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Examining the Impact of Implementation of Electronic Health Record System for Effective Health Management in Katsina State Hospitals, Nigeria

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Abstract: The medical records in use in the state are still paper based records, which make it very difficult when searching patient records due to the large population. The objectives of this research are four fold: 1) To identify the steps needed for the implementation of EHR; 2) To highlight the problems of EHR implementation; 3) To determine the resources needed, 4) To identify the advantages of EHR implementation in Katsina state as a case study. This is an Exploratory Research using a Quantitative method. SPSS (version 22.0) was used to analyze the data. Cluster sampling was used, sample size was 331. Data was collected from the seven pilot hospitals of Katsina state, Nigeria. A close ended questionnaire (likert type 5 point scale) was used to collect the data, of the three hundred and thirty one participants (331), 60 were doctors, 92 nurses, 38 Pharmacists, 26 lab-technicians, 69 record keepers, and 46 others. Based on their responses majority of the respondents strongly endorse the system implementation. Implementation of EHR will provide a lot of benefits to healthcare sector in Katsina State, the key findings indicate that majority of the respondents embraced the need for EHR to assist in improving the quality of healthcare in Katsina state. The state government has to provide the required resources, there is need to follow specific steps, and also there is need to solve the problems hindering implementation of EHR practices in Katsina state, there is also benefits that the state will gain if the system is implemented successfully.

Keywords: Electronic Health Record (EHR), Information Communication Technology (ICT), SPSS, Katsina State, Nigeria

1. Introduction

1.1. Background and Significance

EHR refers to the use of Information Communication Technology (ICT) devices and the internet to aid public healthcare, medical informatics and business in order to render quality services and improve information dissemination [1]. With the exception of efforts that have been made by private institutions and academic hospitals in Nigeria, there is minimal to invisible progress in terms of the implementation of EHR, from national to local levels in Nigeria within the public healthcare sector [2]. In effect, implementation of EHR was estimated to be less than 5% of any form of HIT in Nigerian healthcare facilities as of 2010 [3].

All of the medical records in the state are still paper-based, which make it difficult to properly access or retrieve patient information by healthcare providers when it is needed. Due to the large population the current system is not supportive because there is misplacement of patient information, which causes it to take more time to search for patient files which causes the patient to stay longer in a hospital without being attended to for treatment.

Katsina state was created on 23rd September, 1987 out of defunct Kaduna State. The state is located at the extreme

Northern part of Nigeria in the Sahel zone of tropical savannah and has low rainfall and not much vegetation with the exception of the southern part of the state which has more rainfall and vegetation. Katsina state shares boarder with five other states as follows; Kaduna state in the south, Jigawa and Kano states to the east, Zamfara and Sokoto states to the west as well as international border with Niger Republic to the North. The state has 34 local government areas.

Katsina state is a mono lingual and mono ethnic state. The people are Hausa/Fulani. The state occupies an area of about 29,938 square kilometres with a projected population of 5.267 million people. The weather varies according to the season of the year, but mostly it is cool in the morning, hot in the afternoon and cool again in the evening.

The major economic activity of the state is agriculture which is the main stay of the people of the state, both farming and rearing of animals occupy the lines of about 80% of the total population of the state. Some of the crops grown are; guinea corn, millet, maize, cotton, ground nut, rice, beans, soya beans, yam, sweet potato and cocoyam. The range of livestock is essentially cattle, sheep and goats. During the dry season, people are engaged on dry season farming (irrigation) mostly in river basin and fadama areas. Local crafts (Blacksmithing, poetry, carpentry, welding etc) are also practiced. Other economic activities that are carried on in the state are poultry farming, transportation, banking, small and medium scale enterprise and fishing. The state is accessible by road, air and with communication network (Post office, telephone, courier services and internet). There are two Radio stations and two television stations which are received throughout the state [4].

On human resources, the state is highly endowed with highly skilled manpower especially in the area of administration. For manpower development, the state has three universities; there is a state polytechnic, two schools of Basic and Remedial studies, Colleges of Nursing and two Schools of Heath Technology as well as two Colleges of Education. There are a number of technical colleges in different locations of the state coupled with a number of Business Apprenticeship training centre to cater for vocational training to employ youth in various fields of endeavour [5].

The healthcare system faces many challenges including lack of personnel (Doctors, Nurses, Pharmacist, and other supporting staff), lack of awareness among the people in the rural area, poor healthcare seeking behaviour among the people as well as the outbreak of some diseases. Many physicians attribute the problems of EHR as including a lack of safety, requiring considerable funding before implementation as well as needing comprehensive training and requiring technical knowledge from the user. Though there is a problem of lack of infrastructure in Nigeria for the successful implementation of EHR, the EHR is seen as a way in which to improve quality of healthcare and to minimize the treatment time [6]. Healthcare professionals in Nigeria have reportedly complained of the declining quality of healthcare in the country. The backwardness of healthcare delivery may be linked to the lack of funding, mismanagement and the impact of the boko haram crisis [7]. Despite the efforts of previous administrations to restore the healthcare system in Katsina State, the sector is not well equipped with the required facilities and neither does it have particularly well trained personnel (Doctors, Nurses, Pharmacists and other supporting staff) in order to provide the people, especially in the rural areas, with effective healthcare where the majority of the population reside [5].

1.2. Significance of the Study

This study may encourage Katsina state ministry of health, health services management board, primary health care, agency for health care, international health care organizations and other hospitals in the state to implement EHR practices in order to improve healthcare.

1.3. Objectives

The objectives of this research are four fold: 1, to identify the steps needed for the implementation of EHR; 2, to highlight the problems of EHR implementation; 3, to determine the resources needed, and 4, to identify the advantages of EHR implementation in Katsina state as a case study

1.4. Hypothesis

H_1 = There is no relationship between steps and implementation of EHR in Katsina State.

H_2 = There is no relationship between problems and EHR implementation in Katsina State.

H_3 = There is no relationship between resources and implementation of EHR in Katsina State.

H_4 = There is no relationship between advantages and implementation of EHR in Katsina State.

2. Literature Review

Lawrence L. Weed, a physician in the 1960s first introduced EHR. He suggested a system which saved the medical records of the patients in electronic form to improve the delivery of care. This work started at the University of Vermont in 1960, to convert paper based medical records into electronic form [8].

For every system to be successfully implemented it has to follow these five steps

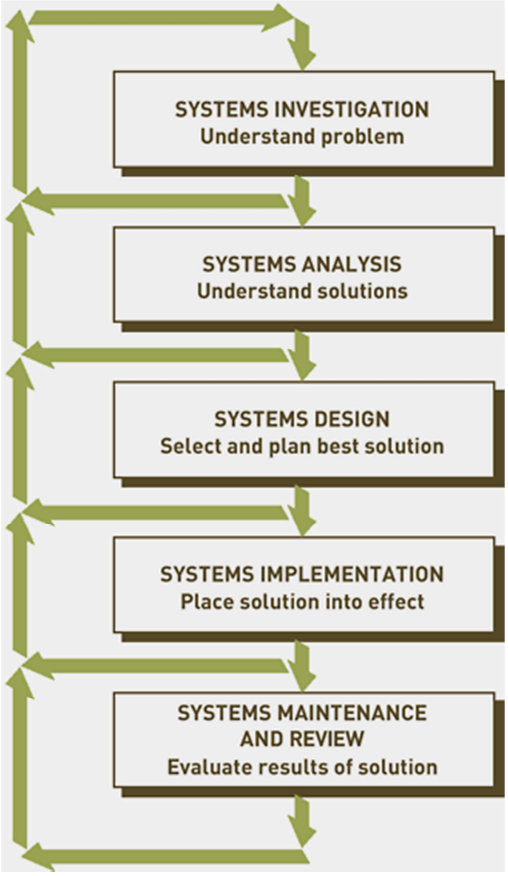

Figure 1. *Step for EHR Implementation.*

2.1. Electronic Health Records in Developed Countries

Cresswell presents ten key considerations to realize successful adoption and implementation of health information technologies (HIT), this new system needs to be usable by end-users, especially healthcare professionals in terms of time-efficiency, cost-effectiveness, and interoperability with other systems, as they are the ultimate care givers to patients. As a standard to assess EHR in developed countries, these considerations were summarized into four technology lifecycle stages to simplify the complex nature of adoption, and most significantly, the implementation of EHR the first key consideration to achieve successful EHR implementation is to clarify a problem which a system is designed to solve After clarifying the problem, the second key consideration is to build consensus between all the relevant stakeholders to guarantee successful implementation, after the consensus has been reached, the 3rd characteristic recommends implementers to consider the available options on the systems choice, such that all stakeholders deliberate extensively on how the new system complements the existing systems, also the 4th key considerations are to choose a system that meet clinical needs and is also affordable [9]. In order to prevent errors and security issues, securing the appropriate infrastructure is the most important factor in the implementation of HIT systems. Infrastructure serves as the platform on which software and hardware operate [10]. The risks associated with inappropriate infrastructure include reduction in the speed of the system, regular loss of network connection and inevitable loss of data, as well as possible damage to the systems. Furthermore, users might become frustrated and develop negative attitudes to using systems, resulting in the systems being under-utilized, and eventually, the technology being discarded [11].

2.2. Primary Healthcare in Nigeria

Quality healthcare is a fundamental right of any citizen. Local government areas are responsible for coordinating the activities of primary healthcare (PHC) centers in Nigeria, because rural areas do not utilize the basic healthcare services they are entitled to have [12]. Capacity building and communities' empowerment through orientation, mobilization, and community organization as regards training, information sharing and continued dialogue, could further enhance the utilization of PHC services by the rural population. PHC centers were established in both rural and urban areas in Nigeria with the intention of providing equity and easy access to their healthcare, though regrettably, the rural populations in Nigeria are seriously underserved when compared to their urban counterparts [12]. More than two thirds of Nigerians reside in rural areas, therefore they deserve to be served with all the components of PHC, although PHC which is supposed to be the bedrock of the country's healthcare policy, is currently catering for less than 20% of the potential patients. PHC facilities are mostly in various states of disrepair, with equipment and infrastructure being either absent or obsolete [13]. The goal of the National Health Policy is to bring about a comprehensive healthcare system based on PHC that is promotive, protective, preventive, restorative and rehabilitative to all citizens within the available resources such that individuals and communities are assured of productivity, social well-being and enjoyment of living. The health services, according to PHC include undertaking education concerning prevailing health problems and the methods of preventing and controlling them, promotion of food supply and proper nutrition, material and child care, including family planning and immunization against the major infectious diseases, prevention and control of locally endemic and epidemic diseases, and provision of essential drugs and supplies [12].

2.3. Electronic Health Record in Nigeria

The Nigerian government took up the adoption of HIT as an enabler to advance healthcare services in realizing the United Nation Millennium Development Goals (UNMDGs) as a cue from developed countries. The Nigerian government recognized a collapse and the burden of diseases in the nation's public healthcare sector. This prompted the need to rebuild and redress the healthcare system in the country. The Nigerian Government through the Federal Ministry of Health (FMoH) planned to develop, adopt and implement policies that will strengthen the national healthcare system for effective, accessible and affordable service delivery, in

partnership with several stakeholders [13]. The first national conference on HIT was organized by the FMoH and held in November 2011, the conference focused on deploying a centralized national health data management system so as to review the country's EHR strategies and capacity building. This indicated an attempt by the Nigerian government to facilitate a form of agreement between different end-user groups and organizations which consisted of private and public, that would be involved in the implementation processes [14].

2.4. Challenges of Electronic Health Record in Nigeria

Healthcare professionals generally admit the efficacy of adopting of EHR tools in the Nigerian public healthcare system for the purpose of improving service delivery. Adeleke (2014) argues that there are inadequacies with regards to clinical documentation, which gives rise to setbacks as regards the meaningful use objectives [14], rendering the existence of EHR unsuitable for the work processes. Furthermore, inappropriate confidentiality and security measures intended to safeguard patient information and records in the public health sector are acknowledged [15]. However, such critical and ethical matters have hardly been addressed in the limited cases of EHR implementation in Nigeria [13]. Despite the identification of the national healthcare challenges in the public sector by the Nigerian government, there are yet to be evident developments towards putting in place the adequate requirements for successful EHR implementation. It was confirmed that healthcare organizations have accepted ICT as a vehicle for innovative advancements of the national healthcare information systems in low-medium income countries. However, the implementation and usage of EHR remains an extremely complex exercise due to varying country specific socio-economic, political and technical development contexts [16]. The implementation of EHR falls short in data aggregation and reporting components, with negative implications on the data quality in the healthcare sector. Specifically, not all hospitals and clinics have computers and web based versions of Department of Health Information Systems (DHIS) available in all of the provinces. The problem of inadequate staffing and lack of technical skills among healthcare practitioners has been a growing challenge in public health institutions [17].

3. Materials and Method

An exploratory study design was used, and using a quantitative research method the data was analyzed using SPSS (version 22.0), the data was tested using Chi-square.

The population included all directors from the ministry of health, health services management board, agency for primary healthcare and all doctors and supporting staffs at the seven pilot hospitals in the state, totalling 2487 which constituted the target population [4], out of which 331 were drawn as a sample size based on Krejcie and Morgan [18]. These hospitals are Katsina, Funtua, Daura, Malumfashi, Kankia, Mani and Dutsinma. A probability sampling technique was employed; under this technique, cluster sampling was used. The study used a close ended questionnaire (Likert type, 5 point scale) to obtain data from the respondents.

The data was collected using a questionnaire about the perception of the respondents with regards to EHR implementation in Katsina state hospitals for effective health management; then the data was transferred to Excel format in numerical terms.

4. Results

4.1. Demographic Data of the Respondents

Table 1 summarizes the characteristics of the respondents. 54.7% were male, the most populous age clusters was 31-40 years (57.4%), in regard to marital status, and most of the respondents (70.4%) were married. Nurses account for (27.8%) with the highest response rate compare to other occupations. (54.4%) were from those working within the period of 5 but less than 15 years, while those earning 50001 to 100000 naira account for (40.2%) response.

Table 1. *Demographics of the respondents.*

		Number of Respondent	Percent %
Gender	Male	181	54.7
	Female	150	45.3
	Total	331	100%
Age	Below 20 years	2	0.6
	20-30 years	83	25.1
	31-40 years	190	57.4
	41-50 years	39	11.8
	51 years above	17	5.1
	Total	331	100%
Marital Status	Single	69	20.8
	Married	233	70.4
	Separated	29	8.8
	Total	331	100%
Occupation	Doctor	60	18.1
	Nurse	92	27.8
	Pharmacist	38	11.5
	Lab-Technician	26	7.9
	Record-Keeper	69	20.8
	Other	46	13.9
	Total	331	100%
Length of Time	Less than 5 years	109	32.9
	5 but less than 15 years	180	54.4
	15 but less than 25 years	35	10.6
	25 but less than 35 years	7	2.1
	Total	331	100%
Monthly Income	Less than #50000	64	19.3
	#50001 - #100000	133	40.2
	#100001 – 150000	83	25.1
	#150001 and above	51	15.4
	Total	331	100%

4.2. Hypotheses Testing

Four hypotheses were raised towards a realization of the objectives of this study. The data obtained from the responses of the respondents were meant to provide abundant and highly desired information for data analysis of the various hypotheses raised in the study.

Hypothesis one

H_1: It was assumed that there are no steps needed for the implementation of EHR in Katsina State. The data used for testing the first hypothesis were drawn from eleven items of the questionnaire instrument, items (2, 5, 7, 12, 17, 19, 20, 21, 22, 23 and 24). The frequency data (see Table 2) designed for testing this hypothesis was derived from respondent's perception (from the seven pilot hospitals) regarding the extent to which "It was assumed that there are no steps needed for the implementation of EHR in Katsina State". The eleven frequency data were respectively subjected to chi-square (x^2) statistical test significance at 5% level of significance. The critical chi-square value at which any of the hypotheses raised in the study could be accepted whenever calculated value is less than tabulated value or rejected whenever calculated value is greater than tabulated value at 5% confidence level. The Table displayed revealed that each of the eleven chi-square values computed for testing the first hypothesis was respectively calculated value greater than tabulated value. The chi-square values stood at 21.026, 21.026, 31.410, 21.026, 26.296, 21.026, 31.410, 21.026, 9.488, 26.296, 31.410 and 21.026 based on these computations, the first null hypotheses was therefore, rejected. There was a confirmation that there are some steps needs to be followed in order to implement EHR in Katsina State. The respondents from the seven pilot hospitals registered about 82% "STRONG ENDORSEMENTS" and "ENDORSEMENTS" regarding the issues at stake in the eleven questionnaire items (2, 5, 7, 12, 17, 19, 20, 21, 22, 23 and 24) used in testing the first hypothesis. In other words, amongst the 331 respondents used in the research study, there was a prevalence of about 82% have a positive view that there are steps needed to follow for the implementation of EHR in Katsina State.

Table 2. *Respondents response based on their perception of First Hypothesis.*

SNO	Doctors, Nurses, Pharmacists, Lab-Tech, Record-Keepers and Others	Cal-Value	SD	D	NE	A	SA	Total
2	The use of EHR leads to effective data management in health institutions	24.416	11	51	14	108	147	331
5	Management of Health Records is more effective using HER	31.813	22	33	18	107	151	331
7	EHR is required in Katsina state for qualitative healthcare delivery	49.432	8	42	14	127	140	331
12	EHR is vital towards development of effective health systems in Katsina state	28.799	3	26	16	137	149	331
17	EHR helps in integrating patient information	34.886	8	21	5	133	164	331
19	Patients can have access to their records using EHR easily	42.041	6	20	15	140	150	331
20	EHR eases communication within departments	21.655	6	23	11	115	176	331
21	Lack of adequate power supply hinders the successful implementation of EHR	12.010	8	31	11	120	161	331
22	Poor internet access is among the major factors hindering EHR in Katsina State	26.969	12	35	9	112	163	331
23	Lack of adequate facilities contribute to the factors of not implementing EHR	48.470	9	23	10	123	166	331
24	Fear of system failure during the work process hindering implementation of EHR	43.705	14	30	5	141	141	331

(Cal-Value: Calculated Value, SD: Strongly Disagree, D: Disagree, NE: Neutral, A: Agree, SA: Strongly Agree)

Hypothesis Two

H_2: It was assumed that there are no problems of EHR implementation in Katsina State. The data for addressing the foregoing research hypothesis were drawn from five items (8, 21, 22, 23 and 24) of the questionnaire instrument. The frequency data which are displayed in respect of each of these five items (Table 3) were meant to endorse the extent to which respondents from the seven pilot hospitals of the state viewed "It was assumed that there are no problems of EHR implementation in Katsina State". The five frequency data were respectively subjected to chi-square test of significance to 5% confidence level. The table displayed at the appendix disclosed that each of the five chi-square values computed for testing the second hypothesis was respectively calculated value is greater than tabulated value. These five chi-square values stood at: 8, 21, 22, 23 and 24. Again, based on these computations, the second null hypothesis was therefore, rejected. There was a strong confirmation from the respondents that there are problems hindering EHR implementation in Katsina State. The respondents from the seven pilot hospitals registered over 80% "STRONG ENDORSEMENTS" and "ENDORSEMENTS" regarding the issues at stake in the five questionnaire items (8, 21, 22, 23 and 24) employed in testing the second hypothesis. In other words amongst the 331 respondents used in the research study, there was a prevalence of over 80% positively viewed that there are problems hindering EHR implementation in Katsina state.

Table 3. *Respondents response based on their perception of Second objective.*

SNO	Doctors, Nurses, Pharmacists, Lab-Tech, Record-Keepers and Others	Cal-Value	SD	D	NE	A	SA	Total
8	Illiteracy is the major factor hindering EHR in Katsina state	34.101	10	33	10	115	163	331
21	Lack of adequate power supply hinders the successful implementation of EHR	12.010	8	31	11	120	161	331
22	Poor internet access is among the major factors hindering EHR in Katsina State	26.969	12	35	9	112	163	331
23	Lack of adequate facilities contributes to the factors of not implementing EHR	48.470	9	23	10	123	166	331
24	Fear of system failure during the work process hindering implementation of EHR	43.705	14	30	5	141	141	331

Hypothesis Three

H_3 = It was assumed that there are no resources needed for the implementation of EHR in Katsina State. The data employed for addressing this research hypothesis were derived in items (6, 10, 13, 16, 21, 22, 23 and 24) of the questionnaire instrument. The frequency data which were displayed in respect of each of these eight items (see Table 4) were meant to determine the extent to which respondents perceived that there are resources needed for the implementation of EHR in Katsina State. The eight frequency data were respectively subjected to chi-square (X^2) tests of significance at 5% level of significance. The table displayed in the appendix revealed that each of the eight chi-square values computed for testing the third hypothesis was respectively calculated value greater than tabulated value. These eight chi-square values presented thus: 31.410, 21.026, 21.026, 21.026, 9.488, 26.296, 31.410, and 21.026. Based on these computations, the third null hypothesis was therefore rejected. There was a confirmation there are resources needed in order to implement EHR in Katsina State. The respondents from the seven pilot hospitals registered over 85% "STRONG ENDORSEMENT" and "ENDORSEMENS" regarding the issues at stake in the eight questionnaire items (6, 10, 13, 16, 21, 22, 23 and 24) employed in testing the third hypothesis. In other words amongst the 331 respondents used in the research study, there was a prevalence of about 86% positively viewed that there are resources needed in order to implement EHR in Katsina State.

Table 4. *Respondents response based on their perception of Third Hypothesis.*

SNO	Doctors, Nurses, Pharmacists, Lab-Tech, Record-Keepers and Others	Cal-Value	SD	D	NE	A	SA	Total
6	EHR eases the work of medical staff in providing effective healthcare	39.883	9	23	15	146	138	331
10	Using EHR assists medical personnel to attend to patients within the shortest possible time	52.016	16	37	10	120	148	331
13	EHR reduces the time doctors spend with their patients	40.656	4	31	11	112	173	331
16	It is easy to receive lab results using EHR	21.497	7	23	10	134	157	331
21	Lack of adequate power supply hinders the successful implementation of EHR	12.010	8	31	11	120	161	331
22	Poor internet access is among the major factors hindering EHR in Katsina State	26.969	12	35	9	112	163	331
23	Lack of adequate facilities contributes to the factors of not implementing EHR	48.470	9	23	10	123	166	331
24	Fear of system failure during the work process hindering implementation of EHR	43.705	14	30	5	141	141	331

Hypothesis Four

H_4: It was assumed that there are no advantages of EHR implementation in Katsina State. The data used for testing the hypothesis were drawn from thirteen items of the questionnaire instrument, items (1, 2, 3, 4, 6, 9, 11, 13, 14, 15, 16, 17 and 18). The frequency data (see Table 5) designed for testing this hypothesis was derived from respondents perception (from the seven pilot hospitals) regarding the extent to which "It was assumed that there are no advantages of EHR implementation in Katsina State". The thirteen frequency data were respectively subjected to chi-square (x^2) statistical test significance at 5% level of significance. The Table displayed in the appendix revealed that each of the thirteen chi-square values computed for testing the fourth hypothesis was respectively calculated value greater than tabulated value. The chi-square values stood at 31.410, 21.026, 21.026, 31.410, 31.410, 31.410, 21.026, 21.026, 31.410, 21.026, 21.026, 21.026, and 21.026 based on these computations, the fourth null hypotheses was therefore, rejected. There was a confirmation that there are many advantages that EHR implementation can bring to Katsina State. The respondents from the seven pilot hospitals registered about 90% "STRONG ENDORSEMENTS" and "ENDORSEMENTS" regarding the issues at stake in the thirteen questionnaire items (1, 2, 3, 4, 6, 9, 11, 13, 14, 15, 16, 17 and 18) used in testing the fourth hypothesis. In other words, amongst the 331 respondents used in the research study, there was a prevalence of about 90% have a positive view that there are steps needed to follow for the implementation of EHR in Katsina State.

Table 5. *Respondents response based on their perception of Fourth Hypothesis.*

SNO	Doctors, Nurses, Pharmacists, Lab-Tech, Record-Keepers and Others	Cal-Value	SD	D	NE	A	SA	Total
1	The use of EHR could enhance the quality of healthcare in Katsina state	51.171	16	53	19	109	134	331
2	The use of EHR could lead to effective data management in health institutions	24.416	11	51	14	108	147	331
3	The use EHR gives an accurate record of data in the healthcare system in Katsina state	27.175	12	48	13	97	161	331
4	EHR assists medical personnel to get data on patients easily	54.489	20	44	13	108	146	331
6	EHR eases the work of medical staff in providing effective healthcare	39.883	9	23	15	146	138	331
9	It is easy to have updated record keeping using EHR	33.521	5	32	14	111	169	331
11	There is easy retrieval of documents using EHR	37.219	13	36	11	120	151	331
13	EHR reduces the time doctors spend with their patients	40.656	4	31	11	112	173	331
14	It is easy to transfer patient data to other departments using EHR	41.405	13	42	14	110	152	331
15	EHR makes work easy for record keepers	22.434	5	39	11	111	165	331
16	It is easy to receive lab results using EHR	21.497	7	23	10	134	157	331
17	EHR helps in integrating patient information	34.886	8	21	5	133	164	331
18	EHR helps doctors in checking patients' previous history very easily	43.399	7	23	10	134	157	331

4.3. Steps to Be Followed for EHR Implementation in Katsina State

Based on the results of this study, these steps have to be followed in order to successfully implement EHR practices in Katsina state.

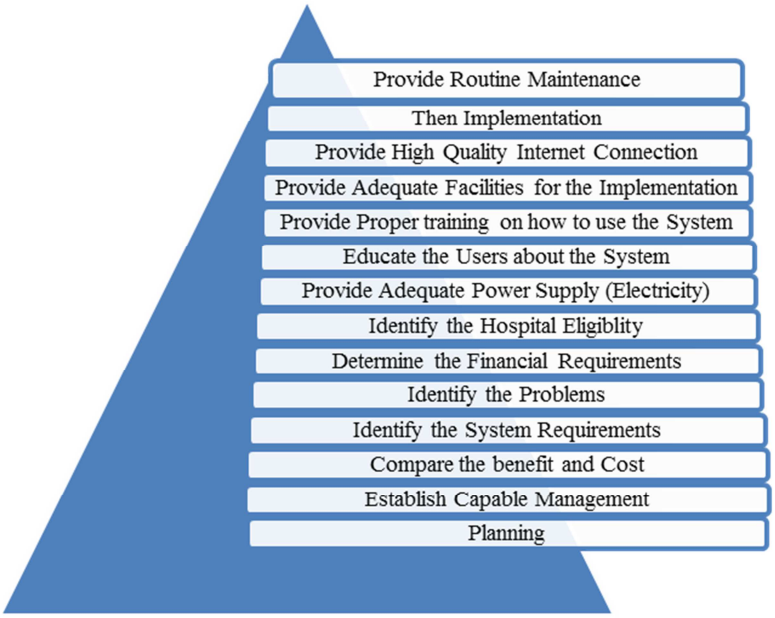

Figure 2. *Steps for EHR implementation in Katsina State.*

5. Discussion

The key findings of this study indicate that the majority of the respondents embraced the need for EHR to assist in improving the quality of healthcare in Katsina state. The state government should provide the required resources needed for the implementation of EHR including human, financial, and basic amenities. However, there is a need to follow some specific steps in order to implement the EHR practices. The first step is that there must be good planning, because you cannot achieve anything without planning for it; then, there is a need for capable management that will oversee the process of implementation of the new system. Before the state implements EHR, there must be a comparison between the benefits that the new system will bring and its possible cost; if the benefits supersede the costs then it is granted that the process will be continued. In order for the system to be successfully implemented and achieve meaningful use objectives, the state must identify the requirements of the system as well as the problems that the system is designed to solve. Financial requirement is among the most important steps to consider, thus before the state implements EHR, as a matter of priority it should identify its financial capacity before going ahead with the implementation of the system. To implement the EHR practices, determining the capacity of the hospital is very important because not every hospital has the capacity to take the risk, cost, and procedures of maintaining the system. There has to be adequate power supply, because you cannot achieve modern technology without a sustainable and stable power supply. Also, the users need to be educated about the system and the problems the system is designed to solve, including adequate training on how to use the system. The state must provide the adequate facilities needed for the implementation (Equipment's, Machines, Computers, Buildings, Hardware, and Software), and a high quality internet connection is needed when the state achieves these steps; then it can implement EHR practices in any hospital within the state that fulfils all requirements of the EHR implementation steps. The last step of EHR implementation in Katsina state is that there must be routine maintenance monthly, quarterly, or each year to support the continued usage of the system and to achieve meaningful use objectives. There is also a need to solve the problems hindering the implementation of EHR practices illiteracy, lack of electricity, lack of facilities needed, poor internet connection and lack of basic amenities.

6. Conclusion

This study examines the impact of implementation of EHR in Katsina state hospitals for effective health management; EHR implementation will provide a lot of benefits to healthcare sector in Katsina State. The state needs to implement EHR in order to accommodate all information captured in paper based systems like patient medical history, physical examinations findings, all laboratory findings and diagnosis of all infections. The limitations of this study were the limited timeframe for collecting data, and the time of engagement with the respondents was not long enough. A further limitation of this study was that the research findings cannot be generalized to the entire country.

7. Recommendations

The following recommendations are made in order to attain the full potential benefits from EHR implementation:

1. Katsina state government should provide an adequate and sustainable power supply (Electricity). Incessant power failure can lead to loss of data.
2. Provide a better structured training with more time and some basics on the technical aspect of the EHR.
3. There is need for the development of a user manual or guidelines, with all the trouble shooting needed and what to do when the system, including the server, has a problem.
4. The Ministry of Health should come up with a clear scale up plan of the EHR, so that potential sites and users are well prepared in advance, and should have a clear and realistic timeframe.

8. Suggestions for Further Study

It is very obvious from the result of this research that the implementation of EHR will impact positively on the healthcare sector in Katsina State. The authors are convinced that there is a need for further research to be carried out in all the hospitals in the state, and if possible for the entire country for greater impacts and generalization. This is necessary because such researches could assist further identification of the steps that need to be followed in order to implement EHR, and other problems of why the system is not adopted in the country. A replication of this study in other states of the federation might be useful in order to get healthcare providers' perceptions about EHR and the way in which to implement it. Furthermore, another study with regards to costs and financial requirements of the system is needed.

References

[1] Detmer DE. Interprofessional clinical informatics education and practice: Essentials for learning healthcare systems worldwide. J Interprof Care [Internet]. 2017; 31 (2): 187–9. Available from: https://www.tandfonline.com/doi/full/10.1080/13561820.2016.1250554

[2] Qureshi QA, Shah B, Khan N, Miankhe AK, Nawaz A. Determining the Users' Willingness To Adopt Electronic Health Records (Ehr) in Developing Countries. Gomal Univ J Res [Internet]. 2012; 28: 114–22. Available from: http://ezproxy.lib.ed.ac.uk/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=91729100&site=eds-live

[3] Mehmood H, Aslam M, Aslam S, Waqar A, Khan A. ELECTRONIC HEALTH RECORD SYSTEMS.

[4] Katsina State Ministry of Heath. Katsina State Strategic Health Development Plan. 2010; (March 2010): 6–8.

[5] Sani S, Ibrahim MH, Mustafa M, Go R. South African Journal of Botany Ethnobotanical survey of medicinal plants used for traditional maternal healthcare in Katsina state, Nigeria. South African J Bot [Internet]. 2015; 97: 165–75. Available from: http://dx.doi.org/10.1016/j.sajb.2015.01.007

[6] Devaraj S, Ow TT, Kohli R. Examining the impact of information technology and patient flow on healthcare performance : A Theory of Swift and Even Flow (TSEF) perspective. J Oper Manag [Internet]. 2013; 31 (4): 181–92. Available from: http://dx.doi.org/10.1016/j.jom.2013.03.001

[7] Omogbadegun ZO. Development of a framework for collaborative healthcare services delivery. (IJACSA) International Journal of Advanced Computer Science and Applications. 2013; 30 (xxx).

[8] Dissertation B, In S, Fulfilment P, The OF, For R, Award THE, et al. REQUIREMENTS FOR THE AWARD OF THE DEGREE OF DOCTOR OF. 2004: 1960–2004.

[9] Cresswell KM, Bates DW, Sheikh A. Ten key considerations for the successful implementation and adoption of large-scale health information technology. J Am Med Inform Assoc [Internet]. 2013; 20 (e1): e9–13. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23599226%5Cnhttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC3715363

[10] Middleton B, Bloomrosen M, Dente MA, Hashmat B, Koppel R, Overhage JM, et al. Enhancing patient safety and quality of care by improving the usability of electronic health record systems: recommendations from AMIA. J Am Med Inform Assoc [Internet]. 2013; 20 (e1): e2-8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23355463%5Cnhttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC3715367

[11] Id KS, Management O, Supervisors L, Tu VG. Identifying and ranking the selection criteria in European tenders regarding the procurement of HIS / EHR systems in Dutch academic hospitals. 2012; 5–12.

[12] Abdulraheem IS, Olapipo AR, Amodu MO. Primary health care services in Nigeria : Critical issues and strategies for enhancing the use by the rural communities. J Public Heal Epidemiol. 2012; 4 (January): 5–13.

[13] Oyibocha E., Irinoye O, Sagua E., Ogungide – Essien O., Edeki J., Okome O. Sustainable Healthcare System in Nigeria: Vision, Strategies and Challenges. IOSR J Econ Financ. 2014; 5 (2): 28–39.

[14] Adeleke I, Lawal A, Adio R, Adebisi A. Information technology skills and training needs of health information management professionals in Nigeria: a nationwide study. Heal Inf Manag J [Internet]. 2014; 44 (1): 1–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24682768%5Cnhttps://xa.yimg.com/kq/groups/22694470/1685575444/name/HIMJ1319Adeleke.pdf

[15] Kossman SP, Scheidenhelm SL. Nurses' perceptions of the impact of electronic health records on work and patient outcomes. Comput Inform Nurs. 2008; 26 (2): 69–77.

[16] Bonfrer I, Soeters R, Poel E Van De, Basenya O, Longin G. Downloaded from content.healthaffairs.org by Health Affairs on December 11, 2014 at UCSF Library & CKM RECS Mgmt. 2014;

[17] Miriovsky BJ, Shulman LN, Abernethy AP. Importance of health information technology, electronic health records, and continuously aggregating data to comparative effectiveness research and learning health care. J Clin Oncol. 2012; 30 (34): 4243–8.

[18] Krejcie RV, Morgan DW. Determining sample size for research activities. Educational and psychological measurement. 1970 Sep; 30 (3): 607-10.