Embracing Digital Health: Factors Influencing Electronic Medical Records Adoption Among Healthcare Workers in Northwest Ethiopia

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Abstract

Background: Although Electronic Medical Records (EMRs) play a vital role in strengthening the healthcare system by improving efficiency, data management, and patient care, their development in Ethiopia is still in its early stages. This slow progress is attributed to multiple challenges, including limited digital literacy and resistance to change among healthcare workers, alongside organisational factors.

Objective: This study aims to determine the level of acceptance of the Electronic Medical Records system and describe contributing factors.

Methods: A cross-sectional study was conducted at Healthcare Facilities in Bahir City, Northwestern Ethiopia. The study units were health workers in five health facilities that have implemented the Electronic Medical Record system were included in the study. The data entry and analysis were done with SPSS software. Descriptive statistics and Bivariate and multivariate binary logistic regression were done to determine factors associated with EMRs acceptance. x

Results: Out of the 322 respondents, 256 (73%), with a 95% confidence interval of 67.4% to 78.2%, showed a good acceptance towards using electronic medical records (EMRs). Years of work experience, satisfaction with monthly income, owning a personal computer, attending EMR training sessions, finishing the foundational training on using an electronic health management information system, and system usability were all significant predictors of EMR acceptance, with a p-value of 0.05.

Conclusions: Healthcare workers showed moderately positive acceptance of EMRs (4.87/7), valuing their usefulness (PU) over ease of use (PEOU) but lacking confidence in mastering the system. Key factors influencing acceptance included job experience, salary satisfaction, computer ownership, and training. Professionals with over ten years of experience were 14 times more likely to accept EMRs, while computer owners were 11 times more likely. EMR training increased acceptance fourfold, and DHIS2/eHMIS training tripled the likelihood of strong acceptance.

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Original Manuscript

Embracing Digital Health: Factors Influencing Electronic Medical Records Adoption Among Healthcare Workers in Northwest Ethiopia

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Abstract

Background: *Although Electronic Medical Records (EMRs) play a vital role in strengthening the healthcare system by improving efficiency, data management, and patient care, their development in Ethiopia is still in its early stages. This slow progress is attributed to multiple challenges, including limited digital literacy and resistance to change among healthcare workers, alongside organizational factors.*

Objective: *This study aims to determine the level of acceptance of the Electronic Medical Records system and describe contributing factors. A cross-sectional study was conducted at Healthcare Facilities in Bahir City, Northwestern Ethiopia. The study units were health workers in five health facilities that have implemented the Electronic Medical Record system were included in the study. The data entry and analysis were done with SPSS software. Descriptive statistics and Bivariate and multivariate binary logistic regression were done to determine factors associated with EMRs acceptance. Out of the total 322 study participants/respondents, this study showed that 256 (73%) with (95% CI; 67.4, 78.2) had a good acceptance of using electronic medical records. And the predictors of EMR acceptance were work experience, being satisfied with monthly income, owning a personal computer, attending a training on EMR, having basic eHMIS or DHIS2 training, and system usability, significant at a P -value of 0.05. The level of EMR acceptance among healthcare is above the mid-point, however it is somehow lower than other findings. Perceived usefulness of the EMR is higher than their perceived ease of use.*

Keywords: *Acceptance, Electronic Medical Records, Healthcare Workers, Implementation, Scale up strategy, Northwest Ethiopia*

Introduction

Although there were improvements on EMRs features, the system still did not work to the fullest. Past experience and knowledge indicate the need to assess the reasons for weak implementation of the EMR system to take a lesson for the improvement of the design and effective changes. Important system elements and functionalities of EMRs like adjustable checklists and registries, design and run reports, easy provider interfaces, and accessible patient portals provide efficient use of the system [1]. However, there are many aspects that limit the wider adoption of EMRs in sub-Saharan Africa. These include high procurement and maintainance consts to introduce the EMRs, lack of incentives for implementation, lack of concern to prioritize, electric power shorage, absence of internet, health profesional inadequate computer skill, and absence of strong health care facility infrastructure [2].

Although most public healthcare facilities in Ethiopia manually manage data tasks related to their clinical services, there has been a growing demand to adopt the EMR system in the healthcare facilities [3]. Evidence [4] shows that lack of strategic planning in the field EMRs had negative influence on the implementation of the system in the healthcare facilities. Moreover, the Ethiopian ministry of health recommended [5] that health care facilities should have a change management strategy that facilitates the smooth transition of the newly introduced EMRs system. This strategy will be part of the health care facilities' strategic paper and shows how the new systems are to be implemented and sustainable for longer time. There should also be a protocol to select best performers and to reward those health professionals working on EMRs. The strategy document should also contain principles on data generation and use at the local level for decision making [5].

And regarding health professionals' behaviors, perceived usefulness (PU) and perceived ease of use (PEOU) will influence user acceptance of the EMRs. User acceptance of technology and associated factors has been considered as an important issue that should be presented and understood before introducing and expanding any software applications or systems [6]. Motivation and engagement to use EMRs influences the acceptance and attitude of healthcare workers towards the technology. In turn, the motivation to use the system is influenced by the EMRs usability, healthcare workers competence, technology skill and confidence and perceptions. In general, the workplace motivation of health care workers affects work engagement, job satisfaction and intention to stay in the workplace [7].

The healthcare workers perceived ease of use (eg, accessing patient data) and perceived usefulness (eg, providing alerts and reminders) are keys to acceptance of EMRs [8]. Since their introduction, electronic medical records have been a recurrent issue for physicians across all specialties. From user experience to interoperability, nearly every facet of computer-based systems has drawn the ire of those using them. It was found that the amount of time spent in the physician's inbox and total time using EMRs were associated with higher physician turnover. The American Medical Association found that EMRs contribute to between 11% and 60% of the burnout physicians experienced in 2021 [9].

Since motivation has an important role in the behaviors of healthcare workers; the adoption, acceptance of, and attitude toward a new technology such as an EMR system, may be influenced by individual motivation [10].

A study on the Australian EMR system revealed that nurse motivation emerged as the most common factor relating to both perceived barriers and enablers to a new Australian EMR system implementation [10]. The development and implementation of EHRs involve lots of challenges including nurses' stress and negative consequences for patient safety [11]. Designing a user-friendly interface is another challenging task. A poorly designed interface may lead to reduced time efficiency, and poor quality of health care delivery and can become a threat to the patient's safety as well. Acceptance of EHR by doctors is also perceived as a barrier. This is due to the extra time that doctor spends entering data electronically which otherwise they can spend treating the patients [12].

So far, the Ethiopian Ministry of Health, in collaboration with partners implemented an EMRs system in some governmental healthcare services. The EMRs system in Ethiopia started ten years ago but could not go far as expected due to factors like behavioral, and technical within the health care workers, and factors related to the organization [5]. It was also observed that most of the EMR systems in Ethiopia were not interoperable and automated only some aspects of health services. So that most of them cannot be used to exchange patient data with other e-health systems. Additionally, the systems did not address the growing need for individual-level data for better patient care and follow-up and the data collected in the system lacks uniformity [3].

Hence, most public healthcare facilities in Ethiopia manage their patient information using paper-based recording which results in errors, delays, and reduced service quality [3]. Therefore, the shift to electronic records is not questionable, for improved standards of care, clinical decision-making [3]. Moreover, some health care workers encountered mistrust with the system. In this regard, there

are only few studies to show EMRs acceptance among healthcare workers in hospitals, and specifically in the contexts of privacy and security concerns [13].

Therefore, this study aims to provide information for the development EMR scale-up strategy after identifying and framing the determinates of EMR acceptance and barriers to the system implementation at healthcare facilities.

Methods

Study Design

This study employed a cross-sectional quantitative study design to assess healthcare workers' acceptance of Electronic Medical Records (EMRs) in healthcare facilities where the system has been implemented. The study aimed to systematically evaluate factors influencing the adoption and utilization of EMRs among healthcare professionals, considering key determinants such as perceived usefulness, ease of use, and organizational support.

Study Setting

The study was conducted at healthcare facilities found in Bahir Dar city, Northwest Ethiopia. Totally, there are seven hospitals in the city; three of them are private owned. There were also ten government owned health centers any many private clinics. However, among these only five healthcare facilities were introduced the Electronic Medical Records that were included in the study, and where the sample was drawn.

Participants

The study population was all healthcare workers who are currently practicing on EMRs at healthcare facilities in Bahir Dar City, Northwest Ethiopia. This includes physicians, health officers, nurses, midwifery, laboratory professionals and pharmacy professionals, information system officers, and medical data clerks who are working on EMRs.

Healthcare workers who have prior exposure to Electronic Medical Records at least for six months were included in the study and those with less than six months exposure to Electronic Medical Records were excluded from the study.

The sample size is calculated with Epi Info (V 7.2.5) STATCALC, considering population size (P=1848), proportion (p=0.5), Confidence Interval (CI=95%), and Margin of Error (d=0.5).

$X = (Z_{\alpha/2})^2 * p*(1-p) / d$

The above sample size calculator reflects the recommended number of samples required to estimate the true proportion mean with the required margin of error and confidence level.

This means 318 or more measurements/surveys are required to have a confidence level of 95%. Moreover, to minimize the challenge of dropout, it was assumed there would be a dropout rate of 5%. Therefore, the final sample size was, n = 318 + (318x0.05) = 334.

Data Collection methods

The data was collected with a questionnaire prepared to address the research objectives. The questionnaire has five sections of which two were Likert-like items based on a scale from "extremely disagree" to "extremely agree". The other sections are questions regarding information on healthcare workers socio demographic and EMRs implementation related questions.

Since quantitative data are always numerical in kind or numbers that have a certain intrinsic meaning, the researchers assigned scores to all kinds of variables in the questionnaire. The score number constitutes a shorthand way of expressing a respondent's answer [14].

The data collection tool was developed by the researcher, reviewing similar scientific literature on the topic [15–18]. A pretest was conducted, and revisions was made accordingly.

Measurements

According to (Lewis & Hf, 2019), to provide TAM scores that are consistent with SUS and UMUX-related metrics, the following formulas were used to put PU and PEU on a 0–100-point scale, averaging PU and PEU to get the overall TAM.

- *PU = (AVERAGE(TAM01, TAM02, TAM03, TAM04, TAM05, TAM06) – 1)(100/6)*
- *PEU = (AVERAGE(TAM07, TAM08, TAM09, TAM10, TAM11, TAM12) – 1)(100/6)*

Accordingly in this study, perceived usefulness (PU) is computed with the SPSS statistical package as;

- *(MEAN(SE01,SE02,SE03,SE04,SE05,SE06) - 1) * (100 / 6) and*

Perceived ease of use (PEU) is computed as;

- *(MEAN(SE07,SE08,SE09,SE10,SE11,SE12) - 1) * (100 / 6) that converts 7-point scale to 100-point scale.*

Data analysis

As this was a systematic search for meanings, the data was, first, cleaned and recoded to fit with the

model. The data management and analysis were done with the SPSS Version 28.0 software. Reliability analysis for the internal consistency of items/scales of the outcome variable done using cronbach's alpha [20]. Descriptive statistics applied to analyze the mean, standard deviation, range, and median. Chi-square (X2) test was used to identify the relationships between categorical variables. Participant responses was dichotomized into two levels with a mean split by the value of EMR acceptance score, where the variable is split at the mean. Bivariable and multivariable binary logistic regression was done to determine factors associated EMR acceptance, and a P-value of 0.05 considered statistically significant. Binary logistic regression assumptions were checked before running the model.

As indicated by Zach, assumptions of the logistic regression [21], logistic regression is a method that we can use to fit a regression model when the response variable is binary.

One of the assumptions is that the response variable is binary, and in this regard the logistic regression assumes that the response variable only takes on two possible outcomes, low or high acceptance of electronic medical records. The second assumption was the observations are independent, and logistic regression assumes that the observations in the dataset are independent of each other. The third assumption was no multicollinearity among explanatory variables as logistic regression assumes that there is no severe multicollinearity among the explanatory variables. The VIF indicates whether a predictor has a strong linear relationship with the other predictor(s). A value of 10 is a good value at which to worry. if the average VIF is greater than 1, then multicollinearity may be biasing the regression model. The fourth assumption was there are no extreme outliers.

Ethical Considerations

Ethical approval for the study obtained from College Research Ethics Committee (CREC) at the College of Human Sciences (CHS), University of South Africa. In addition, permission to conduct the study was granted from the public health institute, Bahir Dar City, Northwest Ethiopia. Moreover, the present study ensured the confidentiality, anonymity, privacy, autonomy, justice, beneficence, and no maleficence of the study.

Results

Socio demographic characteristics of the participants

About 322 participants responded to the questionnaire with a response rate of 96.4%. The respondents age in this study ranges from 23 to 62 years. The mean age of the respondent was 35 years with the standard deviation (SD = 6.4). Table 1. indicates that 29.5% (n=95) of the

respondents were in the age group of 21- 30, 53.4% (n=172) were aged 31- 40, and 17.1% (n=55) were older than 40 years. And, most of the respondents were female which accounts for 53.4% (n=172).

The majority of the respondents, 63.4% (n=204) were married, and most of them had educational level of BSc and above where 60.9% (n=196) had BSc Degree, 15.5% (n=50) had MSc Degree and above, see Table 1.

With regard to health profession, About half of the respondents were nurses which accounted for 50% (n=161) of the total participants. And, the number of specialists and above was very low, 4% (n=13). Laboratory and pharmacy professionals had nearly similar figures 8.7% and 7.1%, respectively, as shown in the Table 1. Indeed, above half of the participants were not satisfied with their monthly income which is 61.5% (n=198).

Table 1. Frequency distribution of background characteristics of the respondents (n=322)

Variable	***Category***	***Frequency***	***Percent***	***Mean***	***SD***
Age Group	*21-30 years old*	*95*	*29.5*	*34.75*	*6.40*
	31-40 years old	*172*	*53.4*		
	> 40 years old	*55*	*17.1*		
Sex	*Male*	*150*	*46.6*		
	Female	*172*	*53.4*		
	Total	*322*	*100.0*		
Marital Status	*Married*	*204*	*63.4*		
	Single	*88*	*27.3*		
	Others	*30*	*9.3*		
Educational Level	*Diploma and below*	*76*	*23.6*		
	BSc	*196*	*60.9*		
	MSc	*50*	*15.5*		
Work experience as health professional	*Junior (1-2 Years)*	*8*	*2.5*	*10.8*	*5.7*
	Associate (2-5 Years)	*41*	*12.7*		
	Mid-level (5-10 Years)	*124*	*38.5*		
	Senior (Above 10 Years)	*149*	*46.3*		
Experience on EMR	*1 - 5 Years*	*267*	*82.9*	*4.1*	*1.8*
	Above 5 Years	*55*	*17.1*		
	Total	*322*	*100.0*		
Health Profession	*Specialist and above*	*13*	*4.0*		

	Medical Doctor	*43*	*13.4*	
	Nurse	*161*	*50.0*	
	Pharmacy	*23*	*7.1*	
	Laboratory	*28*	*8.7*	
	Others	*54*	*16.8*	
Income of healthcare workers	*unsatisfactory*	*198*	*61.5*	
	satisfactory	*124*	*38.5*	
Total		***322***	***100.0***	

Information system and Electronic Medical Records use

Above half of the study participants, 66.1% (n=213) reported owning a personal computer or a laptop. In is understandable that knowhow and exposure on information communication technologies will contribute to the usability and acceptance of different information systems. In this regard, this study observed training of basic computes among the healthcare workers and found that about half of the respondents took the training which is 56.8% (n=183). However, those who frequently use internet outside the office were 32.9% (n=106), somehow lower, Table 2.

Table 2. Basic computer training and ownership of computer and experience on other health information system among health care workers (n=322)

Variables	***Category***	***Frequency***	***Percentage***
Own a personal computer	*No*	*108*	*33.5*
	Yes	*214*	*66.5*
Attended a basic computer training	*No*	*139*	*43.2*
	Yes	*183*	*56.8*
Attended a training on EMR	*No*	*160*	*49.7*
	Yes	*162*	*50.3*
EMR training taken	*Before starting to work on the EMR*	*68*	*21.1*
	While working on	*94*	*29.2*

	the EMR		
	No EMR training	*160*	*49.7*
other eHealth trainings	*No*	*240*	*74.5*
	Yes	*82*	*25.5*
Basic eHMIS and/or DHIS 2 training	*No*	*182*	*56.5*
	Yes	*140*	*43.5*
know about ICD 10 (International Classification of Disease)	*No*	*265*	*82.3*
	Yes	*57*	*17.7*
produce a health service report using EMR	*No*	*193*	*59.9*
	Yes	*129*	*40.1*
	Total	***322***	***100***

Not having adequate training and experience is one of the main obstacles to a good EMR implementation and productivity. There were a rapid development of health innovations where most of them are targeting the point of care. And, sometimes health professionals may forced to use the new system without having prior knowledge about it. This can be a factor for low acceptance of EMRs among healthcare workers.

In this regard, there were about half of users who did not take a training on EMR, 49.7% (n=160). This will not be a surprise if these providers have a lower EMR acceptance, as most of them believed to learn from their coworkers. This is indicated in the Table 2, where most of the health workers took the training while working on the EMR system, 29.2% (n=94).

Another was training on eHMIS/DHIS2. DHIS2 is the latest version of eHMIS, mostly practiced by health offices and monitoring and evaluation experts at health facilities to manage health service reports. The study showed that above half of the respondents 56.5% (n=182) did not attended the training.

Further advanced know how on the electronic medical records were very limited, as it was indicated by other eHealth trainings and information about ICD (international classification of diseases), a very common terminology standard most EMR vendors are currently using, Table 2.

Electronic Medical Records Acceptance among Healthcare workers

Electronic Medical Records acceptance in this study was measured with 12 item variables of perceived usefulness and perceived ease of use. And each item had a 7-point ordinal scale response options/agreement scale, from extremely disagree on the left to extremely agree on the right. The

study was on Electronic Medical Records implemented healthcare facilities; the researcher measures acceptance related to actual use rather than the anticipated, Table 3.

Therefore, the level of EMR acceptance for this study was, 4.87 (SD = ±0.83), with the range from 2.92 to 5.75.

Table 3. Mean and standard deviation of EMR acceptance among healthcare workers as measured by the 7 point Likert scale

TAM	***SN***	***Items to measure EMR Acceptance***	***Mean***	***SD***
Perceived Usefulness	*1*	*Using Electronic Medical Records in my job enable me to accomplish tasks more quickly.*	*5.96*	*0.748*
	2	*Using Electronic Medical Records improves my job performance.*	*4.53*	*1.038*
	3	*Using Electronic Medical Records in my job increase my productivity.*	*5.43*	*0.694*
	4	*Using Electronic Medical Records enhance my effectiveness on the job.*	*4.25*	*0.877*
	5	*Using Electronic Medical Records make it easier to do my job.*	*6.26*	*0.597*
	6	*I have found Electronic Medical Records useful in my job.*	*6.30*	*0.780*
Perceived Ease of Use	*7*	*Learning to operate Electronic Medical Records was easy for me.*	*5.35*	*0.985*
	8	*I found it easy to get Electronic Medical Records to do what I want it to do.*	*4.36*	*0.821*
	9	*My interaction with Electronic Medical Records was clear and understandable.*	*4.16*	*0.680*
	10	*I found Electronic Medical Records to be flexible to interact with.*	*4.00*	*0.994*
	11	*It was easy for me to become skillful at using Electronic Medical Records.*	*3.31*	*0.717*
	12	*I found Electronic Medical Records easy to use.*	*4.56*	*1.079*
Overall Acceptance			*4.87*	*0.83*

When comparing perceived usefulness with perceived ease of use, the healthcare workers perceived usefulness score is higher than their perceived ease of use, as described in Figure 1. Among the six items from the perceived usefulness, the item; I have found Electronic Medical Records useful in my job, have had the highest score of 6.30 from 7.0. And, among the items of perceived ease of use, the item, learning to operate Electronic Medical Records was easy for me, had the highest score. However, the

least score was about its easiness to become skillful, 3.31.

Those healthcare workers who scored above or equal to the mean score value was categorized as having a good Electronic Medical Records acceptance and those healthcare workers who scored below the mean value were classified as having Poor EMR acceptance.
Out of the total 322 study participants, this study showed that 256 (73%), with (95% CI; 67.4, 78.2) of the study participants had a good acceptance on using electronic medical records.

Figure 1. Line graph comparing perceived usefulness, perceived ease of use and system usability towards EMR acceptance (converted to 0-100 points)

Even though, the acceptance on EMRs increased with the increase in work experience as shown in the Figure 2, there was a large gap between work experience as health worker and on electronic medical records. Lower work experience on EMR is due to late adoption of the system in the health facilities.

Figure 2. a line graph showing the years of experience as a healthcare worker versus on Electronic Medical Records

Higher acceptance of electronic medical records was observed among pharmacy professionals, specialists, and medical doctors. This was observed in the boxplot, Figure 3.

Figure 3. Boxplot showing health professionals acceptance of electronic medical records over professional category

Factors associated with healthcare workers' acceptance of Electronic Medical Records at healthcare facilities

To identify predictor variables using a statistical model, it is important to understand type of the dependent (outcome) and explanatory variables. Hence the dependent variable in this study is acceptance of electronic medical records (poor or good). Since the researcher interest is to look the factors that determine good acceptance of Electronic Medical Records, good acceptance is coded as 1 and poor acceptance coded as 2. Then in binary logistic regression model, the first step is to use univariable analysis to explore the unadjusted association between variables and outcome.

The purposeful selection process begins by a univariate analysis of each variable. Any variable having a significant univariate test at some arbitrary level is selected as a candidate for the multivariate analysis. We base this on the Wald test from logistic regression and p-value cut-off point of 0.25.

As shown in Table 4, the bivariable and multivariable logistic regression analysis was performed to assess the statistical association between the dependent variable (EMR acceptance), and the independent variables. The variables assessed in the bivariable logistic regression analysis were sex, age, years of work experience (grouped), years of experience on EMR (grouped), owning a personal computer, attending a basic computer training, attending a training on EMR, having basic eHMIS and/or DHIS 2 training, information about ICD 10 (International Classification of Disease), average monthly income and EMRs system usability (grouped). And variables which were statistically significant at P-value < 0.25, chi-square statistics and Wald test for individual parameters are examined, and selected for multivariable logistic regression analysis. The Wald statistics tells us If the coefficient is significantly different from zero then we can assume that the predictor is making a significant contribution to the prediction of the outcome.

Hence, some variables (Age Group, Experience on EMR (Grouped), Information about about ICD 10 (International Classification of Disease)) were excluded from the model. Finally, to control the potential confounders multivariable logistic regression was done.

The model test showed that the logistic regression model was statistically significant and able to estimate the acceptance of EMR among healthcare workers (73%, p < 0.001). The model explained between 51.8% (Cox and Snell R square) and 75.2% (Negelkerke R squared) of the variance in the confidence score.

Accordingly, the predictors (with control for other independent variables in the regression model) are: years of work experience, satisfied with monthly income, owning a personal computer, attending a training on EMR, having basic eHMIS and/or DHIS 2 training, and system usability were significant at a P -value of 0.05 (Table 4).

The result found in the multivariable analysis shows that, healthcare workers with more than 10 years of work experience had fourteen times (AOR: 14.32 (95% CI: 4.60, 44.5), P<0.001) more likely to accept using EMR than their counterparts. Healthcare workers who own personal computer had odds of having good EMR acceptance (AOR: 11.08 (95% CI: 4.03, 30.42), P<0.001).

Training on EMR had also a significant effect to accept EMR, where healthcare workers who took training on EMR were four times more likely to have a good acceptance than those who did not take

the training, (AOR: 4.71 (95% CI: 1.52, 14.54), P<0.007). Similarly having the basic eHMIS or DHIS2 training while working in the health facilities helped the healthcare workers to have a good acceptance of electronic medical records (AOR: 3.06 (95% CI: 1.02, 9.17), P<0.007).

Table 4. Bivariable and multivariable binary logistic regression to determine factors associated with EMR acceptance

Variables	***Category***	***EMR Acceptance***		***COR (95% CI)***	***AOR (95% CI)***	***P-Value***
		Poor	***Good***			
Sex	*Male*	*55*	*95*	*1*	*1*	
	Female	*32*	*140*	*2.53 (1.52, 4.21)*	*2.68 (0.88, 8.14)*	*0.082*
Work Experience	*1 - 10 years*	*72*	*107*	*1*	*1*	
	> 10 years	*15*	*128*	*5.74 (3.11, 10.60)*	*14.32 (4.60, 44.58)*	*0.000*
Average monthly income	*Unsatisfied*	*63*	*135*	*1*	*1*	
	Satisfied	*24*	*100*	*1.94 (1.14, 3.33)*	*0.28 (0.10, 0.82)*	*0.020*
Do you own a personal computer or laptop?	*No*	*67*	*41*	*1*	*1*	
	Yes	*20*	*194*	*15.85 (8.68, 28.95)*	*11.08 (4.03, 30.42)*	*0.000*
Attended a basic computer training	*No*	*58*	*81*	*1*	*1*	
	Yes	*29*	*154*	*3.8 (2.26, 6.40)*	*0.79 (0.27, 2.30)*	*0.668*
Attended a training on EMR	*No*	*60*	*100*	*1*	*1*	
	Yes	*27*	*135*	*3 (1.78, 5.06)*	*4.71 (1.52, 14.54)*	*0.007*
have basic eHMIS and/or DHIS 2 training	*No*	*61*	*121*	*1*	*1*	
	Yes	*26*	*114*	*2.21 (1.31, 3.74)*	*3.06 (1.02, 9.17)*	*0.046*

System Usability	*Low*	*81*	*65*	*1*		*1*		
	High	*6*	*170*	*35.31 (14.69, 84.88)*		*38.24 (12.26, 119.27)*		*0.000*

Note: some variables were recoded to identify the category that have more effect on the outcome variable (like work experience; recoded into two categories)

Discussion

In summary, the study found that above half of the healthcare workers (73%) had a good acceptance of EMR. And, factors associated with this were years of work experience, satisfied with monthly income, owning a personal computer, attending a training on EMR, having basic eHMIS/DHIS 2 training, and system usability.

EMR implementation was seen as challenge for older health professionals, especially above 60 years old, that may therefore cause to their retention in the workforce [22]. However, in this study, most of the participants were young adults between the age of 21 to 40 (53.4%), with standard deviation (SD = 6.4) which is consistent with the study done in Saudi Arabia Hospital, about 62% [23]. Hence, the researcher believed that the acceptance of EMR would be much lower if there were a significant number of older populations found in the sample. Strategies to address technology anxiety as well as the physical and psychological limitations of an older workforce are needed to support these work force during an EMR implementation [22].

More than half of the healthcare workers, 66.1% reported owning a personal computer. However, this was lower than the study done in Oman where a wide majority of the healthcare workers participated in the study which is 92.3%, reported owning a personal computer or a laptop [24]. Since, ownership of technology will improve perceived ease of use, the healthcare facility should consider a strategy to enhance technology exposure and/or supporting laptops and smartphones for the healthcare provider.

Regarding basic computer training, this study showed that about half of the respondents took the training, 56.8%, which is nearly similar with the study in Saudi Arabia hospital where 52.3% of the participants described that they had a formal computer training while 47.7% mentioned that they did not have any type of computer training [23]. However, the finding is lower than a study done in muscat where about three-quarter of the study participants had computer training. This may affect their abilities to competently use the EMR system, and influence the quality of interaction with the system while providing health care [24]. It can be explained that having a good experience on

information communication technology will help the healthcare workers to have a higher perceived ease of use, which in turn improves the usability and acceptability of electronic medical records.

Absence of training and lower experience are among of the main obstacles to a good EMR implementation and productivity. In this regard the study observed EMR training among the healthcare workers and found that about half of users did not take a training on EMR, 49.7%. The magnitude of the problem, the gap in EMR training, will be more visible as one understands how effective the training was. This was described in the Rwandan study where 98% respondents agreed that their training on the EHR was effective and about 93% were confident in using the EMR after having the training [25].

Years of experience as health professional is another factor that determine EMR acceptance. In this study, about half of the participants were mid and lower-level experience (1-10 years), 54%. This is consistent with the study in saudi arabia hospital, 56% [23]. The adoption of Electronic Medical Record has great paybacks for health professionals, health facilities, and also for the health outcome of the people; if it was used effectively. Therefore, a higher attention should be given to the human resource development in line with investing on the introduction of the technology.

EMR acceptance was measured with the latest version of technology acceptance model, 12 items and 7-point scale measurement (Lewis & Hf, 2019) The level of EMR acceptance for this study was 4.87 (SD = ±0.83) on a 7-point scale. This finding is lower than a study done in Marie Stops International Clinic in Myanmar among clinical and management staffs, which 4.24 (5-point scale) or 5.94 (7-point scale). The scale is converted to compare it with this study [27]. However, it is consistent with the study done in northeastern US regional medical center among ICU nurses, that was 6.91 (on 10-point scale) that means 4.83 (on 7-point scale) [28].

To identify factors associated with the acceptance of the electronic medical record, the variable is recoded and dichotomized into two categories (Good and Poor acceptance with mean 4.87(SD = ±8.3) cutoff points. Multivariable analysis showed that, healthcare workers with more than 10 years of work experience had a very high effect to EMR acceptance. This finding is supported by many evidences; a report at government hospital in muscat stated, healthcare workers with six years and more experience in using the EMR system had two times more likely to accept the EMR than their counterparts (OR: 2.49 (95% CI: 1.23, 5.04), p = 0.01). And, another study from Saudi Arabia indicated that notable positive relationship were found between years of experience at the organization and acceptance of EMR [23,24,29].

Owning a personal computer had also a positive effect to acceptance of the electronic medical

records among healthcare workers. This is consistent with the done in Belgian Hospital among hospital staffs, where the length of computer usage found to have a positive correlation with acceptance of EMR [29]. This may be due to health workers behavior would be influence by information technology use and being more familiar with computer usage. So, EMR adoption can sometimes be effective with only little support to the system users.

Sometimes technology may be introduced into the organization without creating awareness and having a training, that leads to hesitancy to use the system. In this study, about half of the participants reported as having the training on EMR. And, it has a significant effect to accept EMR, where healthcare workers who took the training on EMR were four times more likely to have a good acceptance than those who did not take the training (AOR: 4.71 (95% CI: 1.52, 14.54), P<0.007).

Limitations

Cross-sectional design limits the ability to establish causal relationships between factors and EMR acceptance. And, self-reported data may introduce social desirability and recall biases, potentially affecting the accuracy of responses. Finally, while key factors influencing EMR acceptance were identified, other potential determinants like organizational culture and technical support were not extensively explored.

Conclusion

The level of EMR acceptance among healthcare workers is 4.87 out of seven-point scale. Though, this is above the mid-point, the level of EMR acceptance is somehow lower than other findings. Perceived usefulness and perceived ease determine the level of Electronic Medical Records acceptance. EMR acceptance is the actual use rather than the anticipated.

The healthcare workers perceived usefulness of the EMR is higher than their perceived ease of use. Years of work experience, being satisfied with monthly income, owning a personal computer, attending a training on EMR, having basic eHMIS and/or DHIS 2 training, and system usability were factors that are associated with the acceptance of EMR. It is recommended to have appropriate strategies relevant to the context before implementing the Electronic Medical Records.

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Conflict of Interest

None declared.

Abbreviations

EMR: Electronic Medical Records

ICD: International Classification of Disease

ICU: Intensive Care Unit

PEOU: Perceived Ease of Use

PU: Perceived Usefulness

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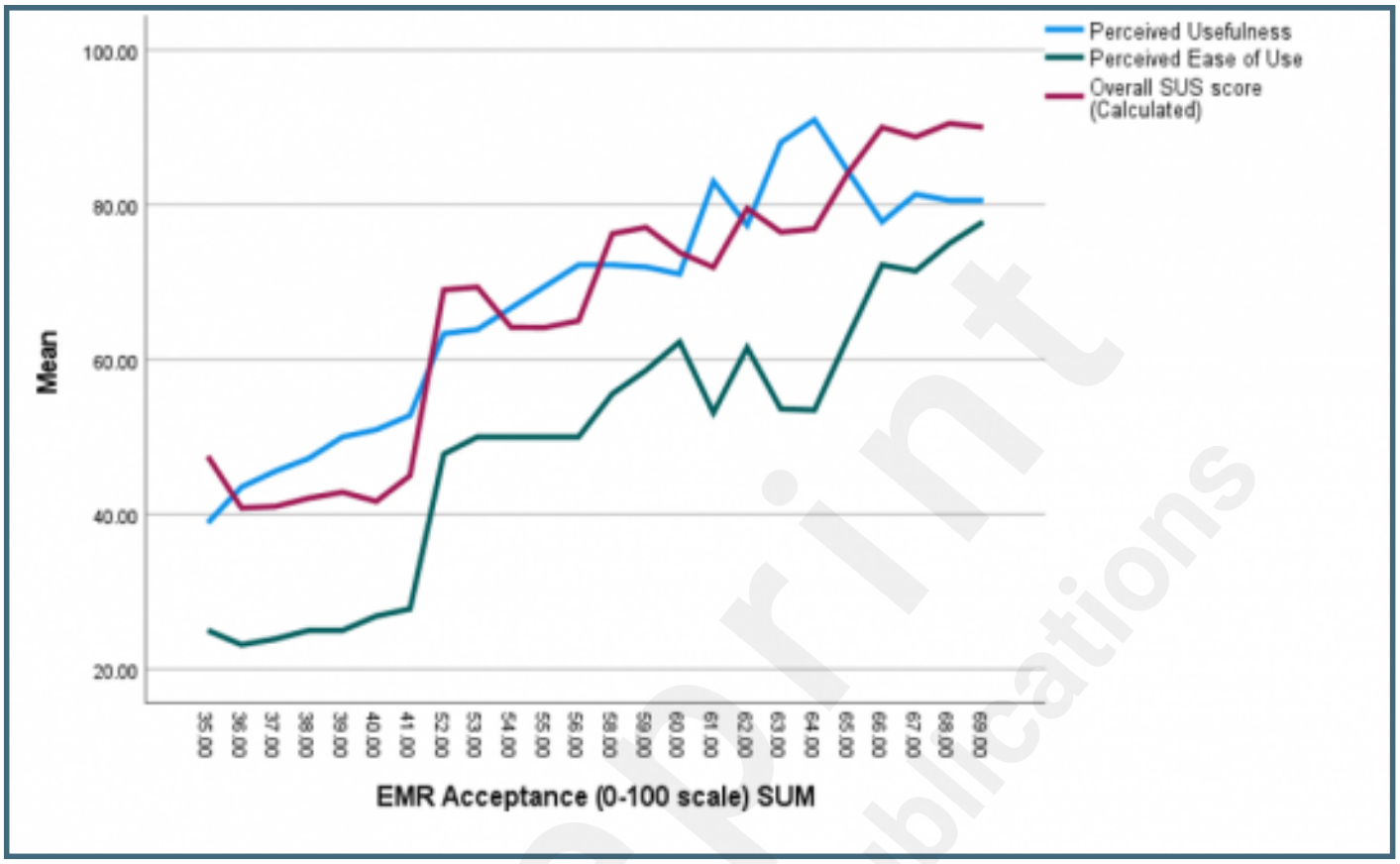
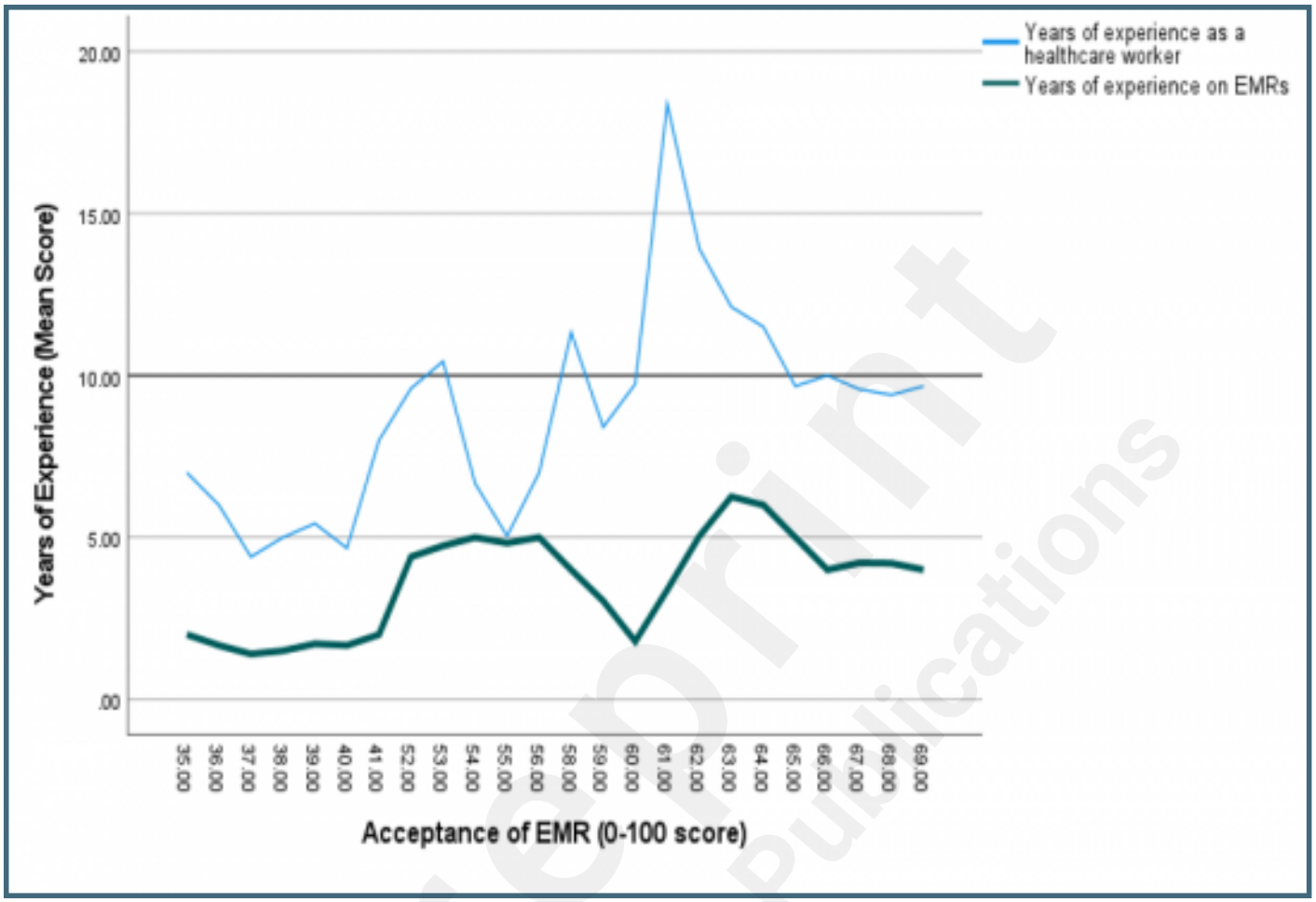
Supplementary Files

Figures

Line graph comparing perceived usefulness, perceived ease of use and system usability towards EMR acceptance (converted to 0-100 points).



A line graph showing the years of experience as a healthcare worker versus on Electronic Medical Records.



Boxplot showing health professionals acceptance of electronic medical records over professional category.