An assessment of the knowledge of medical doctors on Electronic Medical Records in a Tertiary Health Center in Sub-Saharan Africa: A cross sectional study

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Abstract

Background: There is a general lack of empirical research regarding the implementation and pre implementation stages of electronic medical records (EMRs), especially in Sub-Saharan Africa. User resistance has been identified as one of the primary factors responsible for unsuccessful EMR implementations. This study aims to assess the knowledge of medical doctors at a tertiary hospital in Nigeria on electronic medical records and to identify factors associated with it.

Methodology: This was a across sectional descriptive study conducted at the Lagos University Teaching Hospital, Nigeria in 2017. Using stratified sampling, 212 doctors were selected. A pretested self-administered questionnaire was used to collect the required data which were entered and analyzed using the Epi-info version 7 software. Associations between age, gender, work duration, IT skills and overall knowledge were determined using the chi-square and fishers' exact tests. Level of statistical significance was set at p≤0.05.

Results: The response rate was 202(95.3%). Almost all (99.95%) the doctors had good knowledge of EMRs. There was no significant association between IT skills, age, gender and knowledge of electronic medical records but a significant association (p<0.05) with work duration was found.

Conclusion: The overall knowledge of doctors in LUTH of electronic medical records is high (99.95%). Work duration was significantly associated with knowledge. This is a step in the right direction towards facilitating the adoption of EMRs.

Introduction

In the last 20 years, the world has experienced advancement in information communication technologies (ICTs) and different systems are being implemented in health-related organizations to improve the healthcare services provided in terms of better management, decision making and transfer of information from one health care provider to the next [1]. The priority agenda of these systems is the implementation of an electronic medical record system. This is important not only in developed countries but also in countries in Sub-Saharan Africa [2]. The term Electronic Medical Record (EMR), is best described as an automated system based on document imaging which has been developed within a medical practice or community health center comprising components such as patient identification details, medications and prescription, laboratory results and all healthcare information recorded by the healthcare professional during each visit by the patient at the point of care [3]. EMR is seen as a way of improving the quality of health care worldwide by increasing productivity, reducing workload, minimizing costs, and creating a sustainable linkage between health care providers [4].

Published research studies regarding the implementation & pre implementation stages of hospital information systems in Sub-Saharan Africa are scarce [7]. More than 50% of EMR systems that are implemented worldwide either fail or fail to be properly utilized and research has identified user resistance as one of the primary factors responsible for unsuccessful EMR implementations [1,7]. On a closer investigation, it was discovered that the resistance is mostly due to computer illiteracy and a lack of knowledge about electronic medical records including its function and benefits [4].

Our study was designed to assess the knowledge of medical doctors at a tertiary hospital in Nigeria on the definitions, functions and benefits of electronic medical records. It also aims to identify factors associated with its knowledge.

Methodology

A cross sectional descriptive study was carried out among medical doctors at the Lagos University Teaching Hospital, Lagos. Nigeria which is the foremost referral hospital in Lagos metropolis with over 13 clinical departments, 761 beds and about 894 doctors across these
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The data was collected through a self-administered questionnaire which was developed by reviewing relevant literature. The questionnaire comprised questions on socio-demographic characteristics (age, gender, marital status, religion, self-reported IT skills and work duration) knowledge of definition, components, functions and advantages of EMRs. The section on knowledge contained 21 items and respondents were asked to indicate either ‘yes’ or ‘no’ or ‘I don’t know’. Four questions were asked under the definitions of EMRs and only two were correct. Respondents who said that ‘medical records could be both paper and electronic based and that an electronic medical record system includes clinical information entered by the health care professional at the point of care within one health care organization’ were correct and one mark was given for each correct answer. These definitions were adapted from the WHO manual on electronic health records [3]. Five questions were asked under the components of electronic medical records all of which were correct. Respondents were asked to tick the ones thought to be correct.

Respondents that said the components patients’ progress note entry, patient’s call log, data module input system, prescription management system and a backup system were correct, and one mark was given for each correct answer. No mark was given for each wrong answer.

The questions on the functions of an electronic medical record system were adapted from the Agency for Health Care and Research Quality Sites of which all the answers were correct, and each correct answer was awarded one mark [10]. Incorrect answers were awarded no mark. The questions on advantages were adapted from Henry Schein Micro MD practice management and include; EMRs are faster in transferring patient data from one department to the next, EMRs increase the number of patients served per day leading to increased productivity, EMRs lead to an improvement in results management and patient care with a reduction in errors in practice, EMRs lead to reduced operational costs such as transcription and overtime labour services and EMRs involve advanced e-prescribing and clinical documentation capabilities [11]. All statements were correct statements and respondents who ticked ‘yes’ to them were awarded one mark for each statement. No mark was given to respondents who ticked ‘no’ or ‘I don’t know’.

Scores greater than or equal to 11 (50%) were categorized as good knowledge while scores less than 11 were categorized as poor knowledge.

The tool was pretested on a group of 20 doctors who worked in LUTH. These doctors were exempted from the actual study and necessary corrections were made on the questionnaire based on the pretest results. Four undergraduate students of the College of Medicine, University of Lagos participated in the data collection process and they were supervised by the principal researcher. There were trained for a day on the objectives of the study, the sampling method and data collection procedures.

Data were immediately entered to prevent loss. Only fully answered questionnaires were analysed. Epi-info, version 7 was used for this analysis. Proportions and frequencies were calculated and presented as

### Results

#### Socio demographic characteristics

The mean age of the respondents was 18.74±1.88. About half of them were within the age range of 30-39 years (Figure 1). Of the respondents, 107 (52.97%) were males while 95 (47.03%) were females. (Figure 2). More than half of them were married 113(55.94%). One hundred and eight (53.47%) of the study participants had worked at the hospital for less than 12 months while less than half of them 94(46.55%) had worked for over 12 months, (Figure 3). Interestingly, 104(51.49%) and 41(20.30%) of the respondents rated their IT skills as ‘good’ and ‘very good’ respectively. (Figure 4)

#### Knowledge of the definition of electronic medical records

Two hundred and one respondents said they knew about electronic medical records of which majority of them 192(95.52%) said medical records could be both paper and electronic based. Majority of the respondents 175(87.06%) said EMRs involve just one health care organization

| Cadre of doctors | Total number (N=679) | Percentage (%) | Sample size after percentage division |
|------------------|---------------------|----------------|---------------------------------------|
| House officer    | 200                 | 29.5           | 63                                    |
| Junior residents | 289                 | 42.6           | 90                                    |
| Senior residents | 190                 | 27.9           | 59                                    |

#### Knowledge of the types of medical records

| Variable | Frequency | Percentage (%) |
|----------|-----------|----------------|
| Respondent has heard of the term Electronic Medical Records n=202 | | |
| Yes      | 201       | 99.50          |
| No       | 1         | 0.50           |
| Types of Medical Records n=201 | | |
| Paper only | 1         | 0.50           |
| Electronic only | 8         | 3.98           |
| Both Paper and Electronic | 192       | 95.52          |

### Table 1. Distribution of doctors according to cadres

### Table 2. Knowledge of medical doctors on the types of medical records and the definition of electronic medical records in Lagos University Teaching Hospital, Nigeria, 2017

*Multiple responses allowed*
Table 3. Knowledge of medical doctors on the basic components and functions of electronic medical records at the Lagos University Teaching Hospital, Nigeria, 2017 (n=201)

| Variable | Frequency | Percentage (%) |
|----------|-----------|----------------|
| *Basic components of Electronic Medical Records (EMR) include;* | | |
| Patient progress note entry | 191 | 95.02 |
| Data module input system | 184 | 91.54 |
| Patient call log | 127 | 63.18 |
| Prescription management system | 176 | 87.56 |
| A backup System | 174 | 86.57 |
| *Functions of EMR;* | | |
| To provide physicians easy access to patient information | 201 | 100.00 |
| To provide access to new and past test results | 200 | 99.50 |
| To provide computerized decision support systems to prevent drug interactions | 192 | 95.52 |
| To secure electronic communication among providers and patients | 172 | 85.57 |
| To give patients and appropriate personnel access to health records and disease management tools | 173 | 86.07 |
| To provide standard-based electronic data storage and reporting for patient safety and disease surveillance | 196 | 97.51 |

Table 4. Knowledge of medical doctors of the advantages of electronic medical records at the Lagos University Teaching Hospital, Nigeria, 2017 (n=201)

| *Advantages of EMRs* | Frequency | Percentage (%) |
|----------------------|-----------|----------------|
| EMRs are faster in transferring patient data through departments | 201 | 100.00 |
| More space in storing information | 199 | 99.00 |
| Increases the number of patients served per day leading to increased productivity | 182 | 90.55 |
| An improvement in results management and patient care by reducing medical errors | 196 | 97.51 |
| Reduced operational costs such as transcription services and overtime labor expenses | 186 | 92.54 |
| More advanced e-prescribing and clinical documentation capabilities | 191 | 95.02 |

*Multiple responses allowed*

Figure 1. Age in percentage (%) of doctors in LUTH, 2017

Figure 2. Gender distribution in percentage (%) of doctors in LUTH, 2017
Knowledge of the basic components and functions of electronic medical records

Out of 201 respondents, 191(95.02%), 184(91.54%), 127(63.18%), 176(87.56%) and 174(86.57%) knew that the basic components of EMR include patient progress entry, data module input system, patient call log, prescription management system and a backup system respectively.

Nearly all the respondents 201(100%) knew that providing physicians easy access to patient information is a function of EMRs. 200(99.50%), 192(95.52%), 172(86.07%) and 196(97.51%) knew that providing access to new and past results, preventing drug interactions, securing electronic communication between patients and providers, access to health records and disease management tools and provision of standard based electronic storage for disease surveillance respectively were functions of electronic medical records.

Knowledge of the advantages of electronic medical records

All the respondents 201(100%) knew that EMRs are faster in transferring patient data through departments. 199(99%) knew that EMRs have the advantage of space in storing information. 182(90.55%) of them knew that the number of patients attended to per day are increased with EMRs. 196(97.51%), 186(92.54%) and 191(95.02%) knew that reducing medical errors, operational costs and improving clinical documentation capabilities respectively were advantages of Electronic medical records.

Total knowledge of medical doctors of electronic medical records

Of all the 202 respondents, almost all of them 201(99.50%) had good overall knowledge of electronic medical records.

Relationship between knowledge and independent variables

In this study, variables like age, gender, work duration and computer literacy were associated with the knowledge of medical doctors of EMRs. All the doctors in the age group 20-29 and 40-49 had good knowledge. More male doctors 201(100%) had good knowledge than the female doctors (98.95%) however these two associations were not statistically significant. All the doctors (100.00%) that had worked for less than 3 years had good knowledge, some of the doctors that worked between 3 and 4 years ago had poor knowledge while doctors that had worked for more than 4 years all (100.00%) had good knowledge. The association was said to be statistically significant. The only doctor that had bad IT skills had good knowledge of electronic medical records. This association was not statistically significant.

Discussion

This study assessed the knowledge of medical doctors on EMRs in Lagos University Teaching Hospital, an institution that is yet to adopt an Electronic Medical Record system. This is a step in the right direction as it is important to assess the potential users of the system to facilitate its adoption during the implementation phase. Studies on the pre implementation phases of EMR in developing countries are limited [12]. Also, this study examined the association between knowledge of EMRs and variables such as age, gender, work duration and computer literacy.

We discovered that 201(99.5%) of the respondents were familiar with the term electronic medical records however majority of them 144(82.29%) could not differentiate between electronic medical records and electronic health records. This is similar to a study conducted among nurses in a teaching hospital where a minority of them (19%) had a good knowledge about the terminologies related to EMRs and EHRs [13]. This is important as a health care organization needs to transition from a well-established paper record system to an electronic medical record system before adopting electronic health records [3]. Such a misconception could contribute to a resistance to the use of the system when installed. Majority of the doctors in this study had good knowledge of the components and functions of electronic medical records as the mean score was 84.77% and 94.02%. This is similar to a study conducted among the nurses at Tehran where 66% of them had good knowledge on the category of information contained in EMRs, and 75% of them had good knowledge of the usefulness of EMR systems [12].

Overall, an encouraging 201(99.5%) of all the respondents in this study had good knowledge of electronic medical records. This could be due to the increasing use of technology in the world today and the readily availability of information on the internet. Moreover, all the respondents were professionals with some of them having additional medical qualifications 72(35.64%). In a Christian medical centre in Korea, 98.8% of the respondents had a good knowledge of EMRs of which 17.6% of them had been previously trained in using EMRs [14]. Comparing these findings to the study conducted among health professionals in Ethiopia where 71.3% of them had good knowledge of EMRs, it can be said that the knowledge of EMRs among healthcare professionals is relatively high [1].
In this study, all the doctors who were between the ages of 20-29 and 40-49 were more knowledgeable about electronic medical records than few of the doctors who were between the ages of 30-39. Likewise, all the doctors who had worked in LUTH from 3 years and below months and from 4 years and above were more knowledgeable than few of the doctors who had worked between 3 and 4 years. This can be due to the fact that the younger doctors who had worked for lower number of years at the hospital were fresh graduates who have been more exposed to the current internet age and are more open to new ideas and information. This could also be said for the older doctors with more working experience at the hospital because of the exposure to international institutions with already developed EMRs.

All the male doctors in this study had good knowledge of electronic medical records while very few of the female doctors had poor knowledge of electronic medical records however as seen from Table 5, there is no significant association between IT skills, age, gender and knowledge of electronic medical records but there was a significant association between work duration and knowledge of EMRs. This shows the area of focus of an awareness scheme on EMRs.

The overall knowledge of doctors in LUTH of electronic medical records is quite high and this is encouraging to the management of EMRs. This shows the area of focus of an awareness scheme on EMRs. Table 5, there is no significant association between IT skills, age, gender and knowledge of electronic medical records but there was a significant association between work duration and knowledge of EMRs. This shows the area of focus of an awareness scheme on EMRs.

The overall knowledge of doctors in LUTH of electronic medical records is quite high and this is encouraging to the management of potential investors looking to implement the system at the tertiary health center. All the doctors who were between the ages of 20-29 and 40-49 were more knowledgeable about electronic medical records than few of the doctors who were between the ages of 30-39. Likewise, all the doctors who had worked in LUTH from 3 years and below months and from 4 years and above were more knowledgeable than few of the doctors who had worked between 3 and 4 years. This can be due to the fact that the younger doctors who had worked for lower number of years at the hospital were fresh graduates who have been more exposed to the current internet age and are more open to new ideas and information. This could also be said for the older doctors with more working experience at the hospital because of the exposure to international institutions with already developed EMRs.

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Table 5. Relationship between age, gender, work duration, IT skills and knowledge of electronic medical records among doctors at Lagos University Teaching Hospital, Nigeria, 2017

| Variable | Group | Knowledge (%) | X² | P-value |
|----------|-------|---------------|----|---------|
| Age      |       |               |    |         |
|          | 20-29 | 30-39         |    |         |
|          | 100.00| 99.04         | 0.00| 0.00    |
|          | 3-4   | 1-2           | 0.00| 0.00    |
|          | 100.00| 93.33         | 6.67| 0.00    |
|          | ≥5    | 4-5           | 0.00| 0.00    |
|          | 100.00| 100.00        | 0.00| 0.00    |
| Gender   | Male  | Female        |    |         |
|          | 100.00| 98.95         | 0.00| 0.05    |
|          | 1.05  | 1.132         |    | *0.470  |
| Duration of Work (in years) | ≤1 | 2-3 | 4-5 | ≥5 |
|          | 100.00| 100.00        | 0.00| 0.00    |
|          | 93.33| 6.67          | 0.00| 0.00    |
|          | 100.00| 100.00        | 0.00| 0.00    |
| IT skills | Very Good | Good | Average | Bad |
|          | 100.00| 100.00        | 0.00| 0.00    |
|          | 98.21| 1.79          | 0.00| 0.00    |

*Fisher’s exact used

Limitations

A limitation to this study is the fact a self-reported rating of IT skills was used to determine the IT skills. This could have led to some level of bias. We tried to reduce this by outlining the expected skill sets for grouping respondents into bad, average, good and very good.

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