

Analyzing Electronic Medical Record System of Selected Health Institutions In Osun State Nigeria

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ABSTRACT:—Clinical data in EMR are potential source of longitudinal Clinical data for research. The Electronic Medical Record (EMR) investigates whether data captured through routine clinical care can identify the factors affecting the implementation of EMR; 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 EMR in the healthcare environment and the worker's behavior towards the implementation of EMR in the healthcare environment. Information was gathered through the use of questionnaire which was dispatched to 276 healthcare workers but was administered by 274 of them. When the questionnaires were administered it was found that the respondents need a wide EMR capability to include Decision Support System and Reminder System and the spread of EMR is supported by the response from the respondents.

Keywords: ICT, Electronic medical record system (EMR), Healthcare, Developing countries.

I. INTRODUCTION

An electronic medical record(EMR) contains a standard medical and clinical data gathered in one provider's 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. An EMR is mostly used by providers for test or know the causes of illness and treatment [1]

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 Nigerian healthcare system.

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 [2], [3]. 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 [4], [3]. 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 [3], [5]. Further studies on EHR are presented in [6], [7], [8], [9], [10], [11], [12], [13].

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 [14], [15]. Workarounds are ways of overcoming an impediment or problem brought on by the newly deployed IT system and the efforts initiated by clinicians in making the system easier to use [16], [17].

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 [18], [19], [20]. The EMR promises rapid access to health information, which leads to improved healthcare outcomes and more efficient use of resources; for example, the US Institute of Medicine has presented information technology (IT) based operations such as EMR as essential technology for healthcare in the 21st century [21]. 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. The subject EMR has been extensively discussed in [22],[23],[24],[25],[26],[27],[28]. Other authors

have also cited the high cost of healthcare computerization as being the greatest impediment to EMR adoption[29],[30],[31]. There is, however, emerging evidence that even large healthcare institutions that possess the capacity to adopt EMR choose not to [32],[33]. 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).

We 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 influence the healthcare workers' attitudes resulting in their decision or desire to use or not to use a computerized system. An understanding of these relationships can provide insights for effective EMR implementation and adoption into clinical practice. The specific aim of this study was 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 EMR.

II. RESEARCH METHODOLOGY

We gave out 276 pretested self-administered questionnaires but it was completed by 274 participants from the three hospitals in Osun State. A hospital was considered in each of the 3 senatorial districts of the state (Table 1). Data for the research were collected through the administered questionnaires, journals and the internet. To actualize the objectives of the research, data were analyzed with SPSS version 20 as well as descriptive statistics and multi-variate.

Table 1; Hospitals Used

INSTITUTION	TYPE	SYSTEM TYPE	SYSTEM AGE	LOCATION	Senatorial District
Hospital 1	General Hospital	Manual	N/A	Ilesa	Osun East
Hospital 2	Health Centre	Manual	N/A	Ejigbo	Osun West
Hospital 3	Teaching Hospital	EMR/Manual	10 years	Osogbo	Osun Central

Hospital 1

This is a Federal Hospital with experienced and training healthcare workers. The hospital is currently upgrading its facilities to EMR to 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 EMR. It has less experienced healthcare workers.

Hospital 3

This is a public healthcenter for the general public managed by the Local Government. The hospital attends to patient with less chronic ailments such as malaria, cold, diarrhea, body pains and also attends to pregnant women and mothers. They also organize Community Health Service programs to monitor and improve their health status.

The initial sampling plan of the questionnaire targeted the Doctors, Nurses, Administrators and Others, including the Medical Lab Tech (MLT), Pharmacist (Pharm), Occupational Therapist (OT), Physical Therapist (PT).

Table 2; Healthcare workers in the three hospitals by profession

	Frequency	Percent	Valid Percent	Cumulative Percent
Doctors	60	21.9	21.9	21.9
Nurses	111	40.5	40.5	62.4
Administrators	73	26.6	26.6	89.0
Others	30	11.0	11.0	100
Total	274	100.0	100.0	

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.

2.1 Theoretical Framework

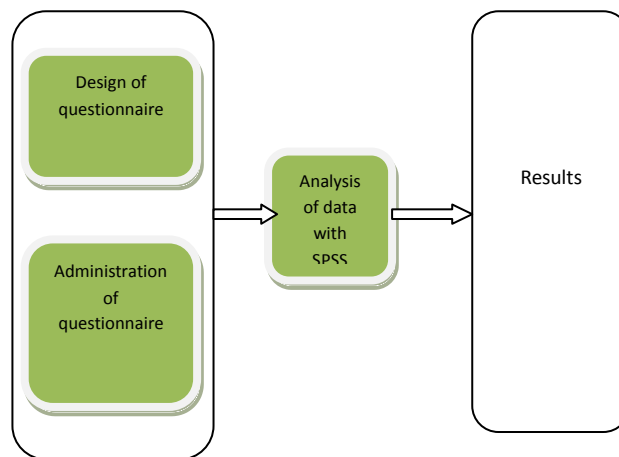


Fig 1 Conceptual diagram of the design

People develop their beliefs which determine their behavior. The Theory of Reasoned Action (TRA) was used in this study. It was

described by [34]. 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. The conceptual diagram of the design is presented in Figure 1.

2.2 Instruments

The survey questionnaire was designed following [35], [30]. The survey consisted of five sections:

- Two items on IT skills with response options ranging from Great, Little and None
- 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.
- 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.
- An open-ended section that welcomed comments from respondents.
- One item asking the respondents to indicate their professions.

2.5 Results

Table 3 - Response rate by Hospital

	Frequency	Percent	Valid Percent	Cumulative Percent
Hospital 1 - Teaching Hospital	101	36.9	36.9	36.9
Hospital 2 - State/General Hospital	127	46.4	46.4	83.3
Hospital 3 - Primary Health Centre	46	16.7	16.7	100.0
Total	274	100.0	100.0	

Table 4-Responses of Healthcare workers per Profession

	Frequency	Percent	Valid Percent	Cumulative Percent
Doctors	60	21.9	21.9	21.9
Nurses	111	40.5	40.5	62.4
Administrators	73	26.6	26.6	89.0
Others	30	11.0	11.0	100
Total	274	100.0	100.0	

As presented in Table 3, in Hospital 1 we had a response rate of 36.9% (101/274), in Hospital 2 we had a response rate of 46.4% (127/274) while in Hospital 3 we had a response rate of 16.7% (46/274). While in Table 4, we had a response rate of 21.9% from the Doctors (60/274), nurses had a response rate of 40.5% (40.5), the administrators

2.3 Data collection

To collect data from the hospitals, a letter was sent to the Director of Administration of each hospital explaining the purpose of the study. Once the permission was obtained, necessary visit(s) are made to the hospital. During the visits, the details of the study were discussed with the Director Personnel/Administration, while the secretary directed us to the various departments/units to administer the questionnaire. A good number of questionnaires were administered while some were turned down.

2.4 Analysis

We used SPSS v20 to analyze the data. 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 a 2-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.

had a response rate of 26.6% (73/274) and the others (Pharmacy, IT etc) had a response rate of 11.0% (30/274).

2.6 Comparisons between various responses in the hospitals.

Differences between the responses of healthcare workers were observed for two attitude statements and three IT skills. In most instances, where staff use computer they tended to agree or disagree, the category of computer often usage tended to disagree or remain neutral, with

exorbitant cost being in between. Table 5 shows items where differences were observed between response rates. Overall, IT skills tended to be extremely positive compared with the rest of the statements.

Table 5. Present status of computerization

Are the following computerized in your hospital?	Percentage(%)
1. Writing of patient summaries Yes No	50.3 49.7
2. Storage of patient information Yes No	53.6 46.4
3. Storage of patient image files Yes No	52.2 47.8
4. Preparation of referral letter Yes No	55.1 44.9
5. Writing prescription Yes No	54.7 45.3
6. Recording consultation Yes No	55.0 45.0
7. Accessing educational files Yes No	49.2 50.8
8. Recall system Yes No	47.5 52.5
9. Decision support system Yes No	59.3 40.7
10. Registration of patients Yes No	53.1 46.9
11. Billing of payments Yes No	47.5 52.5
12. Scheduling of appointments Yes No	46.9 53.1
13. Staff payroll Yes No	84.7 15.3
14. Stock and stores control	

Yes		35.8
No		64.2
15.	Finance management	
Yes		63.1
No		36.9
16.	Making insurance claims	
Yes		55.3
No		44.7

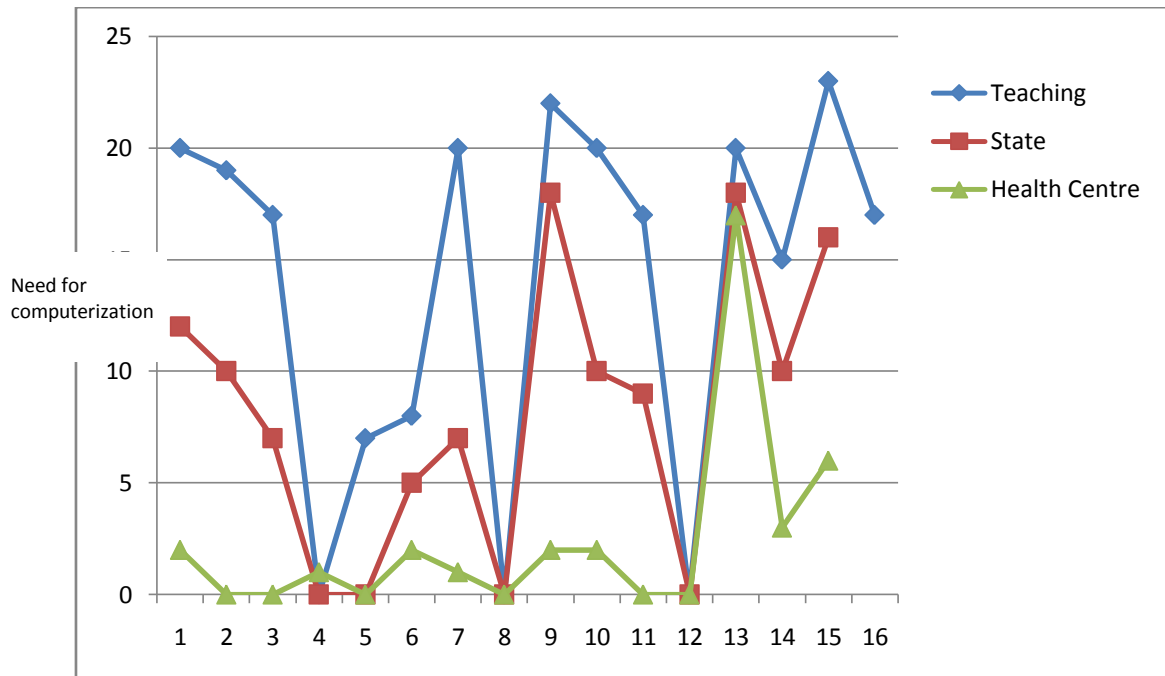


Fig 2 Status of computerization of clinical and administrative functions in the Hospitals

Legend: Are the following functions computerized?

Clinical functions

1. Writing patients' summaries
2. Storage of patient information
3. Storage of patients' image files
4. Preparation of referral letters
5. Writing Prescriptions
6. Recording consultations
7. Accessing educational materials
8. Recall system (that reminds patients that they are due for routine tests)

9. Decision support system (to assist doctors to solve diagnostic or treatment problems)

Administrative functions

10. Registration of patients
11. Billing and payments
12. Scheduling of appointments
13. Staff payroll
14. Stock and stores control
15. Finance management
16. Making insurance claims

2.7 Comparisons between the hospitals

2.7.1 Present status of computerization

Fig.3 presents results of analysis of the status of computerization of clinical and administrative functions in the Hospitals. The functions considered by the highest number of respondents to be computerized were 'staff payroll' in the hospitals .Stock and stores control was

reported by the least number of respondents as being computerized in all the three hospitals.

2.7.2 Desired status of computerization

Table 6 summarizes the proportion of the respondents who indicated that the functions in the survey should be computerized

Table 6 Desired status of computerization

Should the following be computerized?	Percentage (%)
1. Writing of patient summaries Yes No	95.7 4.3
2. Storage of patient information Yes No	94.6 5.4
3. Storage of patient image files Yes No	94.6 5.4
4. Preparation of referral letter Yes No	94.6 5.4
5. Writing prescription Yes No	95.1 4.9
6. Recording consultation Yes No	94.6 5.4
7. Accessing educational files Yes No	96.2 3.8
8. Recall system Yes No	95.7 4.3
9. Decision support system Yes No	95.1 4.9
10. Registration of patients Yes No	94.0 6.0
11. Billing of payments Yes No	95.7 4.3
12. Scheduling of appointments Yes No	95.1 4.9
13. Staff payroll Yes No	95.6 4.4
14. Stock and stores control Yes No	96.7 3.3
15. Finance management Yes No	96.2 3.8
16. Making insurance claims Yes No	96.2 3.8

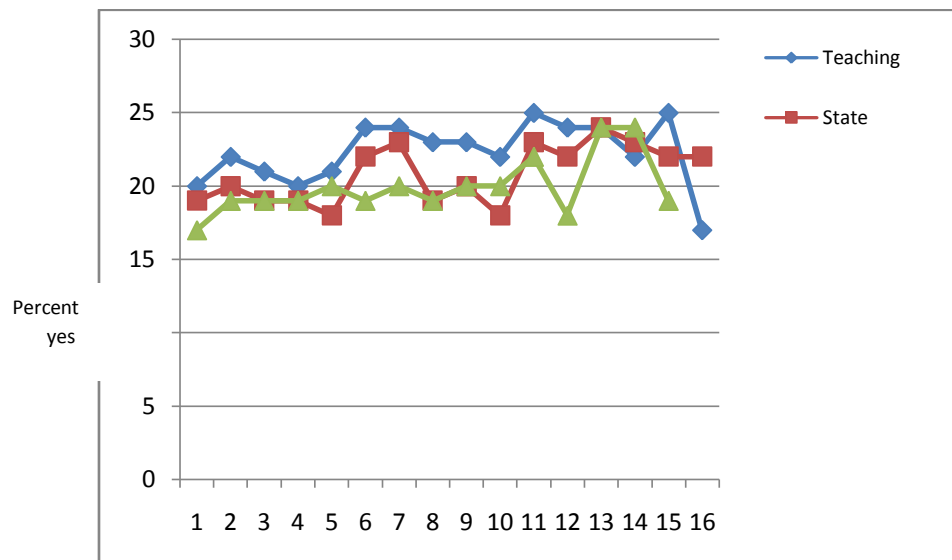


Fig3 Desired status of computerization

Legend: Should the following functions be computerized?

Clinical functions

1. Writing patients' summaries
2. Storage of patient information
3. Storage of patients' image files
4. Preparation of referral letters
5. Writing Prescriptions
6. Recording consultations
7. Accessing educational materials
8. Recall system (that reminds patients that they are due for routine tests)

9. Decision support system (to assist doctors to solve diagnostic or treatment problems)

Administrative functions

10. Registration of patients
11. Billing and payments
12. Scheduling of appointments
13. Staff payroll
14. Stock and stores control
15. Finance management
16. Making insurance claims

III. DISCUSSION

This work demonstrates that detailed clinical information is recorded in the electronic medical record EMR and can be extracted for research purposes with high reliability.

The main reason of the research was to examine those factors affecting the implementation of electronic record (EMR) in the healthcare environment such as; IT infrastructure, cost of computerization, computer interference with

patient, and the behavior of the health workers to computerization.

The result of the analysis conducted on selected health workers from three institutions in Osun state reveals that they are at various stages of computerization. Also 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 or direct observation would have been the ideal to use in order to provide a better understanding.

The result of the research also shows that IT skills of health workers in Nigeria is average. Nevertheless, our research also shows that one of the hospitals which is the Teaching hospital has health workers with efficient and accurate IT skills. In our view we noticed 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.

IV. IMPLICATIONS AND CONCLUSION

The result of this study has an important implication for the factors that may affect the implementation of EMR. This work demonstrates that detailed clinical information is recorded in the EMR and can be extracted for research purposes with high reliability. EMR do help improve care coordination. Since anyone with that EMR 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 patient's better access to test results, identifying missing patient information, and offering evidence-based recommendations for prevention.

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 EMR and those factors that can affect the implementation; therefore encouraging the continued use of these system .

Furthermore, Cost of computerization will require a concerted effort that will bring together different healthcare workers and government if the government can encourage the adoption of electronic medical record (EMR).

In conclusion, EMR promotes patient centered, efficient and effective healthcare and also save time of consultation. For this research outcome to be actualized, training and retraining of healthcare workers and assessing the level of their educational standard should be put into action to show positive behavior toward those factors that can affect the implementation of the EMR.

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