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Assessing Electronic Medical Records Readiness for Service Delivery in State Hospitals in Southwest Nigeria

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ABSTRACT

Electronic Medical Records (EMR) is an important communications channel relating to patient health conditions. Unfortunately, many hospitals in Africa, including Nigeria, have not implemented EMR. The few Hospitals that have some level of EMR continues are still struggling with the use of paper and hybrid medical records, which has led to inadequate medical follow-up, medical error, and long waiting time for patients. A sample size of three hundred and ninety-seven (397) was determined using krejcie and morgan models, comprising of strategic managers, and the operational staff drawn from a population of 2889 in the selected hospitals. Questionnaires were used for data collection. The study adopted a descriptive statistical analysis method to describe the existing medical records systems. The data from the quantitative method was presented in tables and figures. The findings indicated that management readiness which covers financial and political readiness was very low. In the area of readiness, which covers the availability of electronic record managers, the availability of ICT support staff, computer compatible medical devices, among others, was low. The study concluded that hospitals in Nigeria are not taking a adequate preparatory step in implementing EMR. Before embarking on the implementation of EMR, the study recommended that the selected hospitals should ensure there is the availability of fund, staff training, and technical infrastructures like electronic record managers, ICT support staff, and computer compatible medical devices.

Key Words: *Health Records, Electronic Medical Records, Record Automation Readiness*

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1. Introduction

Medical records that come in either paper or electronic are a means of communication related to the health condition of a patient and are maintained for purposes of patient diagnosis and treatment. Although, EMR readiness and implementation in developed countries has been high, in Nigeria and other developing countries it has been low and not growing compared to penetration of ICT in other sectors like banking, commerce, education among others. Despite the effort the Nigeria government has initiated such as guidelines and policies on health information systems, evidence indicate poor compliance in EMR implementation. Electronic medical records failure and rejection by users have been reported where implementation was done without readiness assessment. The hospitals are struggling with problems associated with manual medical records system, which has led to challenges like medical errors, poor performance in treatment area, and poor service delivery on the part of healthcare workers, among others. It is not known why hospitals in Nigeria are not taking advantage of the benefits provided by EMR to improve services. The low penetration of EMR despite the initiatives the government has made still remain questionable. At the core of this

study are issues surrounding low readiness and Implementation level. The research is motivated by the need to find out the factors leading to non-readiness and non-implementation of EMR systems in state teaching hospitals in southwest Nigeria in the 21st century. The crux of the problem the readiness and implementation levels exist in state teaching hospitals in southwest Nigeria towards implementation of EMR and how the selected hospitals compare to the rest of the hospitals in Nigeria, Africa and the world at large.

The world health organisation in 2006 published medical records manual for developing countries on how to what to consider when conducting EMR readiness. The guideline agreed that governments should start with an in-depth evaluation of their readiness to adopt EMRs, including infrastructure, implementation standards, business and clinical processes and education and training, human capital and public will. The guidance further states that the evaluation process should be adapted to the country's unique EMR needs and that resources, including personnel, should be a top priority. The guideline did not include psychological and technological readiness for EMR implementation. Yusif, Hafeez-Baig, and Soar (2017) in their a study on E-Health readiness assessment and measuring tools. The researchers posit that inability to conduct readiness can lead to EMR implementation failure and redundancy of the computer-based system. Xu, Gao, Sorwar and Croll (2013), in their article on the implementation of electronic health records in Australia, stated that in 2004, MediConnect completed its readiness test in Launceston general hospital and Ballarat equine hospital. Since then, they were able to obtain vital experience in implementing an EMR system. Medicare does not cover ambulance services; most dental services; eyes care and glasses, contact lenses and hearing aids; cosmetic surgery.

A USA government health information technology website called HealthIT.gov (2013), argued that assessing hospital readiness is a foundational step in the EMR implementation process. The findings identify some readiness assessment fundamental questions, for example, "administrative processes streamlined and documented to accommodate the new change? What is the level of clinician understanding of their workflow? Are the data collection process well reported, established, and documented in the hospital? What is the computer literacy level of an operational health worker in the hospital? Is the hospital connected to the internet and how familiar are the staff with internet communication? Does the hospital budget cover the purchase of hardware and software that will give the hospital a better opportunity to implement EMR?" among other questions. The study did not consider if the health workers have access to a computer and are psychologically ready for technological change. Also the readiness did not consider existing policies that will facilitate the EMR implementation in the hospital. According to Digitised medicine (2009), in his study on selecting an EMR readiness assessment in the USA, readiness helps hospitals set for technological change and enable successful EMR implementation. The study also identifies readiness factors such as physician perceptions toward EMR use, staff readiness and willingness to change, vision and goals related to technology adoption and skills, level of EMR literacy, current data management technique, managerial decision-making process, and available resources. The study did not consider financial readiness as one of the indicators for managerial readiness for EMR implementation.

Ajami, Isfahani, and Heidari (2011) in their study on the readiness of Electronic records implementation road map in Iran and found four major areas of readiness that are very important to EMR implementation in hospitals. He identifies management, operational readiness, technological readiness, organisational culture as key areas to be considered in the pre-

implementation stage of EMR. Ghazisaeidi, Ahmadi, Sadoughi, and Safdari (2014) in their study on readiness assessment for pre-implementation of EMR in general education hospitals at Tehran University of Medical Education, Iran.In which Five dimensions model designed was used to assess the readiness for EMR implementation, namely cultural, leadership and management, technical infrastructure, governance, and operational dimensions. The findings show that only 28.6 % of general – teaching hospitals were ready to implement EMR in Iran. Implementation has not taken place. In Pakistan Qamar, BahadarGhulam Allah, ShadiullahAmanullah, and Abdus (2013), in their article on determining the user's willingness to adopt HER in developing countries, the finding shows the willingness to use EMR based on readiness factors. The finding also shows that the willingness (readiness) to use EMR has not been positive by medical practitioners due to the low level of technology literacy. The author of this work does not consider staff training, availability of the hardware and software, management readiness, among other readiness factors, before implementation. Six related structures for assessing readiness for electronic medical records in the Mauritian health care sector have been established by Beebeejauna and Chittoo (2017). The readiness comprises core readiness, technological readiness (ICT infrastructure and resources), readiness for society, political readiness, readiness for acceptance and readiness to use. The readiness indicator did not mention if the readiness has been conducted to cover all the functions of EMR in the implementation process. Moomba (2017) conducted a research thesis on the perception and experience of healthcare workers on the use of EMR in two hospitals in Livingstone in Zambia. The result shows that the organisation was already using computer hardware and is ready to implement EMR. This means that the same EMR used in antiretroviral therapy (ART) to capture data across the regional network would be used in all patient care products, such as registries, outpatient care, mothers' and children's units (MCH), family planning, tuberculosis and others. The study did not identify the need for staff training, internet connectivity, and staff perception of the use of EMR when implemented.

Attah (2017), citing McGowan, Cusack, et al. (2008), in his article on implementing the EMR in Nigerian Secondary Healthcare Facility, opined that the purpose of readiness is to achieve user service delivery and perception towards the implementation of EMR. The finding also identifies organisational challenges in the course of EMR implementation in the hospital. The study did not look at available policy and management readiness to change as a major factor for readiness for EMR implementation. Ojo and Popoola (2015) studied EMR information management in Nigeria. Teaching Hospitals identify four main areas of EMR readiness (Management and leadership, Operational readiness, Technology readiness, and hospital culture). In Nigeria, one of the tertiary healthcare services that have implemented EMR is the Federal Medical Center (FMC) Gusau. According to Management science for health (2017), in 2016, Management Science for Health (MSH) introduced the EMR system to FMC Gusau to overcome poor record-keeping challenges. The findings show that ten (10) laptop computers and a server were donated to the facility, and health workers were also trained to manage records using the new EMR platform. This process shows that the hospital conducted both technical and management readiness before implementation. In southwest Nigeria, Onigbogi, Poluyi, Poluyi, &Onigbogi (2018) researched Doctors' Attitude and Willingness to Use EMR at the Lagos University Teaching Hospital. Despite the positive perception of readiness to use EMR, the findings show a very low level of competence in I.T. skills by medical doctors in the hospital. The study did not indicate the readiness and willingness of the management to implement the use of EMR.

2. Theoretical Review

The study used the Theory of Organisational readiness for change by Weiner (2009). Readiness to change refers to the willingness and commitment of members of organisations to change positively (change commitments) and share belief that can improve their performance. The theory identifies three key determinants of readiness for change, namely, task demands (operational readiness), resource availability (ICT infrastructure and resources), and situational factors (organisational and management readiness). The determinants show that when an organisation's readiness for change is high, employees are more likely to implement change, put in the more constructive effort, be more persistent, and cooperate. This can be linked to preparedness by members of the organization to implement change. Mangundjaya, (2013) Organisational readiness for change and individual readiness for change has positively contributed to commitment to change.

The theory also show that individual readiness for change is the most important variable to commitment to change. Johnblack, Kabukye, Keizer, and Cornet (2020) cite Koller (1995), who claims that half of the major organisational changes fail due to a lack of readiness. Staff members strive to preserve a state of affairs that gives them a sense of psychological protection, power, and identity, and any attempts to alter this status quo are met with resistance. Wiener (2009), in his study looking at the theory of organisational readiness for change, focused on the organisational level of analysis to enhance health care delivery. Organisational readiness for change (ORC) is a universal concept that is essential for the introduction of any changes in the healthcare sector. The organisational readiness for change theory has been successful in measuring organisational readiness and implementation of EMR and other services in healthcare. This is evident in a study carried out by Randall, Hort Huebner, Mallort, Mancl, Milgrom, Nelson, Senturia, Weiner, Cunha-Cruz,(2020) on Organizational Readiness to Implement System Changes in an Alaskan Tribal Dental Care Organization. The result indicated that readiness-for-change scores is capable of influencing institutional adoption of new policies and procedures.

Another study by Wiener, Amick, and Lee (2008) on the conceptualisation and evaluation of organisational readiness for change in health services research and other fields posited that organisational readiness for change is a key precursor to effective change implementation in healthcare. Readiness is a psychological and physical condition in which members of an organisation feel secure in collectively introducing organisational change. This way of thinking about organisational readiness is ideally suited to evaluating organisational changes where collective behavioural change is needed to successfully introduce change and, in some cases, to deliver expected benefits. The theory is relevant to this current study because it identifies the main parameters used in the determination of readiness for change, thereby providing a picture of the factors to be considered in assessing readiness for EMR implementation. Successful change efforts are based on the perception of the employee and manager to organisational change factors like management readiness, available resources, and planning, among others.

3. Research Methods

Being a study on EMR implementation, descriptive design was selected in order to show the current EMR situation in the selected state universities teaching hospitals in southwest Nigeria. The study was conducted in four selected state university teaching hospitals in Nigeria namely; Osun state, Lagos state, Ondo state, and Ekiti state, respectively. This study population included

strategic hospital managers such as medical directors and department heads and operational health workers such as doctors, nurses, pharmacists, health information managers, physiotherapists, radiologists, medical laboratory personnel, maternity and family care personnel, planning and research and finance personnel. The operational staff wereof importance to this study because as users of EMR they hold information on the whether it is easy to use and benefiting them in service delivery, how the management has prepared them for EMR implementation. Health workers are expected to benefits more in the implementation. The strategic managers as the decision makers and strategic driver of the institution they are expected to spearhead the implementation process of EMR, through financing and planning, and to provide information on the readiness level of the hospital.

The sample size determination was based on Krejcie and Morgan (1970) Sample Size Determination Table for ±5% precision level and 95% confidence level. It stated that when the population is 2,889 at ±5% precision, 397 should be the sample at a 95% confidence level. This means each hospital sample was calculated proportionately by using a formula recommended by Krejcie and Morgan. The study used two questionnaires, one for strategic mangers and the other for operational staff. The instruments are suitable for collecting data from the group of respondents. The methods enabled the researcher to obtain more accurate information as the instrument allows face to face interaction during data collection and give room for on the field observation. Also, the instrument allows confidentiality and can be used to collect information from a large group of respondents. The research adopted a quantitative research method. With the aim of the study to investigation of readiness and state of implementation of EMR, inorder to capture descriptive data on the existing scenario quantitative methods which allows for genralisation and capturing of numeric data was found suitable for this study.

The Quantitative (Questionnaire) method suitable and it enable the researcher to capture data on available ICT infrastructure and resources,and level of implementation of EMR from each department of the selected state universities teaching hospitals. The questionnaire was used because of it ability to capture large respondents. The strategic manager's readiness and implementation was measured quantitatively through the use of a questionnaire. The variable was measured using Management readiness, financial readiness, implementation plans and focus, challenges of EMR implementation, Hospital policies and law guiding EMR use, and operational readiness of EMR implementation in the hospital selected was also captured through a questionnaire. It allowed the respondents to answer questions related to the readiness and implementation of EMR for service delivery anonymously, considering their confidentiality. To assess EMR system, the data on types of EMR system was categorized in terms of paper-based, hybrid and electronic systems and analyse and tabulated using percentage frequency table. To establish the level of readiness, data on readiness parameters such as implementation plans, availability of funds, guideline and policies, political will, staff readiness and training, availability of ICT infrastructures and software among others were tabulated by percentage to show the level of readiness and implementation. A chi square test of independent was used to test the association between user readiness and EMR usefulness, and EMR ease of use and staff training. To establish whether readiness and implementation were impacting on usefulness, data on readiness was cross tabulated with data on benefits of EMR and chi square test was computed. The Social Science Statistical Package (SSPS) was used to enhance the data analysis.

4. Research Findings

To assess the EMR readiness in the selected hospitals, health care staff were asked to rate the assessment indices identified under existing ICT resources and infrastructure, psychological readiness, staff readiness in preparation for EMR implement.

4.1 Existing ICT infrastructure and resources in selected hospitals

Existing ICT infrastructures and resources plays a significant role in EMR implementation in hospitals. Ajami et.al (2011) argued that ICT resources emphasis on the needs assessment of technology support, ICT support staff, continue maintenance of infrastructure ICT within the hospital. The purpose of this analysis is to understand how ready the healthcare workers are in terms of ICT infrastructure and resources in the selected state university teaching hospitals in south west Nigeria. To ascertain the existing ICT infrastructure and resources, three hundred and ninety seven (397) respondents were asked question with regards to ICT infrastructure and resources in their various hospitals, two hundred sixty nine (269) responded. The results are indicated in figure 1.

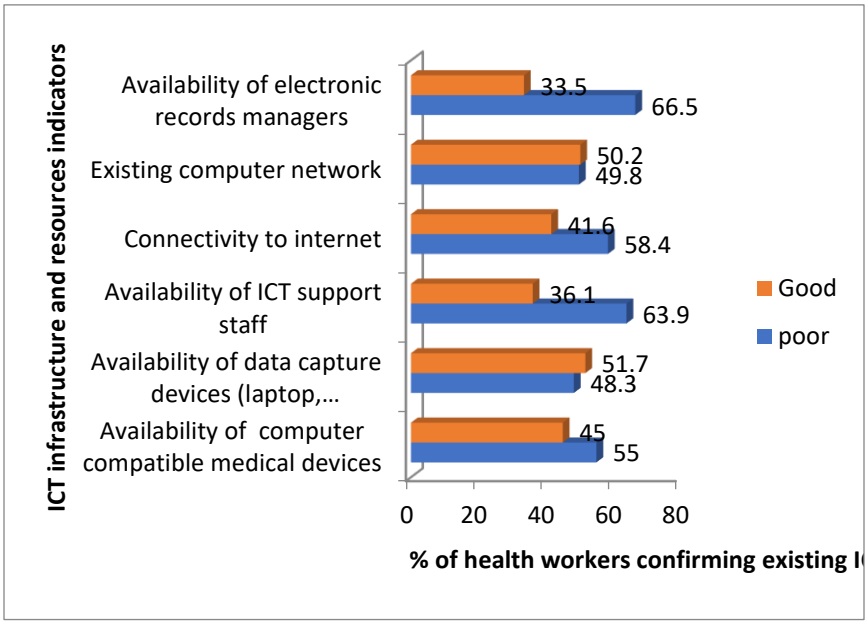

Figure 1 ICT infrastructure and resources in the selected hospitals

Source: Research questionnaires 2020

In figure 1 above Majorityof the health workers covering nurses, doctors among others ranging between (50-67%) confirmed lack of availability of key ICT resources such as computer compatible medical devices, connectivity of internet, availability of ICT support staff, availability of electronic records managers. Less than half (49.8%, 48.3%) of the respondents confirm existing computer network and Availability of data capture devices in the selected hospitals. From the foregoing results, the researcher submitted that existing ICT infrastructure and resources of the hospitals understudy was grossly inadequate due to the fact that most of the indices such as availability of electronic record managers, availability of ICT support staff, computer compatible medical devices among others, were found to be poor which could hinder implementation of EMR for the purpose of treatment and follow up. Ojo and Popoola, (2015), reported in a study that poor ICT resources are usually coursed by change in new technology, such effort has often been

confronted with problems such as inadequate resources (poor financial resources and uneven infrastructural development).

4.2 Staff readiness for EMR implementation in selected hospitals

Staff training is a major consideration in EMR readiness plan. Pantuvo, Naguib, and Wickramasingh (2011) found out that early involvement of health workers in the implementation process as it relate to training, selecting EMR champion, and planning would assist in the creation of end-user requirements and the reduction of EMR resistance. To confirm whether what management planned was implemented on staff readiness, operational staffs were asked to confirmed areas they were involved in the EMR planning. Three hundred and ninety seven (397) respondents were asked question with regards to staff readiness for EMR implementation in their various hospitals, two hundred sixty nine (269) responded. The resultsare indicated in figure 2 below.

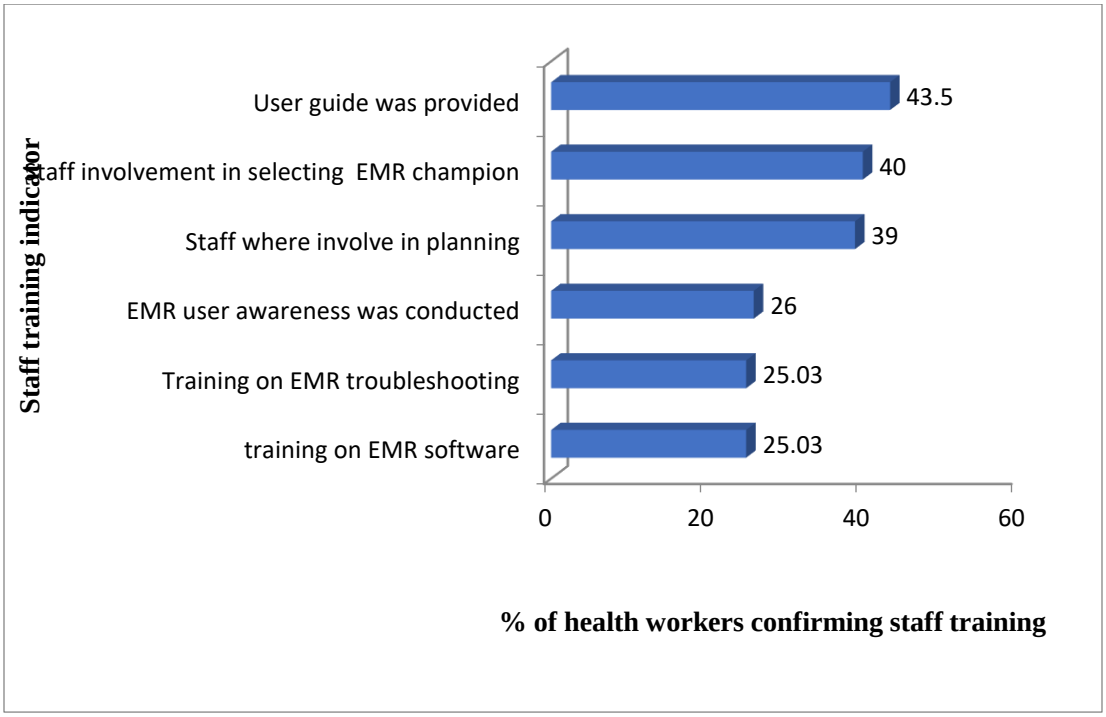

Figure 2 staff training in the selected hospitals

Source: Research questionnaires 2020

To further confirm staff training in management plan on implementation of EMR, the operational staff, response showed in figure 4.8 above that three quarter 201 (74.7%) confirmed that users were NOT trained on the use of EMR software and troubleshooting the EMR system. Also, nearly two third (164, 61.0%; 162, 60%) claimed that users were not involved in planning and that management selected EMR champion. The import of this is that healthcare staff in selected hospitals unanimously submitted that staff readiness for EMR implantation in the selected hospitals was grossly inadequate. There was disparity between strategic managers and operational staff readiness. As stated earlier in management implementation plan and staff readiness, management promised to train operational health workers to use the EMR, findings has shown disconnection between response on strategic managers' users' involvement and operational health

workers. The strategic managers posits that users were trained on the use of EMR system, and they were involved in the implementation plan, while probing the staff readiness from the part of operational staff, operational health workers confirm lack of EMR training, poor user involvement in planning and selection of EMR champion, which raises a lot of quarries on weather management planning is been implemented. Adeleke, Erinle, Ndana, Anamah , Ogundele and Aliu (2014), report that when users are not involved in the implementation of EMR, it becomes difficult to analyse how the implementation will help to manage work flow in clinical areas. Similarly, Pantuvo, Naguib, and Wickramasingh (2011) report that Planning stage of EMR should involve Health workers in the planning process, to determine how current workflows will be redefined with EMR system selection, staged implementation processes, and learning from facilities that have implemented EMR systems". This position is lacking in the implementation process of teaching hospitals in south west Nigeria, which means that the strategic managers did not fulfill the promise of involvement operational staff which could result to poor acceptance and perception among health workers.

4.3 Psychological Readiness of EMR in selected hospitals

Psychology readiness is one of the indicators for EMR implementation. According to Salah and Alsadi, (2019), Psychological readiness refers to the state of mind for being ready for the use of technology in work place. The purpose of this table is to rate the preparedness of healthcare workers in the selected hospitals in terms of how EMR implementation was going to affect their job security and to what extend can they handle technophobia. To ascertain psychological readiness, three hundred and ninety seven (397) respondents were asked question with regards to psychological readiness in their various hospitals, two hundred sixty nine (269) responded. The results are indicated in figure 3 below.

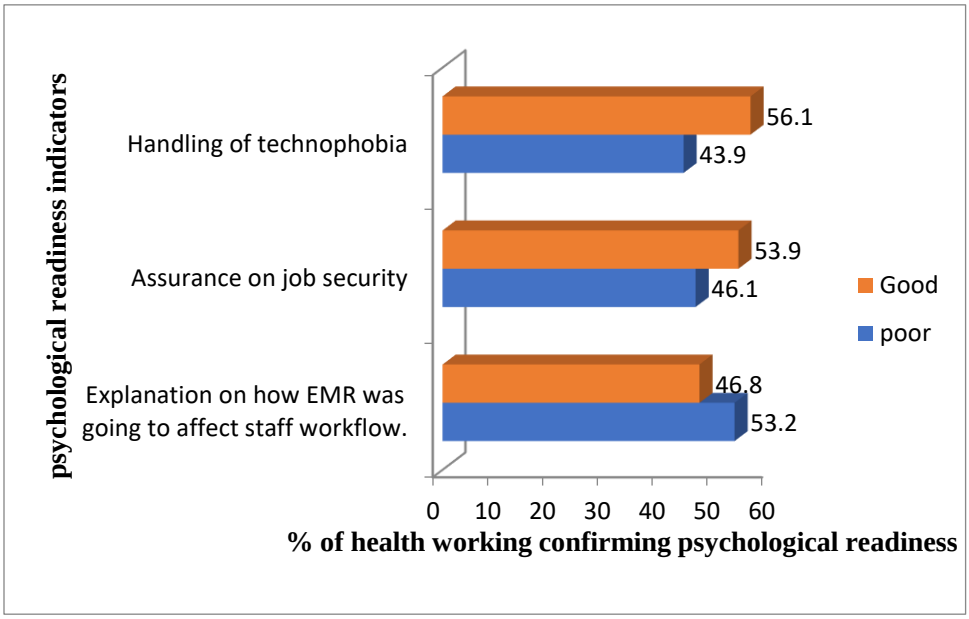

***Figure 3 P*sychological readiness of the selected hospitals**

Source: Research questionnaires 2020

Figure 3 above shows that above half (53.2%) of the respondents confirmed EMR was going to affect staff negatively. On the contrary less than half (43.9%, 46.1%) of the respondents confirmed

poor Assurance on job security and handling of technophobia. The import of this is that despite the fact the health workers are assured of job security with the introduction of EMR, and they can also handle technophobia, the essential part of psychological readiness which is getting health care worker ready on how EMR can affect the services they provide was poor. The core duty of health worker is to provide health related services, the import of the report shows that health workers are not ready with regards to if EMR can enhance the services they provide which could lead to poor acceptance.

4.4 Test for relationship between user readiness and EMR usefulness

According to Khoja (2007), in an ideal situation readiness is supposed to impact on EMR usefulness in supporting for treatment, enhancing record management, assisting planning and management of hospitals among others. Therefore to test whether there is a relationship between user readiness and EMR usefulness the following assumption statement was used as the hypothesis. That there is relationship between user readiness and usefulness. As per objective five which is meant to test whether there is a association between user readiness and EMR usefulness, data on both parameters was cross tabulated as indicated in table 1 below for the purpose of computing chi square value in order to conduct chi test for independent.

Table: 1 Test for relationship between user readiness and EMR usefulness

USER READINESS INDICATOR	**EMR USEFULNESS**				
	Support for treatment	**Support for Record Management Functions**	**For Hospital Planning and Management**	**Support for Research**	**Total**
ICT infrastructure and resources	133	151	176	76	536
	133.15	151.15	176.63	75.07	
Staff readiness	120	137	162	63	482
	119.73	135.93	158.83	67.5	
Psychology readiness	139	157	182	82	560
	139.11	157.92	184.54	78.43	
Total	392	445	520	221	1578

Source: Research questionnaires 2020

In table 1 above, the degree of freedom for the cross tabulation data was obtained using the formula df=(r-1) (c-1) =6. Where r is the number rows and c is the number of columns. If the observed chi square test statistics is greater than critical value, the null hypothesis can be rejected. Chi square value for the cross tabulation was obtained using $x^2= (o-e)^2/e= 8.79$ where o is observed and e is expected. For a confidence level of 0.05, the critical value read in the chi

table was 12.59 which was higher than the calculated value chi value of 8.79. Meaning there were association between user readiness and EMR usefulness. Based on this, we accept the assumption that there is association between user readiness and EMR usefulness. The meaning of this is that although EMR penetration is low as stated in figure 4.3, management has done some user readiness which has impacted on usefulness of EMR in area where EMR has been implemented as earlier stated in figure 4.17 and 4.18 with the intention the enjoying the benefits of using EMR for treatment, planning, record keeping function and work flow management.

5. Conclusion and Recommendations

5.1 Conclusion

This study sought to assess the readiness and implementation of Electronic medical records for service delivery in selected state hospitals in southwest Nigeria. Revelations from the research have showed most medical records practices are still in a paper-based format. The entire hospitals' understudy has implemented one form of EMR or the other. It is also concluded that health workers only identify data capture of patient identity, interoperability between the doctors and pharmacy for drug prescription, generate X-ray film translation among others as the intended purpose of implementing EMR, without considering other key benefits of EMR such as to improve Patient examination by healthcare units, approve discharges of patience from the wards, document patient referral from one unit of the hospital to another, support treatment through doctors notes, improve communication with patients relatives, allow patients referral from one hospital to another, generate reports through Ordering of investigations from the laboratory, improve clinical decision support among others. Although management readiness was high in some preparedness areas, a vital aspect of readiness concerning financial readiness, political readiness, implementation plans and user involvement was very low. This means that strategic healthcare managers in the state teaching hospitals in Southwest Nigeria are not fully prepared to implement EMR in their hospitals to help reduce clinical work follow, improve treatment, and follow up.

5.2 Recommendations

It was noted that hospitals lacked adequate funding, political good will, implementation plans, staff readiness, and availability of EMR standards and ICT policy, which has affected patient treatment and follow up negatively. To deal with the problem, the study recommends that strategic managers should have a financial plans and budgeting system that will help to implement EMR in phases, including staff training programs, set up implementation planning and committees, and evaluation strategies to improve on her EMR process in southwest hospitals in Nigeria. The researcher noted lack of ICT support for staff, computer compatible medical devices, availability of data capture device, connectivity to the internet, among many other ICT facilities. To deal with the problem, the study recommends that strategic managers should make the above-listed facilities available and involve operational health workers through training on the use and choice of the best EMR system, create awareness on likely benefits they will be deriving from EMR implementation to enhance treatment and follow up.

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