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Investigating Electronic Medical Record System of Selected Healthcare Institutions in Nigeria

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ABSTRACT: Clinical data in Electronic Medical Record System EMRS are potential source of longitudinal Clinical data for research. The Electronic Medical Record System (EMRS) investigates whether data captured through routine clinical care can identify the factors affecting the implementation of EMRS; using data from three different hospitals. The purpose of this study is to examine the effect of three factors: Knowledge about the use of Computer Application, Present status of EMRS in the healthcare environment and the worker's behavior towards the implementation of EMRS in the healthcare environment. Information was gathered through the use of questionnaire which was dispatched to about 184 healthcare workers. When the questionnaires were administered it was found that the respondents need a wide EMRS capability to include Decision Support System and Reminder System and the spread of EMRS is supported by the response from the respondents.

KEYWORDS: ICT, Electronic medical record system (EMRS), Healthcare, Developing countries, Healthcare Information and Management Systems Society (HIMS).

I. INTRODUCTION

An electronic medical record (EMR) contains a standard medical and clinical data gathered in one provider office. An electronic medical record is a digital version of a paper chart that contains all of a patient's medical history from one practice. Electronic medical records (EMRs) have been promoted as essential to improving healthcare quality. Although current adoption rates are below normal level, recent government efforts may likely increase the use of EMRs in clinical settings. The U.S. Centers for Medicare and Medicaid Services recently finalized a definition for "meaningful use" of EMRs, which defines attainment for the recording and use of data in EMRs to promote quality care. This standard, coupled with significant financial incentives and consequences, is intended to promote widespread implementation of EMRs within Nigerians' healthcare system. Simpson and Gordon 1998 in Japan confirm that adoption of computer technology in healthcare is very fast by desire to (streamline) i.e. a process in order to increase its efficiency in the clinical and administrative functions [1] [2].

Understanding the strengths and limitations of current EMR, data capture is essential for identifying present status and clinical presentation. In clinical care, EMRs serve to backup clinical observations and patient-provider interactions and generate billing documentation. Clinical data collection in EMRs may have a secondary application in the research environment. In parallel with increasing EMR implementation, high throughput, EMR allows a clinician to track data over time and easily identify which patients are scheduled for preventative screening.

The use of full or partial electronic health record (EHR) systems—also referred to as electronic medical records (EMRs)—in physicians' offices is increasing [3] [4]. However, by 2012, only 40 percent of providers used a fully functional system, or "Basic EHR", defined by the U.S. National Center for Health Statistics to include patient history and population, patient problem records, specialist clinical notes, comprehensive lists of patients' medications and disorder, electronic orders for recommendations, and the competence to view laboratory and imaging results electronically [5] [4]. Meanwhile, only 27 percent of physicians intending to apply for meaningful use incentives reported having EHR systems in place with capabilities to actually meet the Stage 1 core objectives for meaningful use [4] [6].

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In medical literature, clinicians' adaptation to a new system is often discussed as workarounds. A "workaround" is a specific type of adaptation that is widely reported in Health Information Technology implementation literature [7] [8]. Workarounds are ways of overcoming an impediment or problem brought on by the newly deployed Information Technology (IT) system and the efforts initiated by clinicians in making the system easier to use [9] [10]. An EMR is said to make the process of record keeping easier, more accurate, broad and more efficient. A doctor uses unique software, which allows them to store information electronically and makes a patient complete history available immediately. Specialist can use a desktop, laptop or electronic clipboard to navigate through patients chart and record notes.

The information stored in EMRs is not easily shared with providers outside of a practice. A patient record might even have to be in a printed form and delivered by mail to specialist and other members of the care team. The potential benefits of using Electronic Medical Records (EMR) over paper records in improving the quality of healthcare delivery have been extensively studied [11] [12]. The EMR promises rapid access to health information, which leads to improved healthcare outcomes and more efficient use of resources. The Institute of Medicine report emphasizes the critical role played by IT in achieving patient safety, effectiveness, patient focus, promptness, efficiency and equity of healthcare. Although EMR has many advantages over paper records, its adoption in healthcare has been slow.

A survey conducted by the [1] reports that only thirty percent (30%) of hospitals in Japan have adopted EMR and cites the high cost of computerization as the major barrier to EMRS adoption. Other authors have also cited the high cost of healthcare computerization as being the greatest impediment to EMRS adoption [13] [2] [14]. There is, however, emerging evidence that even large healthcare institutions that possess the capacity to adopt EMR choose not to [1] [15]. In recognition of this, the Japanese Government recently issued a policy paper requiring larger healthcare institutions with 400 beds or more to implement EMR. While the government did not offer direct incentives to encourage adoption of EMR, the benefits are expected to arise out of faster filing of insurance claims and efficiency of patient care leading to retention of clients (patients).

In a project initiated by the Office of the National Coordinator for Health Information (ONC), surveyors found that hospital administrators and physicians who had adopted EMR noted that any gains in efficiency were offset by reduced productivity as the technology was implemented, as well as the need to increase information technology staff to maintain the system.

The Healthcare Information and Management Systems Society (HIMSS), a very large U.S. healthcare IT industry trade group, observed that EMRS adoption rates "have been slower than expected in Nigeria, especially in comparison to other industry sectors and other developed countries.

National Institute of Standards and Technology of the Department of Commerce studied usability in 2011 and lists a number of specific issues that have been reported by health care workers. The U.S. military's EHR, AHLTA, was reported to have significant usability issues. It was observed that the efforts to improve EMRS usability should be placed in the context of physician-patient communication.

However, physicians are embracing mobile technologies such as smart phones and tablets at a rapid pace. According to a 2012 survey by Physicians Practice, 62.6 percent (6.62%) of respondents (1,369 physicians, practice managers, and other healthcare providers) say they use mobile devices in the performance of their job. Mobile Devices are increasingly able to synch up with electronic health record systems thus allowing physicians to access patients' records from remote locations. Most devices are extensions of desk-top EMR-Systems, using a variety of software to communicate and access files remotely. The advantages of instant access to patient records at any time and any place are clear, but bring a host of security concerns. As mobile systems become more preferred, practices will need comprehensive policies and government security measures and patient privacy regulations. The function will make the worker of the institution to realize the adequate benefit of the EMRS and those factors that can affect the implementation; therefore encouraging the continued use of these system .

The following questions pertaining to the introduction of EMRS into the Nigeria healthcare system have been addressed in this study:

i. Could the observed reluctance by hospitals in adopting EMRS be a result of other factors besides financial cost?
ii. What is the outcome of human factors, particularly behavioral factors, on the adoption of EMRS?
iii. To what level do IT skills and the present status of computerization affect the desire to adopt EMRS?

It was hypothesized that the present status of computerization and IT skills will enable healthcare workers to form unique beliefs towards use of computers in healthcare. The beliefs then influenced the healthcare workers' attitudes resulting in their decision to desire to use or not to use a computerized system. An understanding of these relationships can provide insights for effective EMRS implementation and adoption into clinical practice. Therefore, this study was

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to examine the effect of three factors, namely: present status of healthcare computerization, healthcare workers' IT skills, and attitudes towards computerization on the implementation of EMRS.

II. METHODOLOGY

An institution based cross-sectional quantitative study was conducted on 184 study participants at 3 hospitals in Nigeria as shown in Table 1. A pretested self-administered questionnaire, surfing of internet, journals was used to collect the required data. The data were entered and analyzed using SPSS version 20 software. Descriptive statistics, multi-variants, were used to describe the study objectives and assess the readiness for the system.

Table 1: Participating Institutions

Institution	Type	System Type	System Age	Location
Hospital 1	Teaching Hospital	EMR	48 Years	Ife Central
Hospital 2	General Hospital	Manual	N/A	Osogbo
Hospital 3	Health Centre	Manual	N/A	Ede

Hospital 1: This is a Federal Hospital with experienced and training healthcare workers. The hospital is currently upgrading its EMRS to a filmless state. All their records are stored and maintained in a computerized system.
Hospital 2: A State Hospital owned by the State Government. It is still upgrading its EMRS. It has less experienced healthcare workers.
Hospital 3: A public health information system for General Public managed by the Local Government. The hospital attends to patient with less chronic ailments such as malaria, cold, diahorrhea, body pains and also attends to pregnant women and mothers. They also organize a Community Health Service program to monitor and improve their health status.
The questionnaire administered targeted the Doctors, Nurses, Administrators and Others, including the Medical Lab Tech (MLT), Pharmacist (Pharm), Occupational Therapist (OT), Physical Therapist (PT) as shown in Table 2. Four concepts were deliberated in this study.

a. Desired status of computerization, the dependent variable was measured using dichotomous adoption.
b. Present status of computerization was also measured using dichotomous adoption (has it been computerized?).
c. IT skills of healthcare workers were deliberated using self-reported knowledge of computer application in healthcare and frequency of use of common application programs, including email, Internet browsers and word processors.
d. Attitudes of healthcare workers were deliberated using their attitude towards the use of computers in patient care.

Table 2: Distribution of all healthcare workers in the three hospitals based on profession

	Frequency	Percent	Valid Percent	Cumulative %
Doctor	51	27.70	27.70	27.70
Nurse	76	41.30	41.30	69.00
Administrators	13	7.10	7.10	76.10
Others	44	23.90	23.90	0.00
Total	184	100.00	100.00	100.00

Theoretical Framework: The Theory of Reasoned Action (TRA) was used in this study. A person develops beliefs based on observations, reflections and experiences [8]. Behavioral intentions, such as desire to have a computerized system (in the case of this study), are the immediate antecedents to behavior; the stronger the person's intention to perform a particular task, the more successful they are expected to be. TRA has been used successfully to examine

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behaviors in technology adoption in information management sciences. Three independent variables were used. The present status of Computerization, IT skills of healthcare workers and Frequency of use of common application programs i.e. E-mail, Internet Browser and Word Processing and the Attitude of workers were measured using their attitude towards use of computers.

Instruments: The survey questionnaire was designed following Leung et al. [2] and [14]. The survey consisted of five sections:

a. Two items on IT skills with response options ranging from Great, Little and None
b. A list of 16 functions in patient care where respondents were asked to check whether each had been computerized (present status) or whether they should be computerized (desired status) were included.
c. A 10-item attitude scale assessing the healthcare workers' attitude towards the use of computers in patient care, where response options were: disagree, neutral, agree.
d. An open-ended section that welcomed comments from respondents.
e. One item asking the respondents to indicate their professions.

Data collection: In order to obtain permission from the institutions, a letter was sent to the Director of Administration of each institution explaining the purpose of the study. We visited the institution once permission was obtained. During the visits, the details of the study were discussed with the Dean, The secretary to the Dean directed us to the various departments to administer the questionnaire. A good number of questionnaires were administered.

Analysis: Data were analyzed using SPSSVs 20.IT skills were measured on a 3 - point scale ranging from (Agree, Neutral and Disagree). Use of common application program was measured using (Always, Rarely and Never) and Attitude of the healthcare workers were measured in (Great, Little and None). Computerized clinical function was on two point scale ranging of Yes and No. The data were explored in three stages: Description of the sample, comparison among Professional groups and comparison among healthcare institutions.

III EXPERIMENTAL RESULTS AND DISCUSSSION

Table 3: Results Obtained from distribution of questionnaire to the Institutions

Health Care Institutions	Frequency	Percent	Valid Percent	Cumulative Percent
Teaching Hospitals	90	48.90	48.90	48.90
State Hospitals	77	41.80	41.80	90.80
Primary Health Centre	17	9.20	9.20	0.00
Total	184	100.00	100.00	100.00

Table 4: Results Obtained at different level of professions

Clinical Personnel	Frequency	Percent	Valid Percent	Cumulative Percent
Doctor	51	27.70	27.7	27.70
Nurse	76	41.30	41.3	69.00
Administrators	13	7.10	7.10	76.10
Others	44	23.90	23.90	0.00
Total	184	100.00	100.00	100.00

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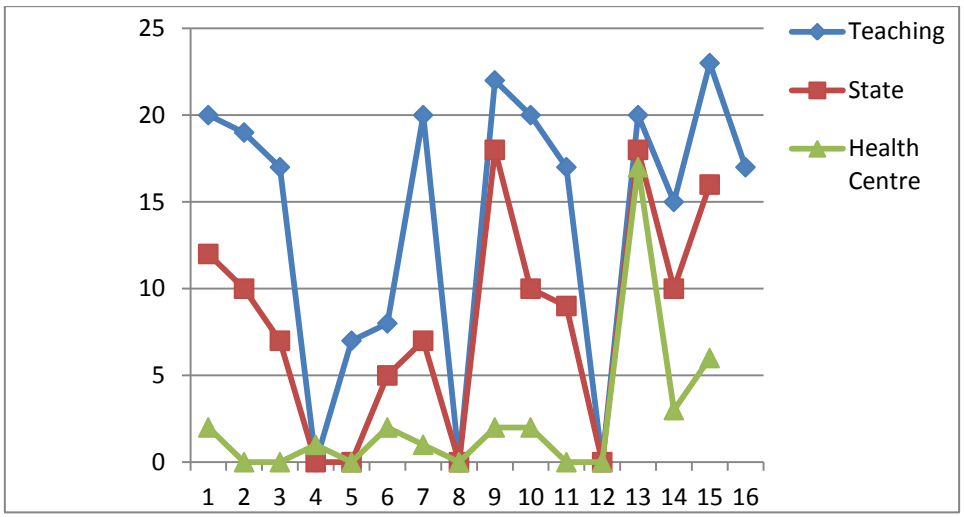

Figure 1: Graph to show the comparison between the Institutions

Legend: Are the following functions computerized?

Clinical functions

i. Writing patients' summaries
ii. Storage of patient information
iii. Storage of patients' image files
iv. Preparation of referral letters
v. Writing Prescriptions
vi. Recording consultations
vii. Accessing educational materials
viii. Recall system (that reminds patients that they are due for routine tests)
ix. Decision support system (to assist doctors to solve diagnostic or treatment problems)

Administrative functions

x. Registration of patients
xi. Billing and payments
xii. Scheduling of appointments
xiii. Staff payroll
xiv. Stock and stores control
xv. Finance management
xvi. Making insurance claims

Table 5: Response of the Healthcare Workers in the hospitals

Concept Considered	Metrics	Frequency	Percentage (%)
Computer Usage	Agree	130	70.7
	Disagree	15	21.2
	Neutral	39	8.2
Computer Cost Is Exorbitant	Agree	59	32. 1
	Neutral	72	39. 1
	Disagree	53	28.8
Often Use Of Computer	Agree	150	81.5
	Neutral	27	14.7
	Disagree	7	3.8

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Word Processing	Always	57	85.3
	Rarely	22	12.0
	Never	5	2.7
Internet Use	Always	148	80.9
	Rarely	24	13. 1
	Never	11	6.0

Table 6: Present status of computerization

Are the following computerized in your hospital?	Percentage %
Writing of patient summaries	
Yes	50.3
No	49.7
Storage of patient information	
Yes	53.6
No	46.4
Storage of patient image files	
Yes	52.2
No	47.8
Preparation of referral letter	
Yes	55.1
No	44.9
Writing prescription	
Yes	54.7
No	45.3
Recording Consultation	
Yes	55.0
No	45.0
Accessing Educational Files	
Yes	49.2
No	50.8
Recall system	
Yes	47.5
No	52.5
Decision Support system	
Yes	59.3
No	40.7
Registration of patient	
Yes	53.1
No	46.9
Billing of payments	
Yes	47.5
No	52.5
Scheduling of appointments	
Yes	46.9
No	53.1
Staff payroll	
Yes	84.7
No	15.3
Stock and store control	
Yes	35.8
No	64.2
Finance management	
Yes	63.1
No	36.9

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Making insurance claims	
Yes	55.3
No	44.7

Table 7: Desired status of Computerization

Should the following be computerized?	Percentage (%)
Writing of patient summaries	
Yes	95.7
No	4.3
Storage of patient information	
Yes	94.6
No	5.4
Storage of patient image files	
Yes	94.6
No	5.4
Preparation of referral letter	
Yes	94.6
No	5.4
Writing prescription	
Yes	95.1
No	4.9
Recording consultation	
Yes	94.6
No	5.4
Accessing educational files	
Yes	96.2
No	3.8
Recall system	
Yes	95.7
No	4.3
Decision support system	
Yes	95.1
No	4.9
Billing of payments	
Yes	95.7
No	4.3
Scheduling of appointments	
Yes	95.1
No	4.9
Staff payroll	
Yes	95.6
No	4.4
Stock and stores control	
Yes	96.7
No	3.3
Finance management	
Yes	96.2
No	3.8
Making insurance claims	
Yes	96.2
No	3.8

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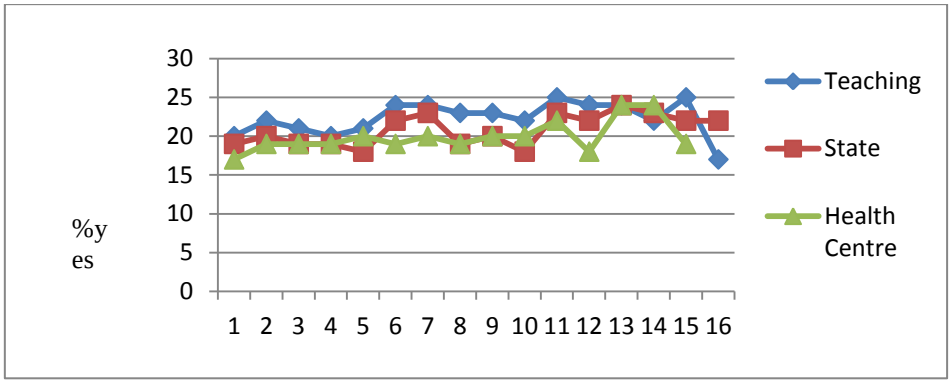

Figure 2: Graph to show the comparison between the Institutions

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xii. Scheduling of appointments
xiii. Staff payroll
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xvi. Making insurance claims

The result of the research show that cost of computerization of the health work for each institution is moderate. Given the cost of computerization, there is a doubt whether actual result will reflect on the cost of computer for each institution, direct observation would have been the ideal to use in order to provide a better understanding. Also, the study shows that one of the hospitals (teaching hospital) has health workers with efficient and accurate IT skills. It was noticed that almost all the functions in the Teaching hospital were already computerized both in the clinical and the administration. There are some functions that really need to be computerized to support management of patient care like patient referral letter, decision support system, and reminder system which have not actually been computerized to a certain level.

IV. CONCLUSION

It was observed that some of the functions in the hospitals have already been computerized except for hospital 3 where most of the functions are still performed manually. EMRS helps improve care coordination. Since anyone with that EMRS can view the patients' chart it cuts down on guessing histories, seeing multiple specialists, smoothing transitions between care settings, and better care in Emergency situations. EMRS may also improve prevention by providing doctors and patients' better access to Test results, identifying missing patient information, and offering evidence-based recommendations for prevention. Furthermore, Cost of computerization will require a concerted effort that will bring together different healthcare workers and government if government can encourage the adoption of electronic medical record (EMR). In conclusion, EMRS promote patient centered, efficient and effective healthcare and also save time of consultation.

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