SCHOOL OF PUBLIC HEALTH
COLLEGE OF HEALTH SCIENCES
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ASSESSING MANAGERS AND STAFF PERCEPTIONS OF THE BENEFITS OF IMPLEMENTING AN ELECTRONIC HEALTH RECORD (EHR) SYSTEM: A CASE STUDY OF THE GHANA ATOMIC AND ENERGY COMMISSION CLINIC

BY

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A PRATICUM REPORT SUBMITTED TO THE SCHOOL OF PUBLIC HEALTH, UNIVERSITY OF GHANA, SCHOOL OF PUBLIC HEALTH LEGON IN PARTIAL FULFILLMENT OF THE AWARD OF DEGREE OF MASTER OF SCIENCE IN HEALTH INFORMATICS

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DECLARATION

I hereby declare that apart from referencing other peoples' work that I have duly acknowledged, this project is my original work, produced from a research I have undertaken under supervision and that no previous submission of either whole or part of this project has been made elsewhere for a degree. I, therefore, submit this project to the Department of Biostatistics, School of Public Health, Universityof Ghana in partial fulfillment of the award for Master of Science in Health Informatics

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ABSTRACT

Health Information Technologies such as Electronic Health Records (EHRs) is considered by health care professionals, consumers and policy makers to be fundamental in transforming the health care industry. Given the complex nature of the health care industry, the limitations of using paper-based medical records are obvious, hence a transition of traditional paper-based medical records to electronic health recording system. EHR is known to reduce loads of medical records keeping, quality of care and improved health workers productivity and clients-provider interaction. The situation was not different at the Ghana Atomic Energy Commission Clinic (GAECC) where this study was conducted after three (3) years of implementing an EHR. The study assessed managers and staffs' perception on the expected benefits, realized benefits and the challenges encountered during and after implementing the EHR.

Quantitative method was used to achieve the objectives which used structured questionnaire as the main data gathering tool. Respondents were selected based on those who had access or used the EHR system. The level of perception for benefits was assessed based on the following indicators, Quality of care, Evidence-based & patient safety, Communication and coordination of care, Efficiency, Patient experience and involvement in care and Usefulness of system.

Descriptive univariate analysis was used to describe the demographic characteristics of the respondents. Whereas t-test and Oneway Anova was done to determine the difference between the perception of expected benefits and the benefits that were realized after all the dependent variables were rated and the average means of all created composite variables were calculated.

The results showed that staff stakeholders had high perceptions of EHR to yield benefits like Quality of Care, Communication, Co-ordination of care, Efficiency and Patient Experience and Involvement.

Secondly, even though some of the benefits have been realized, a comparison between the expected and the realized was significantly different with all the average scores of the expected being higher than the realized.

Some of the challenges identified from the study include inadequate training which was identified as a major challenge to the smooth use of the system, system downtime led to work overload and lack of readily available technical support to resolve hitches in the system.

To ensure the smooth running of the system it was recommended that the management of Ghana Atomic Energy Commission Clinic ensures that a refresher training be carried out by vendor for all users and technical support be made available as and when needed.

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LIST OF ABBREVIATIONS

ABC	Advisory Board Company
BR	Benefit Realization
CDSS	Clinical Decision Support System
CHC	Community Health Centres
CMR	Computerized Medical Record
CPOE	Computerized Physician Order Entry
CPR	Computer-based Patient Record
CPT	Current Procedure Terminology
EHR	Electronic Health Record
EMARs	Electronic Medication Administration Records
EMR	Electronic Medical Record
EPR	Electronic Patient Record
GAEC	Ghana Atomic Energy Clinic
GHS	Ghana Health Service
GoG	Government of Ghana
HAMS	Health Administration Management System
HIE	Health Information Exchange
HIMSS	Healthcare Information and Management Systems Society

HIS	Health Information Technology
HIT	Health Information Technology
HITECH	Health Information Technology for Economic and Clinical Health
ICD	International Classification of Diseases
ICT	Information Communication Technology
ISO	International Standard Organization
I.T	Information Technology
LEKMA	Ledzokuku Krowor Municipal Assembly
LHDs	Local Health Departments'
MOH	Ministry of Health
MMDAs	Metropolitan, Municipal and District Assemblies
OCIO	Officer of Chief Information Officer
OPD	Outpatient Department
PwC	PriceWaterHouseCoopers
ROI	Return on Investment
U.K	United Kingdom
USA	United States of America
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background

There has been a lot of development in the healthcare industry and this development has led to a change in the tools being used by healthcare professional in their field of work. The traditional paper-based medical record has been replaced with the Electronic Health Record (EHR). This important shift which is the growing use of EHR has been the focus of attention over the past years.

An EHR is defined as "a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. Included in this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports" (Menachemi & Collum, 2011).

Notwithstanding the advancement of technology in every walk of life where most commercial transactions are automated with the aim to achieve efficiency and accuracy, in the medical field most encounters are manually documented on papers. Documentation takes 25–50% of clinicians' time in a typical health facility (Clynch & Kellett, 2015). Thus with this growth in technology, there is an increasing demand for a transition from traditional paper-based laborious health recording system to more innovative technological-based electronic health recording system. In the USA, a study among 505 Local Health Departments'(LHDs) that responded to the survey showed that 122 (22.2%) had implemented electronic health records (EHRs), 245 (47.5%) had implemented electronic laboratory reporting, 368 (73.0%) had implemented an electronic disease reporting system, and 416 (83.8%) had implemented an immunization registry

(Shah, Leider, Castrucci, Williams, & Luo, 2016). Another study also in the US further showed that 42% of LHDs use EHR, 71% has reviewed their existing system to see if there was need for EHR and 6% conducted readiness assessment (Williams & Shah, 2016).

According to Van der Lei, (2002), "EHR are becoming available, researchers use these records to change medical practice by providing decision support, and analyse observational databases to study the delivery of care. The evolution of EHRs is driven by the fact that it will considerably improve providers' performance and reduce costs in the healthcare industry, however, evidence supporting these beliefs is inadequate (Mills, Vavroch, Bahensky, & Ward, 2010). The implementation of EHR is driven by the need to realize certain benefits in the health sector but such benefits are rarely achieved. This is so because of the numerous competing interest of different stakeholders in such IT investments. According to Glynn, (2006), to achieve benefits from IT investment, the new strategy is to focus on dynamic planning of how benefits will be realized and measured. Therefore this study seeks to investigate the users' perception of the benefits of an implemented EHR and to examine what benefits have been achieved so far.

1.2 Problem Statement

The EHR is considered by health care professionals, consumers and policy makers to be fundamental in transforming the health care industry. Given the complex nature of health care industry, the limitations of paper-based records are obvious (Care, 2015). Several versions of the electronic health recording system and data management are being used across countries with reports showing differences in their success rates. Some studies have shown that EHR is able to reduce loads on medical records keeping, improved health workers productivity and clients' provider interaction (Police, Foster, & Wong, 2010). On the other hand, Kimble, (2014) in their

review of health facilities that have implemented electronic health records found that the objectives of reducing cost, reducing errors, improving coordination, and improving adherence to standards are sometimes not met. According Xierali et al., (2013), realizing the benefits of implementing EHRs in a large measure depends more on clinicians and health provider's interest and the significant use of the technology**.**

The Ghana Atomic Energy Commission Clinic (GAEC) realized the need to invest in EHR as a result of the deficiency in the paper based record keeping system. Initially they provided care for just the staff and their immediate families but later opened up their services to the general population and realized the need to adopt an innovative system to keep the records and improve the quality of care provided to their clients. Since the three years of implementation, no assessment has been done to determine whether the reasons for which the system was implemented have been achieved. However, without an assessment of the perception of managers and staff with regards to the benefits and challenges they have experienced so far, the problems cannot be addressed for a scale up to be carried out in the other branches of the facility.

1.3 General Objective

To assess managers and staff's perceptions of the benefits of EHR implementation at Ghana Atomic and Energy Commission Clinic

1.3.1 Specific Objectives

1. To explore stakeholders expected benefits.
2. To determine which benefits stakeholders have realized.
3. To explore the challenges encountered during implementation and use of EHR

1.4 Research Questions

1. What are the perceptions of stakeholders and staff with regards to the benefits of the EHR system prior to implementation?
2. What benefits have been realized?
3. Is there a difference between the perceived benefits and benefits realized?
4. What are some the challenges encountered during implementation and use of the EHR system?

1.5 Significance of the study

The findings of this study are therefore relevant to the health facility that was selected for the study as well as other health institutions in general. It can help hospitals and other health institutions appraise their uptake of technology and particularly assess the constraints that militate against it. The findings of the study are beneficial to the Ministry of Health and the Ghana Health Services and other agencies that have oversight responsibility of healthcare administration in Ghana. Based on the findings of the study, they can re-appraise some of the strategic issues concerning EHR adoption and constraints in the country. Finally, the study is beneficial to future researchers as it serves as background information on future studies on the subject matter. This is especially important because EHR is still in its infant stages in the country and hence other researchers will benefit from the work.

1.6 Organization of practicum report

The study is organized into six chapters: Chapter 1 comprises the background to the study, statement of the problem, objectives of the study, research questions, and significance of study. The second chapter covers the review of literature relating to the subject matter of the study from

scholarly sources. Chapter 3 covers the Research Design, Sampling and Sampling Techniques, Data collection procedure, while the Chapter 4 captures the analysis, Chapter 5 covers the discussion of data. The Chapter 6 focuses on the summary, recommendation and conclusion of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature on Electronic Health Records systems, the barriers, benefits of EHR and conceptual framework for the study.

2.2 Electronic Health Record in Healthcare Service Delivery

2.2.1 EHR

In healthcare delivery, various names with their associated abbreviations are used in describing the use of computer systems or ICT, some of which include Computerized Medical Record (CMR), Electronic Patient Record (EPR), Computer-based Patient Record (CPR), Electronic Medical Record (EMR) and Electronic Health Record (EHR). Nohr, (2006) indicated that although these vocabularies used often have similar meaning, depending on the health sector, period of time, professional discipline and the defining country of origin, there could be slight differences. This study chooses to adopt EHR. A number of definitions by various authors have been ascribed to EHRs and the International Standard Organization's (ISO) universally acknowledged definition of EHR is "a repository of information regarding the health of a subject of care, in computer process able form." Since the definition centers on EHR systems structure, Saranto & Nyk, (2007) suggested that EHR should be understood as encompassing a retrospective, concurrent and prospective information with the principal aim of continuously supporting an efficient and quality delivery of integrated healthcare. According to Luo, (2006), EHRs surpass the electronic form of the paper based version to include the entire data management requirements for patients' care. Therefore Bernstein et al., (2005) established that

EHRs perform a multifaceted function in the delivery of healthcare than just being a computer system in any facility.

2.3 Benefits of EHR

Bossen, Groth, & Witt, (2013) specified that the EHR systems are very configurable and has adjustable features for different groups of staff and departments which are important contributing factors to implementation success. However, studies conducted in seven different countries by Ludwick & Doucette, (2009) as well as Nah, Lau, & Kuang, (2001) demonstrate that a successful role out of EHR is mainly dependent on a varied range of organizational and contextual factors (Bossen et al., 2013).

It is worth noting that, EHR systems are known to have the potential to improve health care by assisting clinical workflow between various departments in health facilities and making room for information to be aggregated for quality assessment, billing and research needs(Gøeg, Chen, Højen, & Elberg, 2014). Especially, literature has it that, physicians or healthcare organizations that use an EHR that met the Meaningful Use Criteria are likely to report or achieve the clinical benefits. This Meaningful Use Criteria demand that, EHRs comprise functionalities such as Clinical Decision Support System(CDSS), Computerized Physician Order Entry (CPOE) and Electronic Medication Administration Records (EMARs) as these EHRs benefits are facilitated by these functionalities (King, Patel, Jamoom, & Furukawa, 2011). The findings of a study by King et al., (2011) stated that, using an EHR that met Meaningful Use criteria was significantly associated with reporting clinical benefits and this is consistent with other study findings that reported higher EHR satisfaction and benefits among clinicians who used robust EHRs (Menachemi & Collum, 2011). Again the meaningful use criteria was one of the goals set by Health Information Technology for Economic and Clinical Health (HITECH) for healthcare

facilities to achieve or attain before they were given any incentive payments through Medicare and Medicaid. Blumenthal & Tavenner, (2010) explain the "meaningful use" by HITECH as the use of EHRs by providers to achieve significant improvements in care by applying the clinical care components such as CDSS, CPOE and others.

From the review of literature, the following are the benefits of EHR.

2.3.1 Useful for decision making process

An Electronic Health Record system has the potential to enhance evidence-based decision making at the point of care. Electronic Health Record offers physicians the ability to access accurate, current and comprehensive information on patients' health such as laboratory test, diagnostic images and annual physicals. Thus, they are able to address a range of health care issues holistically at a time visit rather than requesting for follow ups which are sometimes unnecessary and inefficient.

Again, with the use of EHR clinical care components as CDSS which has flagging mechanism and alerts physician in cases where test or diagnostics results are not within thresholds, physicians are able to make timely clinical decisions.

2.3.2 Improve Patient Safety

An EHR system has the potential of improving patient safety. Patient safety requires a systems for reporting and analyzing procedures and prevention or reduction of errors. An EHR system has several effective clinical care components like Clinical Decision Support System (CDSS) and Computerized Physician Order Entry (CPOE) that can assist in the prevention or reduction of medical errors, adverse events and ensure data quality.

The CDSS has inbuilt tools that give an up-to-date information about a drug and cross check a patient allergy to a given medication. It also has an alert function that alerts for drug interactions and highlights any probable patient issue. As medical information continues to grow, the CDSS can be used to prevent medical errors. This will therefore enhance patient safety and efficient use of resources.

The CPOE systems permit providers to request or enter orders like laboratory test, drugs and radiology into a computer rather than hand written on papers. These computerized order system prevents possible medical errors which would have occurred if they were poorly and incomplete handwritten orders. This goes a long way to enhance efficient ordering as staff at the pharmacy or laboratory units do not have to seek for clarification from orders that are incomplete or not well written (Menachemi & Collum, 2011).

In a study by Agrawal, (2009), it was reported that CPOE systems have the greatest potential of reducing medication error whilst prescribing with a reduction of 55-83 percent. Furthermore, the findings from another study showed that before the intervention, the mean proportion of unnecessarily repeated HB antigen tests increased by 0.4% per month (absolute increase, 95% CI 0.2% to 0.6%, $p < 0.001$) but after the intervention of a CDSS alert system, a significant change occurred, with a monthly difference estimated at -0.4% (95% CI -0.7% to -0.1%, $p = 0.02$) resulting in a stable proportion of unnecessarily repeated HBs antigen tests. The conclusion drawn from this study was that the proportion of unnecessarily repeated tests immediately dropped after CDSS was implemented (Niès et al., 2010).

2.3.3 Facilitate Patients Referral and Information Exchanges

Electronic health record systems can allow physicians from different locations or even different countries to access the same patient information. For example, a patient may give a thorough medical history to his primary physician, but forgets valuable information when visiting a specialist. An electronic health record maintains all past information, including x-rays, medications and doctors' progress notes. Keeping health or medical records electronically allows for permanent, accurate and easy transfer or exchange information which healthcare practices use to allocate patient-related task to health professionals. Electronic medical records are stored within secure databases where they can never be lost or misfiled unlike paper-based which can easily be lost or misclassified (Burton, Anderson, & Kues, 2004; Kohane, 2011). The inter-physician data sharing system was also found to facilitate clinical decision making for patients who are unable to provide medical history in times of emergencies and access patient health information remotely or outside the health care facility (Jian et al., 2011). Through this information exchange, health care professionals are able to follow up on and receive feedback on referrals.(Do, n.d.)

Electronic Health Records are also able to reduce physician requesting for redundant medical examination which could have cost implications for both the health facility, the patients and sometimes may result in false-positives (D. Bates, Goldman, & Lee, 1991). Menachemi & Collum, (2011) butteress this by stating that Health Information Exchange(HIE) can reduce the expensive unnecessary tests that patient are required to undergo because one provider does not have access to the medical data kept at another provider's site. As it is known, patients have their health data stored in different places where they receive care (Menachemi & Collum, 2011). Traditionally, health care providers exchange important information on patients through emails

and faxes which do not facilitate "real time" access to where and when they are needed. With HIE, information can be shared in "real time" which will lead to a more cost-effective and better-quality of care (Menachemi & Collum, 2011). Evidence indicates that, there is a significant negative association between redundant diagnostic testing and the use of an EHR and/or its component. (Niès et al., 2010).

2.3.4 Facilitate Health Research and Job Satisfaction among Physicians

EHR can improve ability to conduct health research. When patients records are stored electronically, it increases the availability of data for faster quantitative analyses to identify evidence based best practices more easily (Aspden, 2004). Also, health researchers can use electronic clinical data that are aggregated across populations to produce research that is beneficial to society. The availability of clinical data is limited, but as providers continue to implement EHRs, this pool of data will grow. Use of electronic data tracking system was reported as one of strategies that Nigeria used to contain 2015/2016 West African Ebola outbreak (Sifferlin, 2014).

2.3.5 Improve quality of care

When implemented successfully, the EHR system, can advance and improve a more comprehensive and accurate access to healthcare data thereby patients receive improved quality of care (Khalifehsoltani et al., 2010; Boyer, Samuelian, Fieschi, & Lancon, 2010; Sood et al., 2008; Randeree, 2007; Bossen et al., 2013). The system helps improve care given to patient by making health information accessible and this results to a reduction in medical error linked to the paper based system.

The quality of care for patient is equally reflected in test result waiting time reduction which ultimately results in the waiting time reduction of patients at the health facility. Kaushal et al., (2008) conducted an empirical study and the results indicated that a huge majority representing 97% of respondents had timely access to health records due to the EHR system and 82% indicated this positively impacted on the quality of clinical decisions.

Similarly a systematic review by Chaudhry, Wang, & Wu, (2006), on the impact of health IT on quality of care revealed an increase in healthcare delivery in the ranges of 5 to 66 percentage points.

2.3.6 Enhance productivity and efficiency

In the healthcare industry, professionals operating the paper based records usually spend their time completing paperwork and looking for records that are not readily available rather than their core duties of care giving. The EHR system implementation has resulted in a reduction of the paperwork for clinicians which in turn has lessened record keeping time and thereby optimizing the efficiency in workflow as well as productivity of healthcare professionals (Estrad, 2003). As health professionals do not have to reschedule or defer their duties whiles they wait for others to complete theirs, they become more productive (Menachemi & Brooks, 2006). According to Agrawal, (2002) the EHR systems are able to help improve productivity and efficiency in the healthcare facilities by ensuring improved resource utilization and reduction in duplication of efforts. Khan, Hedstrom, Shahid, & Anderson, (2012) confirmed this in a study conducted in Bangladesh in which a 25 year old female doctor mentioned that, using the EHR has made her more efficient and this ‘made her work easier’. This improved efficiency therefore has the probability to increase the morale and job satisfaction of employee. Evidence by Bedeley, (2014) also indicated the positive effect e-health tools like EHR has on users. Thus EHR users

are motivated to be well informed, better supported with improved outcomes in behavior compared to non-users of EHR in the same health facility (Murray, Burns, S, Lai, & Nazareth, 2009). Again as patient's visit or appointments are documented health care providers are able to routinely produce a list of codes for billings and submit for insurance claims.(Do, n.d.)

Furthermore, a study conducted in the United States of America (USA) to explore the perspective of user's with the implementation of EHR in Community Health Centers (CHC), identified that, EHR has improved efficiency of care deliveries in these CHCs. This efficiency was in two folds; workflow efficiency as providers no longer have to search paper chart flows and laboratory turn-around times were faster (Scheck, Robbins, Hirsch, Jorina, & Harrop, 2010). In another study, all thirty three (100%) respondents from different healthcare facilities reported that improved efficiency was a motivating factor for implementing EHR in their facilities (ABC-HIMSS, 2012).

2.3.7 Improved care coordination and communication

Smith et al., (2005) conducted a study and found that one out of every seven hospitalization is due to misplaced health information. This occurs because patient's health data such as diagnostic results, laboratory tests or other data are mostly unavailable when needed and in some cases are completely missing. The likelihood of misplaced or lost records are reduced with EHR system, therefore patients' health records and other important data are always available when required which enable healthcare professionals' easy access to information at the various departments and healthcare delivery point. Burton et al., (2004) posited that, advances in the EHR system improves communication which facilitates overall value-added coordination of care, among

different healthcare facilities. This care coordination among healthcare facilities is very vital in chronic disease management (Bodenheimer & Wagner, 2013).

Features built into the EHR such as email helps enhance communication by enabling clinicians of different hospitals the ability to communicate among themselves. (Menachemi & Brooks, 2006). It also allows for communication that is instantaneous and real time amongst health professional which offers clinicians the opportunity to simultaneously accomplish tasks at various sites thereby saving time (Menachemi & Brooks, 2006). This is confirmed by a study conducted by Kaushal et al., (2008) which identified that majority of study respondents in (72%), indicated EHR improved care coordination as well as communication with patients.

2.3.8 Better Patient Experience and Involvement

According to literature, only a small proportion of patients will stop seeing their clinician due to lack of confidence in them (Advancedmd, 2013). However, most patients leave when they experience long waiting periods, billing errors, poor follow-up and rudely un-cordial interactions with healthcare professionals all of which can be controlled with the use of EH R (Advancedmd, 2013). Patients accept technology that involves them in their own health care. EHR enables clinicians to print salient self-management tools, educative materials and self-readable and explanatory clinical summary for their patients when they visit the facility. Again, EHR uses stored patients' laboratory results and vital signs to create automated graphs and charts and this enables patients know and see how they are faring in managing their health. Furthermore, EHR helps healthcare providers to send reminders to patients when their follow up dates are due. All these help in the healing process, as patients' involvement is key to their own healing process.

2.3.9 Reduction of cost and enhanced revenue

The increased cost of providing healthcare can partly be attributed to inefficiencies of paper-based systems. Processes in the manual procedure such as physician's dictated noted transcription expenses incurred, filing, pulling, charts maintenance and storage cost are some of the well-known expenditures associated with the paper based system (Brochure, 2005). Menachemi & Brooks, (2006) reiterated that many health facilities that implemented the EHR experienced reduction in supply and printing cost. As such the expenditure incurred in initiating and maintaining paper based health records comprising printing cost, clerical supplies and cost of paper are reduced when EHRs are used. A study by (Ewing & Cusick, 2004) in a health facility reported 90% reduction in the paper backlog after a few months of implementing an EHR system and this led to a decline in paper and supply costs. Remlex (2007) also argued that use of ICT in the health sector is cost efficient. Additionally, EHR implementation improves revenue collection by ensuring that charges for medications, medical supplies and clinical services are accurately captured (Menachemi & Brooks, 2006).

Also, Agrawal, (2002) buttresses on the role EHRs play in enhancing the cash flows of the healthcare facilities when implemented. Since patients' visits, diagnoses and medication are well documented the EHR's claims-related structured data sets such as Current Procedure Terminology (CPT) codes and International Classification of Diseases (ICD) automatically generate codes for billing and claims purposes (Mitre, 2006). This practice reduced billing errors and increased cash flow thereby enhanced revenue to the health facility (Menachemi & Collum, 2011).

2.4 Challenges to EHR usage

In spite of the remarkable benefits of EHR system, the successful implementation of the system is faced with numerous challenges that must be addressed by managers or stakeholders before making any commitment to its' adoption. The current challenges affecting implementation of EHR in most healthcare facilities include the standardization software and hardware, huge resources required to purchase EHR software and hardware, maintenance and systems sustainability as well as human resources with inadequate computer literacy. Other costs incurred through upgrades to the system that are regular and constant maintenance produces a situation whereby clinicians and hospitals are discouraged to add to their operations an EHR system.

2.4.1 Cost

In the implementation of the EHR system, the cost involved remains one of the greatest challenges (David W. Bates, Gotlieb, Ebell, Zapp, & Mullins, 2003). This cost comprises huge start-up and ongoing cost and uncertainty surrounding the return on investment (ROI). This start-up cost or initial installation cost includes the funds to purchase both hardware and software and cost for training of staff. The ongoing cost is the additional funds needed for regular upgrades and maintenance of systems (Palabindala, Pamarthy & Reddy, 2016). Advanced countries such as U.S. U.K and Australia that have implemented the EHR system successfully have a healthcare system that are very robust and fast growing with significant funding and aid from their respective governments (Sood et al., 2008). In these countries, commitment to invest in research and development is of outmost importance for successful development of health information systems to meet their needs. Whereas in Ghana and other developing countries the situation is somehow different, as government and other institutions' commitment to funding healthcare infrastructure development is not encouraging.

A study on the barriers and factors that contribute to usage of EHR in Nairobi, Kenya in 2016, had concerns raised on EHR sustainability since there were different strategies used for funding different health information systems applications. According to the study, different institutions have mandates and commitments that are diverse and do not line up their resource planning for systems, software and social challenges (Jawhari et al., 2016). One primary challenge in adopting the EHR system is the cost together with some form of uncertainty about the future financial gains or return on investment (ROI) from the implementation (Miller & Sim, 2004). From the study, the up-front costs for EHR implementation could range from $16,000 to $ 36,000 especially during EHR transition stage.

Kuoni, (2012) in a study indicated that according to healthcare administrators, the major reason for not implementing the EHR system is because the financial gains of EHR seems unattainable. In the adoption of EHR, the initial installation phase presents institutions with significant expenses. Therefore, appropriate allocation of capital investment to information systems infrastructure development by healthcare institutions must be embarked on if they want to adopt the system since they cannot acquire such systems without available funds (AL-nassar, Abdullah, & Osman, 2011).

2.4.2 Lack of committed Human Resources with computer literacy

Another challenge to EHR usage borders on human resource availability with the required skillset and commitment to manage the systems effectively. Computer literacy and the needed Information Technology (IT) infrastructure availability such as computers are generally identified as a requirement for system utilization which serves as a contributing factor to the low level of usage by clinicians (Laerum, Ellingsen, & Faxvaag, 2001). In numerous studies on EHR systems, conclusions were drawn that computer skill is a key factor in assessing system

utilization. Eijden et al., (2003) opined that paper based records are preferred by inexperienced computer users to EHR. Similarly, Dansky et al. (1999) indicated that computer usage experiences, perceived benefit, support and expectation of EHR offers an organization, in a way, affects the extent to which clinicians positively view the system.

Ammenwerth, (2003) indicated that use of computer based documentation system by nurses' is largely influenced by their earlier self-confidence during the use of computers. According to Davis, (1989) computer system use may be more linked to apparent usefulness rather than perceived change of ease. Paterson et al. (2011) also indicated that clinicians had problems adapting EHR to their normal workflow changes. As a result, frequent calls were made to technical team for support in ensuring free flow of operations. A related study among multi-disciplinary family medicine group showed that, workflow management changes poses the greatest challenges that must be addressed (Gagnon, Desmartis, Legare, & Lamotle, 2010). According to the study, during the implementation of EHR, substantial amount of time was spent in scanning the documents to be saved in an electronic format therefore it was perceived by staff as a duplication of their work in maintaining paper records in addition to creating records online.

In other studies, age was determined as a factor affecting the realization of EHR system usefulness. Change within the healthcare sector is a major challenge because senior clinicians are afraid of change when it has to do with their work practices (Lium, 2007). In the successful implementation of EHR, staff with the sufficient know how of disease classification systems poses a challenge and efforts to build an online coding will take some amount of time.

2.4.3 Privacy and Security Standards

A major issue for organizations and governments is information security and privacy. In the health care sector, information protection is of utmost importance. The use of IT to share information presents a great risk to patients' security and privacy of personal and health information. A study conducted by Tomasi et al., (2004) emphasized since computers are very powerful tools that helpin the management of large volumes of clinical data generated in recent years, it is important to put in place measures to ensure that healthcare information on patients is made readily available to only clinicians or to those with authorized access to patient's medical information. This is necessary so that breach of privacy and confidentiality rights of patients with EHR system are avoided to help build trust between health care providers and patients, so that patients feel free to disclose their health status to clinicians for better quality of care. In Europe, studies conducted on the evaluation of electronic health information storage and communication indicated that EHR experience and personal exchange of information between healthcare providers in a secure and safe systems increased the confidence of patient in such technology (Pyper et al., 2004; Tjora et al., 2005).

Other related studies has also indicated how patients and clinicians advocate that access to medical record among healthcare professionals should be limited in order to decrease the possibility of the records being misused (Bolton Research Group, 2000; Carman & Britten, 1995). Legal, ethical and social consequences are incurred due to security breaches in the health sector which may result in lawsuits against providers. Clinicians have the responsibility to ensure that patient medical information are kept confidential at all times nevertheless, medical information kept in an electronic format that can be easily accessible and shared by many clinicians comes with enormous challenges of information protection (Canadian Medical

Protective Association, 2014). Furthermore, HIPAA (2015) directs that, regardless of how healthcare information on patients is presented, it is the responsibility of providers to put measures in place to safeguard the information of patients and conform to regulations.

2.5 EHR in Ghana

In Ghana, the health system has an essential objective of maintaining and improving the health outcomes of the citizens and the Ministry of Health (MOH) over the years has explored new ways of service delivery to improve the investment outcomes being made in the sector. E-health implementation presents innovative prospects for making progress in the performance of the sector. According to Afarikumah, (2014) the Government of Ghana (GoG) in 2010 launched the e-health national strategy to streamline the health data regulatory framework and management of information, build capacity of sector for wider application of solutions in e-health, increase access while bridging the equity gap in the sector through the use of ICT and towards a paperless records and reporting system.

There were only a few EHR systems in use in Ghana as at 2014 ("Towards eHealth 2.0 in Ghana: A programme and opportunities for private and public ICT initiatives," 2014). Achampong, (2012) indicated a hybrid system between paper and EHR are used by the medical facilities and several reasons account for this, one of which is that the EHR systems are relatively new in Ghana. A study by Varga, (2011) estimated that it would take a medical facility about 10 - 15 years to migrate from a paper based system to an EHR system. A second reason why hospitals adopt the hybrid system is as a result of requirement from the Ghana Health Service (GHS) which is a body of government that has directed all medical facilities to provide paper records for services rendered for purposes of auditing (Acquah-swanzy, 2015). The Health Administration Management System (HAMS) is one of the EHRs used in a hybrid system.

Ghana has no e-health operational architecture in place and existing systems are not based on any defined data standards and sets with most of the systems in place as "silos" most of which run on different operating systems, generate different reporting formats and data sets and data from one system cannot be interfaced with any other (Ghana: E-Health Startegy, n.d.).

2.6 Benefits Realisation Assessment

Benefit Realization (BR) has been described using a varied range of terms, this comprises benefit management, benefits realization approach and others but they all discuss related set of procedures, deliverables and roles which enable an organization to identify, manage and realize the benefits from investments made. BR has be given several definitions as "one becoming fully aware of the positive impact as a result of a change" (Sapountzis, Harrris, & Kagioglou, 2007), "process of organizing and managing such that the potential benefits arising from the use of IT are actually realized"(Peppard, Ward, & Daniel, 2007).

Literature has it that, the increase of interest in benefit realization has come in the wake of increasing use of IT, thus an organization that invests a chunk of money into a new system would like to ensure it receives the benefits from the investments made. Thus benefits are measured in terms of value for money and quality of service (Breese et al., 2018).

According to Thompson, Osheroff, Classen, & Sittig, (2015) most health facilities wait to implement EHR systems and then look for evidence of benefits, so they tend to lose a lot of improvement phases during their implementation and early use. So they reiterated the need for organizations to monitor the quantitative benefit metric so that amendments can be made if expected benefits are not gained in a timely manner.

DeGiovanni, King, Izmailova, Keyes, & Ho, (2015) in their article on a Benefit realization management strategy for EMR implementation framework utilized three key domains as the foundation to assessing the benefits of the EHR use. In the first domain, information quality and service quality. The second is the use and user satisfaction which includes the ease of use, competency, behavior and pattern use. The last domain represents the benefits that accrue from using such a system comprising Patient Safety, Effectiveness, Health Outcomes, Ability of patients/providers access to services Patient and provider participation, Efficiency and Care coordination.

Other literature on benefit realization assessment have listed a set of key processes that organizations have to go through to realizing benefits. Sapountzis et al., (2007) stated that organizations embarking on any system in health care must clearly define, understand their expected benefits otherwise when problems occur, it will be difficult to be focused. They emphasized the difficulty in measuring all benefits from an investment as some benefits may have resulted indirectly from a change and not what were expected and the intangible ones which cannot be expressed in a profit or loss account. A report by the Office of Chief Information Officer (OCIO) of Victorian Government in Melbourne stated identification of benefit as an initial high level view and the benefits should be Specific, Measurable, Attainable, Relevant, Time-bonded (SMART). (OCIO & Health Report, n.d.) Secondly, both reports emphasized the need for organizations to identify and engage stakeholders as this is important step that puts the responsibility of delivering benefits in the hands of these stakeholders. Thirdly, organizations should prepare the benefit management plan and define target as these will assist them to monitor benefits that will be derived from the project. Sapountzis et al., (2007), added that

CHAPTER THREE

METHODS

3.1 Introduction

This chapter covers the processes and methods used to collect the required data for the study. It outlines the type of study, research design, sampling procedure, population and sample size among others. The population for the study is clearly defined while the main sampling methods employed in the study are also defined and explained.

3.2 Study Design

This design is a descriptive case study which used quantitative method to collect or gather the data. Leedy and Ormrod (2005) indicated that to respond to questions about the relationships between variables that are measurable with the resolve to explain, predict and control a phenomenon, a quantitative research is used. This method was considered appropriate because it best describes the characteristics, perceptions and opinions of the group under study to ensure that the objectives of this study would be achieved. A questionnaire that is structured descriptively comprising four sections was used to obtain this information.

3.3 Research Setting

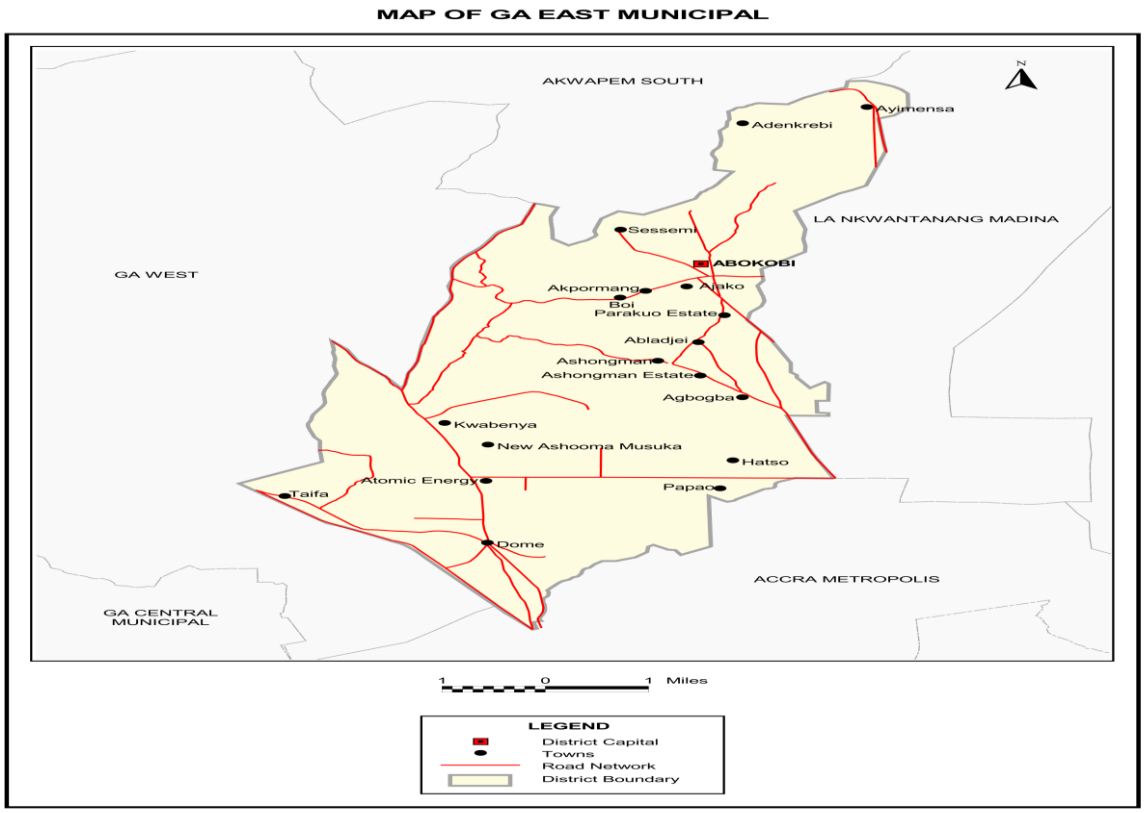
The Ghana Atomic Energy Commission Clinic is a quasi-government facility situated at Atomic Kwabenya which is one of the Towns in the Ga East Municipal District. It was established in 1963 as part of the Atomic Energy Project with the goal of providing health services to staff of the commission and their immediate families but currently the facility has extended its services to the general public. The administration of the clinic is headed by a medical superintendent who

sees to day to day operation. The clinic runs an Outpatient Department (OPD) and Inpatient Department. The first point of call for every patient is the OPD, where patients are attended to by nurse where their vitals are taken referred to appropriate consulting rooms. The clinic has six departments namely Pharmacy, laboratory, nursing, administration, accounts/stores and records. The facility is an NHIS accredited provider with a bed capacity of 39 and a total staff of 137 comprising doctors, nurses, pharmacist, laboratory technicians, radiographers, record officers, accountant, administrators and Information and technology. The staff of GAEC are made up of permanent, locum and contract professionals. Services offered are general OPD care, Internal medicine, Surgical, Obstetrics and Gynecology, Paediatrics, Dietetics, Electrocardiograph and Reproductive and Child Health.

3.4 Demography of Ga East Municipal

GAEC can be located in the Ga East Municipality at the northern part of the Greater Accra Region with twenty six (26) Metropolitan, Municipal and District Assemblies (MMDAs). The population of the Municipality stands at 147,742 representing 3.68 percent of the region's total population with 72,987 (49%) males and 74,755 (51%) females (GSS, 2012). About ninety percent of the population is rural. The municipality has a sex ratio of 97.6. It has less than half (40.3%) of the population below 20 years which is not an indication of a youthful population. The total age dependency ratio for the Municipal is 52.2 with 52 in urban areas and 53.3 in rural areas (GSS, 2012).

Figure 2 Map showing Ga East District



Source: (GSS 2014 "Ga east municipality," n.d.)

3.5 Study Population

The research population for this study was sixty one (61) respondents from the various departments at GAEC comprising the managers, heads of department and health professionals (end users) these are doctors, pharmacist, records officers, laboratory technicians, administrative and IT staff and all others who use the system in the health facility.

3.6 Sampling method

In this study, the selection of the respondents in each department was based on census. That is those who had access or used the EHR system and their availability at the time the data were collected.

3.7 Data Collection Tools

The study used a structured questionnaire as its main data gathering tool. The questionnaire has both open-ended and close-ended questions. The open-ended questions gave respondents the choice to determine the level of detail and length of some accounts to enable the researcher understand their point of view. The open-ended questions permitted the respondents to give a more adequate presentation of their understanding or appreciation of the issue under study and convey flexibility in their choice in an unstructured way, hence providing a kind of qualitative data. Conversely to limit other responses to specific choices while curtailing the risk of misinterpretation, close-ended questions was used. A copy of the questionnaire used for this study is attached as Appendix I

3.8 Data Collection Tool Design and Administration

The questionnaire had four sections with Section A covering the demographic information of the respondents, whiles Sections B, C and D comprised list of statements and questions which were derived from literature eliciting for their expected benefits, actual benefits realized and challenges encountered during implementation and use of the EHR system respectively. The respondents were required to rate their level of expectation, actual benefits realized and challenges on a Likert scale of 1 to 5 where 5 is greater than 1 (5>1). The scale ranges from “Strongly agree” (5), “Agree” (4), “Neutral” (3) “Disagree” (2), “Strongly Disagree” (1). The

questions required participants to list any other expected, actual benefits**,** challenges encountered and recommendation. The questionnaire was self-administered by each respondent (staff) after permission had been sought from the management of GAEC and each respondent agreeing to partake after reading the participant consent form. At least a minimum of 30 minutes was used in filling the questionnaire.

3.9 Data Analysis

The data screens were designed in Epi data version 3.1. In order to ensure a high level of data accuracy, double entry was done on each by different data clerks. The two datasets were validated and all the discrepancies were cleaned or corrected. This process of validation was done till the two datasets were the same. Also, internal consistency checks was ran to pick out errors which were not noticed or picked during data validation, this provided an inherent consistency in the output of the variables. The data was exported into STATA version 15 to be analyzed and general frequencies and cross tabulations were run for input into tables.

Section A of the analysis involved descriptive univariate analysis where frequencies and means for continuous variables were derived to describe demographic characteristics of the respondents. Thus, analysis centered on information regarding respondents' gender, age, highest educational qualification, professional role, and number of years worked in the health facility and used the HER system. Descriptive statistical tools such as tables were used to illustrate the data in this section.

For section B and C the study examined five benefits and each benefit had some indicators so composite variables were created for all the indicators of each benefit and run an average of the composite variable created. An average of the average composite variable was calculated to

establish which benefits respondents rated as high by using their mean score, thus the higher the mean score of a benefit the higher the perception of expected or realized benefit. Also t-test was done to determine the difference between the perception of expected benefits and the benefits that were realized. Further analysis were done comparing the expected, realized benefits and challenges encountered among staff who have used the EHR system for less than two years and those who have used it for two years or more, health workers and non-health workers and among the various departments.

In Section D, which comprises a list of negative statements representing the challenges encountered during the implementation and use of the EHR, the mean score of each statement was generated. The higher a mean score of a statement then it was rated as a major challenge.

3.10 Ethical Issues

Approval of the study was sought from the Management of GAEC clinic. Informed verbal consent was sought from every participant before the interview with them. Participants were informed of their right to opt out anytime in course of the interview. Confidentiality was maintained on any information obtained from the participants. Names were not included in the questionnaires and codes were used for identification purposes. The researcher ensured that participation is this study was purely voluntary, without any element of coercion. To ensure privacy, questionnaires were given to respondents in their various offices at the health facilities. Where such facilities were not available, they were called aside and the questionnaire handed over to them in a confidential manner. Data collected was treated as confidential and participants were informed that the interaction with them will take 30 minutes.

3.11 Pretesting

The questionnaire was pretested at Ledzokuku Krowor Municipal Assembly (LEKMA) hospital. The pretesting was done with doctors, nurses and records staff. The pretesting exercise helped to redefine some aspects of the questionnaires to make it easier and self-explanatory, hence reducing the time spent on answering.

3.12 Limitation of Study

The study was limited to one facility, therefore conclusions drawn should be placed in that context. Again In-depth interview would have added more details on the reason behind the numbers in the quantitative. A mixed method study should be used for any future study.

CHAPTER FOUR

RESULTS

4.1 Introduction

This section presents the analysis of the findings of the study conducted at GAEC. The data from the study is described using tables to enable the researcher report the observation to address the objectives of the study.

4.2 Description of Demographic Information

The study sampled sixty one (61) professionals from various departments at the facility with a mean age of 30.9 and a median working experience of 4. From the results of the study, 59.02% of the respondents are female. Out of the 61 respondents interviewed 34.43% and 6.56% were Nurses and Doctors respectively

Table 4.1: Demographic data on respondents

Variables	No. of Observations N = 61 (100%)
Sex	
Male	25(40.98%)
Female	36(59.02%)
Age (Mean, ± SD 30.9, 7.18)	
20-30	35(57.38%)
31-40	23(37.70%)
40-50	1(1.64%)
51-60	2(3.28%)
Education Level	
Certificate	12(19.67%)
Diploma	9(14.75%)
Degree	34(55.74%)
MBChB	4(6.56%)
Masters' Degree	2(3.28%)
Profession	
Doctor	4(6.56%)
Hospital IT staff	3(4.92%)
Pharmacist	2(3.28%)
Nurse	21(34.43%)
Records Officer	11(18.03%)
Laboratory Technician	6(9.84%)
Accounts Officer	2(3.28%)
Stores Officer	1(1.64%)
NHIS Claims Officer	2(3.28%)
Medicine Counter Assistant	6(9.84%)
Dispensing Technician	2(3.28%)
Accountant	1(1.64%)
Years of using the system	
> 1 year	28 (45.90%)
2 or more years	33 (54.10%)
Years of working experience, Median (LQ-UQ)	4(3-5)

(Source: Field Data, 2018)

4.3 Expected and Realized Benefits of Quality of Care

This section combines the first and second objectives of the study to explore stakeholders expected and actual benefits realized from implementation of EHR. The study had a list of perceived benefits that respondents rated on a 5 point scale. The benefits comprised Quality of

Care with its sub-indicators as evidence based decision making and patient safety, Communication, Coordination and access to care, Efficiency, Patient Experience and Expected Usefulness The tables illustrate the expected and realized benefits in mean scores, standard deviation and their associated *p* values. In comparing the perceived and the actual benefits realized, the paired t test showed that in all cases the average perceived benefit scores were higher than the actual benefits realized. Results from the study indicated that the level of expectation of respondents on the quality of care was high with a mean score of 3.95 compared to the actual benefits which had a mean score of 3.68 out of a mean score of 5. This difference was significant with a (*p*=0.004**),** at an alpha of 0.05. The study results established that the staff interviewed had a high expectation of EHR enabling evidence based decision making (M=4.02; SD=0.60) while ensuring safety of patient (M=3.85; SD=0.70). These values were significantly different from the actual benefit realized with mean scores of "evidence based decision making" (M=3.80; SD=0.57) and "safety of patient" (M=3.50; SD=0.77).

Table 4.2: Expected and realized benefits of Quality of care

Benefit	Expected		Realized		P value
	Mean	SD	Mean	SD	
QUALITY OF CARE	3.95	0.60	3.68	0.61	0.0040
Evidence-based decision making	4.02	0.78	3.80	0.57	0.0123
Patient information/records will be easily accessible	4.21	0.69	4	0.80	
Will enable clinical teams to keep more accurate patient information/records	4.21	0.67	3.87	0.74	
Will enable clinical teams to keep more accurate patient information/records	3.97	0.95	3.79	0.90	
Will enable clinicians order fewer tests due to better availability of lab results	3.54	1.04	3.30	0.80	
Will enable ordering diagnostic or investigative test(lab and x-rays) electronically at point-of-care	4	0.86	3.82	0.83	
Will enable ordering prescriptions electronically at point of care	4.20	0.73	4	0.68	
Patient Safety	3.85	0.70	3.50	0.77	0.0030
Will enhance reduction in medical error due to legibility of automated patient data	3.70	1.00	3.41	0.90	
Will alert clinician\you to a potential medication error due to drug allergy	3.72	1.02	3.44	0.92	
Will help clinician\you order more on-formulary drugs(ie drugs that are safe and effective)	3.81	0.98	3.54	0.83	
All progress notes will be automated	3.92	0.78	3.64	0.90	

(Source: Field Data, 2018)

4.4 Expected and realized benefits of Communication, coordination and access to care

With regards to "Communication, Coordination and Access of care" respondents' perception to yield this benefit was quite high with a mean score (M=4.05; SD=0.70) and this was significantly different from the actual benefits realized (M=3.69; SD=0.87) at a (*p* value= 0.0081). Interestingly, study respondents had high perception of same mean of 4.13 of sub indicators like exchange of patient clinical summaries, efficient communication among clinical team members and coordinated care among clinical team members.

Table 4.3: Expected and realized benefits of Communication, coordination and access to care

Benefit	Expected		Realized		P value
	Mean	SD	Mean	SD	
COMMUNICATION, COORDINATION AND ACCESS TO CARE	4.05	0.70	3.69	0.87	0.0081
Will enable exchanging of patient clinical summaries with other physicians	4.13	0.78	3.85	0.83	
Will enable efficient communication among clinical team members	4.13	0.87	3.72	1.03	
Will enable coordinated care among clinical team members	4.13	0.76	3.67	1.03	
Will enable scheduling of appointments and coordination of patient visits	3.80	0.96	3.52	1.01	

(Source: Field Data, 2018)

4.5 Expected and realized benefits of Efficiency

On the other hand, the level of perception in relation to expected and realized benefit on efficiency was (M=3.84; SD=0.71) and (M=3.51; SD=0.72) respectively. With expected mean score relatively higher than the realized with a significant difference (*p* value=0.0007). Among the sub indicators "EHR making records more readily available at the point of care" had scores in both expected (M=4.28; SD=0.79) and realized (M=3.97; SD=0.95).

Table 4.4: Expected and realized benefits of Efficiency

Benefit	Expected		Realized		*p* value
	Mean	SD	Mean	SD	
EFFICIENCY	3.84	0.71	3.51	0.72	0.0007
Will make records more readily available at the point of care	4.28	0.79	3.97	0.95	
The amount of time spent to plan, review, order and document care will decrease	3.64	1.00	3.49	1.13	
Will enable clinician\you access a patient's chart remotely (e.g., out of facility, from home)	3.30	1.07	3.16	0.97	
Will enable the timely access to investigative or diagnostic ie(xray,lab etc) results	3.54	0.91	3.36	1.00	
Will enable multiple staff with appropriate access privileges view and modify a single patient's information/record simultaneously	4.23	0.88	3.67	0.87	
Will speed up work process increasing productivity	3.74	1.11	3.51	0.07	
Billing for services will be more complete	4	1.05	3.30	1.07	
Will enhance revenue due to accurate and complete billing processes	3.87	1.02	3.61	1.04	
Will be beneficial to your workflow	3.93	0.93	3.51	1.09	

(Source: Field Data, 2018)

4.6 Expected and realized benefits of Patient Experience

The perceived benefits of involving patients in their own care was rated at (M=3.68; SD=0.74) which is higher compared to the realized benefit with (M=3.41; SD=0.82) and the two scores are significantly different (*p*=.018).

Table 4.5: Expected and realized benefits of Patient Experience

Benefit	Expected		Realized		P value
	Mean	SD	Mean	SD	
PATIENT EXPERIENCE (PATIENT INVOLVEMENT IN CARE)	3.68	0.74	3.41	0.82	0.018
Will facilitate communication with a patient	3.72	1.20	3.51	1.06	
Will provide patients with clinical summaries for each visit	4.10	1.01	3.57	1.06	
Will enable health professionals send reminders for recommended services and follow-up visits	3.62	1.04	3.23	0.94	
OPD will be less congested because of system usage	3.43	1.09	3.15	1.25	
Patients waiting time will decrease	3.40	1.13	3.20	1.31	
Patients will be less susceptible to unnecessary diagnostic tests because of timely accessibility and availability of patient information	3.54	1.12	3.62	1.13	
Will save cost as patients will be less susceptible to duplication of test	3.82	1.02	3.43	0.99	
Patients will be given self-management tools (printed materials)	3.59	0.96	3.33	1.01	
Privacy of patient information/records will be assured	3.90	0.81	3.70	0.90	

(Source: Field

4.7 Expected and realized benefits of Usefulness of the system

The respondents rated how useful the EHR system (Carewex) was and the results from the study indicated a high expected usefulness benefit with a mean score (M=3.75; SD=0.96). Whereas the realized benefit was relatively low with a mean score (M=3.40; SD=1.5). These scores were significantly different (*p*=.00232). Other benefits identified from the study include reduction in the use of paper.

Table 4.6: Expected and realized benefits of Expected Usefulness

Benefit	Expected		Realized		P value
	Mean	SD	Mean	SD	
EXPECTED USEFULNESS	3.75	0.96	3.40	1.15	0.0232
Using Carewex will make it easier to do my job	3.66	1.10	3.36	1.16	
Using Carewex in my job will enable accomplish tasks more quickly	3.77	1.07	3.38	1.23	
Using Carewex will improve my job performance	3.79	1.03	3.44	1.13	
Using Carewex will enhance my effectiveness on the job	3.79	1.10	3.44	1.15	

(Source: Field Data, 2018)

4.8 Total mean score of benefits

In comparing the overall expected and actual benefits realized, the paired t test showed that there is a significant difference between the two with the expected higher than the actual with a total average mean score of (M=3.84; SD=0.62)3.84 and (M=3.64; SD=0.72) respectively and this difference was significant.(*p* value=0.0298).

T''able 4.7: Total mean score of benefits

Total Mean Score of benefits	Mean	SD	P value
Expected	3.84	0.62	0.0298
Realized	3.64	0.72	

(Source: Field Data, 2018)

4.9 Challenges Encountered during Implementation and use of EHR system

The negative perceptions concerning the EHR system range from insufficient training, system downtime, inadequate technical support as well as users non-involvement during the planning stages. The first three highest rated negative perceptions were "insufficient training", "work overload" and "system downtime." They had a mean score of 3.62, 3.46 and 3.42 out of a possible 5.0 respectively. Inadequate training was identified as a major challenge to the entire process. This lead to incompetency in the use of the system resulting in respondents not becoming skillful at using the system.

On the other hand "Inadequate computer knowledge affected smooth use" was the lowest rated challenge during the use and implementation of EHR with a mean (M=2.66; SD=1.03). Other challenges identified from the study include the inability to update the system and lack of computers and some laboratory analyzers not interoperable with the Carewex system. The results are presented in Table 4.8.

Table 4.8: Challenges Encountered during Implementation and use of EHR system

	Mean Score	Standard Deviation
Insufficient training has led to less competency in Carewex usage	3.62	1.07
Work overload discourage users from using the system	3.46	1.04
System downtime has led to users inability to capture all data leading to work overload	3.42	1.15
Lack of on field technical support during implementation affected usage	3.41	0.86
Users non-involvement during the planning stages	3.30	1.07
Untimely system technical support	3.38	0.92
Frequent downtimes led to system unreliability resisting usage	3.31	1.04
Frequent power outage has resulted in frequent system downtime resulting in lack of interest in using EHR	3.28	1.08
Resisted usage due to non-involvement of users, saw it as an imposition	3.16	1.08
Learning to use Carewex was very difficult	3.05	1.09
I find Carewex/system not flexible and friendly to interact with	3.07	1.29
Lack of reconciliation between system workflow and business workflow	3	1.03
Resistance of staff to change work habits	2.99	1.06
It has not been easy for me to become skillful at using Carewex	2.80	1.05
Patient confidentiality not assured	2.67	1.12
My interaction with Carewex/system has not been clear and understandable	2.54	1.16
Inadequate computer knowledge affected smooth use	2.66	1.06
Overall Total	**3.12**	**0.54**

(Source: Field Data, 2018)

4.10 Analysis of comparison between health workers and non-health workers

Further analysis was done to compare the perception of benefits among health workers and non-health workers. Summarily non-health workers had a higher perception of the EHR (Carewex system) with a total average mean score of 3.65 and 4 as compared to the health workers whose mean score were 3.63 and 3.7 for the actual realized and expected respectively. These difference were not significant (*p* value= 0.9107 and (*p* value= 0054).

Table 4.9: Actual and Expected Benefit Realized between health workers and non-health workers

Benefit	Health Worker Mean	SD	Non-Health Worker Mean	SD	P value
Actual					
Quality of care	3.74	0.61	3.61	0.63	0.4474
Communication, coordination and access to care	3.67	0.98	3.72	0.73	0.7980
Efficiency	3.93	0.87	3.90	0.73	0.8723
Patient experience (patient involvement in care)	3.32	0.86	3.53	0.78	0.3260
Expected usefulness	3.39	1.14	3.43	1.11	0.8843
Overall Average	**3.63**	**0.76**	**3.65**	**0.68**	**0.9107**
Expected					
Quality of care	3.93	0.69	3.99	0.50	0.7350
Communication, coordination and access to care	4.05	0.73	4.04	0.66	0.9627
Efficiency	3.64	0.73	4.06	0.63	0.0190
Patient experience (patient involvement in care)	3.47	0.87	3.93	0.45	0.0108
Expected usefulness	3.48	0.98	4.06	0.85	0.0164
Overall Average	**3.7**	**0.71**	**4.00**	**0.46**	**0.0541**

(Source: Field Data, 2018)

4.11 Challenges between health workers and non-health workers

The challenges encountered during the implementation and the use was explored among health workers and non-health workers. The findings of the study show that there was no significant difference between the two groups at (*p* value=0.7541) with mean scores (M=3.10; SD=0.42) and (M=3.15; SD=0.66) respectively.

Table 4.10 Challenges between health workers and non-health workers

Total Mean Score of benefits			**P value**
	Mean	**SD**	
			0.7541
Health Worker	3.10	0.42	
Non-health Worker	3.15	0.66	

(Source: Field Data, 2018)

4.12 Analysis of comparison between Staff with <2years of Use and Staff with >2years of Use EHR (Carewex)

A paired t-test was ran for staff who have used the system for less than two years(<2years) and those with more than two years(<2years) of use. The results showed that though those with >2years of use had high perception of the expected benefits with a mean score of 4 which was significantly different (*p* value= 0.0054) from those with <2years using the EHR. Their realized benefits was slightly lower but the difference was not significant (*p* value= 0.5907)

Table 4.11: Actual and Expected Benefit between Staff with <2years of Use and Staff with >2years of Use EHR (Carewex)

Benefit	Used Carewex <2yrs	SD	Used Carewex 2yrs and More	SD	P value
Actual					
Quality of care	3.74	0.61	3.61	0.63	0.4474
Communication, coordination and access to care	3.67	0.98	3.72	0.73	0.7980
Efficiency	3.93	0.87	3.90	0.73	0.8723
Patient experience (patient involvement in care)	3.32	0.86	3.53	0.78	0.3260
Expected usefulness	3.39	1.14	3.43	1.11	0.8843
Overall Average	**3.70**	**0.59**	**3.60**	**0.82**	**0.5907**
Expected					
Quality of care	3.93	0.69	3.99	0.50	0.7350
Communication, coordination and access to care	4.05	0.73	4.04	0.66	0.9627
Efficiency	3.64	0.73	4.06	0.63	0.0190
Patient experience (patient involvement in care)	3.47	0.87	3.93	0.45	0.0108
Expected usefulness	3.48	0.98	4.06	0.85	0.0164
Overall Average	**3.61**	**0.60**	**4.00**	**0.58**	**0.0054**

(Source: Field Data, 2018)

4.13 Challenges between Staff with <2years of Use and Staff with >2years of Use EHR (Carewex)

The paired t-test was ran for staff these two groups showed that there was no significant difference with the regards to the challenges they encountered (*p* value= 0.7841).

Table 4.12 Challenges between Staff with <2years of Use and Staff with >2years of Use EHR (Carewex)

Total Mean Score of benefits	Mean	SD	P value
Used Carwex >2yrs	3.14	0.49	0.7841
Used Carwex 2yrs or more	3.11	0.59	

(Source: Field Data, 2018)

4.14 Comparison among departments that Use EHR (Carewex)

An analysis of variance (Oneway) was done to assess the potential differences in the perception of expected and realized benefits and challenges among the seven departments and to determine which department mean score differs significantly from the rest. The output shows that for "Quality of Care" though there were differences in their mean scores for both expected and realized benefits, with users in the laboratory department having a high perception, the differences were not significant at (p=0.219 and p=0.099) respectively.

Table 4.13: Expected and realized benefits of Quality of Care among departments

Benefit	Expected		P value	Realized		P value
	Mean	SD		Mean	SD	
			0.219			0.099
Consulting	4.4	0.69		4.35	0.75	
Pharmacy	3.84	0.81		2.81	0.51	
Nursing	3.75	0.55		3.77	0.49	
Information & Technology	4.23	0.31		4.07	0.45	
Laboratory	4.5	0.55		3.57	0.50	
Records	3.9	0.322		3.80	0.20	
Accounts	3.97	0.61		4.08	0.39	

(Source: Field Data, 2018)

4.15 Expected and realized benefits of Communication, Coordination and access to care among departments

There was a significant difference in the average mean score (p<0.0001) among staff in the various departments with regards to the realized benefits of "Communication, Coordination and Access to Care". The Bonferroni analysis showed differences between Nursing and Pharmacy (p=0.003), Laboratory and Nursing (p=0.033), Records and Pharmacy (p=0.018) and Accounts and Pharmacy (p=0.024).

Table 4.14: Expected and realized benefits of Communication, Coordination and access to care among departments

Benefit	Expected		P value	Realized		P value
	Mean	SD		Mean	SD	
			0.063			0.000
Consulting	4.38	0.72		4	0.29	
Pharmacy	3.82	1.02		2.83	0.76	
Nursing	3.99	0.58		3.96	0.64	
Information & Technology	4.33	0.14		4.17	0.14	
Laboratory	4.38	0.95		2.83	1.58	
Records	4.02	0.45		3.95	0.10	
Accounts	4	0.74		4.13	0.75	

(Source: Field Data, 2018)

4.16 Expected and realized benefits of Efficiency among departments

There were significant differences in the average mean scores of perceptions with regards to "Efficiency" of both expected (p=0.041) and realized (p=0.002**)** with significant differences at all levels of the departments with the exception of staff in the laboratory who had no significant difference with other staff for the realized benefits.

Table 4.15: Expected and realized benefits of Efficiency among departments

Benefit	Expected		P value	Realized		P value
	Mean	SD		Mean	SD	
			0.041			0.002
Consulting	4.00	0.38		3.94	0.45	
Pharmacy	3.66	1.01		2.6	0.50	
Nursing	3.53	0.73		3.63	0.72	
Information & Technology	4.15	0.17		4.11	0.29	
Laboratory	3.96	0.74		3.17	0.93	
Records	4.23	0.41		3.79	0.18	
Accounts	4.09	0.43		3.83	0.41	

(Source: Field Data)

4.17 Expected and realized benefits of Patient Experience and Involvement in Care among departments

There was no significant difference among departments in both benefits with the rating of "Patient Experience and Involvement in Care"

Table 4.16: Expected and realized benefits of Patient Experience and Involvement in Care among departments

Benefit	Expected		P value	Realized		P value
	Mean	SD		Mean	SD	
			0.066			0.084
Consulting	3.67	0.90		3.72	0.58	
Pharmacy	3.69	0.67		2.74	0.59	
Nursing	3.34	0.84		3.50	0.80	
Information & Technology	3.85	0.45		3.93	0.51	
Laboratory	3.83	1.05		2.63	1.01	
Records	3.94	0.40		3.89	0.33	
Accounts	4.13	0.33		3.69	0.98	

(Source: Field Data, 2018)

4.18 Expected and realized benefits of Usefulness of the system among the departments

The table 4.17 below shows there were significant differences in perception among the departments on the usefulness of the system in both expected (p=0.012) and realized (p<0.001).

Table 4.17: Expected and realized benefits of Usefulness of the system among the departments

Benefit	Expected		P value	Realized		P value
	Mean	SD		Mean	SD	
			0.012			0.000
Consulting	3.75	0.29		3.5	0.58	
Pharmacy	3.43	1.23		2	0.68	
Nursing	3.30	0.95		3.61	1.12	
Information & Technology	4.08	0.15		3.67	1.46	
Laboratory	4.13	1.10		3	1.39	
Records	4.45	0.52		4.07	0.16	
Accounts	4.04	0.60		4.04	0.51	

(Source: Field Data, 2018)

4.19: Total mean average score of benefits among departments

Table 4.18 shows that in comparing the total average benefits score among the departments, there was significant difference only in actual realized benefits (p=0.002).

Table 4.18: Total mean average score of benefits among departments

Benefit	Expected		P value	Realized		P value
	Mean	SD		Mean	SD	
			0.096			0.002
Consulting	4.04	0.63		3.9	0.56	
Pharmacy	3.71	0.78		2.65	0.41	
Nursing	3.57	0.63		3.67	0.65	
Information & Technology	4.11	0.15		4	0.44	
Laboratory	4.14	0.78		3.09	0.85	
Records	4.07	0.33		3.86	0.14	
Accounts	4.05	0.44		3.92	0.53	

(Source: Field Data, 2018)

4.20 Challenges encountered among the departments

The total mean scores of challenges identified are different among departments with Accounts having a significant high mean score (M= 3.61; SD=0.42) (p=0.001).

Table 4.19: Challenges encountered among the departments

Benefit	Expected		P value	Realized		P value
	Mean	SD		Mean	SD	
			0.096			0.002
Consulting	4.04	0.63		3.9	0.56	
Pharmacy	3.71	0.78		2.65	0.41	
Nursing	3.57	0.63		3.67	0.65	
Information & Technology	4.11	0.15		4	0.44	
Laboratory	4.14	0.78		3.09	0.85	
Records	4.07	0.33		3.86	0.14	
Accounts	4.05	0.44		3.92	0.53	

(Source: Field Data, 2018)

4.21 Summary of Key Findings

Summarily, a comparison between the perceived and the actual benefits realized of all the five indicators "Quality of Care", "Communication and Coordination of Care", "Efficiency", "Patient Experience and Involvement in Care and "Usefulness of the System", showed that the average perceived benefit scores were significantly higher than the actual benefits realized.

Also, comparing the total expected and actual benefits realized, the paired t test showed that there was a significant difference between the two with the expected higher than the actual.

Furthermore, analysis of comparison between health workers and non-health workers indicated that, non-health workers had a high perception of EHR benefits though not significantly different.

Again, comparison between Staff with <2years of Use and Staff with >2years of Use EHR (Carewex) showed that those with >2years of use had high perception of the expected benefits. On the contrary, staff with <2years of Use had a high perception of the realized benefits.

In comparing the total average benefits score among the departments, there was significant difference only in actual realized benefits.

The findings from the study showed that, the major challenges encountered during the use and implementation of the EHR (Carewex) were insufficient training led to less competency in Carewex usage, work overload as a result of system downtime discouraged staff from using the system, lack of on field technical support and users non-involvement during the planning stages.

CHAPTER FIVE

DISCUSSSION

5.1 Introduction

In this chapter, the findings from the analysis of data are discussed in light of related literature. The implications drawn would be used to propose recommendations for the future use of the EHR system by healthcare institutions.

5.2 Benefits of implementation of EHR (Carewex)

5.2.1 Quality of Care

5.2.1.1 Evidence based decision making

Planning and policy making in health depends on the availability of accurate data reporting from health facilities. Health information thus constitutes an essential component of any effective health system. Reforms in the Ghana Health Sector can only make the necessary impact with proper data and information management. Without accurate information, wrong management decisions may be made which would cost the health system and the country in terms of use of scarce resources and effective delivery of health services to meet any health or development goal.

A number of studies have demonstrated that evidence based decision making delivered through EHR improves quality of care (PricewaterhouseCoopers, 2015)(Bossen et al., 2013)(Randeree, 2007). The findings indicated that the system has the ability to make readily and easily available comprehensive patient information such as data on medication, laboratory and diagnostic results which enables an improved evidence based decision at the point of care.

Easy access to these information assists clinicians to address issues and discuss patient's healthcare needs entirely other than unnecessary follow-ups. A study by PricewaterhouseCoopers, (2015) stated that 94% of respondents strongly or moderately agreed that the use of EHR improved evidence based decision making.

Several researchers indicated from their studies that EHR introduction has produced benefits of a reduction of patients missing records leading to improved management of records and the access to accurate and up-to-date health records thereby improving the quality of care given to patients (Bossen et al., 2013)(Randeree, 2007). These findings are consistent with study by Kaushal et al., (2008) who specified that the previous medical records of patients' are accessed timely. The above implies that, with the availability of patient records the tendency of clinicians making unnecessary medical errors are reduced. As a result of the EHR implementation the evidence decision making at the point of care has improved.

5.2.1.2 Patient Safety

It is evident from the findings of the study that, the safety of patient has improved due to timely information sharing and response to patient needs. The safety of patients is paramount in healthcare delivery which requires that clinicians limit the possibility of medical error during medication prescribing, dispensing and performing procedures on patient. The World Health Organization(WHO) indicated that medication error is "any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient or consumer'(WHO, 2017). EHR via the CPOE plays a crucial role in reducing medication errors as it allows clinicians to order pharmacy, laboratory and radiology services electronically which eliminates the use of illegible handwritten orders that are

to prone to making errors. This is in agreement with research by Agrawal, (2009), it was reported that CPOE systems have the greatest potential on reducing medication error whilst prescribing with a percentage reductions of 55-83. Furthermore in a study by Bates et al., (1999), it was found that with the introduction of CPOE, allergy errors fell from 10 at the baseline period to 2 in the following three periods with p value less than 0.0001. The safety of patients at the clinic has improved as a result of their information being shared timely and they receiving immediate response to their needs.

5.2.2 Communication, Coordination and access to care

It is evident from the study that communication, coordination and access to care among clinicians through sharing of patient data by multiple users can be achieved with the use of the EHR system. Communication among users is as a very important factor contributing to the user acceptance of these systems and enables healthcare providers to deliver ultimate care to patients.

According to literature, EHRs enable efficient sharing of information through the Health Information Exchange (HIE) system. HIE is the process of sharing patient-level electronic health information amongst different health care facilities (Alliance, Information, Report, Coordinator, & Technology, 2008).

A study by PricewaterhouseCoopers, (2015) had it that EHR has the potential to enhance the scheduling and coordination of patient visits. The study results also indicated that broader access to patient information in EHR by other primary care and community-based providers is seen as an opportunity to improve the continuity of care for patients. There is a need of communication between the users of EHR, so that when an event that causes uncertainty about the use of the system occurs, coworkers can share their experience using the system, therefore promoting its

adoption. Also, since information is centralized and collaborated, clinicians are able to build on each other's information rather than "reinventing the wheel".

5.2.3 Efficiency

EHR has the potential of enhancing efficiency and productivity in both administrative and clinical processes. Findings from the study indicated that, EHR enables faster transmission and communication of laboratory and diagnostic results to healthcare providers to deliver care promptly. This reduces the waiting period which translates to increase their productivity and efficiency. According to PricewaterhouseCoopers, (2015) 73% of respondents strongly agreed to the assertion that diagnostic and laboratory results are immediately available and accessible.

Furthermore, the EHR system has eliminated the use of folders thus the problem of missing records no longer exist. The system has however bridged this gap by providing the physician with the previous diagnosis and treatment of the patient. As a result of EHR implementation, which requires the automation of patient chart flows, the expenditure incurred in procuring paper logistics as well as other stationery has reduced drastically, however, the system indicates nonpayment if a patient has not paid the consultation fees thus enhancing revenue of the facility. Again these findings are consistent with those of Menachemi et al., (2007) and Agrawal, (2002) that EHR can be used as a measure to increase the cash flow of health facilities. The results of the study imply that, EHR has positively impacted productivity as less time is spent filling, filing and retrieving patient's information as such more patients can be attended to.

5.2.4 Patient Experience (Patient involvement in care)

The ability to provide patients an opportunity to view and understand their health information at the point of care is seen to greatly improve patient education and empowerment thus leading to

early recovery from illness. Although satisfaction of patient is difficult to measure, since EHR has a potential of improving quality of care, communication, coordination and access to care and improved efficiency, patients are likely to experience improved healthcare as they are actively involved in their health. In addition, EHR systems and integrated practice management reduces inefficiencies in the office that fuel patient turnover. Since patient information is always readily accessible, thereby reducing the likelihood of unnecessary or duplicate laboratory test they are susceptible to and saving them the burden of wasting money. The findings indicated that, total average mean score for patient experience and involvement in care was rated high for both expected and realized with all sub indicators rated above the score of 3. This is consistent with study by PricewaterhouseCoopers, (2015) which investigated the realization of benefits of the EMR where majority of respondent (94%) agreed strongly or moderately that the use of EMR "enhance patients' experience and empowerment by making them play a more active role in their health".

The use of EHR ensures that patient information is protected by customizing the systems security features and introducing complex passwords to regulate access information. Boyer et al., (2010) and Houser & Johnson, (2008) in a study recognized concerns on privacy and confidentiality to the adoption of EHR. On the other hand the respondents of the study had positive or high perception of EHR to ensure the privacy of patient information as they rated it at 3.9 and 3.7 for expected and realized respectively. This finding is consistent with studies by Rindfleisch, (1997) and Palvia et al., (2012) as their findings alluded to the improvement of privacy of patient records as a benefit of EHR. Despite evidence to the contrary, nonusers believe that there are more security and confidentiality risks involved with EMRs than paper records (Laerum et al.,

2001).This implies that patients being able to access their information and involvement in their own care will accelerate the healing process.

5.2.5 Usefulness

Perceived usefulness is among one of the many determinants that may influence the use of EHR systems. Users may use an application if they believe it would help them perform their roles better and increase satisfaction. The findings of the study indicated that users of the system had a higher expectation of the system with a mean score of 3.75 compared to the realized which was 3.40. This is supported by a study which asserted that usefulness had a significant correlation with usage behavior (Davis & Davis, 1989).

5.3 Comparison between expected and realized benefits

Findings from the study indicated that most of the respondents had high perceptions with regards to the expected benefits but low realized benefits. This is consistent with a study by Staples et al., (2002) which stated that before IT projects are implemented, stakeholders have high expected benefits which leads to low perceived benefits after the implementation of the system. The implication is that until an IT system is implemented the actual expectations of stakeholders can be overestimated and this leads to disappointments and dissatisfaction among staff.

Furthermore, in a study that sought to compare the users' pre-usage level of expectations and subsequent perceptions levels of the same benefit realization during the early stages of EHR usage, the all three measure of central tendency (mean, mode and median) indicated that participants' level of benefit expectations for seven out of the eight benefit scores were high rather than a low level of expectation (Muvungani, 2012).

The implication is that until an IT system is implemented the actual expectations of stakeholders can be overestimated and this leads to disappointments and dissatisfaction among staff. Again the findings imply that organizations that use HIS invest a lot of time, money and effort but have little to show with regards to realizing the actual benefits. (Tiernan & Peppard, 2004). It is worth noting that, though technology brings changes to the way people work and enables processes, however, it is not sufficient itself to bring about benefits expected.

Furthermore, user engagement at the initial stage is key in benefit realization, as is the process by which the users' issues, perceptions and expectations will be of known. A successful user engagement enables the acceptance of HIS and enhances the realization of the benefits. (EHealth,Ontario 2016)

5.4 Challenges

Among the challenges that were listed, study respondents rated insufficient training as a major challenge with a mean score of 3.6 and various studies support this finding. A study identified training as an important component that enables users of a new system to adjust so that they can transfer an attitude that is positive towards a system (Aladwani, 2001). Several studies on EHR implementation in developed and developing countries identified inadequate training as a challenge encountered during the implementation and use of the system. A study conducted in hospitals in Alabama established that the implementation of the system was impaired due to staff not having knowledge about the system with no provision made to train them (Houser & Johnson, 2008). According to Terry et al., (2008) and Studer, (2005) , adequate and sufficient training as well as continuous development of staff is a critical aspect of EHR implementation.

Training of users improves levels of self-confidence and awareness as clinicians are able to overcome their dislike for new technology while linking expected benefits to usage (Sahay & Walsham, 2006).

Users who are well trained become more satisfied with new systems than those not trained and inadequate user training may result in lack of understanding of system abilities and interest to use the system which could lead to workarounds causing the systems to be used in ways unintended or complete avoidance of the system. However Dagroso et al., (2007) and Sicotte, (2006) asserted that the best form of training is one that is tailored to the individual role of the users to allow them practice 'hands-on' while simulating their real working environments.

In developing countries, Omary et al., (2010) states that the low implementation of EHR is due to lack of computer skills amongst clinicians whereas according to Kukafka et al., (2007) countries that have integrated training in ICT for clinicians, have relatively high acceptance of the system. Juma et al., (2012) further reiterated that the correlation between skills in ICT of clinicians in Kenya resulted in low adoption rates and Hogan & Palmer, (2005) indicated that healthcare practitioners without ICT skills of online health data processing turn out spending much time on the system thereby increasing the waiting time of patients. Furthermore, typing skills that are relatively good are needed for entering patient information, notes and prescriptions which most staff lack and this introduces medical errors (Shachak, Hadas-dayagi, Ziv, & Reis, 2009). Therefore, without satisfactory skills in ICT, involvement in selection, development and use on EHR by staff becomes difficult which might lead to systems not accepted widely or effectively used thereby hindering their progress to yield the benefits.

The unpredictable electric power supply poses a challenge for most health institutions in Ghana. Adu, (2013) indicated that this situation is primarily worrying as the general healthcare sector is

affected. Since the system is an electronic device which operates on power supply, power unavailability and disruptions render the system inoperable which could damage the system. The hospital has a standby generator but additional cost is incurred buying fuel to power the plant and maintenance and a study by Achampong, (2012) supports this finding.

A challenge identified from the study was that the laboratory analyzers were not connected to the Carewex system as such the staff spent a lot of time inputting the results into the system which impedes their productivity. David W. Bates et al., (2003) asserted that most EHR systems, lack interoperability in linking with other applications in the same facility for easy flow of data among the various units or departments like radiology, laboratory. Interoperable systems have a disadvantage of becoming a threat if measures are not taken to secure the privacy and safety of patient data (Ludwick & Doucette, 2009).

For the smooth use of the EHR system, there is the need to always have a technical support readily available at all times to attend to issues that arise. Lack of technical support was one of the challenges identified at the facility. A study by Simon et al., (2007) showed that two-thirds of clinicians reported a lack of technical support as an obstacle to adopting EHR whereas Ludwick & Doucette, (2009) also asserted that lack of readily available access to technical support from vendor was one of the complains reported by physicians.

Inadequate computers was identified as a challenge for some users (study respondents) of the system. A study by Ouma & Herselman, (2008) identified lack of computers as a hindrance to the adoption of EHR in rural hospitals. Without computers, users' task will not be accomplished and this will in turn impede their productivity, as a result for the adoption of EHR to be successful it is important that the required resources are always available.

The involvement of all users of EHR system was identified as one of the most important factors in yielding the benefits of the system. It is critical to engage all stakeholders in the set-up, planning and design of the system as they are knowledgeable, else they are likely to find problems if not involved and become dissatisfied (Dix, Finlay, Abowd, & Beale, 2004).

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This is the first assessment of the benefits realization since the implementation of the EHR system.

Findings of the study showed that stakeholders had high perceptions of EHR to yield benefits like Quality of Care, Communication, Co-ordination of care, Efficiency and Patient Experience and Involvement.

Secondly, even though some of the benefits have been realized, a comparison between the expected and the realized was significantly different. Also, the benefits realized may not always meet expectations of health professional as there was a significant difference between the expected and realized benefits.

Some of the challenges identified from the study include inadequate training which was identified as a major challenge to the smooth use of the system, system downtime led to work overload and lack of readily available technical support to resolve hitches in the system.

6.2 Recommendations

The study recommends that Management ensures that:
The templates present in the system should be made flexible are and user friendly

Also, staff should be given a refresher training by the vendor and the training should be tailored to meet the tasks played by individuals in the different departments

Again, technical support should be available as and when needed. All laboratory machines including the hematology and chemistry analyzers must be connected automatically to the system to enhance efficiency.

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APPENDICES

Appendix A: Questionnaire

ASSESSING MANAGERS AND STAFF PERCEPTIONS OF THE BENEFITS OF IMPLEMENTING AN ELECTRONIC HEALTH RECORD (EHR) SYSTEM: A CASE STUDY OF THE GHANA ATOMIC AND ENERGY COMMISSION (GAEC) CLINIC

This questionnaire is designed to gather research information on managers and staff perception of the benefits of implementing an EHR system. The information provided will be used for academic purposes only and will be treated with utmost confidentiality. The questionnaire has four sections. For each section, kindly respond to all items using a tick [ ] or filling in the blanks where appropriate

SECTION A: DEMOGRAPHIC CHARACTERISTICS

1. Your gender
    1. Male [ ]
    2. Female [ ]
2. Specify your age (in years)……..

3. What is your profession in this health facility?
    1. Doctor [ ]
    2 .Hospital administrator [ ]
    3 .Hospital IT staff [ ]
    4 .Pharmacist [ ]
    5 .Nurse [ ]
    6. Records Officer [ ]
    7. Laboratory Technician [ ]
    96. Any other(Specify)……
4. What is your level of formal education?
    1. Certificate **[ ]**
    2. Diploma **[ ]**
    3. Degree **[ ]**
    4. MBChB **[ ]**

5. Masters' Degree **[ ]**
6. PhD**[ ]**
96. Any other(Specify)……

5. How long have you worked in this facility?

……

6. Which Department or unit are you in?

……..

7. Are you the in-charge of this department/unit?
    1. Yes [ ]
    0. No [ ]
8. How long have you worked in this Department/unit?

……..

9. How long have you used the Carewex system?

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10. Which functions in the Carewex system have you used or do use?

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SECTION B: EXPECTED BENEFITS PRIOR TO THE IMPLEMENTATION OF CAREWEX

For the following statements, please select the degree with which you agree or disagree to them with regards to the EXPECTED BENEFITS PRIOR TO the IMPLEMENTATION OF EHR system (CAREWEX) (Please write the corresponding number in the blank beside the statement : Strongly agree (5), Agree (4), Neutral (3) Disagree (2) , Strongly Disagree (1) and NOT APPLICABLE (99) (if the statement does not apply)

	Statement	**Strongly Agree 5**	**Agree 4**	**Neutral 3**	**Disagree 2**	**Strongly Disagree 1**	**NOT APPLICABLE 99**
	Quality of Care (Evidence-based decision making, Patient safety,)						
	Evidence-based decision making						
11.	Patient information/records will be easily accessible						
12.	Will enable clinical teams to keep more accurate patient information/records						
13.	Will enable clinical teams to keep more complete/ comprehensive patient information/records						
14.	Will enable clinicians order fewer tests due to better availability of lab results						
15.	Will enable ordering diagnostic or investigative test(lab and xrays) electronically at point-of-care						
16.	Will enable ordering prescriptions electronically at point of care						
	Patient Safety						
17.	Will enhance reduction in medical error due to legibility of automated patient data						
18.	Will alert clinician\you to a potential medication error due to drug allergy						
19.	Will help clinician\you order more on-formulary drugs(ie drugs that are safe and effective)						
20.	All progress notes will be automated						

	Communication, Coordination and access to care						
21.	Will enable exchanging of patient clinical summaries with other physicians						
22.	Will enable efficient communication among clinical team members						
23.	Will enable coordinated care among clinical team members						
24.	Will enable scheduling of appointments and coordination of patient visits						
	Efficiency						
25.	Will make records more readily available at the point of care						
26.	The amount of time spent to plan, review, order and document care will decrease						
27.	Will enable clinician\you access a patient's chart remotely (e.g., out of facility, from home)						
28.	Will enable the timely access to investigative or diagnostic ie(xray,lab etc) results						
29.	Will enable multiple staff with appropriate access privileges view and modify a single patient's information/record simultaneously						
30.	Will speed up work process increasing productivity						
31.	Billing for services will be more complete.						
32.	Will enhance revenue due to accurate and complete billing processes						
33	Will be beneficial to your workflow						
	Patient Experience (Patient Involvement in care)						
34.	Will facilitate communication with a patient						
35.	Will provide patients with clinical summaries for each visit						
36.	Will enable health professionals send reminders for recommended services and follow-up visits						
37.	OPD will be less congested because of system usage						
38.	Patients waiting time will decrease						
39.	Patients will be less susceptible to						

	unnecessary diagnostic tests because of timely accessibility and availability of patient information						
40.	Will save cost as patients will be less susceptible to duplication of test						
41.	Patients will be given self-management tools (printed materials)						
42.	Privacy of patient information/records will be assured						
	EXPECTED USEFULNESS						
43.	Using Carewex will make it easier to do my job						
44.	Using Carewex in my job will enable accomplish tasks more quickly						
45.	Using Carewex will improve my job performance						
46.	Using Carewex will enhance my effectiveness on the job						

47. Please state if there are any other expected benefits prior to the implementation of EHR?

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SECTION C: BENEFITS REALIZED SINCE IMPLEMENTATION OF EHR SYSTEM (CAREWEX)

For the following statements, please select the degree with which you agree or disagree to them with regards to the BENEFITS REALIZED SINCE THE IMPLEMENTATION OF EHR system (CAREWEX) (Please write the corresponding number in the blank beside the statement :Strongly agree (5), Agree (4), Neutral (3) Disagree (2) , Strongly Disagree (1) and NOT APPLICABLE(99) (if the statement does not apply to your scope of work)

	Statement	**Strongly Agree 5**	**Agree 4**	**Neutral 3**	**Disagree 2**	**Strongly Disagree 1**	**NOT APPLICABLE 99**
	Quality of Care (Evidence-based decision making, Patient safety,)						
	Evidence-based decision making						
48.	Patient information/records is easily accessible						
49.	Enables clinical teams to keep more accurate patient information/records						
50.	Enables clinical teams to keep more complete/ comprehensive patient information/records						
51.	Helps clinician\you order fewer tests due to better availability of lab results						
52.	Ordering diagnostic or investigative test(lab and xrays) electronically at point-of-care						
53.	Ordering prescriptions electronically at point of care						
	Patient Safety						
54.	Helped or enhanced reduction in medical error due to legibility of automated patient data						
55.	Alerted clinician\you to a potential medication error due to drug allergy						
56.	Helped clinician\you order more on-formulary drugs(ie drugs that are safe and effective)						
57.	All progress notes are automated						

	Communication, Coordination and access to care						
58.	Exchanging patient clinical summaries with other physicians						
59.	Enables efficient communication among clinical team members						
60.	Enables coordinated care among clinical team members						
61.	Enables scheduling or appointments and coordination of patient visits						
	Efficiency						
62.	Makes records more readily available at the point of care						
63.	The amount of time spent to plan, review, order, and document care has decreased.						
64.	Helps clinician\you access a patient's chart remotely (e.g., out of facility, from home)						
65.	Less time spent looking for patient charts or missing information						
66.	Timely access to investigative or diagnostic ie(xray,lab etc) results						
67.	Enabled multiple staff members with appropriate access privileges view and modify a single patient's information/record simultaneously						
68.	Speeds up work process increasing productivity						
69	Billing for services is more complete.						
70.	Enhanced revenue due to accurate and complete billing processes						
71	Has been beneficial to your workflow						
	Patient Experience (Patient Involvement in care)						
72.	Facilitating communication with a patient						
73.	Providing patients with clinical summaries for each visit						
74.	Enables health professionals send reminders for recommended services and follow-up visits						
75.	OPD is less congested because of system usage						
76.	Patients waiting time has decreased						

77.	Patients are less susceptible to duplication diagnostic tests because of timely accessibility and availability of patient information						
78.	Saves cost as patients are less susceptible to duplication of test						
79.	Patients are given self-management tools (printed materials)						
80.	Privacy of patient information/records is assured						
	PERCEIVED USEFULNESS						
81.	Using Carewex has made it easier to do my job						
82.	Using Carewex in my job has enabled accomplish tasks more quickly						
83.	Using Carewex has improved my job performance						
84.	Using Carewex has enhanced my effectiveness on the job						

85. Please state, if there are any other benefits you have realized so far since the implementation of the EHR system (CAREWEX)?

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SECTION D: CHALLENGES ENCOUNTERED DURING IMPLEMENTATION AND USE OF THE EHR SYSTEM (CAREWEX)

For the following statements, please select the degree with which you agree or disagree(Please write the corresponding number in the blank beside the statement: Strongly agree (5), Agree (4), Neutral (3) Disagree (2) Strongly Disagree (1) and NOT APPLICABLE (99)

		Strongly Agree 5	**Agree 4**	**Neutral 3**	**Disagree 2**	**Strongly Disagree 1**	**NOT APPLICABLE 99**
86.	Insufficient training has led to less competency in Carewex usage						
88.	Learning to use Carewex was very difficult						
89.	It has not been easy for me to become skillful at using Carewex						
90.	Inadequate computer knowledge affected smooth use						
91.	My interaction with Carewex/system has not been clear and understandable						
92.	I find Carewex/system not flexible and friendly to interact with						
93.	Frequent power outage has resulted in frequent system downtime resulting in lack of interest in using EHR						
94.	System downtime has led to users inability to capture all data leading to work overload						
95.	Work overload discourage users from using the system						
96.	Frequent downtimes led to system unreliability resisting usage						
97.	Lack of reconciliation between system workflow and business workflow						
98.	Users non-involvement during the planning stages						

99.	Resisted usage due to non-involvement of users, saw it as an imposition						
100.	Resistance of staff to change work habits						
101.	Lack of on field technical support during implementation affected usage						
102.	Untimely system technical support						
103.	Patient confidentiality not assured						

104. Please state if there are any other challenges to the implementation and use of the EHR system (CAREWEX)?

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104. What is being done to address these challenges?

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105. What are your recommendations?

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THANK YOU