DETERMINANTS OF IMPLEMENTING ELECTRONIC MEDICAL RECORDS IN CLINICAL MANAGEMENT IN PUBLIC HEALTHCARE FACILITIES IN MOMBASA COUNTY, KENYA

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Abstract

The implementation of information and communication technology had been promoted as a way to reduce cost, increase effectiveness and improve the quality of care. Electronic Medical Record is one of the constituents of ICT in Health fields. Kenya health facilities are introducing step by step EMR in their organizational structures. However, the implementation of the EMR system has been met with partial success with the patient billing component being fully utilized while the patient clinical data capture component of the system remains underperforming. Therefore, the study sought to find out the determinants of implementing electronic medical records system in clinical management in public healthcare facilities in Mombasa County, Kenya. Specifically, it sought to determine the influence of perceived usability of EMR, network infrastructure set-up, staff ICT knowledge and staff attitude on the implementation of electronic medical records system in clinical management in public healthcare facilities in Mombasa County. Cross-sectional study design was adopted which targeted healthcare professionals drawn from various public healthcare facilities in the County. Stratified random sampling was used to acquire a sample size of 215 respondents. Data was collected using structured

questionnaires and was analyzed using both descriptive and inferential statistical techniques. The findings of multiple regression analysis revealed that perceived usability of EMR (β = 0.232, p < 0.05), and staff attitude (β = 0.258, p < 0.05) significantly influenced the implementation of EMR in clinical management in public healthcare facilities in Mombasa County while accessibility to network infrastructure (β = -. 111, p > 0.05) and staff ICT knowledge (β = -. 164, p > 0.05) did not. The study, therefore recommend that the EMR system designers ought to involve the medical staff substantially in the design of the system so as to fully capture their views and working requirements and also help domesticate the system so as to improve its implementation rates in the area. The hospitals' management together with other stakeholders to look for ways of raising funds to increase the network coverage of the system so as to enable their staffs to fully access the system even from remote locations.

Keywords: Perceived usability, staff attitude, EMR, clinical management, network infrastructure, ICT knowledge

INTRODUCTION

Improved access to patient records is critical to the effective management of public health by public sector healthcare entities. Consistent and well-timed data are required feasibly most in reaction to infectious disease and other critical events. The global health body World Health Organization (WHO) states that a virtuous health system requires a reliable and effective platform that can allow the health specialists make sound judgments as well as implement policies that will help in maintenance of the health amenities (WHO, 2011). Electronic Medical Records have emerged as a reliable system of public health information management that has improved health data access by availing timely health data collected and stored in the system (WHO, 2016). In addition, EMRs can be instrumental reminding healthcare providers when patients need immunizations and let the health personnel conduct defaulter tracing activity in the medical practice as well as offer the appropriate clinical procedures (Mugo, 2014). This enables the healthcare institutions to prevent disease spread or outbreaks within the populations they serve (Malunga&Tembo, 2017). This has resulted into a considerable improvement in the quality of health services as well as services in the public sector domain. EMRs have improved the reporting in the health sector by enabling the rapid acquisition, processing and dissemination of data in a reliable way.

However, despite the obvious advantages of the EMR as a component of information systems in healthcare, it has been reported that EMR is still undergoing significant opposition

among the physicians and other health professionals in the field (Davidson & Heslinga, 2007). Singh and Muthuswamy (2013) reporting on the status of EMR implementation in the public health sector in India observed that in spite of the gains made in the public health sector in terms of efficiency due to the implementation of EMR, factors such as the unanticipated costs, time constraints, privacy and unclear requests were constraining the implementation of the electronic system. The mixed success of EMRs has also been reported in Kenya which pioneered the use for an EMR model Medical Record System (AMRS) in Sub-Sahara Africa for healthcare management of patients infected with the Human Immuno-Deficiency Virus (HIV) (Siika, 2005).

In the year 2012 a non-governmental organization known as The Future Group undertook to collaborate with the Health Ministry to support the implementation of the International quality (IQ) care system at the Coast Provincial General Hospital (CPGH), Mombasa County. The Future Group sought the improvement of a simple to use EMR system in the all-inclusive care clinic (CCC), MCH and tuberculosis (TB) clinics when the patients were undertaking treatment. The EMR system was meant to provide a manual to the health care personnel on the methods of diagnosing and treating patients by following the treatment practices that are specified in the country. Further, the EMR was intended to capture information on instantaneous time basis for utilization by healthcare professionals during the patient visits to support in decision making. However, notwithstanding the widely recognized benefits of EMR and the extended donor support for the program, the implementation of the system in public health facilities in Mombasa County is still unsatisfactory motivating the need to establish the determinants contributing to low EMR application in clinical management of patients in the County.

Statement of the Problem

Electronic Medical Records systems have been around in the country for close to two decades now. However, as Mwangi, Namusonge and Sakwa (2016) observed, many health professionals still spend almost half of their time capturing and reviewing patient data leading to long waiting times. This was quite worrying since the routine of manual means delays in diagnosis and the determination of risk factors relating to diseases thereby increasing risks associated with poor healthcare management witnessed in the past. The delays, poor data quality and accessibility, and inaccuracies in the manual medical records management system coupled with the often unavailable or incomprehensible records compromises the treatment process (Lusk, 2010; Kimani, 2015). Several interventions meant to encourage the implementation of EMR in clinical management of patients have been made including donor

assistance in terms of funding and equipping. However, studies still show that there are unsatisfactory levels of EMR implementation in public health facilities in the country. Further, studies reveal that in most cases EMRs are seldom used for clinical management rather for billing and other non-clinical applications. Electronic Medical Records system was introduced in Coast Provincial General Hospital and several other public healthcare facilities in Mombasa County in 2010. However, there has been partial application of EMR in the management of patients' health data in the healthcare facilities. While the patient billing through EMR has been successfully implemented, most of the patients' clinical information is still being captured using manual means. Apart from its obvious benefits in terms of efficiency in the healthcare information management system, the EMR is an expensive system to install and maintain. Therefore, underutilization of the system can lead to significant losses in the public healthcare management system in terms of quality healthcare service delivery and also financially. Previous studies though remain inconclusive on the determinants of EMR implementation in clinical management mainly due to contextual constraints given the fact that most were done at the county level. Mombasa County has, however, not been surveyed to reveal the successes and challenges the County's public health system faces in the implementation of EMR. This study, therefore, found it necessary to establish the underlying reasons affecting the implementation of Electronic Medical Records system in clinical management among healthcare personnel in public health facilities in Mombasa County.

Objectives of the Study

The study sought to establish the determinants of implementing electronic medical records system in clinical management in public healthcare facilities in Mombasa County, Kenya.

Specific Objectives

1. To establish the effects of perceived usability on EMR implementation in clinical management in public healthcare facilities in Mombasa County.

2. To determine the extent to which network infrastructure set-up affects implementation of EMR in clinical management in public healthcare facilities in Mombasa County.

3. To determine the extent to which staff ICT Knowledge affects implementation of EMR in clinical management in public healthcare facilities in Mombasa County

4. To assess the extent to which staff attitude affects implementation of EMRin clinical management in public healthcare facilities in Mombasa County.

LITERATURE REVIEW

Theoretical Framework

This study was centred on the Technological Acceptance Model TAM. It originates from the Theory of Reasoned Action (TRA), set forward by Davis in 1989; TAM was selected as the model for this study since it has been broadly applied in studies associated to technology acceptance and it provides an excellent view on the user acceptance and behaviour in regards to information technology. The model is more pertinent in anticipating aim to use (acceptance) and usage for users than non-users of a particular technological innovation. Davis et al.'s TAM model was used to describe two important characteristics: alleged usefulness and the perceived usage ease of technology to health care practitioners'. These characteristics impact the behavioural intentions of accepting a technology system. Davis (1989) also observed that there is an association between the views that users have about a technology usefulness and the attitude and the intention of using the technology.
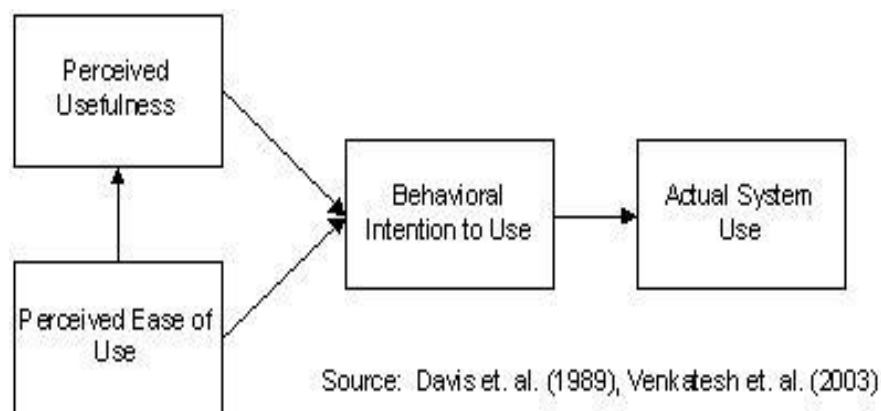
Source: Davis et. al. (1989), Venkatesh et. al. (2003)

Figure 1: Technology Acceptance Model

Perceived Usability and EMR system implementation in health institutions

Davis et al. (1989) explains that perceived usefulness of a specific technology or a component of technology is the extent to which end-users consider that they can improve and increase their job performance by applying the technology. In support, Nysveen et al. (2005), submitted that a technology that does little to enable its end users to improve their jobs performance is quite likely to be regarded as valuable. According to Yeow et al., (2008), people are keen to use a technology when they are persuaded concerning its usefulness and possible gains. Thus, technology acceptance literature rates perceived usability as the strongest predictor of technology reception and that it considerably affects the behavioral intent and real usage of new systems (Ma & Liu, 2004). Consequently, several researchers have linked perceived usability

directly as a factor of behavioral intention towards use (Venkatesh & Davis, 2000; Venkatesh, 2008). In relation to Electronic Medical Records, perceived usability is concerned with the extent to which EMRs bring around perceived benefits and enriches work performance (Holden & Karsh, 2010). Compared to other employers in everyday business settings doctors are distinctive regarding their acknowledgment of technology (Al-Adwan & Berger, 2015). Arguably, physicians tend to be more pragmatic and depends on the applicability of the technology rather than its comparative simplicity of usage. Previous studies suggest that physicians' perceived use of EMRs is directly linked to their behavioral intentions to their usage of EMRs (Esmaeilzadeh & Sambaivan, 2013; Hamid & Cline, 2013). However, with partial implementation of EMRs in patient data management observed in public hospitals in Mombasa County, it remains to be established whether perceived usability of EMRs also contributes to the problem.

Accessibility to network and implementation to of Electronic medical Records

The internet provides a bass for generating the numerous EMR applications. Applications like telemedicine and amenities that transmit data and accessibility to health information depend on the internet (Muchangi & Nzuki, 2014). Consistent use of EMR needs good internet network, that has a fast speed which can increase recovery of data as well as transmission (Ouma & Herselman, 2008). Slow internet connection is the main hinderance in the implementation of EMR in developing countries (Muchangi & Nzuki, 2014). EMR hardware and software cannot be utilized alone, it needs to tie with other devices that match the EMR system as assistance to generate benefits (Boonstra & Broekhuis, 2010). Interconnectivity hitches are well-recognized obstacle to the wide acceptance of EMRs as reported by doctors who have implemented EMR. Network and inter-net problems frequently caused operation slow-downs, with key influences on user confidence of EMR acceptance and the requirement to return to paper-based workflows (Jawhari, 2016). Therefore, in areas such as Mombasa County, the network infrastructure regime could be quite different and, hence, it will be important to establish how it could affect EMR implementation in clinical data management.

Level of ICT knowledge and implementation of EMR Systems

Computer skills are a basic necessity when capturing health information of patients into the system. Nevertheless, some health specialists lack such skills making it difficult to enter the medical information of patients in a correct manner (Boonstra & Broekhuis 2010). EMR application needs employees with higher education level (Martins & Oliveira, 2008). Studies suggest that insufficient knowledge and computer skills is a major contributor to physician

resistance to EMRs (Vishwanath & Scamurra, 2007; Simon et al., 2007; Terry et al., 2008; Jha et al., 2009). Pizziferri et al., (2005) attributed this low level of knowledge and skill in ICT among medical personnel to inadequate integration of ICT into the curricula of most medical programs. Consequently, Addah et al., (2013) argue that EMR vendors often ignore this factual reality, and fail to factor it into their programming, resulting in the development of systems that demand physicians to have advanced computer skills such as good typing skills for instance, to be able to capture patient medical information and make notes and prescriptions. Omary et al., (2010) credited low acceptance of EMR amongst developing nations to shortage of computer skills among the clinicians. Similarly, Abraham et al., (2011) states that extreme use of information technology in changing health care requires medical specialists to have adequate knowledge in information technology.

Staff Attitudes and Implementation of EMRs in Clinical Management

Electronic Medical Records system in clinical management is a relatively new notion or system given that it is yet to gain foothold particularly in public healthcare management in the country. Pointless to state, consequently, the EMR system is bound to encounter considerable opposition from the staff expected to implement it (Meinert, 2005). Clinics face a number of challenges when implementing a new electronic health records (EHR) system. One is often getting doctors on board with the new system. Due to this and other problems, facilities may struggle to uphold production at first. According to Versel (2002) the huge majority (greater than 85%) of individual and group of medical doctors have been unwilling to embrace electronic medical records and continue to rely on paper charts. Versel (2002) further observes that, in spite the availability of a myriad of EMR applications/vendors, estimates suggest that it will take at most a period of 10 years for doctor's acceptance to reach 80 percent. Previous research on staff attitudes and implementation of EMR in hospitals has yielded mixed results. For example, Modern Healthcare and PricewaterhouseCoopers carried out an annual survey 2003 in the US, the results indicated that above one-half (53%) healthcare administrators partaking in the survey cited general practitioner acceptance as obstacles to the implementation of EMR (Morrissey, 2005). Meinart (2005) study on resistance to electronic medical records (EMRS) as a hindrance to enhanced quality of care found that though the status and expected use of EMR functions varied, nearly 80 percent of the physician respondents felt that EMR ought to be implemented. For example, Mulwa (2013) observed that despite Nairobi being the country's capital and visibly endowed with ICT infrastructure and personnel, a considerable number of public health facilities still practiced manual data entry leading to inefficiencies and losses in working man-hours. Therefore, given the observed skewed implementation of EMR in public hospitals Mombasa

County, it was important to establish how staff attitude affects the implementation of the system in management of patients' clinical data in the area.
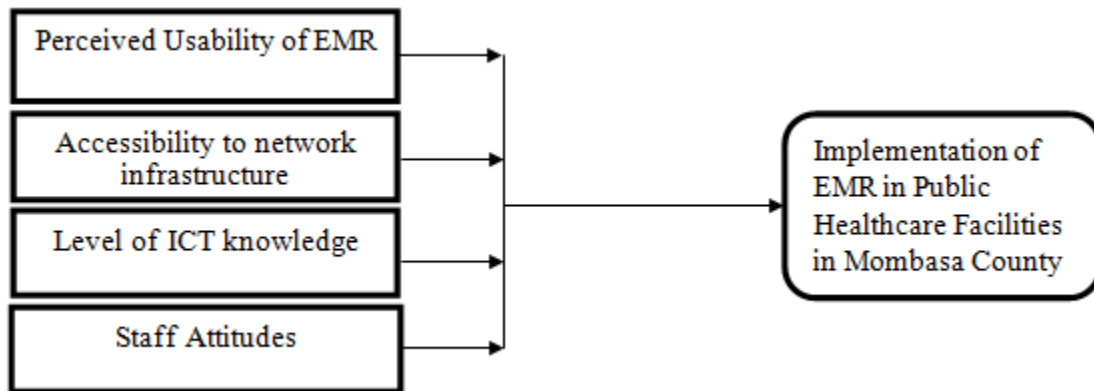
Conceptual Framework

Figure 2: Conceptual framework

METHODOLOGY

Research Design

The study design used was cross-sectional survey research design. This enabled the study to establish variations across sample groups and also allow generalizations of the findings over a large area in relation to EMR implementation in public healthcare facilities.

Study Location

The study was conducted at Mombasa County, Kenya. The County has a population of 939,370 on an area of 219 Km^2. The study area has one provincial general hospital-the Coast Provincial General Hospital (CPGH), three Sub County Hospitals, five Health Centers and twelve dispensaries run by the government of Kenya. The healthcare facilities offer their services to a primary catchment population of over 1,000,000 people and a secondary catchment population of about 2.7 million. In the year 2010, EMR was introduced in some of the healthcare facilities to aid in the management of patient data and also in revenue collection.

Target Population

According to the Mombasa County Health Ministry (2016), there were 4697 technical staff employed in the health sector, these were healthcare professionals carrying out clinical management of patients in the healthcare facilities and include physicians, surgeons,

radiologists, gynecologists, pharmacists, public health staff, dentists, ICU staff, theatre nurses and midwives and other health care professionals.

Sampling

The sample size of the number of respondents was obtained by utilizing Nassiuma (2000) formula. Nassiuma (2000) states that in most surveys, a coefficient of variation ranges from 21% to 30% with an average error in the range of 2% to 5% which is usually acceptable. Therefore, using the Nassiuma (2000) formula:

$$S = (N (CV^{2}))/(CV^2+(N-1)e^2)$$

Where: S = the Sample Size

N = the Population Size (4697)

CV = Coefficient of Variation (30%)

e = Standard Error (2% = 0.02)

Fitting the values into the formula, yielded a proposed sample size of 215 respondents. Stratified random sampling was then used to select the respondents.

Data Collection Instruments

The study utilized the questionnaire as its data collecting instrument. The selection of these instruments was directed by the nature of data to be gathered, availability of time and the study objectives. Closed ended items were used in the questionnaire. The respondents were allowed sufficient time-a maximum of two weeks- to completely fill the questionnaires after which they were collected by the researcher.

Pretesting of the Instrument

The usability of the questionnaire was tested using a pilot study group of 22 respondents at Moi District Hospital in Voi Town where the EMR has also been introduced. The participants for piloting were selected from five departments in the hospital and the pilot questionnaires administered to them. However, this study group was not included in the main study.

Validity of the Instrument

This study used content validity to ascertain the validity of its questionnaire. This was achieved by the researcher consulting with the supervisor at the university and medical professionals who gave an expert judgment on the questionnaire and moderate the test items to ensure their validity.

Reliability of the Instrument

Internal consistency technique of assessing reliability was employed to ensure the reliability of the instruments for this study. Consequently, the coefficient of reliability was computed using Cronbach's Alpha Coefficient which is a form of the Kunder-Richardson (K-R) 20 formula (Mugenda &Mugenda, 2003). The instrument Cronbach's alpha for reliability was α = 0.8113 which as acceptable according to Cronbach and Azuma (1962) who prescribe a Cronbach alpha threshold of 0.7 (70%) as acceptable for research purposes.

Data Analysis Techniques

Data generated in the study was coded and edited after its collection. Data was then analyzed using descriptive and inferential statistical methods. Descriptive statistics involved frequencies and percentages to give the basic features of the data while inferential statistics involved Pearson's Product Moment correlation to determine the relationships between the variables independent and dependent and allow for generalizations.

RESULTS AND DISCUSSIONS

Two hundred and fifteen questionnaires were administered to the respondents and one hundred and fifty- three returned duly filled by the respondents and were useable for the study purposes. This represented 71% response rate and acceptable for the study as shown in Table 1.

Table 1: Response Rate

Instruments issued	Instruments returned	Percentage response (%)
215	153	71

The instrument response rate was acceptable as recommended by Mugenda and Mugenda (2003).

Perceived Usability and EMR Implementation in Clinical Management

The results on the effects of perceived usability on EMR implementation in clinical management in public healthcare facilities in Mombasa County are presented in Table 2.

Table 2: Perceived Usability and EMR Implementation in Clinical Management

Statement	SA Freq(%)	A Freq(%)	N Freq(%)	D Freq(%)	SD Freq(%)
Do you feel use of EMR will enable you to complete tasks more quickly?	83(54)	47(31)	21(14)	2(1)	0
Do you feel use of EMR saves time in your job?	76(50)	49(32)	26(17)	2(1)	0
Do you feel your job performance has improved due to the EMR	58(40)	63(41)	25(16)	5(3)	2(1)
Do you feel EMR system for your facility will increase productivity	67(44)	55(36)	27(18)	1(1)	3(2)
Do you feel the system has simplified your job	61(40)	66(43)	19(13)	3(2)	3(2)
Do you feel EMR system is worth the time and effort required to use?	62(40)	52(34)	30(20)	5(3)	4(3)

The results in Table 2 shows that majority (85%) of the respondents felt that the use of EMR enabled them to accomplish their tasks more quickly. Most of them also felt that the use of EMR saves time in their job (82%). The findings also indicate that the use of EMR had improved the on job performance of the respondents (81%) as well as their productivity (80%). Also most of the respondents were of the view that the use of EMR had simplified their work (83%) and, as such, the system was worth the time and effort required to use (74%). These findings imply that the perceived utility of the EMR system was high among the respondents.

Network Infrastructure Set-Up and Implementation of EMR in Clinical Management

The findings on the extent to which network infrastructure set-up affects implementation of EMR in clinical management in public healthcare facilities in Mombasa County are presented in Table 3.

Table 3: Network Infrastructure Set-Up and Implementation of EMR in Clinical Management

Statement	SA Freq(%)	A Freq(%)	N Freq(%)	D Freq(%)	SD Freq(%)
Inadequate Internet bandwidth is a notable challenge to implementation of EMR	84(55)	49(32)	17(11)	3(2)	0
Legal concepts such as security and privacy issues affect the implementation of EMR	26(17)	39(25)	52(35)	23(15)	13(8)
Security concerns, including confidentiality, integrity and availability, are the major concerns in EMR acceptance at our facility	42(27)	56(37)	29(19)	19(12)	7(5)

	SA	A	N	D	SD	
Poor communication between various players affect the implementation of EMR	83(54)	45(29)	18(12)	5(3)	2(1)	Table 3...
Inadequate EMR software packages hinders acceptance in health facilities	52(34)	64(42)	28(18)	8(5)	1(1)	

From the results in Table 3, it is evident that inadequate internet bandwidth was a notable challenge to implementation of EMR in the area as indicated by majority (87%) of the respondents. It was also evident that legal concepts such as security and privacy affected the implementation of EMR (42%). Further, security issues, including confidentiality, integrity and availability, were the major concerns in EMR acceptance in most public healthcare facilities (64%). The findings also indicate that poor communication between various players affected implementation of EMR (83%). Also, inadequate EMR software packages delayed acceptance in most health facilities (76%). The findings underscore the importance of network communication infrastructure on implementation of EMR.

Staff ICT knowledge and Implementation of EMR in Clinical Management

The study results on the extent to which staff ICT knowledge affects implementation of EMR in clinical management in public healthcare facilities in Mombasa County are presented in Table 4.

Table 4: Staff ICT knowledge and Implementation of EMR in Clinical Management

	SA	A	N	D	SD
Statement	Freq(%)	Freq(%)	Freq(%)	Freq(%)	Freq(%)
General computer knowledge amongst us affect our use of EMR in our hospital	57(37)	48(31)	25(16)	16(10)	7(5)
Lack of Knowledge about EMR affects its acceptance and utilization	49(32)	61(40)	32(21)	6(4)	5(3)
Lack of use of EMR technology hinders its usage and implementation	61(40)	41(27)	25(16)	21(14)	5(3)
Health professionals would prefer not to use computers directly but would rather somebody else do the computer-related work for them	31(20)	56(37)	35(230	18(12)	13(8)
The fear of using technology is a barrier to the implementation of EMR systems by health care professionals.	65(42)	41(27)	27(18)	14(9)	6(4)

The findings in Table 4 suggest that lack of general computer competence amongst the respondents affected their utilization of EMR in the hospitals (68%). Also, inadequate knowledge on EMR affected its acceptance and use (72%). Inadequate use of EMR technology also hindered its application and implementations (67%). The findings further indicate that most of the health personnel would prefer not to use computers directly but would rather someone else do the computer-related work for them (57%). Also, the fear of using technology was an obstacle to the implementation of EMR systems by health care specialists (69%). These findings suggest that there was sufficient level of proficiency in computer applications mostly focusing on online activities. These findings agree with Hasanain, Vallmuur and Clark (2015) whose study on the conduct of health personnel in EMRs compliant in seven hospitals in Saudi Arabia found a positive association between computer and EMR knowledge.

Staff Attitudes and Implementation of EMR in Clinical Management

The findings regarding the extent to which staff perceptions affects implementation ofEMRin clinical management in public healthcare facilities in Mombasa County are presented in Table 5.

Table 5: Staff Attitudes and Implementation of EMR in Clinical Management

Statement	SA Freq(%)	A Freq(%)	N Freq(%)	D Freq(%)	SD Freq(%)
I rely little on paperwork nowadays to record patient clinical information	61(40)	37(24)	26(17)	24(16)	4(3)
I don't find the EMR useful in time saving, hence, I still prefer the paper based system	9(6)	38(25)	35(23)	41(27)	29(19)
I think we medics communicate better when using our own medical handwriting	19(13)	43(29)	35(23)	35(23)	19(13)
Most of my colleagues find information sharing quite difficult when we use EMR due to inaccurate entry of data	26(17)	59(39)	39(26)	14(9)	13(9)
We would prefer to use hand held devices in clinical data recording	29(19)	32(21)	43(29)	31(21)	15(10)

The findings in Table 5 indicates that majority of medical professionals in the area relied on paperwork nowadays to record patient clinical information (64%). Most respondents disagreed with the statement, "I don't find the EMR useful in time saving, hence, I still prefer the paper based system" suggesting that they found the use of EMR system advantageous over the erstwhile paper-based system (46%). However, most respondents were of the view that as

medics they communicated better when using their own medical handwriting (42%). Most were of the opinion that their colleagues found information sharing quite difficult when they used EMR due to inaccurate entry of data (56%). Other findings indicate that the medical staff would prefer using hand held devices in clinical data recording (40%). These findings imply that the staff attitude has implication on the application of EMR in clinical management of patients in the area. The findings agree with Husain, Saikia and Bo (2012) whose study in India revealed that physicians tended to resist the implementation of EMRs than patients.

EMR Implementation for Clinical Management in Healthcare Facilities in Mombasa

Lastly, the findings on the status of the EMR implementation in clinical management in public healthcare facilities in Mombasa County are presented in Figure 3.
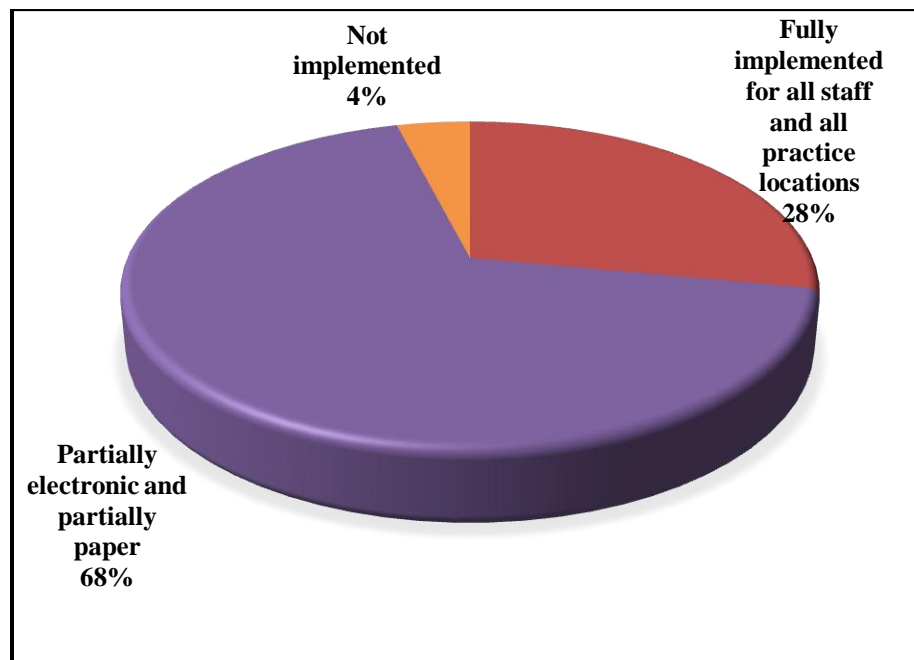

Figure 3: Level of Implementation of EMR

The results in Figure 3 suggest that most hospitals in the area had only partially implemented the EMR system (68%). The findings, however, indicate that very few hospitals in the area (4%) had not implemented the system.

Regression Analysis

Multivariate regression analysis was also used to determine how the independent variables influenced the dependent variable collectively. The results are summarized in Table 6.

Table 6: Multiple Linear Regression Analysis Model Summary

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	2.408	0.534		4.50936	0
Perceived Usability	0.146	0.118	0.232	1.23729	0.013
Accessibility to Network	-0.103	0.028	-0.111	-3.6786	0.906
ICT Knowledge	-0.133	0.118	-0.164	-1.1271	0.073
Staff attitude	0.106	0.092	0.258	1.15217	0.003
R	0.573				
R Square	0.328				
Adjusted R Square	0.305				
F	5.504 (4,136)				
Sig.	0				

The results in table 6 indicate that there is a significant difference between means of independent variables and the one describing implementation of EMR in clinical management in public healthcare facilities in Mombasa County ($F_{o'}$ = 5.504 > F_c = 2.50; α < 0.05; df = 4, 136; p ≤ 0.05). This finding confirms that the model is indeed significant and can be used to infer the relationships between the variables. The resulst further show that the relationship between the dependent variable and all the independent variables pooled together had a model correlation coefficient = 0.573. The adjusted r-square (R^2_{Adj} = 0.305) indicates that the model could explain upto 30.5% of the variations in the implementation of EMR in clinical management in public healthcare facilities in Mombasa County. It also suggests that the model could improve when more predictive variables were incoporated into the model.It can also be deduced from the findings in Table 4.11 that the most influential determinant in the model was Staff attitude (β = 0.258, p < 0.05). This was followed by Perceived Usability (β = 0.232, p < 0.05) respectively. This indicates that the dependent variable, that is, the implementation of EMR in clinical management in public healthcare facilities in Mombasa County, would change by a corresponding number of standard deviations when the respective independent variables change by one standard deviation. Although, two variables, that is, Accessibility to Network Infrastructure (β = -. 111, p > 0.05) and Staff ICT knowledge (β = -. 164, p > 0.05) were not found to be significant in the model. The study thus establishes that as per the model, Perceived Usability and Staff attitudewere the only determinants significantly influencing EMR implementation in clinical management in public healthcare facilities in Mombasa County.

Discussions

The findings revealed that the way EMR use in clinical management was perceived by the medical staff greatly influenced its application to medical practice in the hospitals. The findings support those of Lakbala and Dindarloo (2014) in Iran who found that the anticipated utilization of EMR functions highly correlated with the perceived usability with the importance of the system being equated with utilization. Further, it emerged that the configuration of the ICT networks in the area was limited meaning that the EMR applications could not be fully relied on to provide services to the clients. The findings reflect those of Jawhari (2016) whose study in Nairobi revealed that system reliability challenges were common due to unreliable infrastructure. This at times resulted in Network and Inter-net glitches that slowed down operations with major impacts on user confidence. The results on staff ICT knowledge showed that it was not a major drawback to the implementation of EMR in clinical management in public healthcare facilities. The results are in disagree with those of Omary et al., (2010) who attributed low acceptance of EMR among developing countries to lack of computer skills amongst the clinicians. Finally, the study found that the EMR implementation in hospitals in the area was likely to be impeded by unwillingness views among medical personnel if urgent steps were not taken to remedy the situation by encouraging the users to appreciate the system. The findings agree with Versel (2002) who found that the vast majority (greater than 85%) of individual and group physicians have been reluctant to embrace electronic medical records and continue to rely on paper charts.

CONCLUSIONS

Following the foregoing results, concerning the first objective, perceived usability was found to significantly affect EMR implementation in clinical management in the County's public healthcare system. Its advantages were seen in terms of time saving improved job performance as well as productivity. The study, therefore, concludes that the perceived utility was important for the implementation of EMR system. The study also found in relation to the second objective that the network infrastructure set-up did not significantly influence implementation of EMR in clinical management in public healthcare facilities in Mombasa County. Network infrastructure characterized by inadequate internet bandwidth and network security and privacy concerns still presented considerable challenges to the full realization of EMR utilization in the hospitals in the area. Hence, the study concludes that network infrastructure set-up was not a factor in the implementation of EMR in clinical management in the area. Further, the study the study did find that staff ICT knowledge evidenced by lack of knowledge about EMR and lack of constant use of EMR applications among some staff did not significantly affect implementation of EMR in clinical management in the County's public healthcare facilities. Finally, regarding the fourth

objective, the study established that staff attitude significantly affected implementation of EMR in clinical management in the area and that this was the most influential variable in the model. The study, therefore, concludes that that staff attitudes was a very important factor in the implementation of EMR in clinical management in the area.

LIMITATIONS

The study was limited to public healthcare facilities in Mombasa County. This means the results may not be necessarily applicable to other contexts like private healthcare facilities and also different countries where the healthcare management policies on information capture and sharing may be significantly different. This could likely affect the scope of interpretation. However, the other contexts have been given treatment in the review of literature. The time and financial resources allocated for the study dictated the research design and meant that an in-depth study could not be carried out. Nevertheless, the results are complimented by other similar studies in the country and in related contexts to provide depth in interpretation.

RECOMMENDATIONS

Recommendation regarding perceived usability

The system designers ought to involve the medical staff substantially in the design of the system so as to fully capture their views and working requirements and also help domesticate the system so as to improve its implementation rates in the area.

Recommendation regarding Accessibility to Network Infrastructure Set-Up

The hospitals'' management together with other stakeholders should look for ways of raising funds to increase the network coverage of the system so as to enable their staffs to fully access the system even from remote locations.

Recommendation regarding ICT Knowledge

The county government to increase funding in the health sector for acquisition of ICT resources needed to increase EMR implementation in hospitals as well as sponsor regular training on EMR so as to encourage their staffs to participate in the program and also improve on their computer skills.

Recommendation regarding Staff Attitude

There is need for the County health management team to organize seminars or conferences that bring together academicians, clinicians, hospital administrators and other policy makers to convince the medical staff on the advantages of using EMR in clinical management of patients.

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