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Adoption and Utilization of Electronic Medical Records in Federal Medical Center Nguru, Yobe State, Nigeria.

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Abstract
This study was conducted to investigate the adoption and utilization of electronic medical records in Federal Medical Center, Nguru, Yobe State, Nigeria. Two objectives were raised, two research questions were answered and two hypotheses were tested. Quantitative research design was employed for the study. The study population comprised of all staff of the Department of Medical Record with total population of 54professional medical, a total enumeration of whole population (54) staff were used for the study. A self-developed questionnaire was used to collect data, with a modified five points Likert scale. The instrument was validated using split-half method for pilot testing, data collected from pilot testing was subjected to Spearmen Brown Formula which yielded a reliability index of 0.861 which indicated that the instrument is reliable. Descriptive statistics of frequency counts and percentages were used to answered the research questions while inferential statistics of chi- square (χ^2) of goodness of fit was used to test the hypotheses at 0.05 level of significance. The findings of the study showed that, there is significant observed benefits in adoption and utilization of Electronic Medical Records (EMRs) at the Federal Medical Center, Nguru, Yobe State, chi-square of goodness of fit provides strong statistical evidence ($\chi^2 = 10.296$, $df = 3$, $p < .016$), the result of the study also indicated that, there is significant difference in current state of adoption and utilization of EMRs at the Federal Medical Center Nguru, Yobe State, chi-square of goodness of fit provides strong statistical evidence ($\chi^2 = 34.741$, $df = 3$, $p < .000$). The study recommended among others that, there is a need for further research into the constrain on effective adoption and utilization of EMR systems in tertiary health institutions in Nigeria.

Keywords: Benefits, Adoption, Utilization, Electronic Medical Records, Medical Centre.

1. Introduction

Electronic Medical Records (EMRs) are digital versions of patients medical records, which are centrally stored on a computer system base. EMRs have become an essential aspect of healthcare management, as they improve patients care, safety, and reduce medical errors. In Nigeria, EMRs adoption and utilization in Tertiary Health Institutions (THIs) is still limited, and this affects the overall quality of healthcare delivery.

Similar findings were reported by Berner, Detmer, and Simborg (2021) who analysed the length of hospital stay using manual health records used in healthcare setting and found that, the adoption and utilization of EMRs is essential and urgent adoption of electronic medical records in Nigeria Tertiary Health Institutions required. The study shows that the utilization of EMRs could reduce the length of hospitalization and improve patients outcomes. This highlights the need for more efforts to promote the adoption and utilization of EMRs in THIs in Nigeria.

Poor adoption and utilization of EMRs could lead to high cognitive workload and low performance levels among physicians. Dubovitskaya, (2020) developed a secure and trustable EMRs sharing system using block-chain technology, the system allows patients to share their medical records securely with healthcare providers, improving patient outcomes and reducing medical errors.

A study by Jha, Doolan, Grandt, Scott and Bates, (2020) on the utilization of health information technology in seven countries including US, Canada, UK, Germany, Netherlands, Australia and New Zealand reported that, universal utilization of electronic health records among general practitioners was more than 90%, in Australia, UK, Netherlands and New Zealand, and between 40-80% in Germany, but the rate of adoption and utilization of such systems in hospitals in the developing countries is less than 10%. Although, Hasanain, (2019) observe that, while the uptake of electronic medical records has been low in Saudi Arabia until now, a study by Al-Aswad (2015) reveals that 3 out of 29 hospitals in the Ministry of Health Hospitals in Saudi Arabia have implemented electronic medical records.

In Nigeria, results of a study by Adedeji, Irinoye, Ikono and Komolafe, (2018) indicate that 93.7% of the respondents admitted that paper documentation remained dominant at Obafemi Awolowo University Teaching Hospital, Ile-Ife, Nigeria. While acknowledging that its penetration is very low, Juma, (2020) concluded that there has been an increase in the use of electronic health records in sub-Saharan Africa. Result from a recent research by Abiodun Ikonne, and Madukoma, (2021) shows that medical doctors' use of electronic health records in teaching hospitals in South-West Nigeria is generally low.

2. Conceptual Framework

The adoption of electronic medical records (EMRs) in tertiary health institutions in North East Nigeria is a complex process, affected by numerous factors. This conceptual framework aims to identify and analyse these factors and their interrelationships, drawing on relevant literature and empirical evidence.

Technological Factors

The successful adoption and utilization of EMRs depends on the availability and functionality of technological infrastructure, including hardware, software, and networking systems. According to Elikwu, Igbokwe, and Emokhare, (2020), the integration of EMRs into healthcare systems requires a significant investment in technology and resources. Moreover, the quality of EMRs is crucial to their adoption, as poor user interfaces or system failures can deter healthcare providers from using them (Agbese, & Ikonne, 2018). Therefore, the technological factors that influence the adoption of EMRs should be systematically assessed and optimized.

Organizational Factors

Organizational factors, such as leadership, culture, and workflow, also play a crucial role in the adoption and utilization of EMRs. Gong, (2021) argue that the adoption and utilization of EMRs requires a cultural shift in healthcare organizations, as it affects the way healthcare providers interact with patients, share information, and make decisions. Therefore, the leadership and management of healthcare organizations should prioritize the integration of EMRs, provide training and support to healthcare providers, and encourage a culture of innovation and continuous improvement. Moreover, the workflows and processes of healthcare organizations should be aligned with the functionalities on adoption and utilization of EMRs, to ensure their efficient and effective use (Hamade, 2022).

Legal and Regulatory Factors

The adoption and utilization of EMRs is also influenced by legal and regulatory factors, such as privacy, security, and compliance requirements. Liu, (2022) argue that the privacy and security of patient data are critical concerns in the adoption and utilization of EMRs, as they involve sensitive and confidential information. Thus, healthcare organizations should comply with legal and regulatory frameworks that ensure the confidentiality, integrity, and availability of patient data, and implement technologies such as block-chain that enhance their privacy and security (Liu, 2022). Moreover, healthcare providers should be trained and educated on the legal and ethical aspects of using EMRs, to ensure their responsible and ethical use.

Patient and Healthcare Provider Factors

The adoption and utilization of EMRs also involves the attitudes, beliefs, and behaviours of patients and healthcare providers. According to Ogbonna, Oluwafemi, and Ojo, (2020), the identification and management of suicidal behaviour in patients can be enhanced by the utilization of EMRs, as they provide a longitudinal and comprehensive view of their health and mental status. Therefore, healthcare providers should be trained and educated on the benefits and limitations of adoption and utilization of EMRs, and involve patients in the decision-making and use of EMRs, to ensure their satisfaction and engagement (Hamade, 2022). Moreover, the quality of nursing documentation in EMRs should be assessed and improved, to enhance the accuracy and completeness of patient data (Gong, 2021).

Therefore, the adoption and utilization of EMRs in tertiary health institutions in North East Nigeria is a multifaceted process, influenced by various technological, organizational, legal, patient, and data processing and text mining factors. A systematic assessment and optimization of these factors, drawing on the evidence and insights from relevant literature and empirical studies, can enhance the adoption and utilization of EMRs, and ultimately improve the quality and efficiency of healthcare delivery in the geo-political zone.

4. Statement of the Problem

The adoption and implementation of electronic medical records (EMRs) has become increasingly important in the healthcare industry for improving patient outcomes, reducing medical errors, and enhancing the efficiency of healthcare delivery. However, the adoption and implementation of EMRs in tertiary health institutions in North East Nigeria, particularly at the Federal Medical Center Nguru, Yobe state, remains a major challenge. Several factors have contributed to this problem, including technical, financial, and organizational barriers.One of the main technical barriers to the adoption of EMRs is the lack of standardization and interoperability among different systems, which can hinder the exchange of information and coordination of care. Huang et al. (2020) suggested that deep learning techniques could be used to integrate medical imaging and EMRs, but there is still a need for guidelines and best practices to ensure effective implementation. Furthermore, there is a lack of qualified personnel and IT infrastructure to support the implementation and maintenance of EMRs, which can lead to technical difficulties and system downtime.Another significant barrier to the adoption of EMRs is financial constraints. Mukred et al. (2016) proposed an Electronic Records Management System Adoption Readiness Framework to address the financial challenges faced by higher professional education institutions in Yemen. However, many healthcare providers in Nigeria may lack the resources to invest in EMRs due to limited funding and budget constraints.

5. Objectives of the Study

The specific objectives of the study were to:

1. Examine the observed benefits of adoption and utilization of EMRs at the Federal Medical Center Nguru, Yobe State.
2. Examine the current state of EMRs adoption and utilization at the Federal Medical Center Nguru, Yobe State.

6. Research Questions

The following research questions were raised:

1. What are the observed benefits of adoption and utilization of EMRs at the Federal Medical Center Nguru, Yobe State?
2. What is the current state of EMRs adoption and utilization at the Federal Medical Center Nguru, Yobe State?

7. Hypotheses

The following hypotheses were formulated based on the research questions and objectives:

1. There is no significant difference in observed benefits on adoption and utilization of EMRs at the Federal Medical Center, Nguru, Yobe State.
2. There is no significant difference in current state of adoption and utilization of EMRs at the Federal Medical Center Nguru, Yobe State.

8. Significance of the Study

The adoption and utilization of electronic medical records (EMRs) in tertiary health institutions in North-East Nigeria has significant implications for the healthcare delivery system in the geo-political zone. This study focuses on the Federal Medical Center (FMC) Nguru Yobe State, which is a key healthcare provider in the geo-political zone. The significance of this study can be viewed through the lens of its potential to improve healthcare delivery, enhance patient outcomes, and reduce healthcare costs.

The utilization of EMRs has been shown to improve healthcare delivery by providing healthcare professionals with up-to-date patient information at the point of care (Alsahafi, 2021). This is particularly important in the case of tertiary health institutions where patients often receive complex and specialized care. EMRs can also reduce medical errors by providing healthcare professionals with access to a patient's complete medical history and medication list (Seymour, Frantsvog & Graeber, 2020). This can lead to faster and more accurate diagnoses, which ultimately improves patient outcomes.

The findings from this study can inform the development of research questions and hypotheses for future studies on relevant area. This can ultimately lead to a better understanding of the factors that influence the successful adoption and utilization of EMRs in low-resource settings and inform strategies for improving healthcare delivery in these settings.

9. Scope and Limitations of the Study

The scope of this study is to investigate the adoption and utilization of electronic medical records (EMR) in tertiary health institutions in North East Nigeria, with a focus on the Federal Medical Center Nguru, Yobe State. This study aims to identify the factors that hinder or promote the adoption, utilization and implementation of EMR in the healthcare system of the geo-political zone. The study sought to understand the current state of the adoption and utilization of EMR systems and the benefits associated with the implementation of such systems to the healthcare setting.

10. **Methodology**

This section outlines the research design used, population and sampling strategy, data collection methods, and analysis techniques. Quantitative research design was employed for the study. The study population comprised of all staff of the Department of Medical Record with a total population of fifty-four (54) medical recorders. Since the population was manageable the researchers therefore, used the whole population (54) for the study by using total enumeration. According to Nworgu (2015), when the population of a study is relatively small, all the population can be used as sample for the study.

A self-developed questionnaire was used for data collection, with modified five points Likert types scale. The instrument was validated using split-half method for pilot testing, data collected was subjected to Spearman Brown Formula which yielded a reliability index of 0.861 which indicated that the instrument is reliable. Descriptive statistics of frequency counts and percentages were used to answered the research questions while inferential statistics of chi-square (χ^2) goodness fit was used to test the hypotheses at 0.05 level of significance.

Fifty-four (54) copies of the questionnaire were administered to the respondents The Fifty- four (54) questionnaires were duly completed, retrieved and found usable for data analysis. The questionnaire was divided into three (3) sections. Section A. Demography characteristics of the respondents. Section B. was to examine the current state of EMR adoption and utilization at the Federal Medical Center Nguru, Yobe State. Section C, was to examine the observed benefits of adoption and utilization of EMRs at the Federal Medical Center Nguru, Yobe State.

11. **Results**

Descriptive statistics of frequency counts and percentages were used to describe the demographic characteristics of the respondents and to answer the research questions, while inferential statistics of chi-square (χ^2) of goodness of fit was used to test the hypotheses at 0.05 level of significance.

Table 1:

Demographic Characteristics of the Respondents:

				n=54
S/N	**Items**	**Responses**	**Respondents**	**Percentage (%)**
1.	Age	a. 25-35 years old	13	24.1
		b. 36-45 years old	22	40.7
		c. 46 and above years old	19	35.2
2.	Educational Qualification	a. National Diploma	16	29.7
		b. HND	22	40.7
		c. B.Sc	12	22.2
		d. M.Sc	4	7.4
3.	Marital Status	a. Married	43	79.7
		b. Single	11	20.3
4.	Years of Working Experiences	a. 1-5years	13	24.2
		b. 6-10years	34	62.9
		c. 11 years and above	7	12.9

The result in Table 1: present demographic variable of the respondents. Four variables were displayed in the table namely age, educational attainment, marital status and years of experience. The breakdown of age of the respondents showed that, 13 (24.1%) fall into age bracket of 25-35years, 22 (40.7%) fall into age bracket of 36-45years while 19 (35.2%) fall into age bracket of 46years and above. This meant that, majority of the respondents fall in to age bracket of 36-45years. On the educational qualification of the respondents 16 (29.7%) had obtained National Diploma, 22 (40.7%) had obtained HND, 12 (22.2) had obtained B.Sc while 4 (7.4%) had obtained M.Sc. This meant that, majority of the respondents 22 (40.7%) had obtained HND. On regard to marital status 43 (79.9%) were married while 11 (20.3%) were single. This meant that, majority of the respondents 43 (79.9%) were married. On years of working experience 13 (24.2%) had working experience of 1-5years, 34 (62.9%) had working experience of 6-10years while 7 (12.9%) had working experience of 11years and above. This meant that, majority of the respondents 34 (62.9%) had working experience of 6-10years.

Research Question One: What are the observed benefits of adoption and utilization of EMRs at the Federal Medical Center Nguru, Yobe State?

Table 2:

Observed Benefits of Adoption and Utilization of EMRs At The Federal Medical Center Nguru, Yobe State in Percentages.

Observed Benefits of Adoption and Utilization of EMR in Federal Medical Center Nguru, Yobe State, Nigeria							
SN	**Question**	**SA**	**A**	**N**	**D**	**SD**	**Remarks**
1	Electronic referral letters	20.4	57.4	18.5	0.0	3.7	**100%**
2	Electronic patients' demographic profile	22.2	59.3	14.8	1.85	1.85	**100%**
3	Production and Storage of laboratory reports	28.3	54.7	9.4	4.0	3.6	**100%**
4	Patients' audio-visual collections	11.3	50.9	20.8	15.1	1.9	**100%**
5	Electronic clinical trial data	18.9	60.4	9.4	5.3	6.0	**100%**
6	Electronic death certificates and autopsy reports	31.5	59.3	3.5	3.7	2.0	**100%**
7	Electronic versions of billings/payments	31.5	51.9	2.6	7.0	7.0	**100%**
8	Electronic notes on drug administration	25.9	46.3	13.0	7.4	7.4	**100%**
9	Electronic treatment notes	24.1	53.7	9.3	9.3	3.6	**100%**
10	Electronic versions of appointments	27.8	46.8	14.8	9.3	1.8	**100%**
11	Electronic discharge notes	18.5	55.6	9.3	11.1	5.5	**100%**
Total (%)		**77.88%**		**11.36%**		**10.76%**	**100%**

Source: Research, March 2025

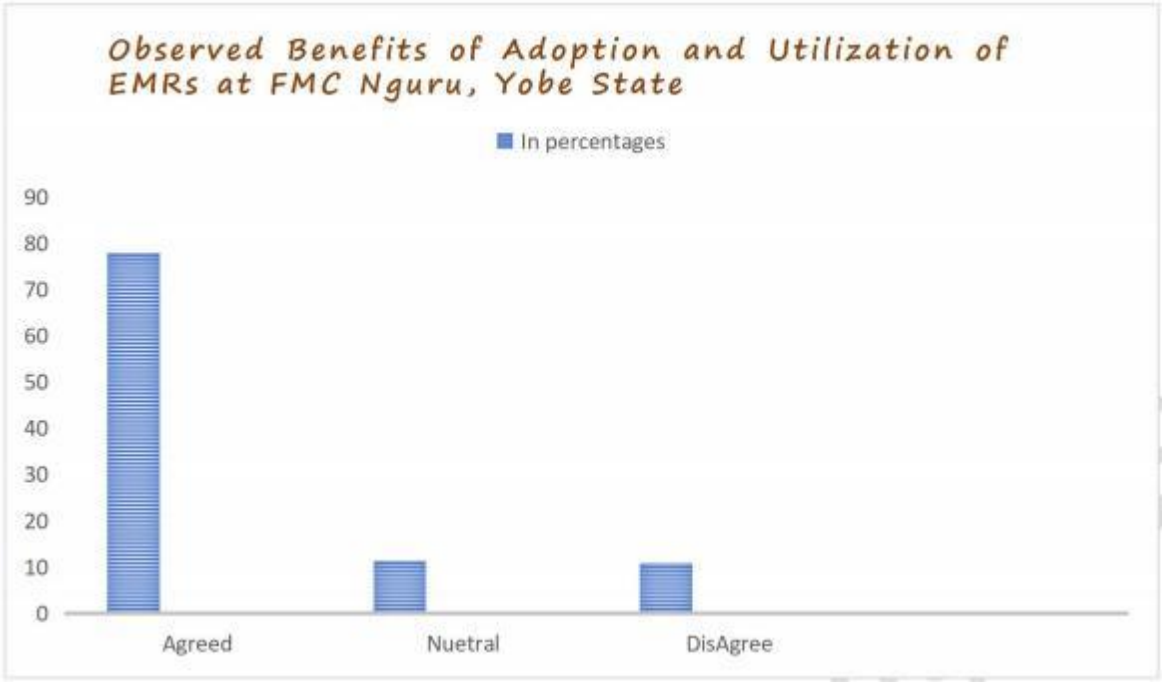

Figure 1: Observed Benefits of Adoption and Utilization of EMRs at FMC Nguru, Yobe State.

Research Question Two: What is the current state of EMRs adoption and utilization at the Federal Medical Center Nguru, Yobe State?

Table 3:
Current State of EMRs Adoption and Utilization at the Federal Medical Center Nguru, Yobe State, Nigeria

Current State of EMRs Adoption and Utilization at the Federal Medical Center Nguru, Yobe State, Nigeria							
SN	**Question**	SA	A	N	D	SD	Remarks
12	It enhances access to medical information	37.0	48.1	6.0	4.0	4.9	100%
13	It saves storage space for records	42.6	48.1	3.7	0.0	6.0	100%
14	It reduces patients' waiting time	38.9	42.6	9.3	3.0	6.2	100%
15	It facilitates clinical decision making	29.6	57.4	5.0	4.0	4.0	100%
16	It saves cost of medical care	24.1	48.1	14.8	9.3	3.7	100%
17	It improves confidentiality or security of medical information	44.4	37.0	11.1	2.0	5.5	100%
18	It enhances healthcare service delivery	37.0	44.4	11.1	3.5	4.0	100%
19	It improves timely communication among medical practitioners	33.3	50.0	9.3	3.7	3.7	100%
20	It reduces risk of treatment errors	29.6	40.7	16.7	6.5	6.5	100%
21	It speeds up treatment process	30.8	40.4	17.3	3.8	7.7	100%
22	It reduces patients' mortality rate	20.4	35.2	20.4	18.5	5.5	100%
Total (%)			**78.16%**	**8.56%**		**13.28%**	100%

Source: Research, March, 2025

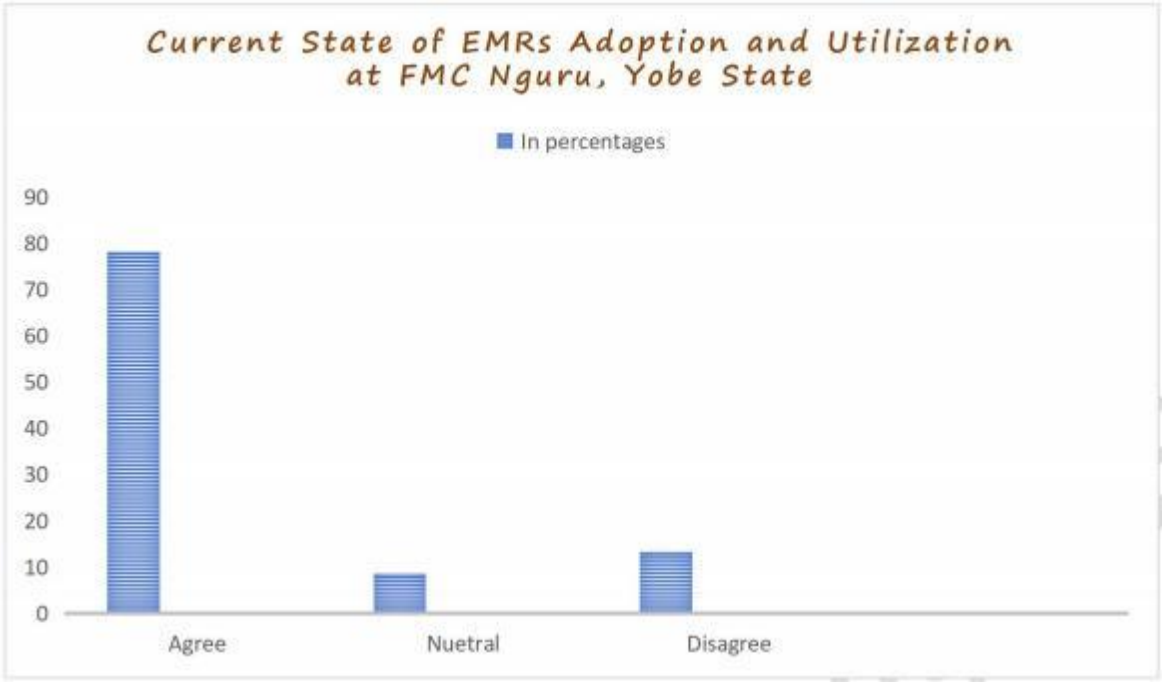

Figure 2: Current State ofEMRs Adoption and Utilization at FMCNguru, Yobe State.

Hypotheses Testing

H_{01}: There is no significant observed benefits in adoption and utilization of EMRs at the Federal Medical Center, Nguru, Yobe State.

Table 4:

Observed Benefits of Adoption and Utilization of EMRs at the Federal Medical Center Nguru, Yobe State

n= 54

Responses Categories	Observed Frequencies (Oi)	Expected Frequencies (Oi)	df	χ^2	Prob
SA	23	13.5	3	10.296	.016
A	13	13.5			
D	11	13.5			
SD	7	13.5			
Total	**54**				

The result in Table 4 showed summary of chi-square of goodness of fit analysis on responses of observed benefits in adoption and utilization of EMRs at the Federal Medical Center, Nguru, Yobe State. Chi-square of goodness of fit provides strong statistical evidence (χ^2= 10.296, df = 3, p< .016) to reject the null hypothesis. The chi-square goodness of fit test revealed a statistically significant difference in adoption and utilization of EMRs at the Federal Medical Center, Nguru, χ^2 (1, N = 54) = 10.296, p< .016. The null hypothesis, which stated that, there is no significant observed benefits in adoption and utilization of EMRs at the Federal Medical Center, Nguru, Yobe State is hereby rejected. Therefore, there is significant observed benefits in adoption and utilization of EMRs at the Federal Medical Center, Nguru, Yobe State.

H_{02}: There is no significant difference in current state of adoption and utilization of EMRs at the Federal Medical Center Nguru, Yobe State.

Table 5:

Current State of EMRs Adoption and Utilization at the Federal Medical Center Nguru, Yobe State.

n=54

Responses Categories	Observed Frequencies (Oi)	Expected Frequencies (Oi)	df	χ^2	Prob
SA	32	13.5	3	34.741	.000
A	10	13.5			
D	5	13.5			
SD	7	13.5			
Total	54				

The result in Table 5 showed summary of chi-square of goodness of fit analysis on responses on the current state of adoption and utilization of EMRs at the Federal Medical Center Nguru, Yobe State. Chi-square of goodness of fit provides strong statistical evidence (χ^2= 34.741, df = 3, p< .000) to reject the null hypothesis. The chi-square goodness of fit test revealed a statistically significant difference in the current state of adoption and utilization of EMRs at the Federal Medical Center Nguru, Yobe State, χ^2 (1, N = 54) = 34,741, p< .000. The null hypothesis, which stated that, there is no significant difference in current state of adoption and utilization of EMRs at the Federal Medical Center Nguru, Yobe State is hereby

rejected. Therefore, there is significant difference in current state of adoption and utilization of EMRs at the Federal Medical Center Nguru, Yobe State.

12. Findings

There were significant observed benefits in adoption and utilization of EMRs at the Federal Medical Center, Nguru, Yobe State.

There was significant difference in current state of adoption and utilization of EMRs at the Federal Medical Center Nguru, Yobe State.

13. Conclusion

There was a significant observed benefit and the current state of adoption and utilization of electronic medical records in federal medical center Nguru, Yobe State.

14. Recommendation for further studies

It is recommended that, further research should be conduct to explore the attitudes and perceptions of medical healthcare workers towards adoption of electronic medical record in tertiary institutions.

15. Conflicts of interest

The authors declare that there are no conflicts of interest.

16. Ethical Considerations and Informed Consent

The study was approved by the research Ethics Board and Human Research Ethics Committee of Federal Medical Centre Nguru**.** Written informed consent was obtained from all the participant.

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