh over a period of three years concluded that the use of ICT in healthcare reduced the time health workers spent searching records. This also corresponds with the conceptual framework that, the adoption of ICT facilities in healthcare can help to reduce waiting time.

According to the key informants interviewed charge of the computerized system, advanced information technologies such as computer-based patient

74

records, portable computers, and expert information systems alter long waiting time by providing clinicians with real-time access to patient information at the point of care. The key informants added that the increasing bandwidth and pervasiveness of communication networks, including ad-hoc and sensor networks, opens up new opportunities for transferring medical information faster through both wired and wireless systems. Information and communication technologies (ICT) combined with wireless and mobile devices, are strengthening the production, dissemination and global use of health information. The increasing capacity of information producers, intermediaries and users is triggering the explosive growth of easily accessible information.

The responses from the key informants also showed that it was easier to access patients' records with the computerized system anytime patients misplaced their hospital cards. They said this was easier than the use of the manual system of keeping patients health records. The computerization of health records helps to locate patients health records with ease rather than the use of the manual records where it becomes difficult sometimes locating patients' folders due to the clumsy nature of the records on the shelve. At the administration and the records section, respondents said the computerization of health records led to smart and quick way of generating reports.

The use of ICT tools has made collection of data on daily attendance to the hospital easier than the manual method. This confirms the results of the study by Ahmed (2004) that the computerization of health records helps to reduce the time

that health workers spent in searching records and it becomes easier for managerial staff to supervise the immunization system and monitor performance in Bangladesh. As stated by Teresa and Gayle (2007), this gives reliable and timely health information which is able to improve drastically, the quality of healthcare in the country.

In the conceptual framework, easy access to patients' information at the hospital is seen as one of the major needs of the health sector. It was also found out, and it is consistent with the variables in the conceptual framework that ICT is the solution to the lack of access to information at the health sector.

**Computerized health records and medical errors**

The objective two sought to examine the impact of computerized health records on medical errors at the University of Cape Coast Hospital. The safety of patients is very paramount in the provision of quality care. As care givers attempt curing the sick, some of them inadvertently make mistakes that either worsen the situation or result in the death of the patient. Medical errors are inevitable because the care givers are human beings and are bound to commit mistakes but with acknowledgement of the possibility of the incidence of errors in the healthcare process, it could lead to a reduction of these errors to the barest minimum (Akouko, 2007 cited in Aviane, 2008).

The Institute of Medicine (1999), an American non-governmental organization, defines medical errors as "the failure of a planned action to be

76

completed as intended or the use of a wrong plan to achieve an aim". By using the index of the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) the experts redefined medical error further as the magnitude of harm suffered by a patient. The classification has five categories ( E-I) ranging from category E, defined as harm that resulted in temporary harm, to category I which is the most serious and is defined as harm that or resulted in the death of a patient.

Kilbridge & Classen (2001) draws into the various attempts at providing a simple definition for medical error, and defines it as the failure of a planned action by medical officer to be completed as intended or the use of a wrong plan to achieve an aim. Kilbride & Classen (2001) further identify the following as the causes of medical errors as over-load of work on health professionals, lack of expertise and training, poor communication among professional in the care process, lack of appropriate technologies, poor labeling, and prescription errors. Other causes identified include non-cohesion in the handing over, victimizing culprits of error leading to non-reporting and non involvement of patients and or their relatives in the care process.

During the study, the respondents (both health workers and patients) stated that medical errors are the negligence of a heath professional in discharging his/her duty as required. In attempt to discharge duties, if a health professional, out of negligence of duty, commits a mistake which can lead to worsening or the death of a patient, it is referred to as a medical error. This confirms the definition

77

of the Institute of Medicine (1999) that medical errors may be seen as the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim among other things, problems in practice, products, procedures and systems. This view of the respondents (both out-patients and health workers) is also not different from the definition given by Kilbridge & Classen (2001) that medical errors refer to the failure of a planned action by medical officer to be completed as intended or the use of a wrong plan to achieve an aim.

Quality of healthcare must lead to the reduction of medical errors in the health system. Medical errors have been so common in health systems and have been responsible for the death of over 98,000 people every year in the US hospitals (IOM, 2001). It has therefore been argued that the use of ICT can lead to the reduction of these common medical errors which include wrong surgery, wrong drug administration, wrong laboratory test and the administration of expired drugs to patients.

During the study, the out-patients were asked if they knew of medical errors at the hospital. The patients said that medical errors were common at the hospital and they mentioned some of their own experiences and the experiences of their friends and family members. The common medical errors that the patients mentioned include wrong diagnosis, wrong surgery, wrong drug administration and wrong laboratory test. However, the most common errors that the patients mentioned were wrong diagnoses which were done by some doctors because some out-patients were not asked to do laboratory test when they go to the

78

hospital to access medical care. Akouko (2007) cited in Aviane (2008), stated that a patient was operated on the wrong leg by three surgeons at the Korle-Bu Teaching Hospital in Ghana. He further stressed the fact that, there are several incidents including prescription errors that have not been properly documented.

Another common medical error mentioned was wrong drug administration and the administration of expired drugs. For instance, a patient narrated his ordeal that he was given a medicine which was meant for the treatment of candidiasis in females, though it was later discovered and retrieved. A patient also stated that an expired drug was administered to him and this was discovered after the respondent had finished taken the second dosage.

The health workers interviewed also confirmed that there were medical errors at the hospital but were hesitant to name specific examples of medical errors at the hospital. They also named wrong diagnoses, and the administration of expired drugs as some of the medical errors that were common at the hospital. The health workers attributed the causes of the medical errors at the hospital, to the work load of medical officers could be a leading factor of medical errors. Further examination of the doctor-patient ratio (1:5200) at the hospital showed that the health workers attend to more patients than required which poses high work load to them. Thus, conclusion from the responses of the health workers showed that work load on the health workers were due to the doctor-patient ratio and the nurse-patient ratio which sometimes led to some medical errors. This

supports the assertion of Kilbride & Classen (2001) that the overload of work on health professionals leads to medical errors in the health care system.

Negligence on the part of medical professionals led to the medical errors in the hospital. Some medical officers, as stated by the respondents, do not pay much attention to what they are supposed to do leading to the medical errors mentioned. A key informant re-iterated that a patient was given a drug meant for a diabetic patient while the patient was not diabetic. It was later discovered that a wrong drug has been given to the wrong patient. Out-patients were also clear that if they were to buy drugs from pharmacies outside the hospital, some pharmacists were able to tell them that such drugs may not be good for the treatment of their ailments.

It has been argued that the use of Information and Communication Technology in healthcare can lead to a reduction of errors in the healthcare system. In response to 'how can ICT in healthcare reduce medical errors' the responses were varied. The out-patients interviewed said the computerization of health records would help to eliminate the issue of illegible hand writing which they said was one of the causes of medical errors. The out-patients said sometimes if they had to access their drugs outside the hospital, some pharmacists were unable to read the handwritings of some doctors which led to the administration of wrong drugs.

When drugs were prescribed at the consulting rooms, they were accessed at the pharmacy which did not involve the reading of handwritings. The key

informants stated that though, the manual prescriptions are still in use, they also crosscheck with the electronic prescription especially, in instances where the handwritings of the doctors could not be read. This has helped to minimize medical errors at the University of Cape Coast hospital. This finding is similar to the statement made by Bates, Boyle and Vander (1995) that electronic prescribing is safer, because it eliminates handwriting and ensures that the key fields for example; drug name, dose, route, and frequency include meaningful data.

In a similar publication, Abdulai (2009) stated that physicians in Ghana have earned notoriety for illegible writing, especially when it comes to prescriptions. According to Abdulai, this may be as a result of their desire to attend to as many patients as possible in a day thus, compromising the legibility of their prescriptions. It was therefore, suggested in Abdulai's study that the use of computerized health record system will help to eliminate this problem.

As presented in the conceptual framework, the effective use of the CBR in healthcare can help to track patients' information and this would help to avoid repeated medication which might lead to medical errors. On one hand, it is worthy to note that some the out-patients interviewed said they did not see the computers being used at the pharmacies. In seeking the views of the pharmacists, they said the patients were not likely to see what happens at the pharmacy due to how the chambers have been structured.

Effective communication is an important tool in the transition points of care such as the records section, pharmacy, intensive care unit and the general

care, recovery and the general ward. A good relationship between health workers and their patients can enhance a healthy communication, effectiveness and productivity. Communication during handing over is very essential in the care process since that will avoid the duplication of therapy and omission of therapy.

During the study, poor communication was also stated by the health workers as one of the causes of medical errors. Doctors, nurses and staff at the record section all stated that some patients found it difficult to provide simple information about themselves and about their ailments. They stated that poor communication hindered the effective work delivery by the health workers to the patients. On the other hand, the out-patients also stated that some health workers did not exercise restraint in handling them at the hospitals. Some out-patients said they feared going to hospitals because of how some health professionals mishandle them the least provocation. This fear prevented the out-patients from being able to even recall basic information about them with ease. This supports the statement of Thatcher (2005) that some patients fail to go for medical care due to the fact that they are afraid of doctors.

The Ghana Health Services Standard Rule for health professionals does not encourage a gap in handing over of patients from one health worker to the other. Communication at various points in the care giving process must be well coordinated such that there is no room for additions and omissions in the drug administration. This study identified ICT as a means of bridging the communications gap between the health professionals. All the key informants

82

interviewed stated that, the use of the ICT tools in the health delivery has helped them to reconcile data and information on the manual and the electronic record forms which has helped them to avoid medical errors.

The availability of doctors is critical to health, because they often determine the type of medical and the test to be performed on patient-samples, carry out surgeries and prescribe the appropriate medication. Non-availability of doctors pose a lot of challenges to health centres and the towns in which such health facilities are located. During the study, information gathered showed that the doctor-patient ratio at the University of Cape Coast Hospital is low. This, the key informants stated that it causes a lot of stress on the doctors which was likely to lead to medical errors.

The doctor-patient ratio at the University of Cape Coast Hospital as at the time of data collection was 1: 5,200 which undoubtedly attested to the fact that there was a lot of pressure on the few medical personnel in the district. This was a real risk factor for medical errors since it could result in long hours of work. This supports the statement of Hendey (2005) that the deficiency of doctors in the health sector may lead to higher errors in diagnosis and prescription and such medical errors are likely to increase especially in countries where a doctor may be responsible for the inpatient wards as well as consult for out-patients. This accession is not over emphasized since it is the situation in Sub-Saharan Africa of which Ghana is not left out.

Working more hours in a complex environment demands rapt attention but it can result in stress leading to errors. This accession is applicable in the situation where doctors, nurses and paramedics have to work long hours resulting in possible errors in the course of their duty.

Abdulai (2009) stated that in Ghana, patients have no physicians assigned to them. It is the physician who is available at the time the patient presents him/herself for medication and most often, no appointments are made prior to a visit to the hospital, and based on the symptoms the patient is assigned to a physician. It is not guaranteed that during the next visit, the patient will be attended to by the same physician, so if the new physician is not abreast of what happened during the patient's previous encounter s/he is likely to start the care process all over again. The out-patients said, during the study that led to the repetition of medication. Out-patients expressed concern that they would have wished the same doctors attended to them anytime they came to the hospital to continue medication. The out-patients also responded that because information about their previous encounter(s) was not handy, physicians repeated clinical processes that might have been done by their colleagues. This did not only waste the already limited resources of the hospital, but could also potentially endanger their lives. An effective computerization of patients' health records would place information just a few clicks away and this will help curtail the waste of repeated clinical history taking laboratory test by the National Academies Press (2001).

**Other usefulness of ICT in healthcare**

Objective four sought to explore other usefulness of ICT in healthcare at the University of Cape Coast. Given the right policies, organisation, resources and institutions, ICTs can be powerful tools in the hands of those working to improve the health system (Daly, 2003). During the study, it was realized that there were lots of usefulness of ICT in healthcare apart from the reduction of medical errors and the reduction of outpatient waiting time at the hospitals. These were consistent with what is found in the conceptual framework, it was presented that the use of ICT can help to make patients' records more secured at health centres and the easy access to health information from the internet. These benefits were mentioned by the doctors, nurses, pharmacist and the staff at the record section. This confirms the modernization theory which posits that for a society to develop, that society must change from the use of simple traditional tools to the application of advanced scientific knowledge (Smelser, 1969). These were revealed during the study and are discussed in the following paragraphs.

Another importance of the information and communication technology found during the study is the ready access to health information by health workers. During interviews, nurses and doctors stated that the use of information and communications technology facilities at the hospital assisted them to access information related to health from the internet. One doctor stated that some diseases have been discovered not too long ago and information about such new

discoveries was not available or was scanty in books. Therefore, the use of the internet facility assisted them to be abreast of new discoveries in the health sector.

The finding is similar to the finding of Teresa and Gayle (2007) in a study conducted to assess the impact of a project launched at the University of Kansas medical school which indicated that health workers were able to get timely and reliable health information which was able to drastically improve the quality of healthcare in the country. During the study, the health workers added that lack of information may hinder the achievement of quality health care as expected by the World Health Organisation. This confirms the assertion that universal access to information for health professionals is a prerequisite for meeting the Millennium Development Goals and achieving health for all by 2015 (Godlee, Pakenham-Walsh, Ncayiyana, Cohen & Packer, 2004).

Lack of access to information remains a major barrier to knowledge-based health care in developing countries (Abdulai, 2008). With cooperation, appropriate use of technology, and financial and political commitment, access to relevant, reliable information for healthcare workers can be improved in developing countries (Morton, 2008). Healthcare is an information intensive industry and healthcare professionals rely on access to correct and comprehensive information, when and where they need it to inform the daily decisions they make about a person's care (Abdulai, 2008). Information and communications technology is largely absent from the way we generate, capture and share health information as we continue to rely on handwritten paper records. This reliance on

paper is inefficient, wastes money and scare resources and compromises patient safety and the quality of care is an understatement (Nichols, Copeland, Craib, Hopkins, & Bruce, 2008).

Computerization of health records also helps in ensuring the security of health information at health centres. The security of health information was seen in two ways during the data collection process. The first aspect was ensuring that no other person apart from the care givers and the patients is allowed access to the health record. The security of patients' health records is of outmost important to the patients and the care givers. The Doctors interviewed during the study mentioned that the patients' health information was important information in the life of the patient and must be kept secret so that only people who were involved in the care giving process to the patient were allowed access to such information.

The above affirms the position of WHO (2008) that a person's health record must be kept secret from the public. Data collected from individuals should be stored in a secured place since the data might contain vital information from the individual which others must not be allowed access to. During the study, respondents stated that the computerization of health records helped in ensuring the security of patients' health records as compared to the use of the manual system of keeping records.

In examining how the security of patients' records was ensured at the hospital, it was realized from the health personnel at the record section and the specialists in charge of the computerized system that all the programmes in each

of the health departments at the hospital were 'passworded' and only workers in each of the departments had access to the passwords to that department alone and this they said ensured that others were denied access to such information if they were not workers in that department. This finding also supports a publication made by Rodriguez, Wilson and Schanz (2001), which revealed that reliability, security, and privacy are accomplished by the implementation of a number of preventive and protective policies, tools, and actions that address the areas of physical protection, data integrity, access to information resources, and protection against unauthorized disclosure of information.

The other aspect of security of patients' records is the provision of backup services so that patients' information many not be lost. Personnel at the record section stated that in case of any natural disaster at the health facility, patients' information would not be lost because backups of soft copies of the records were kept. Though, out-patients who were interviewed talked about the security of their health records, they did not know how the system worked to ensure the security of their records. Out-patients were unable to describe how the computerized system of the keeping their records helped to ensure the security of their health records. This confirms Hunter's (2003), finding on patients' attitudes to electronic medical records that though some patients do not have any firm idea of any security measures that were used to protect electronic personal health information from being accessed by just anyone and they commented that no system was foolproof.

But an issue of concern is that at the time of data collection, the University of Cape Coast Hospital was using both the computerized and the manual system. The implication is that if the information of the patients could not be accessed through the computerized system, the manual system was used and vice versa. Thus, until the full utilization of the computerized system, health information might not be as secured as expected because the records were kept both manually and electronically.

The research also revealed that management was solely responsible for the security and confidentiality of the patient information stored in the server of the hospital. The key informants stated that management of the hospital has taken high level security precautions available. Even though, the data-base was used for research purpose confidentiality of the patient is respected and precautions are taken not breach them. It must be mentioned that the security of health information was of prime importance to the health sector and by extension, University of Cape Coast Hospital. Thus, during the data collection process, all the health workers said data security of records was good in the hospital. The finding supports a statement made by National Academies Press (2001), said that the current situation of paper documentation makes consumers and policy makers share concern about the privacy and confidentiality of health data. This is also not different from findings in a study to assess the national health information system in developing countries by WHO (2008) which emphasized that, though there was the need for easy access to health information, there was also the need to have a means of securing and protecting the information assets of the system. For

example, a system may contain disaggregated patient information affected by privacy and security considerations. It was therefore essential to control access to confidential information (WHO, 2008).

Besides the importance of the ICT in healthcare, the respondents said that the computerized health records system helped to reduce the work load the personnel at the hospital. The personnel at the record section further explained that they spent less time in assessing patients' information especially, in cases where patients did not come to hospital with their hospital cards. This has been stated by the National Academic Press (2001) that effective computerizations of patients' health records would place information just a few clicks away and this will help curtail the waste of repeated clinical history or laboratory tests. The key informants also stated that few people were required to do the work which could not be done by the same number of people when the manual system of record keeping was in full use. This means that less personnel were needed for taking some records as well as reducing storage space to the barest minimum just as stated by Makinde (2008).

**Challenges with the use of ICT in healthcare**

It is important to note that every new idea or new technology comes with its own challenges. Even the acceptance and management of change in a system is a huge challenge that most organisations find it difficult to deal with. The use of ICT in the health sector is not an exception because new technologies come with some challenges that must be addressed, and which if not addressed can lead to

90

the failure of such an idea or technology. Objective 4 looks at the challenges as result of the implementation of ICT in healthcare delivery at the University of Cape Coast Hospital.

In the quest to examine the challenges of the introduction of information and communication technology facilities in health care at the University of Cape Hospital, respondents were asked to mention the challenges posed by the introduction of the new technology. All of the respondents (both out-patients and health workers) stated that there were some challenges. The challenges mentioned by the respondents are discussed in the paragraphs below.

First of all there were the challenges of inadequate IT professionals to respond to the challenges that may be posed by the computerized programme. At the time of data collection, only one specialist has been trained to respond to challenges that may be posed by the new IT programme at the hospital. When respondents were asked whether they have had any formal training in ICT to enable them to use the ICT programme in healthcare, they all said they have had some form of training but some complained that the training they had was inadequate to deal with challenges posed by the system. This confirms a study by the Ministry of Health which shows that in Ghana, there are relatively few ICT professionals as compared to the western nations which might make the implementation of ICT in healthcare difficult (MOH, 2005).

Again, Lippeveld and Sauerborn (2000), in a study on the challenges of introducing computerized programme in the healthcare system opined that

91

introducing ICT into the health sectors was not necessarily the silver bullet which may create effectiveness and efficiency in health service because lack of appropriately trained staff and hardware and software problems sometimes result in the decay or obsolescence of expensive computer equipment, without gains in decision making. This might be a great financial lost to the institution and the state. It is necessary that before the introduction of any new technology, employees are trained to man such facilities effectively.

When key informants were questioned about why there was only one ICT expert to deal with all the challenges of the ICT programme at the hospital, they stated that ICT experts were in short supply in the country. This was likely to pose a serious challenge for hospitals and health centres that use ICT facilities. This adds to the findings of Lippeveld and Sapirie (2000) that there was lack of continuity of national staff for managing IT systems. Lippeveld and Sapirie (2000) continued that an impressive base of skilled human resource is not available in many developing nations characterized by poor literacy levels which make the introduction of such programmes very challenging. Similarly, Baron, Fabens, Schiffman, and Wolf (2005) said that some physicians may have insufficient computer skills or lack the basic knowledge and training necessary to use computers in health care effectively.

Power outage is one factor that hinders the use of technology at the health sector just like any other sector of development in especially a developing country like Ghana. There were issues such as the lack of access to solar power options

92

and Uninterrupted Power Supply (UPS) back-ups. During the interview, the doctors, nurses, pharmacists, and staff at records section all stated that during power outages, it was difficult to use the ICT facilities at the hospital. Management stated that interrupted power supplies at the hospital led to the breakdown of several ICT equipment at the hospital.

The study also revealed that in order to mitigate the challenges posed by the interrupted power supply, the UCC hospital authorities had resorted to the use of manual system (paper records) alongside the computerized system which has helped to overcome the problems that were posed by power outages. It also helped when the system failed to work or anytime the network became so busy and assessing information became difficult. Another strategy to mitigate the impact of power failure at the hospital was the installation of a generating plant that supplied power to the hospital whenever there was power outage at the hospital but fueling the generating plant comes with a huge cost. Any country that finds it difficult to provide uninterrupted power supply to its citizens will definitely have problems with deployment of good ICT services. In Ghana, one cannot fully rely on the electric power being supplied by the Electricity Company of Ghana since at any time without notice power can go off. ICT equipment was made to function with continuous supply of electricity.

The state of information and communication technology and health informatics and other infrastructure can only work under "controlled conditions" that is when electricity supply is stable and constant. This finding is similar to the

position of Alam and Hassan (2010) who stated that in Bangladesh, inadequate access to electricity remains one of the biggest stumbling blocks to create a comprehensive ICT infrastructure. They continued that for running any ICT based services like e-governance successfully, constant electricity supply is essential. They also stated that in a developing country like Bangladesh where load shedding is a normal phenomenon it is quite difficult to use such information technologies. They concluded that this was the major problem which may confront the implementation of ICT-based services.

With the issues of bad network signals, it was said that anytime the network was bad, it became difficult using the computerized system. Health workers interviewed said that the network sometimes became so busy that it took so much time to make an entry. Whenever this happened, health workers depended solely on the manual system to continue work and electronic entries were made latter when the network became accessible. Respondents lamented when the computerized system will fully take over so as to make work at the hospital easier. The health workers interviewed said that this would require an extensive upgrading of such technologies in order to meet such challenges mentioned earlier.

Another challenge with the use of the ICT programme in the hospital was the interest of the health workers in the use of the ICT facilities for the health care based on their age distribution. It was observed that the respondents who were above the age of 45 were not enthused with the use of ICT facilities at the work

94

place and found it difficult to accept the change. Some health workers in this age group explained that they only used such facilities for work because management required them to do so. Thus, some health workers did not see the need for the introduction of the computerized health record system in the hospital. Meanwhile those who fell below the ages of 45 were in support of the computerization of the health records. This supports the position of the proponents of the technology acceptance model (TAM) that in an information system, users will accept the new technology base on two behavioural premises; the perceived usefulness and the perceived ease of use of the technology (Davis, 1989). The uncertainty inherent in any change makes many employees feel uncomfortable and might want to resist such changes.

The amount of information regarding aims and purposes joined with the introduction of ICT implementations was an important factor in this connection. This confirms the publication by the Danish Technological Institute (1997) that the more relevant the information or a new technology, the less risk of uncertainty among employees (Danish Technological Institute, 1997). Therefore, employees needed much education on the implementation of the new IT programmes at the hospital.

In as much as challenges are bound to come with the implementation of new policies, there is definitely going to be challenges with the use of new technology at the health sector. As it can be seen in the conceptual framework, these challenges are called lessons learned. After using the ICT tools in the health

sector, the lessons learned would inform researches into the challenges that may have come up. This would lead to other researches and lasting solutions may be found to the problems identified.

There were suggestions made by the respondents during the collection of the data. During the study, respondents were asked to make suggestions towards the successful computerization of health records at the University of Cape Coast hospital. The suggestions from the respondents are discussed below.

Training was one of the strategies suggested by the health workers as a way of meeting some of the challenges brought about by the introduction of ICT at the University of Cape Coast Hospital. The health workers interviewed were quick to suggest that management should organize more training for the hospital staff. This suggestion supports the assertion of Ash, Anderson, Gorman, Zielstorff, Norcross, and Pettit (2000) that a number of programmes and systems have failed because of inadequate training given to the professionals. They added that training should be organized for them in the forms of in-service training and workshops. As part of the training, management should train more specialists for all the departments at the hospital so that they can supervise the successful implementation of the computerization of health records and deal with challenges at the departmental levels. Respondents also mentioned that regular workshops were necessary to disclose the challenges faced by the stakeholders during the delivery of services to patients. The respondents said weekly reviews should be done so that employees could always give feedback to management on the

challenges that they encountered at the work place concerning the use of the ICT facilities in order to find lasting solutions to the challenges they report.

The health workers also suggested that every department (namely records section, consulting rooms, wards, pharmacy and laboratory) of the hospital should be networked. Apart from the laboratory, all the other departments at the hospital have been networked. During the interview, it was observed that due to an ongoing renovation work at the laboratory, the laboratory had not yet been networked and have not been linked to the computerization of the health records programme. Thus, the health workers interviewed, all suggested that the laboratory should also be hooked onto the programme as early as possible. They also added that the computerized system of keeping health record should be upgraded in order for it to take over fully so that the manual system of record keeping can be phased out completely from the system so that the full benefit of the system can be realised.

Results and discussion were done based on the conceptual framework. The study identified the factors that led to the implementation of the computer-based patients' records at the hospital. It was evident throughout the research process that for the healthcare system to improve, there was the need for the adoption of technology (ICT) to replace the manual system of record keeping which is in line with the modernization theory (Parsons 1967,& Smelser, 1969). It was also clear that before its adoption, there was the need for the actors to be trained and

retrained in the use of the system as explained in the actor-network theory (Monteiro, 2000).

The findings support that the technology acceptance model (TAM) can be a useful tool in evaluating pre-implementation of new technologies in the health sector and the attitudes of health workers.  This explains the factors that show the readiness of health workers in accepting and using the new technology (Davis, 1989). Workers accepted the use the new technology in the health sector based on the perceived usefulness. In examining the readiness of the patients in accepting the new technology, the diffusion of innovation theory (DOI) was useful. This theory examined how new innovations affect social change within a community (Rogers, 2003). It provided an avenue for studying who the various adopters and non-adopters may be, as well as the reasons for adopting or rejecting the computer-based patients' record system.

## CHAPTER FIVE

## SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

**Introduction**

This chapter presents a summary of the findings from the entire study. Conclusions were drawn based on the findings from the study and recommendations made on ways to improve healthcare delivery using the Information and Communications Technology.

**Summary**

The main objective of this study was to examine the use of ICT in healthcare delivery at the University of Cape Coast Hospital. The descriptive design was employed to collect data from the 100 respondents who were sampled using purposive, lottery and accidental sampling methods. Data were collected from the respondents using interview guides, interview schedule and record review. The following findings came out after the analysis of the data collected.

Objective one sought to examine the causes of long waiting times at the University of Cape Coast Hospital.

- There were delays when out-patients were asked to do laboratory test, even some out-patients were asked to go home and come back the following day for their laboratory tests.

- It was also found that inadequate human resources at the hospital also led to the long waiting time. A look at the doctor-patient ratio showed that the doctor-patient ratio at the University of Cape Coast Hospital was below the global average which led to work overload.

- Difficulty in retrieving patients' records also led to long waiting times at the hospital. Some patients were even given new folders because their folders were not found after a long search.

- It was also found that long waiting times at the hospital made some patients to lose interest in presenting themselves for medical care whenever they fell sick. The preferred buying medicines from way-side pharmacies.

Objective two examined the impact of ICT on medical errors at the University of Cape Coast Hospital. The following were the key findings from the study conducted:

- Medical errors were also found to be common at the hospital of Cape Coast hospital before the introduction of the computerized system of records keeping.

- The medical errors mentioned by the respondents included the administrations expired drugs, wrong medications, wrong surgery and wrong diagnosis.

- The main cause of medical errors mentioned by the key-informants is work overload caused by the high doctor-patient ratio at the hospital.

- Another cause of medical errors found included illegible handwritings by health professionals which led to wrong interpretations by pharmacists especially when patients were asked to access their medications from pharmacists outside the hospital.

- The use of the Computer Based Health Records has helped to eliminate the issue of doctors' eligible handwritings, leading to a reduction in medical errors at the hospital.

- Patients' inability to communicate clearly, the symptoms of their ailments also contributed immensely to medical errors. Lack of proper communication on the part of both health professionals and patients is a contributory factor to medical errors.

Objective three focused on other usefulness of ICT in healthcare at the University of Cape Coast Hospital. The following were the key findings:

- ICT tools at the hospitals enables the health workers to access health related information with ease using the internet and to enable them to be abreast of new discoveries in the health sector. Because lack of information could hinder quality health delivery.

- It also helped the hospital authorities to ensure the security of patients' health records the hospital as compared to the use of the manual system. The information kept on the database could not be accessed by just anyone because of the passwords being used.

- The use of the ICT also provided backup services which ensured that patients' information may not be lost even in case of any disaster.

101

- The Computer Based Health Records helped to avoid repeated medical tests in cases where a patients' folder has been misplaced. Thus, the patients' health records can be retrieved easily even in the case where the patient's folder has been misplaced.

- Few human resources were needed at the records section when the Computer Based Health Records is in use because only few people were needed to operate the computer to access patients' information.

- The computer based patients' health a record has also helped to reduce the work load on the health personnel at the hospital.

Objective four looked at the challenges that came about as a result of the introduction of ICT equipment in healthcare at the University of Cape Coast Hospital. The following were the findings in relation to the objective four:

- There was the challenge of inadequate IT experts to respond to the challenges that may be posed by the computerized health records systems.

- Health workers also stated they have not been adequately trained to handle the ICT programme in healthcare. Some health workers did not know how to work with computers.

- Power outage was one of the factors that were hindering the implementation of the computer based patient's health records. Continued power outages led to most of the ICT equipment being broken down.

- Sometimes, the network became so busy that it was difficult to access patients' records electronically. The network became so busy that it was sometimes difficult to make entries or to retrieve information.

102

- The interest of the users of the ICT programmes at the hospital was a bit problematic. It was discovered that some of the health workers were not interested in the use of the computerized programmes in work place. Some health workers made entries not because they were interested in using the system but because management had asked them to do so.

- Some of the patients interviewed were also not aware of the introduction of the computer based patients records at the hospital.

**Conclusions**

Conclusions made here are based on the interpretations done by the author of this study from empirical evidence and the discussions of the findings from the study conducted.

Long waiting time at the University of Cape Coast Hospital were due to inadequate human resources at the hospital. Due to the high doctor-patient ratio at the hospital, doctors attended to more patients than required which put pressure on the health workers at the hospital. The health workers had to spend more time in trying to retrieve patients' health record which took them more time in retrieving such records using the manual records. Health workers have to spend so much time getting records from archive and sorting them according to their needs when using manual system of record keeping. But with the computerization of health records, much time is safe for other activities in the health sector leading to a decrease in out-patient waiting time. It became conclusive that the use of ICT in

103

healthcare especially, the computerization of health records can reduce the wasting of valuable time by health professionals in looking for patients records.

The use of Information and Communication Technology equipment at the University of Cape Coast Hospital presents a great opportunity in reducing medical errors to the bearest minimum. Errors that may result from a break in the continuity of diagnosis and medication due to the misplacement of patients' records were easily avoided. Whenever health records could not be retrieved as a result of inability to locate patients' folders, patients were given new folders which meant they had to start treatment afresh especially if the patient was suffering from a chronic ailment. Therefore, to avoid the repetition of unnecessary laboratory test and other forms of diagnosis, the computer based health records were used to locate misplaced folders.

The computerization of health records ensures the security of health records. Because these programmes are using passwords, only those working at the hospital can access to patients' information. Therefore, ensuring that no one from outside could get access to patients' information. Thus, the security of health records is higher than the use of the manual system. With backup systems, patients' records can be kept for longer duration. In case of any natural disasters, health information will not be lost unlike the manual system. Other usefulness included easy access to health information from the internet. Health workers were able to link with colleagues who have access to better facilities and information sources to get advice and support. It has also helped in reducing the workload on

the health workers at the hospital because few human resources were needed to man the ICT equipment.

The issues regarding manpower and skills for the successful implementation of ICT in healthcare is worth mentioning. Lack of human resource to man the IT programmes is one of the main challenges of the programme. Health workers were also inadequately trained to handle the various computerized programmes that were in place at the hospital. Power outage was one of the main challenges that were hampering the use of the computerized programmes. Power outages have led to some of the IT equipment at the hospital to be broken down. Other challenges include the problems with network failures, lack of interest of the health workers and lack of education on the part of the patients.

Before the introduction of ICT in health, certain needs in the healthcare system which included long waiting times at the hospital, medical errors and the lack of human resource needed to be addressed. Easy access to patients information by the health workers will help promote the work of those working at the health sector. Before any programme can be successfully implemented, there is the need to train and retrain the key actors in the field in order for the smooth running of the programme. Various training sessions must be made available to the health staffs. With computerization data entry requires typing and other computer skills. The observation is that it would be helpful to provide training in computing especially, typing. To find long lasting solutions to the challenges in

the health sector, there is the need for partnership between the ICT experts and the health workers just as presented in the conceptual framework. The health workers must always look out for challenges that may surface during the use of the ICT programmes at the hospital and conduct researches into it and find more lasting solutions that may be discovered.

**Recommendations**

After presenting and discussing the results, the following recommendations were made for the successful integration of the ICT programmes in healthcare delivery.

1. The management of the University of Cape Coast Hospital should upgrade the computerized health record system to help reduce the problems with network failures. Long-term government commitment, based on a good strategic plan is required for the successful implementation of ICT in health programmes.

2. The hospital authorities must train more experts to handle all aspects of the computerized system and to deal with any challenge that may result in the use of the system. Thus, it is also recommended that the hospital authorities organize training sessions for all their health workers so that they can use the ICT facilities available effectively. These training sessions can be organize in the form of seminars and workshops for the health workers.

106

3. The hospital authorities must educate patients who patronize the services of the hospital on the computerization of their records in order for them to be abreast of the changes that are taking place in the healthcare system. They should also be educated on the need to provide important details whenever they come to hospitals and the kind of details they must provide. This can be done early morning as part of the morning devotions that are organized daily at the hospital with the patients.

4. The Ministry of Health must make the effort to integrate the ICT programmes into healthcare system throughout the whole country. And this must be done in such a way that patients can access their records at every hospital in Ghana. This requires the adoption of Electronic Health Records (EHR) countrywide and much resource must be put into it.

5. Health workers must be given education on the importance of the computerizing health records and the need for each one of them to make good use of it. This is because some health workers do not see the need in entering data into the system and will only do so because management requires them do so. But if health workers become aware of the importance of the computerized programmes in healthcare, they will make effective use of it and will help to ensure a successful implementation of it.

6. Management of the hospital must play a supervisory role in ensuring that patients' records are keyed into the systems regularly and promptly. This will ensure effective use of the system.

7. The University of Cape Coast Hospital authorities must try as much as possible for the computerized system to take over the manual system entirely. This is because the use of the manual system alongside the computerized system can be very stressful.

8. The University of Cape Coast authorities must support the hospital in terms of finance in order to upgrade the ICT facilities in the hospital to cater for the changing needs of the population.

**Suggestions for further studies**

After a careful analysis of the entire process in this study, the following areas are suggested for further studies.

Further studies should focus on a comparative study between a hospital which is integrating healthcare with ICT and another one which is using the manual record keeping system. Further researches can also focus on comparing waiting time before and after the introduction of the ICT tools. Waiting time before must be as recorded by the hospital authorities.

108

# REFERENCES

Abdul, S. S. (2008*). The challenges, problems and strategies of electronic medical record implementation: A case study of an eye hospital from India.* Unpublished master's thesis, University of Tromso, Norway.

Abdulai, T. (2009). *Implementing EHR in developing country: Potential challenges and benefits*. Unpublished master's thesis, University of Tromso, Norway.

Abdullah, M. H. (2005). *Study on outpatients' waiting time in hospital university Kebengsaan, Malaysia (HUKM) through the six sigma approach.* Malaysia, Department of Statistics.

Ahmed, M. (2004). *Electronic immunization registry and tracking system in Bangladesh. egoverment for development: Ehealth case study No.6.* Retrieved 2 May 2012 from http://www.egov4dev.org/ banglaimmune.html

Ahonen, T. (2011). *Household penetration rates for technology across the digital divide.* Retrieved 7 April, 2012 from http://www.communities-dominate.blogs.com/brands/2011/01/household-penetration-rates-for-technology-across-the-digital-divide.html

Ajeet, M. (2003). *The role of information technology in designs of healthcare trade.* Retrieved 4 October, 2011 from http//www.healtholine.org

Alam, S. & Hassan S. (2010). *Problems when implementing e-governances systems in developing countries: a quantitative investigation of implementation problems in Bangladesh*. Unpublished master's thesis, University of Boras, Bangladesh.

Allotey, F. A. K. (2005). *National initiatives concerning information and communication technology in Ghana.* Available Retrieved 11 October, 2011from http://www.oit.org/public/english/employment/skills/hrdr/topic n/t8 - gha.htm.

Amatayakul, M. K. (2004). Electronic health records; a practical guide for professionals and organisations. *American Health Informational Management Association Journal*, 2, 23-34.

Amedahe, F.K. (2002). *Notes on educational research.* Unpublished text: University of Cape Coast.

Anderson, G. F., Frogner, B. K., Johns, R. A., & Reinhardt, U. E. (2006). Health care spending and use of information technology in OECD countries. *Health Affairs*, 25(3), 819-831.

Anon, R. (2005). *ICTs will be critical to attaining the United Nations' Millennium Development Goals by 2015.* Geneva: ITU. Retrieved 1 January 2012 from http://www.itu.int/wsis/tunis/newsroom/background/ict-mdg.html

Ash, J. S., Anderson, J. G., Gorman, P. N., Zielstorff, R. D., Norcross, N., Pettit, J., (2000). Managing change: Analysis of a hypothetical case. *Journal of the American Medical Informatics Association*, 7(2), 125-134.

Asmar, R., & Zanchetti, A. (2000). Guidelines for the use of self-blood pressure monitoring: A summary report of the first international consensus conference. *Journal of Hypertension,* 18*,* 493-508.

Atkinson, R. & Castro, D. (2008). *Digital quality of life: Health care.* Washington, DC: The Information Technology and Innovation Foundation.

Aviane, K. (2008). *The occurrence of medication errors and the occurrence of risk factors for medication errors in state hospitals in Ghana: Patients' safety improvement in focus.* Unpublished master's thesis, University of Twente, Netherlands.

Bagozzi, R. P. (2007). The legacy of the technology acceptance model and a proposal for a paradigm shift. *Journal of the Association for Information Systems,* 8(4), 244-254.

Baidoo, R. (2009). Toward a comprehensive healthcare system in Ghana. Unpublished master's thesis, Centre for International Studies in Ohio University, Ohio.

Baron, R. J., Fabens, E. L., Schiffman, M., & Wolf, E. (2005). Electronic health records: Just around the corner or over the cliff? *Annals of Internal Medicine,* 143(3), 222-226.

Bashshur, R., Sanders, J., & Shannon, G. (1997). *Telemedicine theory and practice.* Springfield, IL: Charles C Thomas Publisher Ltd.

Bates, D. W., Boyle, D. L., Vander, V. M. (1995). Relationship between medication errors and adverse drug events. *J Gen International Medicine*, 10, 199-205.

Best, J.W. (1970) *Research in Education* Englewood cliffs, NJ. Prentice Hall.

Bosch, A., Rhodes, R., & Kariuki, S. (2002). Interactive radio instruction: An update from the field. In: Haddad W. D., Draxler. A, (Ed.), *Technologies for education: potential, parameters and prospects* (pp.124-127). Paris: UNESCO.

Cohen, G., Forbes, J., & Garraway, M. (1996). Can different patient satisfaction survey methods yield consistent results? Comparison of three surveys. *British Medical Journal,* 313, 841-844.

Daly, J. (2003). *Information and communications technology applied to the millennium development goal.* Retrieved 20 February 2012 from htt/sdm/p://topics.developmentgateway.org/ict

Danish Technological Institute. (1997). *Organizational factors in ICT design and implementation.* Retrieved 30 November 2011 from http://www.ukwon.net/~ukadmin/files/Theme36.pdf

Darves, B. (2004). *The promise and the pitfalls of health leaders*. Retrieved 3 March 2011 from http://www.healthleaders.com.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340.

Detmer, W. M., & Friedman, C. P. (1994). Academic physicians' assessment of the effects of computers on health care. *Journal of the American Medical Informatics Association, Supplement*, 558-562.

De La Garza, P. (2004). VA vows to retrain Bay Pines staffers. *St. Petersburg Time*. p. 23.

Doyle, V., & Haran, D. (2000). Quality assurance in healthcare: Policy briefings for health sector reform. Health sector reform research work programme. *Liverpool School of Tropical Medicine*, 1-6.

Essex, D. (2000). The many layers of workflow automation. *Healthcare Informatics*, 17, 121-130.

European Commission (2004). e-Health; making health care better for European citizens: An action plan for a European e-health area. Communication

from the commission to the Council, the European Parliament, the
European economic and social committee and the committee of the
regions. Retrieved 2 March 2010 from
http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2004:0356:
FIN:EN:PDF

Fraenkel, J. R., & Wallen, N. E. (1993). *How to design and evaluate research in education.* New York: McGraw-Hill Inc.

First Consulting Group. (2003). *Computerized physician order entry: Costs, benefits and   challenges, a case study approach.* New York: American Hospital Association.

Ghana Health Service, (2007). *Ghana Health Service Annual Report*. Accra, Ghana.

GNA (2011). Retrieved November 1, 2011 from http//www.ghanaweb.com

Godlee, F., Pakenham-Walsh, N., Ncayiyana, D., Cohen, B., & Packer, A. (2004). Can we achieve health information for all by 2015? *Lancet,* 364, 295-300.

Gregory, M., Garrison, M. D., Matthew, E., Bernard, M. D., & Norman, H. (2002) In T. Rasmussen, (Ed.). The effect of computer use by physicians on patient satisfaction at a family medicine clinic. *Family Medicine Journal,* 34(5), 5-12.

114

Greenberg, A. (2005). *ICTs for poverty alleviation: basic tool and enabling sector.* SIDA4937en. Retrieved 7 July 2011 from http//www.sida.se/publications.com

Greenhalgh, T., Robert, G., MacFarlane, F., Bate, P., & Kyriakidou, O. (2004). Diffusion of innovations in service organizations: Systematic review and recommendations. *The Milbank Quarterly*, 82(4), 581-629.

Haux, R. (2006). Health information systems: Past, present, future. *International Journal of Medical Informatics,* 75, 268-81.

Hendey, G. W., Berth, B. E., & Soliz, T. (2005). Overnight and post call errors in medication orders. *Academy of Emergency Medicine*, 12, 629-34.

Hillestad, R., Bigelow, J., Bower, A., Girosi, F., Meili, R., Scoville, R., et al. (2005). Can electronic medical record systems transform health care? Potential health benefits, savings and costs. *Health Affairs*, 24(5), 1103-1117.

Hofmann, B. (2002). Is there a technological imperative in health care? *International Journal of Technology, Assess Health Care*, 18(3), 675-689.

Holliday, I., & Tam, W.K. (2004).  E-health in the East Asian tigers. *International Journal of Medical Information,* 73(11), 759-69.

Hunt, D. L., Haynes, R. B., & Hanna, S. E. (1998). Effects of computer-based clinical decision support systems on physician performance and patient

outcomes: A systemic review. *Journal of the American Medical Association*, 280(15), 1339–1346.

Hunter, I. (2003). *Patient's attitudes to electronic medical records*. Retrieved 13 October 2012, from http://www.nzhis.govt.nz.

infoDev (2006). *Improving health, connecting people: The role of ICTs in health sector of developing countries.* Retrieved December 24, 2012 from http//www.healthlink.org.uk.

Institute of Medicine (1999). *To err is Human. Building a safer healthcare system.* Washington, DC: National Academy Press.

IOM (2001). *Crossing the quality chasm: A new health system for the 21st century.* Washington DC: National Academy Press.

International Institute for Communication and Development (2003). *Ghana establishes ICT policy strategy for the health sector*. Retrieved 02 February from http://www.iicd.org/countries/Ghana.

ITU (2005). *Making better access to healthcare services.* Tokyo: National Institute of Information and Communications Technology.

Jamaiah, H. J., Mohd, S., & Sukeri, S. (2003). Study on waiting time at the pediatric dental clinic, Kuala Lumpur Hospital. *Journal of Quality Improvement*, 7(1), 19–23.

Kilbridge, P., & Classen, D. C. (2001). A process model of inpatient medications. Management and information technology to improve patient safety. *VHA Research Series;* 1, 1-96

Kimambo, A. (2008). *HR leaders in action.* Retrieved 22 January 2012 from http://www.hrhresource/center.org/Kimambo.

Kocher, T. (1973). *The importance of healthcare*. Retrieved 23 November, 2011 from http//www.ehealthonlin.org.

Laufman, H. (2002). Are engineers' unsung heroes of medical progress? The historic bond between physics, engineering and medicine. *Biomed Instrument Technology,* 36(5), 325-334.

Lehoux, P., Battista, R. N., & Lance, J, M. (2000). Monitoring health technology assessment agencies. *Canadian Journal of Program Evaluation,* 15(2), 1-33.

Lippeveld, T., & Sauerborn, R., (2000). *Design and Implementation of health information systems:* Geneva, WHO.

Lorenzi, N. M., & Riley, R. T. (2000). *Organizational aspects of health informatics: Managing technological change.* New York: Springer-Verlag.

Makinde O, (2008.) *Health information system for health care monitoring and evaluation.* Retrieved 19 December 2011 from http://www.euroafrica-ict.org/downloads/awareness/workshop/Nigeria/Olusesan-makinde.pdf.

Micevska, M. B. (2005). Telecommunications, public health, and demand for health-related information and infrastructure. *Information technologies and international development (ITD),* 2(3), 57–72.

Ministry of Health. (2005). *MOH health sector ICT policy and strategy (final report).* Accra: Ministry of Health.

Mildon, J. & T. Cohen (2001). Drivers in the electronic medical records market. *Health management technology*, 22, 14-18.

Monteiro, E. (2000). Actor-Network Theory and Information Infrastructure. In: C. U. Ciborra & Associates. (Eds.), *From control to drift: The dynamics of corporate information infrastructures* (pp. 8-15). London: Oxford University Press.

Morison, L. (2012). The global epidemiology of HIV/AIDS. *Oxford Journals, British Medical Bulletin, 58*(1), 7-18.

Morrissey, J. (2004). *Capital crunch eats away at it*: *Modern healthcare34, no.8* Retrieved 20 November 2011 from http://www.modernhealthcare.com.

Morton, M. E. (2008). *Use and acceptance of an electronic health record: factors affecting physician attitudes.* Unpublished master's thesis, Drexel University, Drexel.

Mujahid, Y. H., (2002). Digital opportunity initiative for Pakistan. *Electronic Journal of Information Systems in Developing Countries*, 8(6), 1-14.

Murphy, G. F. (1999). *Electronic health records: Changing the vision.* Philadelphia: Harcourt Brace & Co.

National Academies Press (2001). *Crossing the quality chasm: A new health system for the 21st century.* Retrieved 7 January 20 from http://books.nap.edu/openbook.php?record-id=10027&page=23.

Nichols, P., Copeland, T. S., Craib, I. A., Hopkins, P., & Bruce, D. G. (2008). *Learning from error: Identifying contributory causes of medication errors in an Australian hospital.* Retrieved 11 December 2011 from http://www.pubmed/central.nih.gov/about/copyright.html.

Norris, A. C. (2002). *Essentials of telemedicine and telehealth.* New York: John Wiley & Sons, Ltd.

Obijiofor, L. Inayatullah, S. Stevenson, T. (2005). *Impact of new information and communication technologies on the socio-economic and educational development of Africa and the Asia-Pacific region.* A paper presented at the working conference on ICT solutions for government, Accra.

Obstfelder, A., Engeseth, K. H., & Wynn, R. (2007). Characteristics of successfully implemented telemedical applications. *Implementation Science*, 2(25), 2-10.

OECD, (2000). *How ICTs can help achieve the millennium development goals*. Paris: OECD

Okyere, P. F. (2000). *Establishment of an African Institute of Science and Technology in Ghana.* Project proposal presented to ICTP.

Osei, D. (2000). An exploratory survey of the application of the use of telemedicine in Ghana. *Journal of Telemedicine and Telecare* 6, 177–183.

Pan American Health Organization, (2001). Health Indicators: Basic elements for the health situation analysis. *Epidemiological Bulletin PAHO*, 22(4), 1-5.

Papazafeiropoulou, A., & Gandecha, R. (2005). Interpretive flexibility along the innovation decision process of the UK NHS Care Records Service (NCRS): Insights from a local implementation case study. *International Journal of Technology and Human Interaction*, 3, 1-12.

Patton, M.Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Newbury Park, CA: Sage.

Parsons, T. (1967). *Sociological theory and modern society*, New York: Free Press.

Poste, G. (2000). The dawn of big biology. *Financial Times*, pp 15.

Rodriguez R.J., Wilson P., & Schanz S. J. (2001). *The regulation of privacy and data protection in the use of electronic health information: an international perspective and reference source on regulatory and legal issues related to person-identifiable health databases. Essential drugs and technology program, division of health systems and services development*. Washington, DC: PAHO/WHO.

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.

Rogers, M. (1995). *Diffusion of innovations*. New York: The Free Press.

Sahay, S., & Walsham, G. (1997). Social structure and managerial agency in India. *Organization Studies*, 18(3), 415-444.

Sarantakos, S. (2005). *Social science research* (3rd ed.). New York: Macmillan.

Saunders, M. K., Lewis, P., & Thornhill, A. (2000). *Research methods for business students*. New York: Prentice Hall.

Sen, A. (2002). Why health equity? *Health economics*, *11*(8), 659-666.

Smelser, N. (1969). *Mechanism of change and adjustment of change*. London: Rinehart and Winston Ltd.

Skuse, A. (2004). *Radio broadcasting for health: A decision makers' guide*. London: DFID.

121

Srivastana, A. (2007). *E-health in developing country; pitfalls, challenges, and possibilities*. Retrieved 3 June 2012 from http://www.ehealthonlin.org.

Suchman, E. (1965). Social patterns of illness and medical care. *Journal of Health and Human Behavior*, 6(3), 114-28.

Teresa, R., & Gayle, K. (2007). Unlocking the power of electronic. *Health Information for Public Health Workers in Kansas*, 95(3), 347–348.

Thatcher, T. D. (2005), Outpatient waiting time in Jos University Teaching Hospital. *Highland Medical Research Journal*, 3, 36–42.

Tierney, W. M., Overhage, J. M., & Murray M. D. (2003). Effects of computerized guidelines for managing heart diseases in primary care. *Journal of General Internal Medicine, 18*(12), 967-976.

Trochin, W. M. K. (2006). *The research methods knowledge based* (2$^{nd}$ ed.) retrieved 6 March, 2014 from http://www.socialresearchmethods.net/kb/

Turkson, P. K. (2009). Perceived quality of healthcare delivery in a rural district of Ghana. *Ghana Medical Journal*, 43(2), 65-69.

UN ICT Task Force. (2003). *Tools for development: using information and communications technology to achieve the millennium development goals. Working Paper*. Retrieved 22 February 2012 from http://www.unicttaskforce.org/perl/documents.pl?id=1275.

Venkatesh, V., Morris, M. G., & Davis, G. B. (2003). User acceptance of information technology: toward a unified view. *MIS Quarterly*, 27(3), 425-478.

Walker, J. (2005). Electronic medical records and health care transformation. *Health Affairs*, 24(5), 1118-1120.

Waterman, A. D., Garbutt, M. B. J., Hazel, E., Dunagan, W. C., Levinson, W., Fraser, V. J., et al. (2007). The Emotional Impact of Medical Errors on practicing physicians in the United States and Canada. *The Joint Commission Journal on Quality and Patient Safety.* 33(8), 467-474.

Watson, A. (2003). *The future role of diagnostic testing.* Management Informer, International Hospital Federation. Retrieved 5 December 2011 from http://www.hospitalmanagement.net/informer/management/diagnostics1/index.html.

Weber, M. (1971). *The protestant ethics and the spirit of capitalism.* London, Unwin University Books.

Webster, A. (1984). *Introduction to the sociology of development.* London: Macmillan Publishers Ltd.

Wilson, E., & Wong, K. (2000). *African information revolution: A balance sheet (draft)*. Retrieved 12 December 2011 from http://www.bsos.umd.edu/cidcm/events/AIR.html

123

Wilson, S., Ruscoe, W., & Chapmen, M. (2001). *General practitioners and hospital  Communications; a review of discharge summaries.* New York: prentice Hall.

WHO. (1946). *Preamble to the constitution of the world health organization.* New York: WHO.

WHO. (2004). *eHealth for health-care delivery: Strategy 2004-2007.* Geneva: WHO.

WHO. (2006). *Electronic health records: Manual for developing countries.* Retrieved 24 October 2011, from http://whqlibdoc.who.int/wpro/2006/9290612177_eng.pdf

WHO. (2006). *E-health tools and services: Needs of the member states – a report of the global observatory for eHealth.* Geneva: Retrieved 25 March 2012 from http://www.who.int/kms/initiatives/tools_and_services_final.pdf

WHO, (2008). *Working together for health: The world health report 2006.* Geneva: WHO.

Wolinsky, F. (1988b). *Seeking and using health services. In the sociology of health* (2nd ed.). Belmont, CA: Wadsworth.

World Bank. (2002). *World development report*. Washington, DC: World Bank.

Yeboah, Z. S. (2008). *The role of information and communication technology in health system of the Afigya Sekyere District, Ghana.* Unpublished master's thesis. College of Health Sciences, Ghana.

## APPENDIX A

## INTERVIEW GUIDE FOR HEALTH WORKERS

This interview guide is to solicit information in relation to the use of information and communication technology in healthcare at the University of Cape Coast hospital. You are assured that all information that you will provide will be treated with outmost confidentiality. You are also informed that this study is purely academic and under no circumstance shall the information provided be released to anyone. Thus, you are entreated to be very objective in providing your responses to the following questions. Thank you for your corporation.

**Section A: Bio Data**

1. Age…………….. …………………………………………………………..
2. Sex.………………………………………………………………………….
3. What is your highest level of education? …………………………………..
4. Position in the hospital……………………………………………………...

**Section B: Use of ICT in healthcare at the hospital**

5. What ICT tools are used at the hospital?

   …………………………………………………………………………
   …………………………………………………………………………
   …………………………………………………………………………

6. Are you interested in the use of ICT tools in your work

    Yes             [       ]         No                   [       ]

7. What kind of job are ICT tools mentioned in question 6 above used for?

    ……………………………………………………………………………

    ……………………………………………………………………………

    ……………………………………………………………………………

8. Have you had any formal training in ICT?

    ……………………………………………………………………………

    ……………………………………………………………………………

    ……………………………………………………………………………

9. Before the use of the ICT tools mentioned above, what were you using for

    the work?

    ……………………………………………………………………………

    ……………………………………………………………………………

    ……………………………………………………………………………

10. Mention some challenges that can be encountered with the use of the use

    of the manual system of record keeping

    ……………………………………………………………………………

    ……………………………………………………………………………

    ……………………………………………………………………………

    ……………………………………………………………………………...

11. What are the advantages of using ICT tools in the hospital over the use of

the manual system?

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

**Section C: ICT and waiting time**

12. Before the advent of ICT in healthcare, what was the average waiting time

at the hospital?

…………………………………………………………………………………

…………………………………………………………………………………

13. What are the causes of long waiting time at the hospital?

…………………………………………………………………………………

…………………………………………………………………………………

…………………………………………………………………………………

…………………………………………………………………………………

14. What are the effects of long waiting time at the hospital?

…………………………………………………………………………………

…………………………………………………………………………………

…………………………………………………………………………………

…………………………………………………………………………………

15. How does the use of ICT tools to reduce waiting time at the hospital?

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

16. What is the average waiting time with the use of ICT tools at the hospital?

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

**Section D: ICT and medical errors**

17. Mention any medical error at the hospital before the use of ICT tools?

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

18. State the causes of the medical errors you have mentioned in question 17 above

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

19. How does illegible handwritings of health professionals need to medical errors? Explain.

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

20. How does the use of ICT in healthcare reduce medical errors?

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

**Section E: Other usefulness of ICT tools in healthcare**

21. What some of the advantages of using ICT tools in healthcare?

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

22. How does the computerization of health records ensure the security of patients' record? Explain.

………………………………………………………………………………

………………………………………………………………………………

…………………………………………………………………………………

…………………………………………………………………………………

**Section F: Challenges that exist with the use of ICT in healthcare**

23. Have you ever had any training in the use of the ICT tools in healthcare?

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

24. What kind of challenges do you experience in relation to the use of the ICT tools?

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

25. How do you overcome those challenges mentioned?

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

26. Suggest ways through which ICT can be used effectively to improve healthcare……………………………………………………………………….

………………………………………………………………………………

………………………………………………………………………………

131

**APPENDIX B**

**INTERVIEW SCHEDULE FOR PATIENTS**

This interview schedule is to solicit information in relation to the use of information and communication technology in healthcare at the University of Cape Coast hospital. You are assured that all information that you will provide will be treated with outmost confidentiality. You are also informed that this study is purely academic and under no circumstance shall the information provided be released to anyone. Thus, you are entreated to be very objective in providing your responses to the following questions. Thank you for your corporation.

**Section A: Bio Data**

1. Sex

   Male   [       ]                              Female [       ]

2. What is your highest level of education?

   a.  MSLC/JHS  [       ] b. SSS [       ] c. Diploma/degree   [       ]

3. What is your age?

   a.  18-30 years      [     ]      b. 30-45years [     ]   c. 45years+      [     ]

**Section B: Use of ICT in healthcare at the hospital**

4. How long have been assessing healthcare from this hospital?

   a.  Less than 1 year [     ]      b. 1-2yrears [     ]   c. More than 2years [   ]

5. Are you aware of the use of ICT tools in healthcare in this hospital?

   Yes     [       ]                              No     [       ]

6. What problems existed with the use of the manual record keeping in the hospital? (chose as many as apply)

    a. Misplacement of health records    [    ]

    b. Difficulty in locating records    [    ]

    c. Long waiting time    [    ]

    d. Medical errors    [    ]

    e. Difficulty in getting statistics    [    ]

    f. Insecurity of health records    [    ]

    Specify others……………………………………………………….

7. (a) Do you think it was necessary to introduce ICT in the healthcare system?

    Yes    [    ]        No    [    ]

    (b) If yes, Explain …………………………………………………………

    …………………………………………………………………………………

## Section C: ICT and waiting time

8. What leads to long waiting time at the hospital?

    a. Lack of human resource    [    ]

    b. Difficulty in locating records    [    ]

    c. Misplacement of cards    [    ]

    d. Increasing number of patients    [    ]

    Specify others…………………………………………………………

9. What are the effects of long waiting time at the hospital?

…………………………………………………………………………

…………………………………………………………………………

…………………………………………………………………………

…………………………………………………………………………

…………………………………………………………………………

10. How many hours do you spend at the hospital these days after the introduction of ICT in healthcare?

    a.  Less than 1 hour [    ]    b. 1-2 hours [    ]    c. 2hours+ [    ]

11. (a) Does the use ICT help to reduce waiting time at the hospital?

    Yes    [    ]                    No    [    ]

    (b) If yes, explain how …………………………………………………..

    …………………………………………………………………………

**Section D: ICT and medical errors**

12. Do you know of any medical error at the hospital before the introduction of the ICT tools in the hospital

    Yes    [    ]                    No    [    ]

13. If 'yes" to question 11, which of these areas did the medical error occur? (chose as many as applicable)

    a.  Wrong medication                    [        ]

    b.  Wrong surgery                        [        ]

    c.  Wrong drug administration            [        ]

    d.  Wrong laboratory test                [        ]

    e.  Expired drugs                           [    ]

      Specify if it is none of the above……………………………………….

      ……………………………………………………………………………….

14. State the causes of the medical errors you have named in question 13 above

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

15. Does the handwriting of health professionals need to medical errors?

    Yes    [    ]                 No    [    ]

16. (a) Do you know of any medical error after the use of ICT tools in the hospital?

    Yes    [    ]                 No    [    ]

    (b) If Yes, Specify………………………………………………………….

    ……………………………………………………………………………

17. Do you think ICT has come to reduce medical errors in the hospital?

    Yes    [    ]                 No    [    ]

18. If 'yes' to question 17, explain how?

…………………………………………………….……….……….……

……………………………………………………………………………

……………………………………………………………………………

**Section E: Other usefulness of ICT tools in healthcare**

19. What are some of the advantages of using ICT in healthcare? (chose as many as applicable)

    a.  Locating health records with ease [        ]

    b.  Reduced waiting time               [        ]

    c.  Reduced medical errors            [        ]

    d.  Getting statistics with ease       [        ]

    e.  Health records are secured        [        ]

    f.  Saves time                        [        ]

    Specify

    others……………………………………………………………………….

20. Do you think the computerization of health records ensures the security of patients' health records?

    Yes    [        ]                      No    [        ]

**Section F: Challenges that exist with the use of ICT in healthcare**

21. What are the challenges that exist with the use of ICT tools at the hospital?

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

22. How can the challenges you have mentioned in question 20 be reduced?

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

23. Suggest ways that ICT tools can be used to improve healthcare

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

**APPENDIX C**

**A GUIDE FOR DOCUMENT REVIEW**

As part of the study, the following documents were reviewed from the hospital

1. Hospital attendance books

2. Entry sheet for the pharmacist on the computer

3. Entry sheet for records on the computer

4. Entry sheet at the consulting rooms

5. Manual entry books for consulting rooms

6. Copies of patients' folders

7. National Health Insurance claims forms

8. Hospital annual report for 2011

# DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Name: Emmanuel Awudi

Signature………………………… Date…………………………

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on the supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Name: Dr. Emmanuel Kodjo Ekumah

Signature………………………… Date…………………………

Co-Supervisor's Name: Ms. Janet Serwah Boateng

Signature…………………………. Date…………………………

## ABSTRACT

This study investigated the application of Information and Communications Technology in healthcare delivery at the University of Cape Coast Hospital. The main objective of this study was to examine the impact of the application of information and communications technology in healthcare delivery at the University of Cape Coast Hospital.

One hundred and twenty-seven participants were sampled for the study through the use of purposive, lottery and accidental sampling methods. Data were collected through the use of interview guide, interview schedule, and guide for review of document. The qualitative data were analysed through the use of the thematic approach and the quantitative data were analysed with the use of SPSS version 16.

The study revealed that the computerization of health records at the hospital had reduced waiting time and medical errors. Other findings also showed that it helped in the speedy retrieval of patients' records and also helped the health professionals in getting necessary information related to their work. It was realized that some of the health professionals do not see the importance of the integration of ICT in healthcare. Finally, it was recommended that management of the hospital must play a supervisory role in ensuring that patients' information are keyed into the system promptly. The Ghana Health Service must integrated ICT programmes into healthcare in all health centres throughout the country.

iii

## ACKNOWLEDGEMENTS

Books become reality through the combined efforts of many people. I am greatly indebted to my ever-caring supervisors, Dr. Emmanuel Kodjo Ekumah and Ms. Janet Serwah Boateng who took time to read through this work and made the necessary corrections.

I also want to appreciate my mentors, Prof. Joseph Ampiah Ghartey (former Ag. V.C), and Mr. Sam Cudjoe (formerly, with Nkroful Agricultural Secondary School) whose pieces of advice have brought me this far. I also salute Ms Grace Bediako (Department of VOTEC), all my friends, mates and lecturers at the Institute for Development Studies for their suggestions and inputs.

# DEDICATION

This work is dedicated to my parents, Mr. & Mrs. Awudi, my wife, Joelle Kafui Awudi, and to my son, Dzidzorli Awudi.

# TABLE OF CONTENTS

## LIST OF TABLES

# LIST OF FIGURES

## LIST OF ABBREVIATIONS

| | |
|---|---|
| ANT | Actor-Network Theory |
| CBR | Computer-Based Health Records |
| CSCW | Computer Supported Cooperative Work |
| DIT | Diffusion of Innovation Theory |
| EHR | Electronic Health Record |
| EMR | Electronic Medical Record |
| EU | European Union |
| GDP | Gross Domestic Product |
| GNA | Ghana News Agency |
| GTUC | Ghana Telecom University College |
| HIV/AIDS | Human Immune Virus/Acquired Immuno Deficiency Syndrome |
| ICT | Information and Communication Technology |
| ICT4D | Information and Communication Technology for development |
| IOM | Institute of Medicine |
| ITU | International Telecommunication Union |
| JHS | Junior High School |
| MDGs | Millennium Development Goals |
| MOH | Ministry of Health |
| MSLC | Middle School Leaving Certificate |
| NCC MER | National Coordinating Council for Medication Error Reporting |
| NHIS | National Health Insurance Scheme |
| OECD | Organisation for Economic Cooperation and Development |
| OPD | Out-Patient Department |
| PDAs | Personal Digital Assistants |

SHS             Senior High School

SPSS            Statistical Product and Service Solutions

UN              United Nations

UPS             Uninterrupted Power Supply

UTAUT           Unified Theory of Acceptance and Use of Technology

US              United States

TAM             Technology Acceptance Model

WHO             World Health Organisation