DEPARTMENT OF BIOSTATISTICS, SCHOOL OF PUBLIC HEALTH

COLLEGE OF HEALTH SCIENCES, UNIVERSITY OF GHANA

ELECTRONIC HEALTH REACORD (EHR) BENEFIT REALIZATION: ASSESSING THE PERCEPTION AND EXPECTATION AMONG ELECTRONIC HEALTH RECORD USERS AT THE VOLTA RIVER AUTHORITY (VRA) CLINIC.

BY

ELIZABETH QUAYE

(10349119)

A PROJECT REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER DEGREE IN HEALTH INFORMATICS

JULY, 2018

DECLARATION

I hereby declare that this work is my original study conducted. No part or whole of this study has ever been submitted before in this institution or elsewhere. Any part attributed to authors have been dully cited and recognized.

I therefore take sole responsibility for any shortcomings that may be detected.

……

ELIZABETH QUAYE

STUDENT

DATE: ……

……

FRANCES BAABA da-COSTA VROOM, PhD

SUPERVISOR

DATE: ……

DEDICATION

I dedicate this work to God Almighty, whose abundant grace and divine direction has seen me through this course successfully.

ACKNOWLEDGEMENT

I first and foremost would like to give great acknowledgement to my able supervisor, Dr. Frances Baaba da-Costa Vroom for her support, dedication and patience towards me throughout the study.

Secondly, special thanks go to the management and staff of the Volta River Authority (VRA) clinic for allowing me undertake my study within their facility.

Last but not least, I would like to thank my family and friends for the encouragement and prayers throughout this work.

I say thank you to everyone who helped in any way to make this project possible.

ABSTRACT

Electronic Health Records (EHR) are being flaunted as the "perfect" replacement for paper-based patient records yet many researches show that adoption and success rate of this Information Technology is less than satisfactory. Involvement of users in system specification and evaluation of performance of EHR has been suggested in literature as one key factor towards successful realization of EHR benefits. The study compares EHR users' level of benefit realization expectations and their subsequent perception level of benefit realization after a few years (one-five years) of using the EHR system. Questionnaires were distributed to participants drawn from a sample of convenience. Non-parametric t-test statistics was used to determine if there were significant differences and relationships between pre-usage levels of expectations and subsequent levels of perceptions. The results showed that users maintained a high level of benefit realization expectations at the end of data collection period. However, participants also expressed some level of dissatisfaction with the current level of performance of the EHR.

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CHAPTER ONE

INTRODUCTION

1.1 Background of Study

Within the healthcare sector, Information Technology (IT) is seen as an important determinant for improving the quality of healthcare and patient safety (Klinis, Markaki, Kounalakis, & Symvoulakis, 2012). There is much evidence indicating that the use of computers and/or technology in medicine (for example, electronic medical record EMR) can save time and cost as well as lead to improved clinical outcomes and data security. Regardless of the advancement, most patient-related information and medical encounters are still documented on paper (Hersh, 1995). For example, majority of patients are still given handwritten medication prescriptions, recording of most medical events, progress reports on each patient encountered, etc. is still done on paper (Menachemi, Prickett, & Brooks, 2011). According to Dick and Steen (1997), the traditional paper record is still used due to its familiarity to the users. There is also a sense of "ownership" of paper records, which increases the sense of their security. Nonetheless, there are many problems with paper-based medical records. The first is that the record can only be used in one place at a time. This is especially seen among patients with complex medical problems and have to interact with numerous healthcare practitioners such as specialists, nurses, physical therapists, etc. at different points. Another problem is that paper records can be very disorganized. That is, as noted above, a particular patient's records can be fragmented across different physician offices and hospitals and the record at each location itself can often be disorganized, with little overall summary (Hersh, 1995). According to Thakkar and Davis (2006), the paper record system is incapable of providing caregivers with all the necessary patient information they need in a way that they can effectively and efficiently utilize it.

In this regard, the health sector recently has adopted the use of ICT in the delivery of healthcare (Yusif & Soar, 2014). Generally referred to as e-health, Yusif & Soar (2014) implied that "the adoption of ICT is not only improving reliability and effectiveness of health information, but also strengthening healthcare delivery systems through its various innovative applications and programs such as the Electronic Health Records, EHRs".

Electronic Health Records (EHRs) is defined as "A repository of electronically maintained information about an individual's lifetime health status and health care, stored such that it can serve the multiple legitimate users of the record" (Tang & McDonald, 2006). One of the key features of an EHR is that health information can be created and managed by authorized providers in a digital format. It is also capable of being shared with other providers across more than one healthcare organization. EHRs are built to share information with other health care providers and organizations – such as laboratories, specialists, medical imaging facilities, pharmacies, emergency facilities, and school and workplace clinics – so they contain information from all clinicians involved in a patient's care. It is worth noting that an EHR integrates data to serve different needs and the goal is "to collect data once, then use it multiple times", according to the National Institutes of Health National Center for Research Resources (April, 2006).

Through its ability to electronically exchange health information, the adaptation EHRs can lead to improved quality and safer care for patients as well as create concrete developments for the healthcare organization. Numerous studies have identified the following as EHR benefits:

- Improved quality of care
- Enhanced productivity and efficiency
- Better communication and collaboration among healthcare workers
- Cost saving

- Safety and privacy of patient records.

In July 2010 the government of Ghana through the Ministry of Health launched the national e-health strategy. Their vision statement is "to ensure the delivery of quality, affordable and up-to-date health services in an equitable and timely manner through the enhancement of communication and the use of information for planning, managing, and delivering health services" (Ghana e-Health strategy, 2010). There are about twenty-two (22) e-Health projects at various stages of execution in Ghana. Most of these projects are dedicated to the promotion of e-Health through the use of mobile phones, personal digital assistants (PDAs), web-based applications, etc. (Afarikumah, 2014). Despite this tremendous step, Ghana like other developing countries is still struggling not only to adopt, but also realize the potential benefits of e-Health and sustain it (Yusif & Soar, 2014).

1.2 Statement of Problem

In most developed countries, paper-based records are fast giving way to electronic health records (EHR) and this ideology is crawling gradually into the developing countries such as Ghana. Investing in change such as the transitioning from a paper-based record system to an electronic health record system should result in benefits of some kind (Thompson, Classen, & Haug, 2007). Benefits can be considered as "the return from the investment in undertaking a project or program" (Thompson et al., 2007). EHRs promise numerous benefits, most importantly unifying fragmented data, reducing errors, improving decision making, and reducing costs. However, despite these potential benefits, many health organizations have failed to realize the benefits of adopting the EHR system.

In the White Paper by Impact Advisors (September, 2016), work on benefits realization in many facilities ceases when implementation is complete, or final measurements are taken a year after, to determine if Return of Investments (ROI) has been achieved from EHR implementation; the result is often very disappointing. Many researches on benefits realization have concluded that benefits do not just happen but is a continuous process. It involves foreseeing outcomes, identifying key determinants of those outcomes, defining a path to achieve the outcomes, implementing, checking results and making dynamic adjustments to ultimately achieve the desired operational outcomes.

The Volta River Authority (VRA) clinic, realizing the deficit in paper-based record keeping has over the past five years invested in EHR system. However, since its implementation no assessment has been done to determine if Return on Investment on the system has been achieved. According to Peppard et al (2007), users are a vital component of the implementation process of EHR systems, hence without an assessment by the clinic of the perception of users with regards to the benefits and challenges they have or are experiencing so far, the problems cannot be addressed, for a scale up to be carried on the system.

1.3 Purpose of Study

The purpose of this study is to assess the perceived benefits of the EHR system among clinicians and nurses at the VRA clinic. The specific objectives of this study are:

1. To measure the users' level of benefit expectations prior to using the EHR system.
2. To measure the users' level of benefit realization of the EHR system after implementation.

3. To identify challenges with the system after implementation.

1.4 Significance of Study

The Ghanaian health system is faced with a plethora of challenges. Over the years, there has been an increased demand to improve health service provision in the country. Record keeping depends overwhelmingly on manual methods needing paper. This inadvertently leads to various challenges varying double issue, misfiling and missing folders. Reports show many hospitals especially in developing countries like Ghana are lacking storage space due to this system. Electronic record keeping can help ameliorate the challenges of the paper-based record system in this age of Information Technology (IT). Implementation of the electronic system in record keeping especially in developing countries has also had a number of challenges identified. These include poor telecommunication infrastructure and limited financial resources. Organizational and human elements have also been identified in the areas of training, utilization of the system (Kifle, Mbarika, Tsuma, Wilkerson, & Tan, 2008).

This encouraged us to undertake the study in a hospital that has implemented such a system and to assess the users' perception of derived benefits. The study would identify the merits and challenges of the EHR system faced by the hospital, and thus lead to measures to roll out the program on a broader nationwide scale, devoid of problems.

CHAPTER TWO

LITEREATURE REVIEW

2.1 Introduction

The implementation of EHR systems within primary care practices is seen as particularly complex (Gans, Kralewski, Hammons, & Dowd, 2005). Physicians and other staff in primary care practices mention that it is quite difficult adapting to the significant changes in workflow and the time commitment required to learn to use the new software while prioritizing patient care can be frustrating (Ilie, Van Slyke, Parikh, & Courtney, 2009). Because of these, many healthcare facilities resist the incentive. Another major barrier to adopting the EHR system recognized by key stakeholders have been financial: most physicians have cited lack of capital and uncertain return on investment as significant hurdles (Adler-Milstein, Green, & Bates, 2013).

These notwithstanding, Electronic Health Records (EHRs) as technology enablers, hold great promise for improving efficiency and quality according to Impact Advisors (September, 2016). In spite of that, a majority of health systems that have implemented EHRs in the past decade have failed to achieve the expected return on investment. There are a variety of reasons for this, but most boil down to health systems not having a clear understanding of what the benefits are and what is required to achieve those benefits.

2.2 EHR Benefits and Values

Potential EHR benefits range from health benefits to financial savings. Some also arise from attributes of the EHR architecture. Some direct benefits to EHR users include record consistency, completeness, accuracy, legibility, better communication and collaboration between health care

workers (Miller, West, Brown, Sim, & Ganchoff, 2005). For such benefits to arise the EHR systems must have such attributes as easy accessibility and availability; user friendliness (user interaction) and flexibility (multiple user views). It should also provide record confidentiality, auditability (digital audit trail) and integration (allowing management and clinical integration) (Iakovidis, 1998). Interoperability is another feature of EHR which gives rise to the potential benefit of better interagency communication which in turn improves continued patient care (Kalra, 2006).

Users tend to invest a lot of time and effort in the implementation health Information Systems (IS) but very little in the actual process of realizing its benefits. Tiernan & Peppard (2004) pointed out that there is a notable gap between having a fully operational IS and actually realizing those benefits; one of the main reasons why so many IT projects result in failure. Without proper planning during implementation phase, benefit realization from IS projects will not materialize according to the Impact Advisors (September, 2016).

Only when a service provider's objectives and benefits have been realized can the value of the IT system be accomplished (Tiernan & Peppard, 2004). It therefore appears that it is possible for an IT project to realize benefits but later fail to release value. From Tiernan & Peppard (2004) work, it can be concluded that while EHRs have the potential to achieve the benefits listed by EHR vendors, it is worth noting that the actual realization of the benefits and value of the EHRs depends on how the end users and stakeholders are willing to implement and invest in the usage of the system in a manner which makes them achieve their organizational objectives.

If and when benefits are realized, they should ultimately lead to savings in money spend on health thus releasing value of the IT system as suggested earlier by Tiernan and Peppard (2004). In a study designed to understand the impact of EHRs on healthcare and cost reduction, Hillestad

et al. (2005) demonstrated the net potential savings of adopting EHR or Electronic Medical Record Systems (EMR-S) in the USA for hospitals and physicians over a 15-year adoption period.

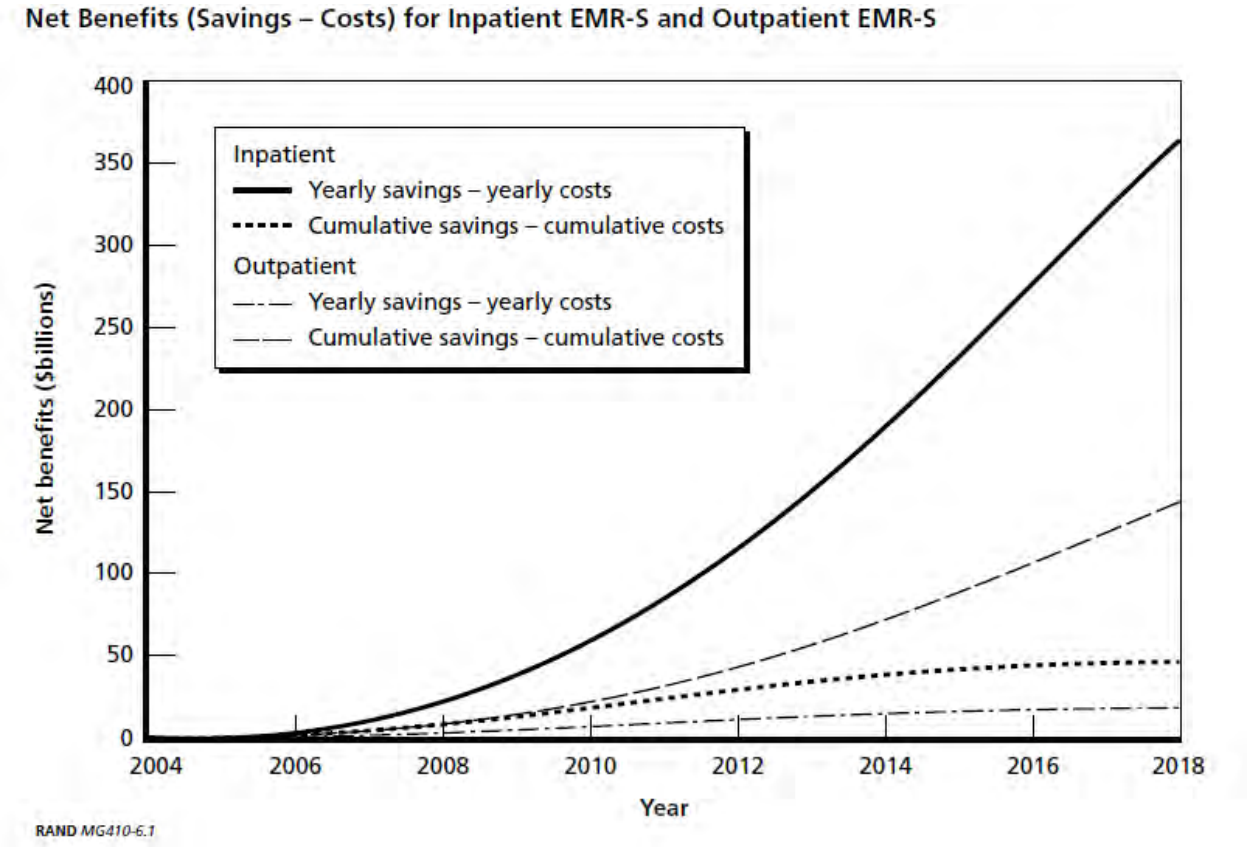

Figure 1 Trend of adoption rate as it relates to outpatients and inpatients. (Hillestad et al., 2005).

The graph shows that net benefits in the first few years of implementation are quite low, a potential source of frustrations for the funding stakeholders. The graph illustrates that projection of benefits rises exponentially (particularly for inpatients) as the adoption process matures, thereby confirming that EHRs take a while to realize their full potential. The savings for outpatients EHRs seem to be very low over the 12-year period under review (Hillestad et al., 2005).

Most studies have shown that the main benefits which range from financial savings, improved clinical outcomes and improved work efficiencies, remain potential benefits unless proper benefit management strategies are put in place to improve likelihood of benefit realization.

Figure 2. Benefits of EHRs

2.3 Users, their Expectations and Perceived Benefits

Szajna and Scamell (1993) defined user expectations as "a set of beliefs held by the targeted users of an information system associated with the eventual performance of the IS and with their performance using the system". Hence the importance of involving users in the set-up and design process of Information Systems.

Implementation of an Electronic Health Record (EHR) may be known to improve the quality of care but it may also generate unintentional consequences, introduce wrong information or impact the information recovery (Gonzalez et al., 2015). That is, the work of care providers and

workflow may be affected, causing problems in communications and coordination of care. In their work, they found that time was a major concern for most of the nurses and concluded that the nurses found it difficult to think positively about the system since if reduction in time of documentation was not assured (Gonzalez et al., 2015).

Also, users have their own expectations and perceived benefits of the system before and after implementation. After sampling views of users of an information system before and after implementation of the system, Staples et al. (2002) observed that before implementation, users had unrealistically high expectations of IT and this usually lead to low perceived benefits after system is implemented.

Clinicians are the people who have to deal with the changes in work practices which are brought about by the implementation of new EHR systems. Involvement of users has been identified in many researches as an important part of EHR product development, implementation and evaluation. Clinicians or users of the EHR systems have been demonstrated to offer very useful information during the planning and implementation of benefit realization management processes therefore their involvement ought to be vital (Peppard et al. 2007).

CHAPTER THREE

METHODS

3.1 Research Site

The study was undertaken at the Volta River Authority (VRA) clinic. It is located at Osu in the Greater Accra region. The facility is a Quasi-Government owned hospital that offers a 24-hour general services to the community.

The hospital is made up various departments which include the Out-Patient Department (OPD), Pharmacy, Maternity, Dental, Records, Ear, Nose and Throat (ENT) unit, and a Laboratory.

3.2 Research Design and Methodology

The study adopted a quantitative research approach with a descriptive case study design. Descriptive research designs help answer questions of who, what, when, where and how associated with the research problem.

3.3 Data Collection Instrument

The data collection tool used for the study was a Questionnaire. The questionnaire comprised of both open-ended and closed-ended questions. A 5-point Likert scale was also used for each of the 5 and other benefits. The score categories ranged from strongly agree to strongly disagree. Table one shows how each of the EHR benefits were scored. Twenty-one questionnaires were distributed and the number received was Eighteen. Appendix A shows an example of the questionnaire.

Table 3.1: Categories and scoring criteria for each of the 5 benefit expectation and perception

Categories for descriptive statistics		Score/rank	Categories for inferential statistics/count
Benefit expectation	**Benefit perception**		
Strongly agree	Strongly agree	5	High level expectation/perception
agree	agree	4	
Neither agree/disagree	Neither agree/disagree	3	Middle level expectation/perception
Disagree	Disagree	2	Low level expectation/perception
Strongly disagree	Strongly disagree	1	

3.4 Sampling method and Sample size

The target population of the study was limited to health and non-health professionals who use the system and management of the hospital. Based on the inclusion and exclusion criteria (participants must be end users of the system), the number of participants was deemed to be too small hence the study adopted the convenient, non-probability sampling technique.

3.5 Ethical Approval

A letter of introduction (research proposal) was referred to the hospital management, who evaluated and gave approval for the study to be conducted.

3.6 Data Analysis

Data generated from the study was entered into excel and analyzed using STATA 15.0. The Likert scale categories for each of the 5 benefits were treated as ordinal data because of their rank ordered categorical nature. Also, t-test was used done to determine the difference between the perceptions and the benefits that were realized.

CHAPTER FOUR

RESULTS

4.1 Socio-demographic characteristics of respondents (N = 18)

A total of eighteen questionnaires were distributed and retrieved successfully. All eighteen questionnaires were completely filled. Half of the respondents (9/18) were between the ages 20 – 29. Male respondents were in the majority 66.7% (12/18). People involved in other professions in health facilities made up half of the respondents (9/18). All participants used the (CAREWEX) EHR system with majority having used it for five or more years 72.2% (13/18).

Table 4.1 Socio-demographic characteristics of respondents (N = 18)

Variables	Frequency	Percent (%)
Age		
20 – 29	9	50.0
30 – 39	6	27.8
40 – 49	4	22.2
Sex		
Male	12	66.7
Female	6	33.3
Profession		
Clinician	1	5.6
Nurse	2	11.1
pharmacy technician	2	11.1
lab scientist	1	5.6
health information officer	2	11.1
Administrator	1	5.6
Other	9	50.0
Duration of EHR use		
between 3 - 4 years	5	27.8
5 or more years	13	72.2

4.2 Users' level of benefit expectations prior to using the EHR system

Majority of the users 64.7% of EHR prior to use expected the EHR system (CAREWEX) to enable them communicate more efficiently with other clinical team members as they extremely agreed that the system was going to do so. One comment made by a user who simply agreed "*was that communication is not flexible since the system did not allow edit nor cancellation".*

The same proportion of users 64.7% expected the EHR system (CAREWEX) to enable clinical teams collaborate and work together better as a team. All users expected that the EHR system would enable clinical teams to keep more accurate records of patients. Nearly eight out of ten (15/18) respondents were extremely in agreement that it would do so prior to using the system. Majority of the users 72.2% were in extreme agreement that the EHR system (CAREWEX) will encourage clinical teams to have a more complete record of patients. Users also expected the EHR system (CAREWEX) to reduce time spent on documentation with 77.8% in extreme agreement that the system would do so prior to using the system.

Table 4.2 Users' level of benefit expectations prior to using the EHR system

Variables	Response	Frequency (%)
Using the EHR system (CAREWEX) will enable me communicate more efficiently with my other clinical team members	strongly agree	11(64.7)
	agree	5(29.4)
	neither agree nor disagree	1(5.9)
Using the EHR system (CAREWEX) will enable clinical teams to collaborate and work together better as a team	strongly agree	11(64.7)
	agree	6(35.3)
Using the EHR system (CAREWEX) will enable clinical teams to keep more accurate records of patients	strongly agree	15(83.3)
	agree	3(16.7)
Using the EHR system (CAREWEX) will encourage clinical teams to have a more complete record of patients	strongly agree	13(72.2)
	agree	5(27.8)
Using the EHR system (CAREWEX) will reduce time spent on documentation	strongly agree	14(77.8)
	agree	2(11.2)
	neither agree nor disagree	1(5.5)
	disagree	1(5.5)

The participants' levels of expectations were transformed into 3 categories previously illustrated in column 4 of table 1. Figure 3 shows the proportions of participants' levels of benefit expectations before CAREWEX usage. Overall a big majority (97%) of participants had high pre-CAREWEX usage expectations.

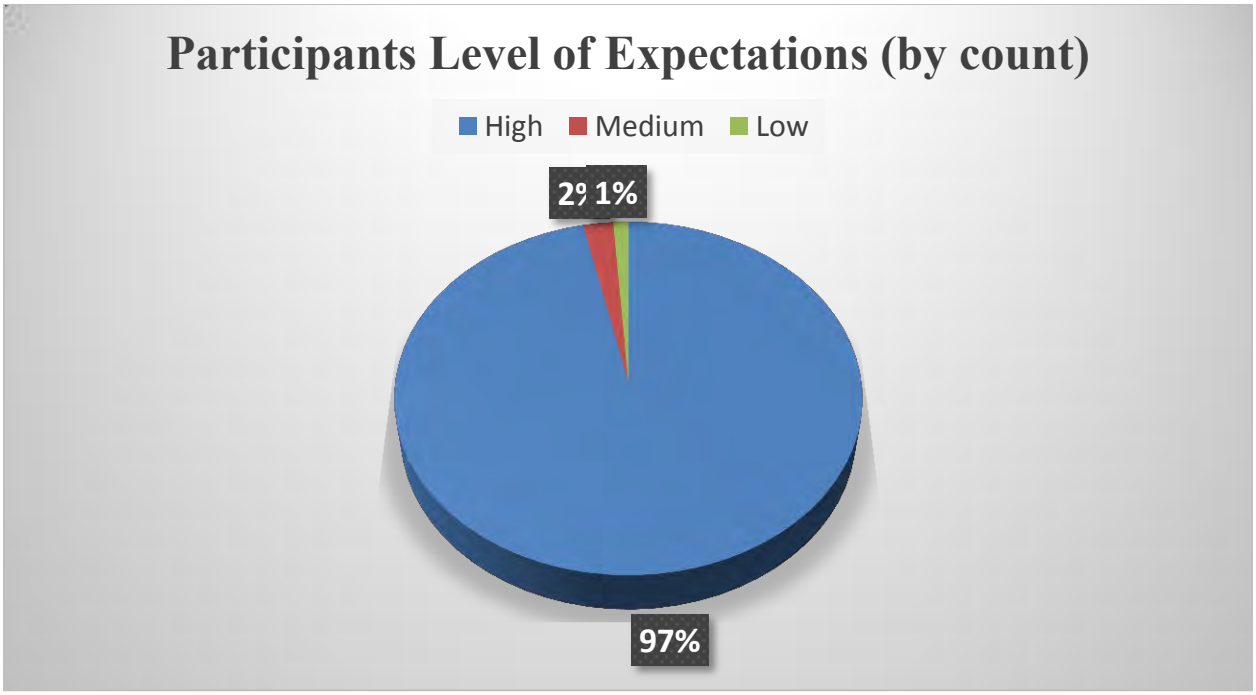

Figure 3: Proportion of participants' benefit expectations

4.3 Users' level of benefit realization of the EHR system after implementation (Perceptions)

After using the EHR (CAREWEX) system, the level of benefits realization among users is shown in table 4.3.

After implementation, 66.6% simply agreed that the system enabled them to communicate better with their team members and 5.6% extremely disagreed to this benefit. Thirty-three percent (6/18) extremely agreed that the system enabled clinical teams to collaborate and work together better as a team post implementation of EHR and 11.1% disagreed that the system offered such a benefit. On the benefit that the system enabled clinical teams to keep more accurate records, 50.0% agreed and 5.6% extremely disagreed after implementation and usage. After implementation, 44.4% agreed and 5.6% extremely disagreed that the system encouraged clinical

teams to keep a more complete record of patients. Fifty percent (9/18) agreed and 5.6% disagreed that using the system reduced time spent on documentation after implementation.

Table 4.3 Users' level of benefit realization of the EHR system after implementation (Perceptions)

Variables	Response	Frequency (%)
Using the system is enabling me to communicate better with my team members	strongly agree	1(5.6)
	agree	12(66.6)
	neither agree nor disagree	3(16.6)
	disagree	1(5.6)
	strongly disagree	1(5.6)
Using the system in the service is enabling clinical teams to collaborate and work together better as a team	strongly agree	6(33.3)
	agree	7(38.9)
	neither agree nor disagree	3(16.7)
	disagree	2(11.1)
Using the system is enabling clinical teams to keep more accurate records	strongly agree	5(27.7))
	agree	9(50.0)
	neither agree nor disagree	2(11.1)
	disagree	1(5.6)
	strongly disagree	1(5.6)
Using the system in the service is encouraging clinical teams to keep a more complete record of patients	strongly agree	6(33.3)
	agree	8(44.4)
	neither agree nor disagree	3(16.7)
	strongly disagree	1(5.6)
Using the system will reduce time spent on documentation	strongly agree	7(38.8)
	agree	9(50.0)
	neither agree nor disagree	1(5.6)
	disagree	1(5.6)

The participants' level of benefit expectations was similarly transformed into 3 categories and figure 4 shows the proportions of participants' level of perceptions of benefit realization.

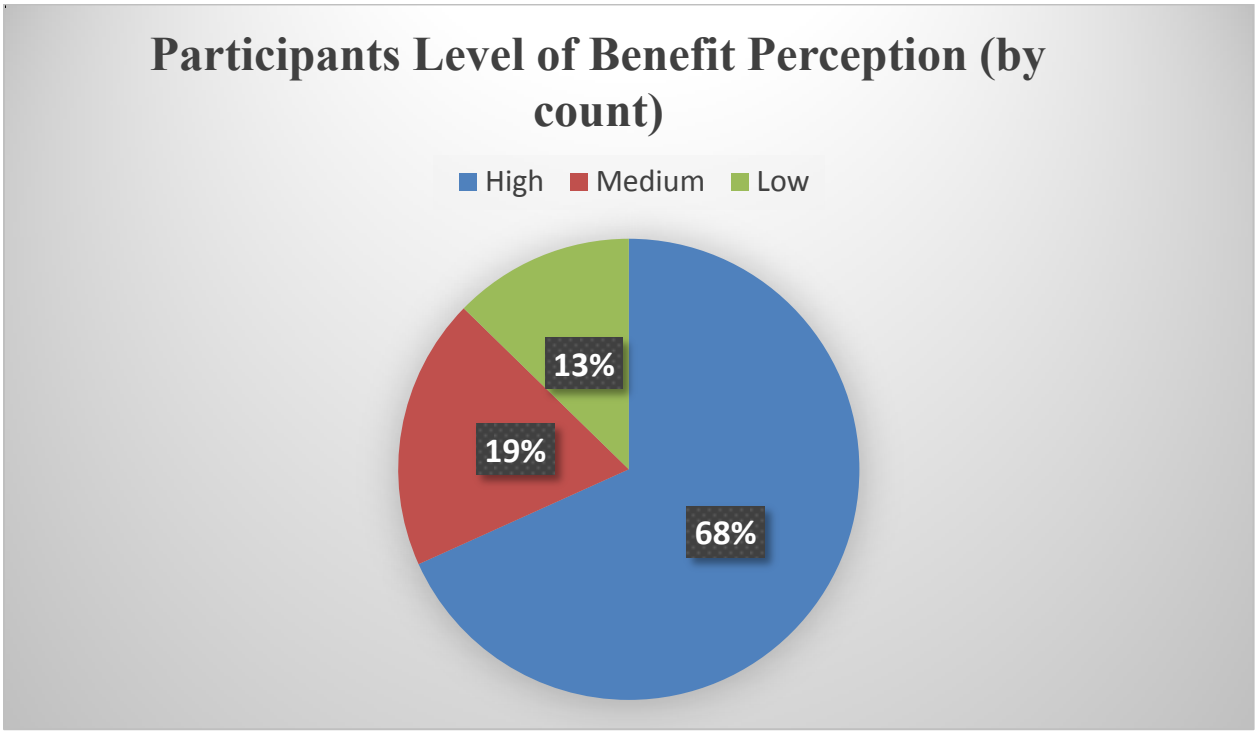

Figure 4: Proportion of participants' level of benefit perception

4.4 Other perceptions regarding usage of EHR after implementation

Fifty-five percent (10/18) of respondents agreed and 5.6% extremely disagreed that the design and features of the system is enabled them to work effectively and efficiently after using the system. One striking comment made was that "*the design can be improved upon"*.

Majority of respondents 72.1% agreed that using the system improved patient quality of care with 5.6% also extremely disagreeing to this benefit.

The EHR system increased concern about privacy of patient personal information was agreed upon by 55.5% of respondents and 11.1% disagreed with this post implementation.

Additional perceptions were stated by way of comments amongst the users. Some of this include;

1. "*it enables safer and more reliable prescribing".* This was rated an extremely likely benefit.
2. "*it makes it easier to analyze trends in daily, weekly and monthly data for generation of reports for submission to supervisors".* This was rated an extremely likely benefit.
3. "*avoids duplication of patient information".* This comment was rated extremely likely.

Table 4.4 Other perceptions regarding usage of EHR after implementation

Variables	Responses	Frequency (%)
The design and features of the system is enabling me to work effectively and efficiently	extremely agree	4(22.2)
	agree	10(55.5)
	neither agree nor disagree	2(11.1)
	disagree	1(5.6)
	extremely disagree	1(5.6)
Usage of the system is improving patient quality of care	extremely agree	1(5.6)
	agree	13(72.1)
	neither agree nor disagree	2(11.1)
	disagree	1(5.6)
	extremely disagree	1(5.6)
Using the EHR system has increased my concern about privacy of patient personal information	extremely agree	3(16.7)
	agree	10(55.5)
	neither agree nor disagree	3(16.7)
	disagree	2(11.1)

4.5 Ranking of EHR benefits according to differences in perceptions and expectations

On the whole, there was significant difference (p = 0.0008) between the benefits of EHR expected by users and actual benefits perceived by the users of EHR (CAREWEX). The mean expectation score was 4.7, SE 0.08, mean perception score of 3.9, SE 0.2 and a mean gap score of (0.8). The benefits of EHR enabling users to quickly access and use patients' records (saves time) ranked first with mean expectation score 4.6, SE 0.2 and a mean perception score 4.2, SE 0.2. This benefit had the smallest difference (-0.4) in what was expected and what was perceived. However, this difference was not significant (p = 0.1100). The benefit of EHR enabling clinical teams to collaborate and work together better as a team and the benefit of EHR encouraging clinical teams to keep a more complete record of patients ranked joint second with equal mean gap score of (-0.7). however, the benefit of EHR enabling clinical teams to collaborate and work together better as a team had a mean expectation score 4.6, SE 0.1 and mean perception score 3.9, SE 0.2 and the difference in mean gap score was statistically significant (p = 0.0032). the benefit of EHR encouraging clinical teams to keep a more complete record of patients also had a mean expectation score of 4.7, SE 0.1 and mean perception score of 4.0, SE 0.2 with the difference in mean gap score statistically significant (p = 0.0146). The EHR benefit of enabling clinical teams to keep more accurate records ranked fourth. The mean expectation score was 4.8, SE 0.09 and mean perception score was 3.8, SE 0.3. The difference in mean gap score was (-0.9). This proved to be statistically significant (p = 0.0009). The EHR benefit of enabling better communication between health professionals and their team members ranked fifth. The mean expectation score was 4.6, SE (0.1), mean perception score 3.6, SE 0.2 and mean gap score was (-1.0). This difference was statistically significant (p = 0.0004).

Table 4.5 Mean score and ranking of EHR benefits according to differences in perceptions and expectations

Variables	Mean perception score (SE)	Mean expectation score (SE)	Mean gap score (SE)	p-value
Using the system is enabling me to communicate better with my team members	3.6(0.2)	4.6(0.1)	-1.0	**0.0004***
Using the system in the service is enabling clinical teams to collaborate and work together better as a team	3.9(0.2)	4.6(0.1)	-0.7	**0.0032***
Using the system is enabling clinical teams to keep more accurate records	3.9(0.3)	4.8(0.09)	-0.9	**0.0009***
Using the system in the service is encouraging clinical teams to keep a more complete record of patients	4.0(0.2)	4.7(0.1)	-0.7	**0.0146***
Using the system is enabling me to quickly access and use patients' records (saves time)	4.2(0.2)	4.6(0.2)	-0.4	0.1100
Overall EHR benefits	3.9(0.2)	4.7(0.08)	0.8	**0.0008***

4.6 Challenges of the EHR system

The challenges associated with the EHR (CAREWEX) system among users is shown in table 4.6. Fifty-five percent (10/18) of respondents extremely agreed to have faced network challenges when using the EHR system.

A few of the respondents extremely agreed to have faced the challenges listed below:

1. Unreliable power supply: 11.1% (2/18)

2. Lack of ICT training for users: 16.6% (3/18)
3. Cost of training employees on how to use the system: 16.6% (3/18)
4. Cost of purchasing new hardware: 5.6% (1/18)

Additional challenges were faced with some users making striking comments such as;

1. *"the absence of stabilizers"*
2. *"the reluctance of some staff not to use the system"*
3. *"stock, position of some medications gets distorted occasionally"*

Table 4.6 Challenges of the EHR system

Variables	Response	Frequency (%)
Poor network/internet connectivity	extremely agree	10(55.6)
	agree	4(22.2)
	neither agree nor disagree	4(22.2)
Unreliable power supply	extremely agree	2(11.1)
	agree	4(22.2)
	neither agree nor disagree	10(55.6)
	disagree	2(11.1)
Lack of ICT training for users	extremely agree	3(16.6)
	agree	1(5.6)
	neither agree nor disagree	9(50.0)
	disagree	4(22.2)
	extremely disagree	1(5.6)
Cost of training employees on how to use the system	agree	2(11.1)
	neither agree nor disagree	13(72.2)
	disagree	1(5.6)
	extremely disagree	2(11.1)
Cost of purchasing new hardware	extremely agree	1(5.6)
	agree	1(5.6)
	neither agree nor disagree	13(72.2)
	extremely disagree	3(16.6)

CHAPTER FIVE

DISCUSSION

Analysis of the results suggests a higher level of expectation (97%) by users prior to implementation of the EHR system. The "band wagon" effect as termed by Sedera et al (2001) may be the only possible explanation to the high optimism expressed by the users. This is in spite of the fact that participants felt that the system was not operating at its optimum level. In particular, users felt that the CAREWEX did not largely meet the user identified requirements and had largely underdeveloped features.

Given that users' experience is evolving their perceptions of benefit realization has changed with time. The results show that more users were uncertain about the success of the EHR system after years of using the CAREWEX than they were before usage. Only 68% of the participants now had a high level of perception of the system; a subsequent reduction in optimism on the part of these users after experiencing EHRs for themselves. The study was in contrast to many literature claims that users with high expectation tend to use the system more (Staples, Wong, & Seddon, 2002; Szajna & Scamell, 1993). Overall there was a statistically significant difference (at 95% confidence interval) between the level of benefit expectation and benefit perception after implementation suggesting to the managers of the facility and the system vendor that the views of clinicians and/or end users' as a whole can be used as an assessment tool (a benefit realization program) in improving the system going forward.

The study resonates the assessment made by Hillestad et al (2005) that there is no definite evidence that EHRs improve clinical care or service users' outcomes as participants showed a

relatively low expectation level that the usage of EHRs will enable clinicians to communicate better and improve collaboration between users.

It is worth noting that, the system displays some challenges (as recognized by the users) which are impeding its full operationalization. One peculiar challenge that was eminent was unreliable power supply. The system is known to operate on electricity. The absence of that means that the system will not be functional or will only function when power is available. This observation is similar to what Acheampong (2012) said that "the poor power supply in Ghana invariably affects any good ICT service provision like EHR".

An important function of the Internet is that it makes available enormous amounts of health-related information that may be very useful for individuals as well as organizations such as hospitals (Andreassen et al., 2007; Kummervold & Wynn, 2012). The lack of it can affect negatively, the effectiveness of diagnosis and treatment regimens. The participants of the study agree to this as more than half of the participants (55.6%) strongly agreed that poor network connectivity was an issue. Majority of the participants neither agreed nor disagreed that the lack of training of users, cost of infrastructure and the cost of training users was a challenge.

CHAPTER SIX

CONCLUSIONS

This study has demonstrated that users remained largely optimistic that usage of EHR system will lead to realization of both literature-based benefits and user-identified benefits. The results showed that both users' pre-implementation benefit expectations and level of benefit perceptions after implementation remained high. This is in spite of the fact that participants felt that the system was not operating at its optimum level. In particular users felt that the CAREWEX did not largely meet the user identified requirements and had largely underdeveloped features. The users' high level of optimism prior to using the system and their perception of a relatively low quality of the system post implementation is rather surprising and quite difficult to explain.

6.1 Limitations

- The adoption of only the quantitative research approach can be regarded as a limitation to the study as results would have been better with a mixed method approach.
- Some of the responses from the participants may be subject to some degree of recall bias because the data was gathered five years after the implementation of the system.

6.2 Recommendations

- Future studies may assess the effect of EHR from the patients' perspective. This would help make known whether or not the intended benefits of the system (to patients) are actually realized.

- For varied responses from participants, other researchers may adopt both quantitative and qualitative research approaches.

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APPENDIX A: SAMPLE QUESTIONNAIRE

The purpose of this questionnaire is to <u>ASSESS THE PERCEPTION AND EXPECTATION AMONG ELECTRONIC HEALTH RECORD USERS</u>. Each question is optional. Feel free to omit a response to any question; however, the researcher will be grateful if all questions are responded to.

Please tick the appropriate box.

1. Age …….

2. Gender

   Male ☐ Female ☐

3. Profession

   Clinician ☐ Nurse ☐ Pharmacist ☐ Pharmacy Technician ☐

   Laboratory Scientist ☐ Lab Technician ☐ Other ☐

4. Department

   Laboratory ☐ Pharmacy ☐ Out-Patient Department(OPD) ☐ Accounts ☐

   Records ☐ In-Patient Department ☐ Administration ☐

5. Have you started using the Electronic Health Record system (CAREWEX)?

   Yes ☐ No ☐

6. If yes, how long have you been using it?

   Less than a year ☐ Between one year - 2 years ☐

   Between 3 years - 4 years ☐ 5 or more years ☐

7. On the average estimate the percentage of time you spend on all forms of documentation prior to implementation of the system.

   Less than 25% of my work roster ☐ Between 26%-50% ☐

   More than 50% ☐

8. ***Below are statements that may relate to your expectations <u>PRIOR</u> to the implementation of the Electronic Health Record (EHR) system (CAREWEX). Please indicate by ticking, the extent to which you agree or disagree with each statement.***

STRONGLY DISAGREE - 1, DISAGREE - 2, NEITHER AGREE NOR DISAGREE - 3, AGREE - 4, STRONGLY AGREE – 5.

No.	Questions	Strongly disagree (1)	Disagree (2)	Neither agree nor Disagree (3)	Agree (4)	Strongly Agree (5)
i.	Using the EHR system (CAREWEX) will enable me communicate more efficiently with my other clinical team members					
ii.	Using the EHR system (CAREWEX) will enable clinical teams to collaborate and work together better as a team					
iii.	Using the EHR system (CAREWEX) will enable clinical teams to keep more accurate records of patients					
iv.	Using the EHR system (CAREWEX) will encourage clinical teams to have a more complete record of patients					
v.	Using the EHR system (CAREWEX) will reduce time spent on documentation					

9. List any other benefits of EHR you consider to be important in enhancing patient care

   i. ……

   ii. ……

   iii. ……

   iv. ……

   v. ……

10. Please rate each of the stated benefits in Question 9 above according to how likely you expect the usage of the system will result in those benefits.

	Extremely likely	**Slightly likely**	**Neither likely/unlikely**	**Slightly unlikely**	**Extremely unlikely**
I	☐	☐	☐	☐	☐
II	☐	☐	☐	☐	☐
III	☐	☐	☐	☐	☐
IV	☐	☐	☐	☐	☐
V	☐	☐	☐	☐	☐

11. ***Below are some perceptions regarding the usage of the EHR system <u>AFTER</u> implementation. Please indicate the extent to which you agree or disagree with each statement by ticking the appropriate column in the table below:***

No.	Perceptions	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
i.	The design and features of the system is enabling me to work effectively and efficiently					
ii.	Using the system is enabling me to communicate better with my team members					
iii.	Using the system is enabling me to quickly access and use patients' records					
iv.	Usage of the system is improving patient quality of care					
v.	Using the system in the service is enabling clinical teams to collaborate and work together better as a team					
vi.	Using the system is enabling clinical teams to keep more accurate records					
vii.	Using the system in the service is encouraging clinical teams to keep a more complete record of patients					
viii.	Using the EHR system has increased my concern about privacy of patient personal information					

12. ***Below are some challenges associated with the EHR system. Please indicate by ticking the appropriate column in the table below, the extent to which you agree or disagree.***

No.	**Challenges of the EHR system**	**Strongly disagree (1)**	**Disagree (2)**	**Neither agree nor disagree (3)**	**Agree (4)**	**Strongly agree (5)**
i.	Poor network and/or internet connectivity					
ii.	Unreliable power supply					
iii.	Lack of ICT training for users					
iv.	Cost of training employees on how to use the system					
v.	Cost of purchasing new hardware and software to meet the requirements of the system					

13. What do you think are some of the challenges to the overall introduction and implementation of the EHR?

i. ……

ii. ……

iii. ……

iv. ……

v. ……