Assessment on the Use of Electronic Health Records in Healthcare Facilities in the Ho Municipality of Ghana

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ABSTRACT

Health records have played a significant role throughout history as important legal documents for the exercise of individuals' rights. However, domestic legislation fails to define health records as a legally important collection of health data and documents. Ineffective records management systems usually lead to long patient waiting times before patients receive health services. The health workers usually end up not rendering certain services because the health history of the patient is not contained in medical files.

The study assessed the use of electronic health records in healthcare delivery in 3 health facilities in Ho municipality in the Volta Region of Ghana. A cross-sectional study design was employed, using a sample of 334 health professionals from three health facilities (Ho Teaching Hospital, Ho Municipal Hospital and Ho Polyclinic). The data collected were analysed using, Statistical Package for Social Sciences (SPSS – 21) and Microsoft Excel 2016.

The result of the study revealed a strong positive relationship between the use of electronic health records (EHRs) and healthcare delivery in the Ho municipality. Most health professionals attested that the electronic health records system helps in the area of service delivery making it easy and faster in compiling and submission as well as a reduction in duplication of data and information of patients and improve data quality and security. The EHR system has so far resulted in the improvement of keeping records of hospital activities. The study recommends that hospitals should take proactive steps in training their human resources on the EHR system.

Keywords: Electronic Health Records, Health Information System, ICT, Health Facilities, Ghana

INTRODUCTION

Health records have played an increasingly important role throughout history as an important legal document for the exercise of individuals' rights (Venugopal et al., 2018). In the last 20 years, the world has experienced advancement in information communication technologies (ICTs) and different systems are being implemented in health-related organizations to improve the healthcare services provided in terms of better management, decision making and transfer of information from one healthcare provider (to the next). The priority agenda of these systems is the implementation of an electronic medical record system. This is important not only in developed countries but also in developing countries in Sub-Saharan Africa (Poluyi et al., 2019).Electronic health record (EHR) systems enable hospitals to store and retrieve detailed patient information to be used by healthcare providers, and sometimes patients, during a patient's hospitalization, over time, and across care settings. Embedded clinical decision support and other tools have the potential to help clinicians provide

safer, more effective care than is possible by relying on memory and paper-based systems (Silow-Carroll et al., 2012).

Health information exchange through electronic interoperability of electronic medical records (EMRs) allows a person's health information to be immediately accessed by any approved health provider and would improve the safety and quality of healthcare, particularly during emergency care (McFarlane, Beer, Brown & Prendergast, 2017). Documentation is often the communication tool used by and between providers. Documenting a patient's record with all relevant and important facts, and having that information readily available, allows providers to furnish correct and appropriate services that can improve quality, safety, and efficiency. EHRs can help improve communication between providers through real-time access to valuable information (Centre for Medicare and Medicaid Services, 2014). Traditionally, each healthcare provider involved in a patient's care has kept an independent record, usually paper-based. The changes in technology particularly the move to computerized information storage make it possible to store the entire medical record, or any part of it in server systems.

The use of information and communication technology is transforming the way work is carried out in government organizations, leading to a much greater dependency on electronic records. This transition to a fuller electronic environment presents both opportunities and full text. Electronic records greatly extend the concept of the medical record and enable many functions that are otherwise quite impossible (Abdulmalek, 2018). Over the past ten years, sub-Saharan Africa has undergone cultural transformations resulting from the development of ICTs at the political, economic, and societal levels. The e-society, beyond the organizational perspectives or the form that can be attributed to it, uses ICT and particularly the Internet (Ahouman & Rongting, 2019).

Ineffective records management systems usually lead to long patient waiting times before patients receive treatment. The health workers usually end up not rendering certain services because the health history of the patient is not contained in medical files (WHO, 2018). (Although research regarding the implementation of EHRs exists, there is a gap in the literature on the positive challenge of the implementation of EHRs which this research sought to address). ICT or electronic records management systems can be used to ensure easy and fast access to treatment and retrieval of information or records (Marutha, 2011). This study, therefore, sought to assess how EHRs implementation positively affects healthcare delivery in the Ho municipality.

Conceptual Framework of Electronic Health Records

eHealth aids every stage of the health delivery chain and across the healthcare value system (Chali, 2019). Further to that, ICTs can, and should, be seen as spreading also across the vertical dimension, being an integral part of all tiers in the figure, if these various functions are to be carried out efficiently. This is related to the requirements of sharing information across all tiers. The study investigated the knowledge of health workers. Knowledge has a role in determining one's ability or readiness to use and accept a new policy or a system and it also influences one's attitude, skill and training. The implementation of EHRs thus, whether the government's policies are in place to support its implementation and the government's investment in ICT infrastructure to facilities. The direct and indirect benefits that EHRs implementation has on health services delivery. The individual facility's readiness to implement the EHRs that are as to whether they have internet and networking infrastructures in place as well as computer accessories. Lastly, the overall look at the uses of EHRs after their implementation.
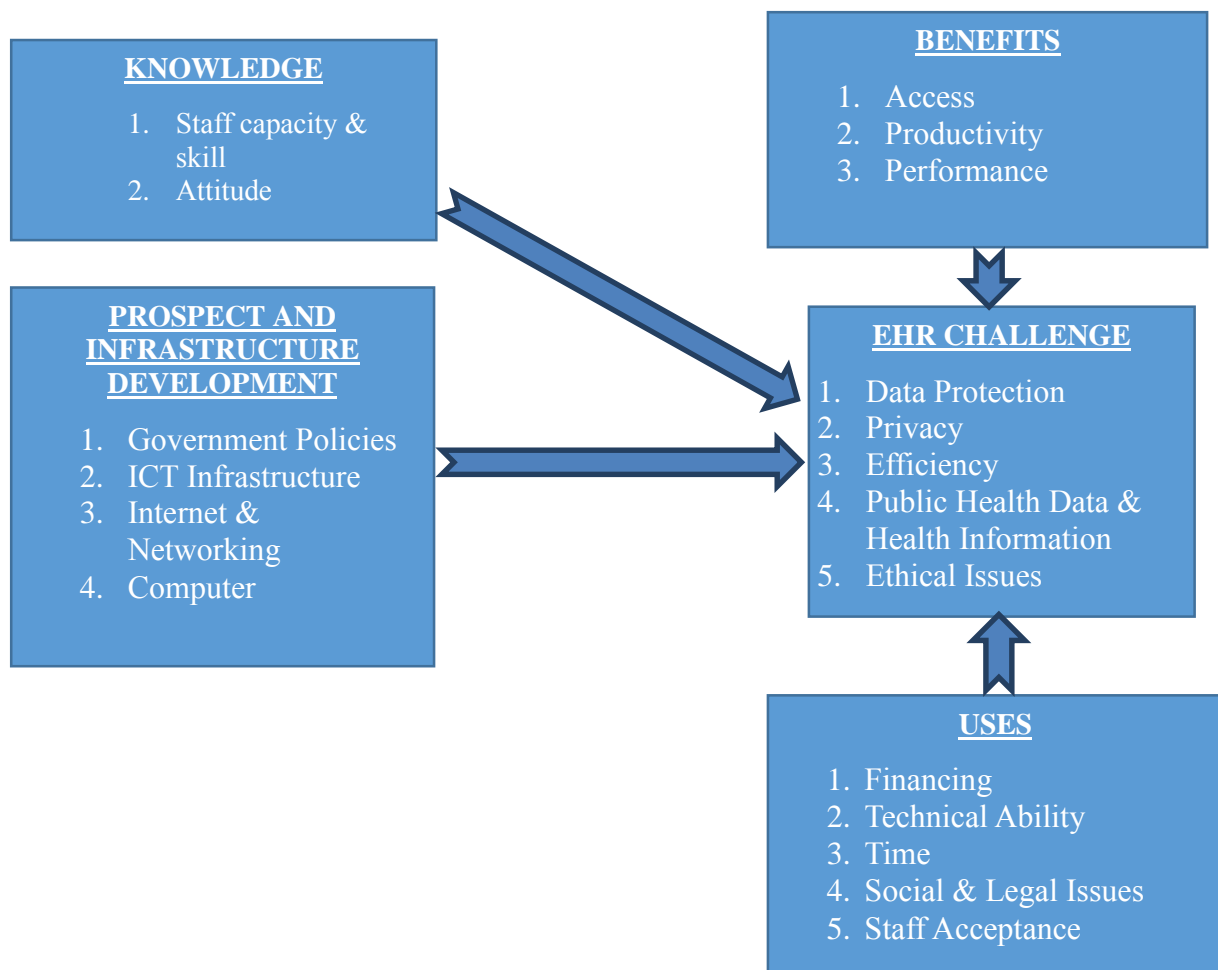
Figure 1: Conceptual Framework of Electronic Health Records

MATERIALS AND METHOD

Study Design and Settings

The study employed a cross-sectional design. (Quantitative data was collected for the study's analysis to achieve the objectives of the study to provide a better understanding of the problem. The quantitative data were collected using a close-ended questionnaire). The study involved data collected at a defined time and was targeted to assess and describe the level of knowledge, the benefit of using EHR, the prospects of the use of EHRs, and the use of EHRs in healthcare delivery in the Ho Municipality to improve healthcare delivery. The study population included all staff working in Ho Teaching Hospital, Ho Municipal Hospital, and the Ho Polyclinic during the time of the study.

Inclusion and Exclusion Criteria

The study included all health professionals from the Ho Teaching Hospital, Ho Municipal Hospital and Ho Polyclinic who were present and consented to the study during the data collection period and excluded those who were not present during the time of the data collection process and those who declined consent during the period of data collection.

Sampling Technique and Sample Size

The study employed simple random sampling methods with every worker considered as a potential participant while purposive sampling was used to arrive at the three hospitals for

the study being, Ho Teaching Hospital, Ho Municipal Hospital and Ho Polyclinic. Using the mathematical relation formula by Rexroat et al. (1992) sample size of 334 respondents comprises all health workers at the post in the three health facilities at the time of the study. A quota system for the allocation of participants per facility was adopted to arrive at the selection of 56 respondents from Ho Poly Clinic, 111 respondents from Ho Municipal Hospital and 167 respondents from Ho Teaching Hospital giving all the workers equal opportunity to be part of the sample.

Data Collection Tools and Techniques

A structured questionnaire comprising close-ended questions was designed for the study. The development of the questionnaire was informed by the study objectives. Primary data collection methods were used during the study together with relevant data for this study. The questionnaires were administered to each selected respondent in the various health facilities. The first section of the questionnaire was made up of demographic information about the respondents. In the second section of the questionnaire, the respondents were tasked to rate the operational process using a 5-point Likert scale namely, Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree. The questionnaire was administered taking into consideration all the COVID-19 prevention protocols.

Data Analysis

Data was analysed using the Statistical Package for Social Science 21 (SPSS-21) and Microsoft Excel 2016. The completeness, accuracy, and internal consistency of data for each respondent were checked. Data were presented in tables and charts for interpretation using statistical tools such as mean, frequency distributions, and percentages on the variables under study. Regression analysis was applied to determine the relationship between independent and dependent variables.

Ethical Consideration

Ethical clearance was sought from the Ethics Review Committee of the Ghana Health Service with reference number GHS-ERC 040/06/20. The nature, purpose and procedure of the study were explained to each participant, and they were informed that they were free to answer any question or decline to contribute to the study without being affected each respondent was consulted verbally before administering the questionnaire. The confidentiality of respondents was ensured, and respondents were not coerced or intimidated to give any information needed for the study.

RESULTS

Demographic Characteristics of Respondents

Table 1 shows that females were 53.9% (180 respondents) and males were 46.1% (154 respondents). The age group between 30 – 39 scored 54.4% (182) and those between 20 – 29, 27.6% (92), 40 – 49, 10.0% (33) and 50 and above, 8.0% (27 respondents). The data analysis from the study also showed that respondents who were married and responded to the questionnaire at the time of the survey represented 56.6%, and those who were single, divorced and separated were 136 representing 40.6%, 3 (1.0%), and 6 (1.8%) respectively. 134 of the respondents had their First Degrees representing 40.1%, 128 representing 38.3% were Diploma Certificated; Professional Certificate; 35 - 10.5%, etc. 87.0% of the respondents were permanent staff; 28 - 8.5%, were National Service personnel; 15 – 4.5%.

Table 1: Demographic characteristics of respondents

Variable	Frequency, n=334	Percentage (%)
Gender		
Male	154	46.1
Female	180	53.9
Age (year)		
20 – 29	92	27.6
30 – 39	182	54.4
40 – 59	33	10
60 and above	27	8
Marital Status		
Single	136	40.6
Married	189	56.6
Divorced	3	1
Separated	6	1.8
Professional Background		
Medical officer	23	6.6
Accountant	6	1.5
Auditor	1	0.5
Nursing/Midwives	186	55.4
Pharmacist	10	3
Clinical engineering	1	0.3
Health Records officer	34	10
Dispensary Assistant	6	2
Medical Lab. Technicians	15	4.3
Administrative Staff	22	6.5
Human Resource Manager	1	0.5
IT professional	1	0.5
Medical Laboratory Scientist	4	1.5
Nurse Assistant Clinical	1	0.5
Nutritionist	1	0.5
Pharmacy technician	1	0.5
Physio Assistant	7	2
Physiotherapist	14	4
Employment Status		
Permanent	291	87
Casual	28	8.5
National Service	15	4.5
Religious Affiliation		
Christian	318	95.2
Muslim	9	2.5
Traditionalist	7	2.3

Source: Field data, 2020

Manual System

The manual system of working in the various facilities was scored as highly negatively affecting their work of service delivery to clients with an average score of 3.4 the standard deviation is 3.2 as respondents were asked to show their level of agreement to the question "during the period workflow has been very slow and difficult" 55% which form the majority agreed neutral response was 13% but 32% disagreed. The response based on their workflow, using registers and patient folders, time spent to attend to clients, duplication and transfer of information has it that 60% of the respondents were of the view that they would not and will be open to recommending electronic health records system if been consulted by the

management of their facilities. 21% were torn between either recommending an electronic system or continuing the use of a solely paper system meanwhile 19% still expressed comfort in using the solely paper-based system of healthcare delivery this resulted in a mean of 3.6 and a standard deviation of 3.3. However, 100% of the respondents agreed that there were many losses of documents, duplication of information etc. associated with the unit concerning workflow during the period that work was done with the solely paper-based system. (Table 2).

Table 2: Difficulty working with solely paper-based system

Question	Strongly Agreed	Agreed	Neutral	Disagreed	Strongly Disagreed	Mean Score	SD
Your workflow during this period has been very slow and difficult.	114 [34%]	69 [21%]	43 [13%]	55 [16%]	53 [16%]	3.4	3.2
Printed registers and patient folders were used to collect information and other documentation during this period.	102 [31%]	96 [29%]	71 [21%]	34 [10%]	31 [9%]	3.6	3.3
Information gets to the next person during this period mostly using paper files and registers.	181 [54%]	121 [36%]	26 [8%]	4 [1%]	2 [1%]	4.4	3.9
Did you spend a minute/hour(s) on a patient/client during this period?	102 [31%]	102 [31%]	102 [31%]	0	0	4.2	3.5
There was much loss of documents, duplication of information etc. associated with the unit concerning workflow during this period.	299 [90%]	35 [10%]	0	0	0	4.9	2

Knowledge Level in Using Information Technology Tool

From Figure 2, 1% of the total respondents indicated that they had no knowledge of using an information technology tool such as an electronic health records system.
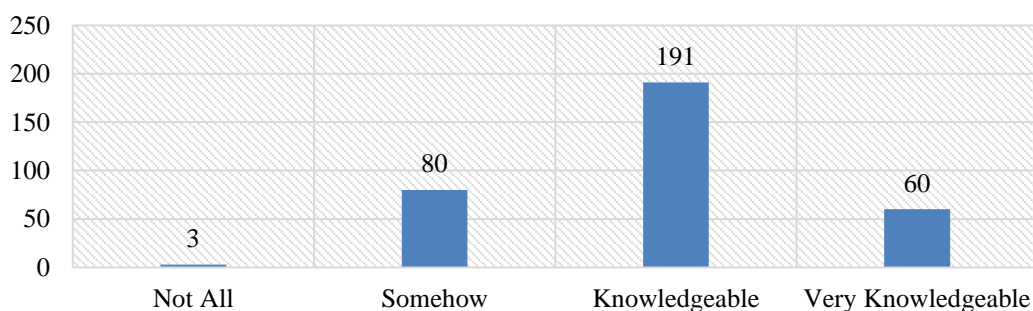

Figure 2: Knowledge level in using an information technology tool

Agreement to Challenge the Level of Individual Healthcare Provider

From Table 3, there is a clear indication that the introduction of an electronic health records system into the healthcare delivery system has greatly challenged individual healthcare providers from increasing their knowledge level to efficiency in their work delivery with a

mean score of 4.5. There is evidence that the introduction of an electronic health records system into the health system has helped in capacity building as the respondents demonstrated in Table 3. Thus 85% of total respondents agreed that knowledge of information technology has increased, 6% disagreed due to reasons the researcher could not find out at the time of the research and 9% could not ascertain whether there had been an increase in ICT knowledge, the mean score of 4 the standard deviation of 3.6 tells how to dispense the response are from the main. And 97% of the respondent agreed that the EHR is important to their daily operational process 2% neutral and 1% disagreed with the mean of 4.4 with a standard deviation of 3.9 There is also a change in the daily workflow as 89% agreed with 7% has been neutral the response also has a mean of 4.2 and standard deviation of 3.7.

Table 1: Agreement to challenge level on individual healthcare provider

Question	Strongly Agreed	Agreed	Neutral	Disagreed	Strongly Disagreed	Mean Score	SD
There is an increase in your knowledge of the usage of HAMS/PHIMS (EHR system)	100 (30%)	183 (55%)	31 (9%)	18 (5%)	2 (1%)	4	3.6
In your opinion, the EHR is important to your daily operational process	167 (50%)	158 (47%)	7 (2%)	2 (1%)	0	4.4	3.9
The introduction of the EHR system in your facility has changed your daily workflow	121 (36%)	178 (53%)	23 (7%)	12 (4%)	0	4.2	3.7
In your own opinion, the introduction of the EHR system has improved your work?	114 (34%)	176 (53%)	24 (7%)	20 (6%)	0	4.1	3.7
The total mean score of challenge on service providers						4.5	

Challenge on Care Operational Processes

Table 4 indicates the electronic health records system has highly challenged healthcare delivery with a score of 4.1. Responses from the table also show that there is an improvement in customer care and service delivery as the majority 84.2% of respondents asserted that indicator, 12.8% being neutral and 3.0% disagreed. The standard deviation of 3.7 is a measure of the amount of dispersion of the values. When it comes to the billing of services and NHIS claims management, 90.5% agreed that the electronic health records system has challenged that area of service delivery making it easy and faster in compiling and submission. Some respondents disagreed representing 2.5% and 7.0% neutral with a mean of 4.2 and a standard deviation of 3.8. The response indicated that 86.7% of the respondents asserted that electronic health records systems have come to reduce duplication of data and information of patients and ensure data quality and security. Productive service delivery has also been seen to improve using e-health systems and as well encourage collaboration among healthcare providers. With the level of agreement made by the respondents, it can be concluded that the challenge(s) of the implementation of the EHR system has improved workflow.

Table 4: Challenge of care operational processes

Questions	Strongly Agreed	Agreed	Neutral	Disagreed	Strongly Disagreed	Mean Score	SD
The introduction of the EHR system resulted in improved customer service at the hospital	107 (32.1%)	174 (52.1%)	43 (12.8%)	10(3%)	0	4.1	3.7
The EHR system helped reduce the time spent on billing and NHIS claims processing	139 (41.4)	164 (49.1%)	23 (7.0%)	8(2.5%)	0	4.2	3.8
The introduction of the EHR system increased productivity by increasing the number of clients you deal with daily	99 (29.6%)	168 (50.4)	42 (12.5%)	18(5.5%)	7 (2%)	4	3.6
The introduction of an EHR system helps reduce the error rate associated with your workflow	81 (24.3%)	191 (57.1%)	43 (13.0%)	17 (5%)	2 (0.5%)	4	3.5
EHR provide the opportunity for sharing best practices among staff in your felicity	82 (24.6%)	175 (52.4%)	62 (18.5%)	10 (3%)	6 (1.5%)	3.9	3.5
The EHR system helped the hospital to have a competitive advantage over fellow hospitals	73 (21.8%)	203 (60.9%)	41 (12.3%)	15 (4.5%)	2 (0.5%)	4.4	3.5
In your opinion, the EHR system has ensure data security and quality at the hospital	117 (34.8%)	186 (55.6%)	28 (8.5%)	3 (1%)	0	4.2	3.7
The introduction of the EHR system has improved efficiency by eliminating duplication of data	107 (32.1%)	183 (54.6%)	41 (12.3%)	3 (1%)	0	4.1	3.7
EHR system implementation has helped to ensure data consistency	104 (31.1%)	208 (62.4%)	19 (5.5%)	3 (1%)	0	4.2	3.7
EHR system easy to use as compared to the manual way of data entry	115 (33.3%)	188 (54.9%)	24 (5.8%)	3 (1%)	0	4.2	3.8
EHR system encouraged collaboration among the various units by eliminating multiple failure points within the workflow	104 (31.1%)	200 (59.9%)	28 (8.5%)	2 (0.5%)	0	4.2	3.7
Challenge mean score for healthcare processes						4.5	

Regression Analysis

From Table 5, the analysis of variance as can be observed from the ANOVA table, the value of $F(11,322) = 9.169$, $p < 0.05$ indicates that at least one of the eleven variables is strongly related to the opinion of the researcher that the introduction of the EHR system has improved work performance. The p-value of 0 also suggests that the regression is very significant.

Table 2: Regression analysis

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.488[a]	.239	.213	.720

ANOVA[b]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	52.291	11	4.754	9.169	.000[a]
	Residual	166.942	322	.518		
	Total	219.234	333			

Coefficients

The β values in Table 6 above tell us how each predictor affects the outcome. Using the *t*-test, we can tell which of the independent variables significantly contribute to the prediction of the model. Apart from $\beta 4$ and $\beta 9$ which have p-value of 0.02 and 0.00 respectively which is less than 0.05 all the other variable has p-values greater than 0.05 making them unfit to be part of the model. The introduction of the EHR system helped in reducing the error rate associated with workflow; EHR system implementation has helped to ensure data consistency have been observed to have significantly contributed to the model.

From the analysis, p (0.000) < α (0.05), we reject H_0 and conclude that the introduction of the EHR system helped in reducing the error rate associated with workflow ($\beta 4$); EHR system implementation has helped to ensure data consistency ($\beta 9$) are significant in the regression model. From the analysis, we failed to reject H_0 and conclude that $\beta 1$; $\beta 2$; $\beta 3$; $\beta 5$; $\beta 6$; $\beta 7$; $\beta 8$; $\beta 10$ and $\beta 11$ are not significant in the regression model since their p-value is greater than 0.05. Hence the developed model for predicting how the EHR system has improved work. The regression equation is: $= 0.736 - 0.976V4 + 0.619V9$.

Table 3: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.736	.335		2.196	.029
	V1	-.213	.202	-.124	-1.054	.293
	V2	-.304	.372	-.226	-.819	.414
	V3	.030	.105	.020	.282	.778
	V4	-.976	.411	-.620	-2.374	.018
	V5	.658	.347	.453	1.899	.059
	V6	-.033	.172	-.023	-.191	.848
	V7	-.121	.137	-.097	-.890	.374
	V8	.273	.140	.191	1.943	.053
	V9	.619	.171	.371	3.625	.000
	V10	.084	.205	.054	.412	.681
	V11	.713	.451	.381	1.581	.115

Coefficient Correlations

It can be observed from the correlation's coefficient that variables with high positive correlation include; V_1 (EHR system resulted in improved customer services at the hospital) and V_{11} (EHR encouraged collaboration by eliminating multiple failures within the workflow) by 0.739 V_8 (EHR system has improved efficiency by eliminating duplication of data) and V_{10} (EHR system is easy to use as compared to the manual way of data entry) by 0.732 and V_1 (EHR system resulted in improved customer services at the hospital) and V_2 (EHR system helped reduce the time spent on billing and NHIS claims to process) by 0.693. The following was also identified with high negative correlation V_1 (EHR system resulted in improved customer services at the hospital) and V_{10} (EHR system is easy to use as compared to the manual way of data entry) by -0.905 V_{11} (EHR encouraged collaboration by eliminating multiple failures within the workflow) and V_8 (EHR system has improved efficiency by eliminating duplication of data) by -0.899.

The following was also identified with high negative correlation V_1 (EHR system resulted in improved customer services at the hospital) and V_{10} (EHR system is easy to use as compared to the manual way of data entry) by -0.905 V_{11} (EHR encouraged collaboration by eliminating multiple failures within the workflow) and V_8 (EHR system has improved efficiency by eliminating duplication of data) by -0.899 (Table 7).

Table 4: Coefficient correlations

Model		V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11
	V1	1.000										
	V2	**.693**	1.000									
	V3	-.659	-.403	1.000								
	V4	-.257	-.091	.450	1.000							
	V5	-.060	-.391	.191	.186	1.000						
	V6	.609	.304	-.609	-.406	.121	1.000					
	V7	.042	.317	-.128	-.223	-.478	-.304	1.000				
	V8	-.712	-.665	.601	.565	.187	-.547	-.188	1.000			
	V9	-.439	-.272	.172	-.361	-.076	.027	-.135	-.096	1.000		
	V10	**-.905**	**-.645**	**.662**	.324	.047	-.791	.019	**.732**	.177	1.000	
	V11	**.739**	**.485**	**-.782**	-.653	-.155	**.684**	.042	**-.899**	.048	**-.790**	1.000

DISCUSSION

From the study, it was revealed that the manual system of working negatively affects work outcomes. With the manual system, more hands are always needed to do everything, and this was attested by Withera et al. (2017) in their work that "there was a shortage of staff in the ICT department to run and maintain the system from working normally" (Waithera et al., 2017). From the study, the manual system of working in the various facilities was identified as having a negative effect on service delivery. The response scored a mean of 4.2. This score was based on their workflow, using registers and patient folders, time spent attending to clients, duplication, and transfer of information. Hence, about 67% of the respondents were of the view that they would be open to recommending an EHRs system if consulted by the management of their facilities. Waithera et al. (2017) identified processes that hinder smooth operation in the hospital to be the long time that is been wasted in filling in the data of the patients which could have been easily retrieved if a computer system had been adopted.

The study revealed that the introduction of EHRs system in the healthcare system poses a great challenge to individual knowledge concerning efficiency in work delivery. Also, the introduction of the EHRs system helped in capacity building as the respondents demonstrated with the outcome of the study. The study had 84.4% of the total respondents agreeing to the fact that knowledge of information technology has increased. The benefit of EHR cannot be understated as cited in (Jawhari et al., 2016) that, ICT presents several opportunities for improving the performance of health systems in developing countries. This means that such a system as the electronic record can dramatically reduce administration errors by validating medications and verifying patient identity (Silow-Carroll et al., 2012).

ICTs, therefore, can in many ways be vital tools in combating disease, promoting individual health, and making health systems more effective and efficient. They can be particularly powerful in monitoring the outbreak and spread of disease, disseminating health information (including information about health-promoting and disease-preventing individual behaviour), and providing training, information and long-distance. In July 2010, the Government of Ghana launched the national e-health strategy. The key strategies under the national e-health strategy are streamlining the regulatory framework for health data and information management, building sector capacity for wider application of eHealth solutions in the health sector, increasing access and bridging the equity gap in the health sector using ICT, and towards paperless records and reporting system (Vest et al., 2014).

Several studies have reported that the use of appropriate information technology in the delivery of healthcare may also improve hospital efficiency, with benefits exceeding the costs of adoption and patient satisfaction rating (Zabada, Singh, & Munchus, 2001). The study revealed that there is a positive relationship between EHR and healthcare delivery in Ho Municipality. According to Chisholm et al., (2015), Electronic Medical Record has a positive relationship with the increasing speed of treatment; error-free and consistency of results. It represents the historical evolution of care delivery records by health professionals from paper-based handwritten formats to electronic formats. The other major savings that EHRs make are the elimination of duplicate testing and patient testing (Connelly et al., 2011).

CONCLUSION

Effective EHR system implementation cannot be achieved if healthcare providers are not ready for such a change. This study found that most healthcare providers at the participating health facilities are ready for EHRs system implementation. The findings of this study can be considered by decision-makers to enhance and scale up the use of the EHR system in health facilities in Ho municipality. As such, efforts should be directed towards capacity building for healthcare providers in the Ho municipality. However, issues of equity of access and quality need not be compromised as that can hinder the success of the process. In general terms, the study reveals EHR has a positive effect on health delivery. Management benefits a lot from the EHR system through the quality of patients' records, attending to patients simultaneously, quality requisitions, and faster and easier booking of appointments among others.

The Ghana Health Service should endeavour to review the recent technologies used in enhancing healthcare delivery and implement better schemes that would lead to higher user satisfaction for their workers. Studies could replicate this study to examine the challenge of EHR on the quality of healthcare delivery in other health facilities. An inclusive and inter-sectoral approach to the development of national EHRs system strategies to ensure their relevance to all stakeholders and to promote shared action in achieving health objectives.

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