

Adoption of Electronic Medical Records in Tertiary Health-Care Centers: A Survey of Federal Medical Centers in South-South Nigeria

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Abstract - The study investigated the adoption of electronic medical records in Federal Medical Centres in Bayelsa and Delta States of Nigeria. The study adopted descriptive survey research design. One hundred and nineteen staff of Departments of Health Records and Information Management of both medical centres participated in the study. Online questionnaire was used for data collection. One hundred and thirty-four soft copies of the questionnaire were distributed to the respondents via personal whatsapp accounts of the respondents and whatsapp platforms of the Health Information Managers Association of Nigeria and the Association of Health Records and Information Management Practitioners of Nigeria to which the respondents belonged. One hundred and nineteen questionnaires were properly completed, retrieved and found usable for data analysis. This produced a response rate of 88.81 %. The data collected were analyzed using weighted mean and standard deviation. Findings showed that the extent of adoption of electronic medical records in the medical centres was low; benefits derived from adoption, which were not perceived much differently by the sampled staff, were enhanced healthcare service delivery/access to medical information, saving of records storage space/cost of medical care, speeding up of treatment process, improvement of confidentiality/security of medical information/timely communication among medical practitioners, reduction of treatment error risk/ patients' mortality rate/patients' waiting time and facilitation of clinical decision making; challenges encountered in adoption, which were seen much differently by the records personnel, were poor internet connectivity or network, high cost of ICT equipment, low technical expertise, lack of funds/training/uniform standards and poor power supply.

Keywords: Adoption, Electronic Medical Records, Medical Centre, Federal Medical Centre, Bayelsa State, Delta State, Nigeria

I. INTRODUCTION

In Nigeria, the federal, state and local governments are responsible for providing tertiary, secondary and primary health care respectively (Ministry of Health, 1995). Tertiary health care can, therefore, be seen as the apex level of health care provided in Nigeria. Thus, it involves providing the most specialized and advanced health care services, and sometimes, handling referral cases from secondary health-care centres. In Nigeria, these services are rendered in tertiary health-care centres such as federal medical centres, national hospitals, teaching hospitals etc. All these health-

care services are accompanied by documentation in the form of records, which is called a medical record. Traditionally, a medical record is paper-based. However, with the advent of information and communication technology (ICT), many medical centres have been experimenting with ICT in their operations, including health records management. Thus, contemporary times have witnessed the widespread use of ICT in nearly all affairs of human beings and organizations, including the health-care sector (Elikwu *et al.*, 2020), where it is applied in such areas as mobile health applications, tele-health, health information management systems and electronic medical records (Walsham, 2020).

Yi (2018) observes that electronic health records, electronic patient records and electronic medical records are related terms which are often used interchangeably. Although the term "electronic medical records" can have various names and has no unique definition (Häyrynen *et al.*, 2008), the concept of electronic medical records has been explored by several scholars, researchers and medical experts.

Boonstra and Broekhuis (2010) see electronic medical records as computerized medical information systems that collect, store and display patient's information. It refers to a set of computerized inter-related components that enable data collection, storage and transformation, aggregate and disseminate information about a patient or a client in a health facility (Juma *et al.*, 2020).

In the context of this study, an electronic medical record is defined as an electronic document which contains information about patients' profile and cycles of health-care such as referral, consultation, observation, diagnosis, treatment and discharge of patients. An electronic medical record contains a wide range of information, including patient's demographic data (patient's name, gender, date of birth, health services number, contact number and address), history, information about diagnosis, physical examination, procedures, treatments, x-ray images, test results, medication (Khan & Hoque, 2015; Mohamamad & Yunus, 2017; Umezurike, 2021). Although the purpose of integrating electronic medical records into medical practice at a Nigerian federal medical centre is to achieve, among

other things, increase in internally-generated revenue, reduction in operational cost, improvement in patient's safety, ease of patient's data management, storage, retrieval and security of patient's data (Hassan *et al.*, 2018), all complete electronic medical records are characterized by large data dictionaries that define their contents; data stamped with time and date; systems capable of displaying data in flexible ways and a query tool for conducting research and accomplishing other aims (Dick & Steen, 1991).

Electronic medical records can be seen as a recent development in medical practice. While the electronic medical records was the earliest Hospital Information Systems used in electronic health records keeping, the first electronic medical records systems was designed in 1972 (Hamade, 2017).

Since then, such systems are being increasingly implemented worldwide (Hasanain *et al.*, 2014). In recent years, there has been a transformation from print medical records to electronic medical records in several countries of the world, including USA where the shift took effect from 2004 to 2014, China from 2004 to 2006, Canada from 2001 to 2010, Australia from 2004 to 2007, UK from 2000 to 2010, Hong Kong from 1991 to 2006, and Korea from 2006 to 2010 (Gong, 2011). In Saudi Arabia, EMR systems were introduced in 1988 (Alsaahfi, 2012), while in Taiwan, its adoption has been promoted by its government since 2010 (Yu *et al.*, 2019).

In Nigeria, electronic medical records have been introduced in a number federal medical centres in the country, including Federal Medical Centre, Lagos State (Folorunsho-Francis, 2020), Federal Medical Centre, Nasarawa State ("Osagie Commissions", 2017), Federal Medical Centre, Ogun State (Amery, 2021) etc. These federal medical centres are established and maintained by the third tier of government, which is the federal government of Nigeria. In other words, they constitute a part of tertiary health care facilities in Nigeria. Adegboire and Omowumi (2021) observe that electronic medical record systems have become a standard for tertiary healthcare facilities in South-West Nigeria. As an important innovation of the 21st century, issues surrounding electronic medical records have attracted the attention of researchers around the world. Consequently, studies on electronic medical records cover a core part of health-care management literature in recent years (Berner *et al.*, 2005).

A. Background Information about Federal Medical Centres in Nigeria

The Nigerian national policy mandates Federal, State and Local Governments in Nigeria to provide tertiary, secondary and primary health care services in Nigeria (Ministry of Health, 1995). In implementing this policy, the Federal Government has established at least one federal medical centre in each of the thirty-six states of the country. While

the objective is to create one of these centres in each state of the federation, they are, however, established in states that lack federal university teaching hospitals. The only state where this practice does not hold true is Lagos State, where a federal medical centre and a federal university teaching hospital co-exist.

As at the onset of 2016, there were twenty-two federal medical centres in Nigeria. Majority of these centres are established in the state capitals, especially in situations where the apex secondary health institution run by the state does not adequately meet the demands for specialist health-care by the citizens. The general mandate given to all these medical centres within the framework of the laws establishing them is to provide qualitative, affordable, specialized/tertiary level hospital care to the citizens and to ultimately reduce the burden of diseases within the communities, through provision of prompt and emphatic preventive, curative and rehabilitative services (Jogo & Achua, 2017).

B. Statement of the Problem

Adoption of electronic medical records in a medical centre can be instrumental in enhancing availability and utilization of medical information by health-care professionals. Such records serve as a guide to effective administration of drugs on patients and treatment of patients. Moreso, the records facilitate smooth information flow among health-care practitioners. They also minimize risks and errors in health-care practice.

However, a preliminary investigation by the researchers shows that some federal medical centres in Nigeria seem yet to take advantage of the potentials offered by information and communication technology by putting in place electronic means of documenting medical or health records. If this trend is not checked, a lot of errors and risks associated with medical treatment are likely to crop up and cases of mortality in these medical centres may increase. The researchers observed that no study has explored issues bothering on adoption of electronic medical records in health-care practice in Federal Medical Centres in South-South Nigeria. Hence, the study investigated the adoption of electronic medical records in Federal Medical Centres in Bayelsa and Delta States of Nigeria.

C. Purpose of the Study

The main goal of this research was to examine the adoption of electronic medical records in Bayelsa and Delta States of Nigeria. The specific purposes of the study were to:

1. Assess the extent of adoption of electronic medical records in Federal Medical Centres in Bayelsa and Delta States of Nigeria.
2. Identify the perceived benefits in adoption of electronic medical records in Federal Medical Centres in Bayelsa and Delta States of Nigeria.

3. Discover the challenges in adoption of electronic medical records in Federal Medical Centres in Bayelsa and Delta States of Nigeria.

D. Research Questions

The following research questions were posed to guide the study.

1. What is the extent of adoption of electronic medical records in Federal Medical Centres in Bayelsa and Delta States of Nigeria?
2. What are the perceived benefits in adoption of electronic medical records in Federal Medical Centres in Bayelsa and Delta States of Nigeria?
3. What are the challenges in adoption of electronic medical records in Federal Medical Centres in Bayelsa and Delta States of Nigeria?

E. Hypotheses

The following hypotheses which were tested at 0.05 levels of significance were formulated to guide the study.

HO₁: There is no statistically significant difference in the mean ratings of health information officers, health records technicians and clerical staff on the perceived benefits in the adoption of electronic medical records in the Federal Medical Centres (FMCs).

HO₂: There is no statistically significant difference in the mean ratings of health information officers, health records technicians and clerical staff on the challenges encountered in the adoption of electronic medical records in the Federal Medical Centres (FMCs).

II. LITERATURE REVIEW

A. Extent of Adoption of Electronic Medical Records in Federal Medical Centres

According to the Health Professions Council of South Africa ([HPCSA], n. d., qtd. in Medical Protection Society, 2017), the range of documents which a medical record covers includes the following: hand-written contemporaneous notes taken by the health-care practitioner; notes taken by previous practitioners attending health-care or other health-care practitioners, including a typed patient discharge summary or summaries; referral letters to and from other health-care practitioners; laboratory reports and other laboratory evidence such as histology sections, cytology slides and printouts from automated analysers, x-ray films and reports, ECG traces, etc.; audio-visual records such as photographs, videos and tape-recordings; clinical research forms and clinical trial data; other forms completed during the health interaction such as insurance forms, disability assessments and documentation of injury on duty; death certificates and autopsy reports.

According to Mathioudakis *et al.*, (2016), medical records comprise a variety of notes entered over time by health-care professionals, recording observations and administration of drugs and therapies, test results, x-rays, reports, medications and medical allergies, immunization records, surgical history, etc. Thus, an electronic medical record comprises electronic versions of the above records.

Devkota and Devkota (2013) identified the components of an electronic medical record to include evidence-based recommendations for specific medical conditions, records of appointments and other reminders, billing records, advanced directives, living wills and health powers of attorney and multi-media (e.g., video, audio) files. Its core components have also been identified to include administrative functions, computerized physician order entry, lab systems, radiology systems, pharmacy systems and clinical documentation (Seymour *et al.*, 2012).

Recent years have witnessed increasing adoption of electronic medical records in medical centres around the globe. However, the extent to which such records have been globally adopted in medical centres appears low. Observations suggest that the pace of the adoption of electronic medical records in medical centres in developing/African countries has been very low (Hassibian, 2013), and less than that of developed countries of the world (Akanbi *et al.*, 2012; Hasanain, *et al.*, 2014). A survey conducted by the Japan Hospital Association (2001) reported that only thirty percent (30%) of hospitals in Japan have adopted electronic medical records. While the United States is yet to witness universal adoption of electronic health records in hospitals and medical offices and the pace of its adoption has been accelerating in the country (Porter, 2013), there has been very slow pace of full adoption in both its primary care facilities and within its hospitals (Palabindala *et al.*, 2016).

A study by Jha *et al.*, (2008) on the use of health information technology in seven countries including US, Canada, UK, Germany, Netherlands, Australia and New Zealand reported that universal use 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 of such systems in hospitals in the countries is less than 10%. Although, Hasanain *et al.*, (2014) 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 *et al.*, (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 *et al.*, (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 *et al.*, (2021) shows that medical doctors' use of electronic health records in teaching hospitals in South-West Nigeria is generally low.

B. Perceived Benefits in Adoption of Electronic Medical Records in Federal Medical Centres

The electronic medical record has been acknowledged to have the highest capabilities and potentials for quality enhancement among the currently-adopted health-care information technologies in the health field (Miller & Sim, 2004). The adoption of electronic medical records in health-care centres comes with several benefits. A study by the RAND Corporation (2005) estimated that adoption of electronic health records in the United States could potentially save \$81 billion annually while enhancing quality health-care (Hillestad *et al.*, 2005). In India, result from a study by Tsai and Bond (2007) indicates that there was a significant reduction in the duration of patients' treatment with electronic record system adoption. The findings indicate that retrieval of proofs from electronic health records system was 40% more complete and 20% faster than paper medical records.

DesRoches *et al.*, (2008) reported in the New England Journal of Medicine that 82% of electronic health records' users enjoyed improved clinical decision-making, 92% improvement in communication with other providers and their patients, and 82% of users, a reduction in medication errors. A subsequent research by Lee *et al.*, (2013) show that the adoption of electronic medical records in hospitals in the United States brings about reduced patients' length of stay, patients' mortality rate and hospitalization by 0.11%, 0.18% and 0.46% respectively, out of 30 days.

Hydari *et al.*, (2014) found that hospitals that adopted a comprehensive electronic health records in Pennsylvania hospitals from 2005-2012 experienced 27% reduction in patients' safety adverse events, 30% decrease in medication errors and 25% decline in procedure-related errors. Outcome of another study by Waithera *et al.*, (2017) suggests that the adoption of electronic medical records systems in Kisii Teaching and Referral Hospital in Kenya brings about enhanced health-care delivery productivity, better clinical decision-making and better collaboration between health-care personnel.

In Nigeria, Elikwu *et al.*, (2020) found that the adoption of electronic health information system across four selected federal medical centres in Makurdi, Keffi, Lokoja and Abuja in North-Central Nigeria reduces risk of treatment errors, patients' waiting time, brings about enhanced timely communication among medical practitioners, health-care service delivery and protects patients' information against unauthorised personnel's access. The same year, Ogbonna *et al.*, (2020) identified the benefits of electronic health records adoption at Obafemi Awolowo Teaching Hospital, Osun State, Nigeria, to include its importance in

transmitting patient prescriptions followed by its potential to reduce medical error.

Findings from a recent study by Agbese and Ikonne (2021) show that electronic health records use contributes to quality health-care delivery by physicians in Federal tertiary hospitals in Federal Capital Territory, Nigeria.

C. Challenges in Adoption of Electronic Medical Records in Federal Medical Centres

Like every innovation in any organization, agency or institution, the adoption of electronic medical records in medical centres, especially in developing countries like Nigeria, is hampered by a number of challenges. Shuaib *et al.*, (2016) observe that, while developed countries prioritize the integration of electronic medical records into patients' care services, its adoption presents serious challenges to developing countries. A study by Jahanbakhsh (2011) groups challenges of electronic health records implementation in Isfahan into two areas: infrastructural challenges and structural challenges. The infrastructural challenges result from information technology problems, high software and hardware cost, non-adjustment data interchange standards, lack of uniform definitions and concepts, cultural problems and lack of needs assessment before implementation.

On the other hand, the structural challenges are attributed to instability, violations of privacy and legal cases, compromise obtaining information from management and lack of integration and sharing of enterprise-level information. In Nigeria, Pantuvo *et al.*, (2011) found that the barriers to electronic health records implementation at Nationwide Electronic Health Record System in the country include political ideologies of leaders, lack of funds, misapplication of funds, corruption, tribalism, difficulty in getting all stakeholders along, lack of constant power supply and absence of a conducive work environment. A study by Alghamdi (2015) reveals four significant barriers to implementation of electronic health records systems by health-care professionals in ten hospitals and General Directorate of Health Affairs in Saudi Arabia to include lack of computer skills, adaptation to new technology, costs of the system, privacy and security issues.

Ross *et al.*, (2016), in a review of forty-four studies from North America and Europe, identified its implementation barriers to include adaptability, complexity, cost, external policy/incentives and personal attributes such as knowledge, beliefs, computer skills, abilities and experience. Findings from a study by Waithera *et al.*, (2017) show that the major challenges facing electronic medical records systems in Kisii Teaching and Referral Hospital, Kenya, include lack of funding for the adaptation and utilization of the systems, computer illiteracy among medical personnel and paucity of information and communication technology staff.

Juma *et al.*, (2020) concluded that the barriers to adoption of electronic health records within Kisumu County, Kenya, include high cost of procurement and maintenance, poor network infrastructure and lack of comfort among health workers with electronic medical records. The same year, Ogbonna *et al.*, (2020) identified the challenges to implementing electronic health records at Obafemi Awolowo Teaching Hospital, Osun State, Nigeria, to include inadequate computers, lack of uniform hospital standard, training, start-up financial costs and productivity loss.

III. METHODOLOGY

The study adopted descriptive survey research design. The population of the study comprised all the staff of the Department of Health Records and Information Management of Federal Medical Centre, Asaba, Delta State and Federal Medical Centre, Yenagoa, Bayelsa State, which are the only two federal medical centres located in South-South Nigeria. A total of one hundred and nineteen health records and information management staff from both centres participated in the study. The instrument for data collection was a self-designed online questionnaire titled “Electronic Medical Records Adoption Questionnaire (EMRAQ)”. The questionnaire comprised two parts: Part A and B. Part A gathered information on the background of the respondents while Part B had three sections with Section A dealing with “extent of adoption of electronic medical records”, Section B with “benefits in adoption of electronic medical records”, while Section C covered “challenges in adoption of electronic medical records”.

Section A adopted a four-point response category of Very Great Extent (4), Great Extent (3), Low Extent (2) and Very Low Extent (1). On the other hand, a four-point Likert-type response category of Strongly Agree (4), Agree (3), Disagree (2) and Strongly Disagree (1) was adopted for Sections B and C. The instrument was validated by two experts in the Department of Library and Information Science in Niger Delta University, Bayelsa State, Nigeria. Reliability test was not conducted on the instrument based on the strength of the opinion of Nworgu (2015) that once a test is valid, it tends to be reliable. The researchers reached the staff of the records department of the medical centres by calling the mobile lines and communicating the email addresses of the medical centres displayed on their official websites.

One hundred and thirty-four soft copies of the draft of the validated questionnaire were distributed by the researchers to the staff of the records departments of the medical centres whose contacts were obtained by the researchers and with the online research assistance of health information officers who worked in these departments. The research assistants were enlightened on the purpose of the study and on how to administer the questionnaires. It was administered via personal whatsapp accounts of the health records personnel and whatsapp platforms of the Health Information Managers

Association of Nigeria and the Association of Health Records and Information Management Practitioners of Nigeria to which the respondents belonged. The research assistants forwarded the questionnaire to the personal whatsapp accounts of records department personnel who worked in the records departments but whose membership of the platforms were deactivated. The respondents were assured of confidentiality of information provided. All respondents were instructed to click on web links which directed them to the online questionnaires sent to them, where they completed the questionnaires anonymously. Reminders in the form of phone calls and chats were issued to the respondents to improve the response rate. Completed copies of the questionnaires administered by the researchers were retrieved by the researchers while the rest were retrieved and returned to the researchers by the research assistants.

One hundred and nineteen questionnaires were properly completed by the respondents, retrieved and found usable for data analysis. This produced a response rate of 88.81 %. The duration of data collection was two months. The data collected were analyzed using weighted mean and standard deviation. The decision rule applied for interpretation of results obtained from data analysis for Section A was that questionnaire items with weighted means which fell into the ranges of “3.50-4.49”, “2.50-3.49”, “1.50-2.49” and “0.50-1.49” were regarded as,

“Very Great Extent (4)”, “Great Extent (3)”, “Low Extent (2)” and “Very Low Extent (1)” respectively. The grand mean for the section was also interpreted the same way.

To interpret the result from Section B and C, an item with a mean equal to 2.50 and above was regarded as either a benefit or a challenge while an item with a mean less than 2.50 was regarded as neither a benefit nor a challenge. The hypotheses earlier formulated for the study were tested using Z-Test Statistic. The decision rule for the acceptance or rejection of the hypotheses formulated to guide the study stipulated that if the Z-calculated value was less than the Z-critical value, -1.96 or 1.96, then the null hypothesis was to be confirmed and accepted. On the other hand, if the Z-calculated value was greater than the Z-critical value, -1.96 or 1.96, the null hypothesis was to be rejected.

IV. RESULTS

This section displays the results of data analysis in tables in line with the research questions earlier formulated to guide the study.

Research Question 1

What is the extent of adoption of electronic medical records in Federal Medical Centres in Bayelsa and Delta States of Nigeria?

TABLE I: MEAN RATINGS OF RESPONSES ON THE EXTENT OF ADOPTION OF ELECTRONIC MEDICAL RECORDS IN FEDERAL MEDICAL CENTRES IN BAYELSA AND DELTA STATES OF NIGERIA

Sl. No.	Adopted EMRs	$\bar{X}$	SD	Remarks
1	Electronic referral letters	0.52	0.78	VLE
2	Electronic patients' demographic profile	2.53	1.09	GE
3	Electronic laboratory reports	1.35	0.45	VLE
4	Patients' audio-visual collections	2.47	0.76	LE
5	Electronic clinical trial data	0.59	0.74	VLE
6	Electronic death certificates and autopsy reports	2.56	1.7	LE
7	Electronic versions of billings/payments	3.45	1.9	GE
8	Electronic notes on drug administration	2.47	0.53	LE
9	Electronic treatment notes	0.53	0.09	VLE
10	Electronic versions of appointments	1.35	1.09	VLE
11	Electronic discharge notes	2.51	0.97	LE
	Grand Mean and Standard Deviation	1.85	0.92	LE

Key: $\bar{X}$: Mean; SD: Standard Deviation; EMRs: Electronic medical records; VGE: Very Great Extent; GE: Great Extent; LE: Low Extent and VLE: Very Low Extent

Table I indicates that the grand mean of 1.85 falls into the real limits of 1.50-2.49, which is classified as "Low Extent". Thus, the extent of adoption of electronic medical records in Federal Medical Centres in Bayelsa and Delta States of Nigeria is low.

Research Question 2: What are the perceived benefits in adoption of electronic medical records in Federal Medical Centres in Bayelsa and Delta States of Nigeria?

TABLE II MEAN RATINGS OF RESPONSES ON THE BENEFITS IN ADOPTION OF ELECTRONIC MEDICAL RECORDS IN FEDERAL MEDICAL CENTRES IN BAYELSA AND DELTA STATES OF NIGERIA

Sl. No.	EMRs Adoption Benefits	$\bar{X}$	SD	Remarks
1	It enhances access to medical information	3.45	1.87	Agreed
2	It saves storage space for records	3	0.94	Agreed
3	It saves cost of medical care	2.56	0.76	Agreed
4	It improves confidentiality or security of medical information	2.51	0.43	Agreed
5	It reduces risk of treatment errors	2.57	0.79	Agreed
6	It speeds up treatment process	2.87	1.09	Agreed
7	It reduces patients' mortality rate	2.98	1.07	Agreed
8	It improves timely communication among medical practitioners	2.98	1.76	Agreed
9	It enhances healthcare service delivery	3.31	1.6	Agreed
10	It facilitates clinical decision making	2.91	1.16	Agreed
11	It reduces patients' waiting time	2.53	0.99	Agreed
	Grand Mean and Standard Deviation	2.88	1.13	Agreed

Key: $\bar{X}$: Mean; SD: Standard Deviation; EMRs: Electronic medical records

Table II shows that the benefits derived from electronic records adoption in Federal Medical Centres in Bayelsa and Delta States of Nigeria include enhancement of healthcare service delivery/access to medical information, saving of records storage space/cost of medical care, speeding up of treatment process, improvement of confidentiality/security of medical information/timely communication among medical practitioners, reduction of treatment error risk/patients' mortality rate/patients' waiting time and facilitation of clinical decision making.

H₀₁: There is no statistically significant difference in the mean ratings of health information officers, health records technicians and clerical staff on the perceived benefits in the adoption of electronic medical records in the Federal Medical Centres (FMCs).

Hypothesis 1 was tested using Z test and the result was presented in Table III.

TABLE III SUMMARY OF Z-TEST TABLE FOR THE SIGNIFICANT DIFFERENCE IN THE MEAN RATINGS OF HEALTH INFORMATION OFFICERS, HEALTH RECORDS TECHNICIANS AND CLERICAL STAFF ON THE PERCEIVED BENEFITS IN THE ADOPTION OF ELECTRONIC MEDICAL RECORDS IN THE FMCS

Variables	$\bar{X}$	SD	N	Sig	DF	Z-cal	Z-crit	Remark
Health Information Officers	22.7	2.18	28	0.05	116	-47.94	-1.96	N.S.
Health Records Technicians	20.1	1.27	47					
Clerical Staff	14.8	1.49	44					

Table III indicates that the Z-calculated, -47.94, is less than the Z-critical, -1.96. Therefore, there is no significant difference in the mean ratings of health information officers, health records technicians and clerical staff on the perceived

benefits in the adoption of electronic medical records in the FMCs.

Research Question 3: What are the challenges in adoption of electronic medical records in Federal Medical Centres in Bayelsa and Delta States of Nigeria?

TABLE IV MEAN RATINGS OF RESPONSES ON THE CHALLENGES IN ADOPTION OF ELECTRONIC MEDICAL RECORDS IN FEDERAL MEDICAL CENTRES IN BAYELSA AND DELTA STATES OF NIGERIA

Sl. No.	EMRs Adoption Challenges	$\bar{X}$	SD	Remarks
1	poor internet connectivity or network	2.78	0.45	Agreed
2	high ICT equipment/maintenance cost	3.57	1.7	Agreed
3	resistance to technology by staff	2.42	0.83	Disagreed
4	low technical expertise	3.18	1.72	Agreed
5	violations of privacy and legal cases	2.35	1.21	Disagreed
6	information overload	2.31	0.67	Disagreed
7	lack of funds	3.58	1.35	Agreed
8	lack of training	3.15	1.74	Agreed
9	poor power supply	2.89	0.79	Agreed
10	lack of uniform standards	2.56	0.91	Agreed
	Grand Mean and Standard Deviation	2.88	1.14	Agreed

Key: $\bar{X}$: Mean; SD: Standard Deviation; EMRs: Electronic medical records

Table IV reveals that the challenges encountered in adoption of electronic medical records in Federal Medical Centres in Bayelsa and Delta States of Nigeria are poor Internet connectivity or network, high cost of ICT equipment, low technical expertise, lack of funds/training/uniform standards and poor power supply. However, violations of privacy and legal cases, information overload and resistance to technology by staff are not perceived as challenges.

H₀₂: There is no statistically significant difference in the mean ratings of health information officers, health records technicians and clerical staff on the challenges encountered in the adoption of electronic medical records in the Federal Medical Centres (FMCs).

Hypothesis 2 was tested using Z test and the result was presented in Table V.

TABLE V SUMMARY OF Z-TEST TABLE FOR THE SIGNIFICANT DIFFERENCE IN THE MEAN RATINGS OF HEALTH INFORMATION OFFICERS, HEALTH RECORDS TECHNICIANS AND CLERICAL STAFF ON THE CHALLENGES ENCOUNTERED IN THE ADOPTION OF ELECTRONIC MEDICAL RECORDS IN THE FMCS

Variables	X	SD	N	Sig	DF	Z-cal	Z-crit	Remark
Health Information Officers	18.5	1.92	28	0.05	116	3.33	1.96	S.
Health Records Technicians	11.7	1.18	47					
Clerical Staff	5.4	0.83	44					

Table V shows that the Z-calculated, 3.33, is greater than the Z-critical, 1.96. Thus, there is a significant difference in the mean ratings of health information officers, health records technicians and clerical staff on the challenges encountered in the adoption of electronic medical records in FMCs.

V. DISCUSSION OF THE STUDY

The study reveals that that the extent of adoption of electronic medical records in Federal Medical Centres in Bayelsa and Delta States of Nigeria is low. The finding agrees with that of Adedeji *et al.*, (2018) which reveal that

the use of electronic medical records in teaching and tertiary hospitals in Nigeria is mainly paper-based. It is also in line with Juma *et al.*, (2020) who concluded that electronic medical records adoption penetration is very low in sub-Saharan Africa, despite an increase in the use of such records in the continent.

The research also indicates that the benefits accruing from electronic records adoption in federal medical centres in Bayelsa and Delta States of Nigeria include enhancement of healthcare service delivery/access to medical information, saving of records storage space/cost of medical care, speeding up of treatment process, improvement of confidentiality/security of medical information/timely communication among medical practitioners, reduction of treatment error risk/patients' mortality rate/patients' waiting time and facilitation of clinical decision making. This is in line with that of Elikwu *et al.*, (2020) which show that adoption of electronic health information system across four selected federal medical centres in North-Central Nigeria reduces risk of treatment errors, enhances timely communication among practitioners, protects patient's information from unauthorised personnel and enhances healthcare service delivery. It also agrees with that of Ogbonna *et al.*, (2020) which identified reduction of medical error as a benefits associated with electronic health records adoption at Obafemi Awolowo Teaching Hospital, Osun State, Nigeria. It further concurs with the outcome of a study by Agbese and Ikonne (2021) which indicate that electronic health records adoption results in quality healthcare delivery by physicians in Federal tertiary hospitals in Federal Capital Territory, Nigeria.

The research also shows that the opinions of health information officers, health records technicians and clerical staff on the perceived benefits of the adoption of electronic medical records in the Federal Medical Centres do not differ significantly. This result may be as a result of the fact that information and communication technologies (ICTs) have been acknowledged to have a positive influence on the daily operations of all organizations, including health care centres. The craze for the use of ICT by people in all walks of life tends to suggest that they increasingly realize the gains of the adoption of these technologies, including electronic medical records. This probably explains why there is not much variation in the views of health information officers, health records technicians and clerical staff on the perceived benefits in the adoption of electronic medical records in the federal medical centres.

The study also indicates that the challenges encountered in the adoption of electronic medical records in Federal Medical Centres in Bayelsa and Delta States of Nigeria are poor internet connectivity or network, high cost of ICT equipment, low technical expertise, lack of funds/ training/ uniform standards and poor power supply. The result is in line with that of Pantuvo *et al.*, (2011) which indicate that the barriers to electronic medical records implementation at Nationwide Electronic Health Record System in Nigeria,

are, among others, lack of funds and lack of constant supply of electricity. It is also in line with that of Ogbonna *et al.*, (2020) which identifies challenges in electronic health records implementation at Obafemi Awolowo Teaching Hospital, Osun State, Nigeria to include, among others, shortage of computer facilities and start-up financial costs. However, there is a significant difference in the opinions of health information officers, health records technicians and clerical staff on the challenges encountered in the adoption of electronic medical records in the federal medical centres. The large number of clerical staff (44) engaged in the study, whose number is far more than that of health information officers (28) and almost equal to that of health records technicians (48) could be accountable for this finding. Moreso, the seeming lack of technical expertise and training among the clerical staff sampled in the study may have also resulted in this outcome.

Finally, the research reveals that there is a significant difference in the mean ratings of health information officers, health records technicians and clerical staff on the challenges encountered in the adoption of electronic medical records in the FMCs. This result could be attributed to the fact that the three categories of records management personnel sampled in the study are personnel who have different levels of skills, knowledge and educational backgrounds. Thus, the personnel may have diverse obstacles in handling the electronic medical records in the federal medical centres.

VI. CONCLUSION

The study has shown that that the extent of adoption of electronic medical records in Federal Medical Centres in Bayelsa and Delta States of Nigeria is low. It has also indicated that the benefits derived from electronic records adoption in the medical centres, which are not perceived much differently by the records workers, include improved healthcare service delivery/access to medical information, saving of records storage space/cost of medical care, speeding up of treatment process, improvement of confidentiality/security of medical information/timely communication among medical practitioners, reduction of treatment error risk/ patients' mortality rate/patients' waiting time and facilitation of clinical decision making. Lastly, the research has revealed that electronic medical records adoption obstacles in the medical centres are poor Internet connectivity or network, high cost of ICT equipment, low technical expertise, lack of funds/training/uniform standards and poor power supply. However, these obstacles are seen much differently by the records personnel.

VII. RECOMMENDATIONS

On the basis of the findings of this study, the following recommendations were made.

1. Nigerian federal government should increase the budgetary allocation to federal medical centres in the country so that such centres would make adequate provision for information and communication technology (ICT) and constant power supply in the medical centres for effective tertiary health-care delivery services.
2. The federal medical centres should organize internal and external digital training for their personnel so as to equip them the technical-know-how to effectively implement electronic medical records systems in the medical centres.
3. Federal medical centres management should engage the services of information and communication technology (ICT) experts in the implementation of electronic medical records systems to ensure effective integration of ICT initiatives in the medical centres.

APPENDIX: DISTRIBUTION OF RESPONDENTS OF THE STUDY

Sl. No.	Federal Medical Centre, Yenagoa, Bayelsa State	Federal Medical Centre, Asaba, Delta State	Respondents
1. Health Information Officers	13	15	28
2. Health Records Technicians	25	22	47
3. Clerical staff	20	24	44
Row Total	58	61	119

REFERENCES

- [1] Abiodun, O. O., Ikonke, C. N., & Madukoma, E. (2021). Institutional support and use of electronic health records by medical doctors in teaching hospitals in South-West Nigeria. *International Journal of Academic Library and Information Science*, 9(4), 149. DOI:10.14662/ijalis2021.120
- [2] Adedeji, P., Irinoye, O., Ikono, R., & Komolafe, A. (2018). Factors influencing the use of electronic health records among nurses in a teaching hospital in Nigeria. *Journal of Health Informatics in Developing Countries*, 12(2), 1. Retrieved from <http://www.jhdc.org>.
- [3] Adegboye, A. M., & Omowumi, A. T. (2021). Factors influencing electronic medical record systems success in selected tertiary health-care facilities in South-West Nigeria. *Information Impact: Journal of Information and Knowledge Management*, 11(4), 14. DOI: <https://dx.doi.org/10.4314/ijikm.v11i1.2>.
- [4] Agbese, F. A. O. & Ikonke, C. N. (2021). Electronic health records (EHRs) use and quality healthcare delivery by physicians in tertiary hospitals in Federal Capital Territory, Nigeria. *Library Philosophy and Practice (e-journal)*, 5027, 1. Retrieved from <https://digitalcommons.unl.edu/libphilprac/5027>.
- [5] Akanbi, M. O., Ocheke, A. N., Agaba, P. A., Daniyam, C. A., Agaba, E. I., Okeke, E. N., & Ukoli, C. O. (2012). Use of electronic health records in sub-Saharan Africa: Progress and challenges. *Journal of Medicine in the Tropics*, 14(1), 1. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/25243111>.
- [6] Al-Aswad, A. M. (2015). *Issues concerning the adoption and usage of electronic medical records in Ministry of Health Hospitals in Saudi Arabia*. (Unpublished Ph.D. dissertation). The University of Sheffield. Retrieved from <core.ac.uk/download/pdf>.
- [7] Alghamdi, A. S. M. (2015). *Factors associated with the implementation and adoption of electronic health records (EHRs) in Saudi Arabia*. (Unpublished Ph. D. dissertation). The State University of New Jersey. Retrieved from <rucore.libraries.rutgers.edu/rutgers-lib> > PDF > play.
- [8] Alsahafi Y. (2012). *Studies of EHR implementation and operation in different countries with particular reference to Saudi Arabia*. Massey University. Retrieved from <mro.massey.ac.nz> > handle.
- [9] Amery, H. (2021, Feb. 9). Momentous innovation at FMC Abeokuta, as the hospital launches electronic medical record system. *Newsflagship*. Retrieved from <newsflagship.com> > Health.
- [10] Berner, E.S., Detmer, D. E., & Simborg, D. (2005). Will the wave finally break? A brief view of the adoption of electronic medical records in the United States. *Journal of the American Medical Informatics Association*, 12(1), 3-7. Retrieved from <www.ncbi.nlm.nih.gov/pmc/articles/PMC543824>.
- [11] Boonstra, A., & Broekhuis, M. (2010). Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. *BMC Health Services Research*, 10(1), 231. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/20691097>.
- [12] DesRoches, C. M., Campbell, E. G., Rao, S. R., Donelan, K., Ferris, T. G., Jha, A., et al., (2008). Electronic health records in ambulatory care: A national survey of physicians. *N Engl. J. Med.*, 359(1), 50-60. DOI: <http://dx.doi.org/10.1056/nejmsa0802005>.
- [13] Devkota, B., & Devkota, A. (2013). Electronic health records: Advantages of use and barriers to adoption. *Health Renaissance*, 11(3), 181-184. DOI: 10.3126/hren.v11i3.9629.
- [14] Dick, R., & Steen, E. (Eds.). (1991). *The cor??pfrcr-hash puricnt rccord: In es.wnrulrc,cl7no/o.el,/i7rpnriuricare*. National Academy Press.
- [15] Elikwu, I. M., Igbokwe, A. C., & Emokhare, G. (2020). Effect of electronic health information system on medical records management in public healthcare institutions. *Unizik Journal of Business*, 3(1), 43. DOI: 10.36108/unizikjb/0202.30.0140
- [16] Folorunsho-Francis, A. (2020, Jan. 5). FMC introduces e-medical record to replace paper cards and files. *Punch*. Retrieved from <https://healthwise.punchngh.com/fmc-introduces-e-medical-record-to-replace-paper-cards-files>.
- [17] Gong, J. G. (2011). *Realizing the medical e-vision vision, electronic medical record integration/interoperability is imperative*. Retrieved from <https://www.2cm.com>.
- [18] Hamade, N. (2017). Improving the use of electronic medical records in primary health care: A systematic review and meta-analysis. *Electronic Thesis and Dissertation Repository*. 4420. Retrieved from <http://ir.lib.uwo.ca/etd/4420>.
- [19] Hasanain, R., Vallmuur, K., & Clark, M. (2014). Progress and challenges in the implementation of electronic medical records in Saudi Arabia: A systematic review. *Health Informatics- An International Journal*, 3(2), 1. DOI: 10.5121/hij.2014.3201.
- [20] Hassibian, M. R. (2013). Electronic health records acceptance and implementation in developing countries: Challenges and barriers. *Razavi International Journal of Medicine*, 1. DOI: 10.17795/RIJM.15077.
- [21] Häyrynen, K., Saranto, K., & Nykänen, P. (2008). Definition, structure, content, use and impacts of electronic health records: A review of the research literature. *International Journal of Medical Informatics*, 77(5), 291-304. DOI: 10.1016/j.ijmedinf.2007.09.001.
- [22] Hillestad, R., Bigelow, J., Bower, A., Girosi, F., Meili, R., Scoville, R., & Taylor, R. (2005). Can Electronic medical record systems transform health care? Potential health benefits, savings, and costs. *Health Affairs*, 24(5), 1103-1117. DOI: 10.1377/hlthaff.24.5.1103.

- [23] Hydari, M., Telang, R. & Marella, W. (2014). *Saving patient Ryan-Can advanced electronic medical records make patient care safer?* Retrieved from <http://papers.ssm.com/sol3/paperscfm?abstractid=2503702>.
- [24] Jahanbakhsha, M., Tavakoli, N., & Mokhtari, H. (2011). Challenges of EHR implementation and related guidelines in Isfahan. *Procedia Computer Science*, 3, 1199. DOI:10.1016/j.procs.2010.12.194.
- [25] Jha, A. K., Doolan, D., Grandt, D., Scott, T., & Bates, D. W. (2008). The use of health information technology in seven nations, *International Journal of Medical Information*, 77, 848-54.
- [26] Jogo, A. A., & Achua, J. K. (2017). Human resource management and clinical productivity in Nigerian federal medical centres. *IOSR Journal of Business and Management (IOSR-JBM)*, 19(7), 63-67. DOI: 10.9790/487X-1907026367
- [27] Juma, R., Abila, J., & Oluoch, J. (2020). Electronic medical records software types in use within Kisumu County. *International Journal of Innovative Science and Research Technology*, 5(5), 1989-1990. Retrieved from <https://ijisrt.com/assets/upload/files/IJISRT20MAY395.pdf>.
- [28] Khan, S., & Hoque, A. (2015). Towards development of health data warehouse: Bangladesh perspective, in *Proc. 2nd International Conference on Electrical Engineering and Information Communication Technology (ICEEICT)*, 1-6. Retrieved from https://link.springer.com/chapter/10.1007/978-3-319-23258-4_36.
- [29] Lee, J., Kuo, Y. F., & Goodwin, J. S. (2013). The effect of electronic medical record adoption on outcomes in US hospitals. *BMC Health Services Research*, 13(1), 5-6. Retrieved from <https://bmchealthservres.biomedcentral.com/articles/10.1186/1472-6963-13-39>.
- [30] Mathioudakis, A., Rousalova, I., Gagnat, A., Saad, N., & Hardavella, G. (2016). How to keep good clinical records. *Breathe (Sheff)*, 12(4), 369-373. DOI: 10.1183/20734735.018016.
- [31] Medical Protection Society (2017). The importance of keeping good medical records. *Junior Doctor*, 7(1), 5. Retrieved from <https://www.medicalprotection.org/southafrica/junior-doctor/volume-7-issue-1/the-importance-of-keeping-good-medical-records>.
- [32] Miller, R. H., & Sim, I. (2004). Physicians' use of electronic medical records: Barriers and solutions. *Health Affairs*, 23(2), 116-26. DOI: 10.1377/hlthaff.23.2.116.
- [33] Ministry of Health. (1995). *Nigerian national health policy*. Federal Government of Nigeria.
- [34] Mohamamad, A., & Yunus, A. M. (2017). Technology acceptance in healthcare service: A case of electronic medical records (ERM). *International Journal of Academic Research in Business and Social Sciences*, 7(11), 863. DOI: 10.6007/IJARBS/v7-i11/3522.
- [35] Msiska, K. E. M., Kunitawa, A., & Kumwenda, B. (2017). Factors affecting the utilisation of electronic medical records system in Malawian central hospitals. *Malawi Medical Journal*, 29(3), 44-45. DOI: 10.4314/mmj.v29i3.4.
- [36] Nworgu, B. G. (2015). *Educational research: Basic issues and methodology*. (3rd Ed.). University Trust Publishers
- [37] Ogbonna, M. A., Oluwafemi, O. M., & Ojo, P. O. (2020). Acceptance and barrier of electronic health records in a tertiary hospital in Nigeria. *European Journal of Social Sciences Studies*, 5(6), 171. DOI: <http://dx.org/10.46827/ejsss.v5i6.960>.
- [38] Osagie commissions. (2017, Feb. 1). Osagie commissions 'first-in-Nigeria' Keffi FMC's electronic medical record facility. *Dailytrust*. Retrieved from <https://dailytrust.com/osagie-commissions-first-in-nigeria-keffi-fmcs-electronic-medical-record-facility>.
- [39] Palabindala, V., Pamarthy, A., & Jonnalagadda, N. R. (2016). Adoption of electronic health records and barriers. *Journal of Community Hospital Internal Medicine Perspectives*, 6, 32643. DOI: <http://dx.doi.org/10.3402/jchimp.v6.32643>.
- [40] Pantuvo, J. S., Naguib, R. N. G., & Wickramasinghe, N. (2011). Towards implementing a nationwide electronic health record system in Nigeria. *International Journal of Healthcare Delivery Reform Initiatives*, 3(1), 53. DOI:10.4018/jhdri.2011010104.
- [41] Porter, M. (2013). *Adoption of Electronic Health Records in the United States*. Kaiser Permanente International. Retrieved from <http://xnet.kp.org/kpinternational/docs/Adoption%20of%20Electronic%20Health%20Records%20in%20the%20United%20States.pdf>.
- [42] Ross, J., Stevenson, F., Lau, R., & Murray, E. (2016). Factors that influence the implementation of e-health: A systematic review of systematic reviews (an update). *Implementation Science*, 11, 146. DOI: 10.1186/s13012-016-0510-7.
- [43] Schiff, G., David, W., & Bates, M. (2010). Can electronic clinical documentation help prevent diagnostic errors? *New English Journal of Medicine*, 362(1), 1066-1069. DOI: 10.1056/NEJMp0911734.
- [44] Seymour, T., Frantsovog, D., & Graeber, T. (2012). Electronic health records (EHRs). *American Journal of Health Sciences*, 3(3), 201. DOI: 10.19030/ajhs.v3i3.7139.
- [45] Shuaib, W., Suarez, J. M., Romero, J. D., Pamello, C. D., Alweis, R., Khan, A. A., Shah, S. R., Shahid, H., Pierre-Charles, S. B., & Sanchez, L. R. (2016). Transforming patient care by introducing an electronic medical records initiative in a developing country. *Health Informatics Journal*, 22(4), 976. DOI: 10.1177/1460458215589204.
- [46] Tsai, J., & Bond, G. (2007). A comparison of electronic records to paper records in mental health centers. *International Journal for Quality in Health Care*, 20(2), 136-143. DOI: 10.1093/intqhc/mzm064.
- [47] Umezurike, I. S. (2021). Exploring the adoption of electronic medical records in primary health care centres in Calabar municipality: The challenges and prospects of e-governance. *Journal of Good Governance and Sustainable Development in Africa (JGGSDA)*, 6(2), 72. Retrieved from <http://journals.rcmss.com/index.php/jggstda/article/view/91>.
- [48] Waithera, L., Muhia, J., & Songole, R. (2017). Impact of electronic medical records on healthcare delivery in Kisii Teaching and Referral Hospital. *Medical and Clinical Reviews*, 3(4), 1. DOI: 10.21767/2471-299x.1000062.
- [49] Walsham, G. (2020). Health information systems in developing countries: Some reflections on information for action. *Information Technology for Development*, 26(1), 194-200. DOI: 10.1080/02681102.2019.1586632.
- [50] William, F., & Boren, S. (2008). The role of electronic medical record in care delivery in developing countries. *International Journal of Information Management*, 28(6), 503-507. DOI: <https://doi.org/10.1016/j.ijinfomgt.2008.01.01>.
- [51] Yi, M. (2018). Major issues in adoption of electronic health records. *Journal of Digital Information Management*, 16(4), 180. Retrieved from www.dline.info/paper/jdim.
- [52] Yu, W., Tsai, M., Hung, S., & Chen, C. C. (2019). Understanding physicians' adoption of electronic medical records: Healthcare technology self-efficacy, service level and risk perspectives. *Computer Standards and Interface*, 66(1/11), 2. DOI: <https://doi.org/10.1016/j.csi.2019.04.001>.