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ADOPTION OF ELECTRONIC PRESCRIPTION PRACTICES IN KENYA; UNDERSTANDING THE ROLE OF HEALTH CARE WORKERS' ATTITUDE

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ABSTRACT

This study investigated the influence of health care workers' attitude on uptake of electronic prescribing practice among health workers in Nandi County The study was based on Technology Acceptance Model (TAM). The study took a cross-sectional descriptive survey designed and utilized both qualitative and quantitative methods. A total of 92 respondents out of the expected 101 participated in the study. Data was collected using both structured interviews and Key Informant Interviews. Data was analysed using both quantitative (Use of SPSS. Version 25) and qualitative methods (Thematic analysis assisted by MAXQDA software). Both descriptive and inferential statistics were employed in the analysis process. The study found out that about 74% of the respondents in the sampled facilities used electronic prescription practices. The findings of the study also reveal positive attitude towards use of electronic prescription practices and that this influenced its use ($p<0.05$). Also, the study established that demographic factors influence use of electronic prescription practices ($p<0.05$). From the study findings, recommendations are made for future studies to include other dimensions and magnitude of influence on use of electronic prescription practices. Policies could also be enhanced to cater for factors limiting use of electronic prescription practices. On programs, the study recommends educational programs both for those in practice and those in the medical schools.

KEYWORDS: Electronic prescription, attitude, health care workers, Technology.

INTRODUCTION

An electronic prescribing system is a process of where a prescription processes through a computerized system that enables a prescriber to enter and transmit electronically to pharmacy, medication orders through a computer.[1] There are three main categories of electronic prescribing systems: systems with decision support (clinical decision support); systems where electronic prescriptions integrated with electronic medical records system (computerized physician order entry); and the last electronic prescriptions as a stand-alone function. Electronic prescribing is defined as the utilization of electronic systems to facilitate and enhance the communication of a prescription or medicine order, aiding the choice and supply of a medicine through knowledge and decision support and providing a robust audit trail for the entire medicines use process.[2] There are other names for electronic prescribing such in USA, Computerized physician order entry (CPOE) and the automated prescribing. The utilization of electronic systems to facilitate and enhance the communication of a prescription or medication order , aiding the choice, administration and supply of a medicine through knowledge and decision support and providing a robust audit trail for the entire medicines use process.[2]

Electronic prescribing system was introduced into Nandi County ten years ago with initial system in former Kapsabet District Hospital with intention of improving prescription practices among clinicians; directing of prescriptions from clinicians rooms to pharmacy, laboratory orders to laboratory, reduce billing challenges and improve on coordination among health workers.

Electronic prescribing Practices

Prescribing practices has become a challenge globally due to the ever increasing number of drugs introduced into the market having diverse mechanisms of actions, contraindications, interactions, adverse events among

others.[3] The ability to recall these pharmacological and toxicological parameters in relation to particular patient condition and more so drug and drug history is subject to human error and thus requires new and innovative ways such as integrated computer systems; this is why electronic health records system was developed. Electronic prescribing system is a prescribing practice where medications orders for specific patients are transmitted electronically through computer system to pharmacy instead of paper based system whereby a prescription is made and provided to the patient to present it to pharmacy outlet of their choice. Simple systems will only process prescriptions but complex ones would include other orders such as tests and medical interventions.[4]

Computerized physician order entry (CPOE) enables physician to order medications, tests, and procedures directly into the hospital computer system and hence eliminating illegible handwriting while requiring the physician to complete all essential data fields. This solves the problem in the current paper-based prescription system on errors such as missing dose, route and frequency of administration as well as decreasing medication errors and increasing compliance with recommended prescribing regimen.[5]

On the other hand, computerized decision support system (CDSS) is an important input in electronic prescribing software which reviews orders as they are written by a prescriber.[6] It compares new orders with patient medication and health history in relation to drug interactions, appropriate dosing schedules and alerting physician to avoid the errors of omission or commission and hence improve on patient safety; this is because of inclusion of automated checks, formulary list, drug reference guides and safety alerts for contraindications and interactions. These capabilities are not possible in a manual prescribing system.[7]

Electronic prescribing practice is technology dependent concept and for its benefits to be realized, acceptance by the used by the health workers. Even though, many healthcare organisations that have made efforts to implement EMR, there is a very high failure rate, and studies show that up to 80% of EMR implementation fails; accurate estimates of implementation failures are difficult to find as many healthcare organisations are reluctant to report it.[8]

Studies by Varghese et al. (2018), show that approximately 19% of EMR are uninstalled after implementation and approximately 30% are not used to their full potential by the staff. It is very evident that implementation of EMRs systems remain a challenge especially in Kenya, the factors that influence EMR implementation is not clear, especially in Nandi County. Kenya National health strategy 2011-2017 was launched and automation of patients' records by use of EMRs will enhance the strategy by greater extent. The national e-health strategy was launched in 2010 with the aim of ensuring provision of health information to the right person at the right place and time to support quality and efficient healthcare (GOK, 2010). According to study by WHO (2011), there is an increasing number of local examples showing that faster and better information can improve healthcare delivery and public health information.

METHODOLGOY

This was a cross sectional descriptive survey conducted in Nandi Hills County Hospital and Kapsabet County Referral Hospital aimed at elucidating factors determining the use of electronic prescribing practice. Data was analysed using both qualitative and quantitative methods

RESULTS

Socio-Demographics Characteristics of the Respondents

Socio-demographic factors considered included gender, marital status, level of education, age, duration of service, cadre of service and working place. Table 1 below presents the findings.

Table 1: Socio-demographic characteristics of the respondents.

Variable		Frequency	Percent
Facility	Nandi	32	34.8
	Kapsabet	60	65.2
Gender	male	46	50
	female	46	50
Marital Status	Married	66	71.7
	Single	24	26.1
	Widowed	2	2.2
Level of Education	Tertiary	82	89.1
	University	6	6.5
	Masters	4	4.3
Age	23 - 40	86	93.5
	41 - 60	4	4.3
	61+	2	2.2

	Mean	**34**	
	Max	**50**	
	Min	**23**	
Duration of Service	<= 12	20	22.7
	13 - 128	54	61.4
	129 - 244	8	9.1
	245+	6	6.8
	Min	**2**	
	Max	**360**	
	Mean	**82.95**	
Cadre	Medical Officer	**10**	7.8
	Clinical Officer	**82**	92.2

As indicated in Table 1 above, the mean age for the study was 34 years, with the minimum age being 23 years and a maximum of 50 years. About 93.5% of the respondents were aged between 21-40 years. The findings reveal equal gender representation among the respondents (50%). About 71.7% of the respondents were married. Those who were single were 26.1% of the total population of the respondents. By levels of education, about 89.1% of the respondents indicated that they had attained tertiary levels of education by the time of the study. Those with university graduate levels of education were 6.5% while those with masters were 4.3%. Overall, the average years of service was 83 months (7 years) with a minimum of 2 and maximum of 360 months (30 years). Most (65%) of the staff were from Kapsabet County Referral Hospital while a lower number (35%), Nandi Hills County Hospital. By cadre, 92.2% of the sampled respondents were clinical officers. Table 4.1 above presents a summary of the findings

Extent of Use of electronic prescribing system

The extent of use of electronic prescription services was investigated in terms of frequency of use, devices used, perceived ease of use as well as perceived usefulness. The findings are presented in the sub-sections below.

Frequency of Use of electronic prescribing system

The respondents were requested to indicate how often they applied electronic prescription services. Figure 1 below presents the findings.

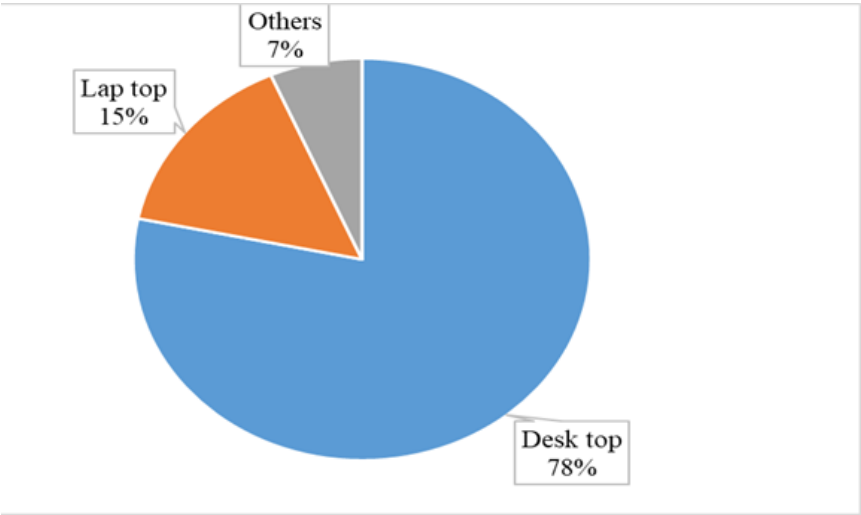

Figure 1: Frequency of use of electronic prescription.

The findings of the study indicate that about 38% of the respondents used electronic prescription often. Those who used electronic prescription very often were 36% while those who did not use it at all were 8 % of the respondents. Also, the findings indicate that those who rarely used electronic prescriptions were 12 %. Figure 4.1 above provides the details.

Electronic device used in prescribing practices

The study enquired the type of electronic devices used in prescribing practices. Figure 2 below presents the findings.

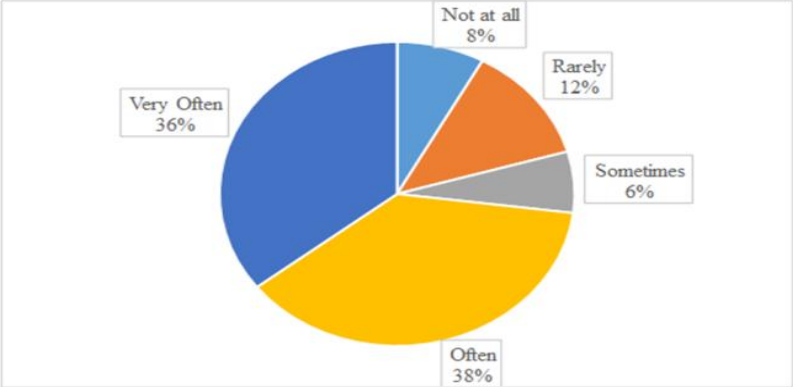

Figure 2: Electronic device used in prescribing practices.

The findings indicate that most of the respondents used desktop computers (78%). Those who used lap top computers were 15% of the respondents. About 7% of the respondents used other devices such as hand held devices.

Perceived ease of Use

Perceptions on ease of use of e-prescription practice were investigated in terms of accessibility, ability to use and application in practice. Four and Five point Likert scale was used where 1= Strongly Agree, 2=Agree, 3=Not certain, 4=Disagree and 5=Strongly Disagree. Table 2 below presents the findings.

Table 2: Perceived ease of use of electronic prescribing.

	N	Min	Max	Mean	Std. Deviation
Using technology in practice	92	1	5	3.39	1.213
Enjoy using technology such WhatsApp in communicating	90	1	4	1.6	0.747
EMR documents are accessible in a timely manner to all health care workers	88	1	5	2.09	1.046
Ability to use electronic prescribing system effectively	88	1	4	2.02	0.971
Valid N (listwise)					

As indicated in Table 2 above, the mean response for those who indicated that they used technology in practice was 3.39 (SD=1.213). This implies that, most of the respondents were not certain as to whether they used technology in all their practices. The findings also indicate that most of the respondents agreed that they enjoyed using technology in their practices M=1.6, SD=0.747. Also, most of the respondents agreed that EMR documents were accessible to them in a timely manner (M= 2.09 and SD=2.09). Finally, majority of the respondents also agreed that they had ability to use electronic prescription systems effectively (M=2.02, SD=0.971).

Perceived usefulness of electronic prescribing system

Perceived usefulness of electronic prescribing system investigated in terms of perceived credibility, patient safety, information access, patient follow up, risks of medication errors and user experience. A Five point Likert scale was used where 1= Strongly Agree, 2=Agree, 3=Not certain, 4=Disagree and 5=Strongly Disagree. Table 3 below presents the findings.

Table 3: Perceived Usefulness of electronic Prescribing System

	N	Min	Max	Mean	Std. Deviation
e-prescribing practices are more credible than paper system	92	1	4	1.57	0.803
e-prescribing improve on patient safety	90	1	4	1.51	0.782
e-prescribing practices enable quick access to patient information in real time	90	1	4	1.4	0.65
e-prescribing improves patient follow up	92	1	4	1.39	0.71
e-prescribing reduces risk of medication errors of	90	1	4	1.33	0.6
e-prescribing has been a positive experience in my practices	92	1	4	1.74	0.85
Valid N (listwise)	86				

As indicated in table 3 above, while the minimum response was 1, the maximum response was 4 against the expected 5. This shows that none of the respondents strongly Disagreed with the statements under investigation. Most of the respondents agreed with the statement that e-prescribing practices are more credible than paper system (M=1.57, SD=0.803). From the findings, most of the respondents also agreed that e-prescribing improve on patient safety (M=1.51, SD=0.782). Similar finding was also obtained with regards to the statement that e-prescribing practices enable quick access to patient information in real time. Least deviation was obtained when respondents were asked to indicate their agreement on the statement that 'e-prescribing reduces risk of medication errors' (SD=0.6) Table 4.3 above provides a summary of the findings.

During the Key Informant interviews, it emerged that electronic prescription services are majorly used at the outpatient departments. One of the informants indicated that, *On the extent of use of electronic prescribing systems I can say that the system is majorly in use at outpatient departments (consultation rooms, records sections, laboratory section and pharmacy sections) and all billing offices (both inpatient and outpatient)* **(KII,2).** It also emerged that the facilities sampled had varying degree of adoption of electronic prescription services. One of the informants indicated that.

In our facility, the system is purely paperless. We no longer do paper prescription. This has been achieved due to the fact that we adopted the system fully and encourage its application so as to leverage on its benefits **(KII1).**

In the other facility, it emerged that *Adoption of electronic prescription services has not been entirely adopted in our facility. We still use paper in some cases. We have faced many challenges with it hence the incomplete adoption* **(KII 2)**

Influence of attitudes of health care workers on electronic prescribing practices

Attitude of respondents was investigated on user attitude on enjoyment of technology, attitude on training as well as perceived credibility. Table 4 below presents the findings.

Table 4: Attitudes towards electronic prescription practices.

	N	Min	Max	Mean	Std. Deviation
enjoy using technology in prescriptions	90	1	4	1.6	0.747
computers complicated	90	1	5	3.87	1.173
EMRS/ERP require special training	90	1	4	1.64	0.708
e-prescribing practices are more credible than paper system	92	1	4	1.57	0.803
Valid N (listwise)	86				

The findings indicate that most of the respondents agreed that they enjoyed using technology in prescriptions (M=1.6). Most of the respondents also indicated EMRS/ERP require special training (M=1.64). Respondents also agreed that e-prescribing practices are more credible than paper system (M=1.57). However, the findings indicate that most of the respondents disagreed with the statement that EMRS/ERP require special training (M=3.87). Collapsing agreeing and disagreeing into two variables interpretable as poor attitude and positive attitude, Table 5 below presents the findings.

Table 5: attitude towards use of electronic prescriptions.

	Negative	Positive
EMRS/ERP require special training	4(4.3%)	88(95.7%)
computers complicated	12(13.0%)	80(87.0%)
enjoy using technology such WhatsApp in communicating	6(6.5%)	86(93.5%)
e-prescribing practices are more credible than paper system	10(10.9%)	82(89.1%)
Average	9(9.8%)	90(90.2%)

Findings as presented in Table 5 above, indicates that most respondents had positive attitude towards use of electronic prescriptions. On average, 90.2% of the respondents had positive attitude towards use of electronic prescriptions. The findings are as summarized in the Table 5 above. A cross tabulation was further conducted on use of electronic prescription against attitude towards electronic Prescriptions. Table 6 below presents the finings.

Table 6: Cross tabulation of Attitude and Use of Electronic Prescription.

Variables			Users	None Users	OR (CI)	p
computers complicated	Positive	80	70	10	1	0.0015
	Negative	12	3	9	21(4.85-90.88)	
enjoy using technology such WhatsApp in communicating	Positive	86	71	15	1	0.0001
	Negative	6	2	4	9.5(1.59-56.5)	
e-prescribing practices are more credible than paper system	Positive	82	71	11	1	0.0001
	Negative	10	2	8	25.8(4.84-137.8)	

As indicated in table 6 above, there was a statistically significant relationship between attitude and use of electronic prescription. Respondents whose respondents were negative with regards to the notion that computers are complicated were 21 times less likely to use computers for prescriptions (CI=4.85-90.88, p=0.0015). Those who did not enjoy using technology and thus with negative attitude towards use of electronic prescriptions were 9.5 times less likely to use electronic prescription services (CI=1.59-56.5, p=0.0001). Those who did not hold to the belief that e-prescribing practices are more credible than paper system and therefore negative attitude were 25.8 times less likely to use electronic prescription services (CI=4.84-137.8, p=0.0001). Regression analysis conducted were as presented in table 5 below.

Table 7: Regression analysis on the relationship between attitude and use of electronic prescription services.

ANOVA							
	Df	Multiple R	R Square	*F*	*Significance F*	*t Stat*	*P-value*
Regression	1	0.762483	0.58138	5.555209	0.077922	2.356949	0.007792
Residual	4						
Total	5						

As indicated in Table 7 above, there was a significant relationship between attitude and use of electronic prescription services (p=0.007792, t=2.356949). There was a 58.14 % fit to the regression equation (R Square=0.58138). The Multiple R obtained for the analysis was 0.762483 indicating a positive relationship between the variables.

From the Key informant interviews, it emerged that attitude towards use of electronic prescription services and that such attitude greatly influences its use in the facilities. One of the respondents indicated that *On the attitudes of health workers on the electronic system, I can say that initially there was a negative attitude towards adoption and use of the automated systems but with time most workers are now embracing the system. Some weaknesses in the system is that apart from lacking linkages between departments, the mediboss system could not seal revenue leaks. This really affects its adoption in our facilities* (KII 3).

DISCUSSION

Extent of Use of electronic prescribing system

The study established that only 74% of the respondents used electronic prescription services. The other 26% did not or rarely use the system. The degree of use however, varied with the facility. This finding may lead to an understanding that there is high percentage of prescribers using electronic prescription services in the study area. In a study conducted by[9], despite the well documented reports on the benefits of electronic health, adoption remains low in developing countries. The difference could be explained by the fact that electronic prescribing system was introduced in the study area as a measure aimed at improving prescription practices among clinicians; directing of prescriptions from clinicians rooms to pharmacy, laboratory orders to laboratory, reduce billing challenges and improve on coordination among health workers. The high percentage of users among the prescribers could therefore be explained by its presence as a recommended practice. However, it can still be reasoned that the 26% none users was still a big figure given the established benefits of adoption of the services.

The study also established that most of the prescribers used desk top computers for electronic prescription. The study findings also revealed that that in as much as prescribers did not use technology in all their practices, they enjoyed using technology in prescription, electronic prescription services were accessible and were able to use it effectively. This finding leads to an understanding that the prescribers in the study area perceived ease in use of electronic prescriptions services. In a study

conducted by[10], ease of service was established as an important factor for use of electronic prescription services. This finding may lead to an understanding that prescribers adopting electronic prescriptions services have ease of use for the services and that this may lead to high percentage of adoption of the technology.

From the study findings, these services were also perceived to very useful. It was described as more credible, improves safety, enables quick access to information, improves patient follow up, reduces errors and presents a positive user experience. This finding may lead to an understanding that prescribers perceive electronic prescription services as very useful. In a study conducted by[11], among the documented evidence of use of electronic prescription services include the fact that enhance the safety of pharmacological treatment by reducing the morbidity associated with medication errors by eliminating illegible hand writing, providing alerts on drug-drug interaction and drug allergy.[10] Other studies have also provided that by offering access to medication history, including prescriptions issued by other prescribers it helps to identify "doctor shoppers" and that the time spend handling the prescription renewal requests are considerably reduced. Electronic prescribing for controlled substances curbs the abuse and diversion of prescription drugs.[10]

Influence of attitudes of health care workers on electronic prescribing practices

The study established that there was a general positive attitude towards use of electronic prescription practices among the prescribers. The study also established that such attitudes influenced its use. From the study, those who had positive attitude towards use of electronic prescription practices also used electronic prescription practices. This finding may lead to an understanding that attitude of healthcare workers on electronic prescription practices influence its adoption and use. Attitude has been defined as the deeply formed opinions and perceptions regarding certain phenomena.[12] As such, opinions based on the findings of the presents study could have influenced its adoption and use in the study area. Moreover, studies conducted in Europe shows that prescribers' attitude towards use of electronic prescription services affect its adoption in the health facilities.[13] Another study conducted by[14] indicates that factors contributing to health care professional's resistance to use EMR systems are; computer self-efficacy, perceived complexity, peer pressure, anxiety, resistance to sue technology and attitude toward EMR systems. Such findings underscore the central role of prescriber's attitude in implementation of electronic prescription practices.

CONCLUSION

Based on the study findings, it can be concluded that up to 74% of the respondents used electronic prescription services and that use of electronic prescription services varied in the various facilities sampled. From the findings, most of the prescribers used desk top computers and that most of prescribers enjoyed using the electronic prescription practices. The practices presented ease of use and were very useful. Conclusion is also made to the effect that attitude of the prescribers influenced their use of electronic prescription services. As such, prescribers with positive attitude towards electronic prescription practices are more likely to use the services. Based on the regression analysis, it can be concluded that attitude greatly influenced used of electronic prescription practices than demographic factors.

Recommendations

Based on the study findings, the following recommendations are made. The study established that attitude of health care workers influence use of electronic prescription practices. From the theoretical framework of the study however, other factors including those associated with the facility may also influence use of technology. Future studies could take different study designs and include the scope of facility factors. Also, future studies could seek to ascertain the moderating effects of intervening variables in a case control design. The study also established that a considerable proportion of the prescribers still did not use electronic prescription system, even though its benefits were well outlined. In line with afore mentioned, integration policies could aim at ensuring inclusivity based on the established factors limiting adoption of the technology. Such policies could also leverage on the established opportunities for integration within the governance structures in the study area. This could be ensured by the county government as well as the National government.

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