



# A model for computerization and implementation of electronic health records in primary health care in Egypt

**\*Corresponding Author(s): Hend Samy Ibrahim Mohamed**

Faculty of medicine Cairo University. Lecturer public health, Faculty of medicine Cairo University, Egypt  
Tel: +20-011 185 1353;  
Email: Dr.hendsamy.com@hotmail.com

## Abstract

**Introduction:** Primary health care is the corner-stone for universal health coverage. The newly launched family health centers run through family records. Despite their importance they are paper based records and their completeness by health providers consume a lot of effort and time that negatively impact the efficiency and the health care outcome. Electronic health records improve the managerial, operational problems and efficiency which reflects on patient satisfaction.

**Methods:** This ethnographic study was done in Omrانيا family health center, Giza governorate, Egypt. The study was done on two phases. First phase involved merely direct observation and assessment of client satisfaction for a period of 18 months. Then development of a model that can be used to overcome the identified operational problems and methods to implement electronic health records in the health centre.

**Results:** The study showed there was a lack of proper management, organization, integration and staff communication in various departments of Omrانيا FHC. Patients' flow was deregulated creating overcrowding and bottle necks that can harm patients. The majority of Patients are not satisfied from various provided services especially waiting time and physician communication skills.

**Conclusion:** The study endorsed ethnographic qualitative research methods in order to highlight daily work management people interactions and dynamicity and reflect the picture of Omrانيا FHC in real times. It provided an overview on patient flow and doctor patient communication. The study came up with a unique improvement model for organization and implementation of electronic health records. Future researches involve testing and implementation of the modeling technique.

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## Introduction

Primary health care is the corner-stone of the health care delivery. The World Health Organization declaration of Alma-Ata [1] stated that Primary Health Care (PHC) was the key to achieving 'Health for all by the year 2000. It is fundamental in achieving universal health coverage [1].

Egypt launched family health services in some accredited primary health care centers. They offer affordable basic benefit package services ensuring patient centered care which become a critical goal for many high-quality healthcare systems. It ensures patients' engagement and active participation that will lead to positive outcomes [2].

Family health centers run their services through family health records [2]. The records play an important role in monitoring of diseases and patterns of healthcare delivery. They provide a complete and exact chronology of treatments, patient results, plans for care and follow-up [3,4]. Patient records are important in assessing adherence to clinical practice guidelines [5,7] and standards [8,10]. Proper medical recording improves efficiency [11,13]. Patient registries are the basic of quality and are used in quality improvement projects that reflect on patient satisfaction and have gained the focal position in modern day [14,15].

However, patient recording process in healthcare facilities is considered a difficult task, time consuming and lead to improper, incomplete filling and delay in the service delivery due to the lot of paper forms that have to be filled. These delays have been shown to have negative significant effects on patient satisfaction [16,18].

Electronic Health Records (HER) recently adopted by healthcare systems aiming to improve the quality of care delivered that is reflected on patient safety and satisfaction. EHRs lead to facilitation of healthcare delivery and reduction of medical errors. Furthermore, the EHR system gives the health-care provider instant access to other clinicians' evaluations, as well as all diagnostic tests. Overall, the EHR are secure ensuring data confidentiality. They greatly improve the efficiency of health facilities and provide more timely service for patients [19]. Different researches showed that electronic recording saves time [23,25]. Knight et al., 2014 showed that uses of an electronic medical recording system led to significant reduction in waiting time and overall time of the process [26]. Finally, studies show that the EHR has a positive effect on investment from savings in drug expenditures, repetitive investigations and billing errors [27].

From an academic point of view, the EHR is an excellent tool for big data research through the huge amount of clinical information stored in the database [28].

Despite the importance of electronic patient registries, they are inadequately supported. Management and development of EHR is poor and has not been set as a priority, and its full implementation hasn't yet achieved especially in developing countries. Their implementation has met some resistance about its impact on the patient experience [24].

Many studies that dealt with the improving quality of health care and patient satisfaction still focused on the paper-based process [29]. Though there are few studies in the literature that study the transitions to electronic medical recording system and their impact on patient satisfaction. Patient satisfac-

tion should be taken into consideration as it is a main measure of healthcare quality. It provides information on how timely and efficient the services provided. Also it measures the success of the health facility in providing patient-centered health care [31,9].

Given the great benefits of EHR health providers should invest in its implementation. It is a vital component in the field of medicine [30]. Measuring patient satisfaction after implementation of electronic recording system hasn't been studied in any health facility in Egypt to the best of knowledge; it needs to be studied. This work aimed to identify a method for computerization and implantation of EHR in family health center in Giza governorate.

## Methods

### Study Type

The study in this qualitative research is an ethnographic study.

### Site of the study

According to the census conducted by national health registration system 2016, Omrania FHC serves about 60000 (58639) person within its catchment area. The center serves about 200 patients daily. The staff of FHC includes medical doctors, dentists, nurses, lab technicians, administration team of accounting and secretarial staff. The medical doctors specialized in general and family medicine; there are also medical doctors with other specialties such as obstetrics, gynecology and pediatrics whom are provided by Ministry of Health either on a permanent basis in the center or on a rotational basis. The services provided by the center- in addition to outpatient clinics were immunization, dental services, pharmacy, laboratory services and family planning.

The FHC supports continuity of care and integration of health services, through using the family files that included demographic, medical information, earlier complaints, diagnosis, treatment prescribed or any other provided services for every member in the family.

### Study phases

The study was done between September 2016 and December 2019 on two phases. First phase was to identify the current working problems. The second phase was generation of a model that can be used to implement EHR and overcome operational problems.

### Study tools

#### 1. The researcher used formal and informal observational techniques

This was done by the researcher to investigate and describe the flow and behavior of patients, also the health service providers' practices in the FHC.

The researcher observed 7489 patients and all the staff of the FHC. All day by day behaviors, interactions and communications were recorded and documented as much as possible in hand written notes in more than 650 pages.

The researcher took 18 months in ethnographic observation. Ethnography is an effective method for highlighting the interaction between people and systems. It demonstrates the work management in real times and places.

In order to reduce the sampling bias and increase validity the sampling was purposive, instead of random. The researcher covered various times; morning and afternoon shifts and all days of the week. The researcher observed all the departments and clinics of the FHC, all the staff and all types of patients visiting the center for various reasons.

## 2. Assessment of the patients' satisfaction

Patient satisfaction was assessed by the researchers and well-trained investigators carried out exit interview to the patients using structured Arabic questionnaire. These were the patients attending the two-shift periods at Omrania (FHC) (aged 20 years and above) regardless the gender. Consequently, a non-probability /convenient sample of 2500 patients attending the health center were interviewed.

The interview was held on all days of the week other than Fridays. Verbal consent was obtained from each respondent after assuring the confidentiality of their responses. The development of the questionnaire depended mainly on a rigorous review of the literature and consultation of national experts in the field. The questionnaire was piloted on 100 patients. The results of the pilot test were only used for further development of the questionnaire as regards the simplicity and clarity. The questionnaire composed of four main sections. The first section contained questions about the demographic characteristics of the patients. The second section composed of (30 questions) about patients satisfaction. These questions were categorized into subsections which were organization and ease of admission, waiting time, adequacy, process of medical care and staff performance. Third section contained (14 questions) assessing the patients satisfaction towards the physician communication skills. The responses depended on a Likert scale ranging from dissatisfied, satisfied and highly satisfied. Questions were scored 1-3. There was a section contained general questions assessing overall experience of the patients to the health facility. The answers were recorded if they were agreed or disagree. Finally, the last section was an open end question asking the patient to tell his experience about his visit to the center.

### Study ethics

The study was approved by the ethical committee of faculty of medicine Cairo University. There was also an official approval from Ministry of health and population and Giza governorate.

### Data analysis

The observational notes content was analyzed and *thematic analysis* was done. Interpretation and conceptualization for the qualitative data of the observation was done for identifying the operational problems. The researchers coded the responses of the patient satisfaction questionnaire and transferred the data to the computer for analysis using SPSS (version 9). Initially there was descriptive statistics following the computation, a total score was calculated for each participant. The mean percent score of satisfaction was calculated as following equation: (Total score X100 / Maximum possible score). Subjects were categorized those who had mean percent score less than 60% were categorized as dissatisfied, mean percent score from 60% to 75% were categorized as satisfied while those with mean percent score from 75% and more were categorized as highly satisfied

## Results

### 1. Patients flow and behavior

Patients visiting FHC Omrania FHC stopped at the crowded check-in window and their visit recorded. They didn't take a turn number and were not guided to which clinic he/she had to go. Then they have to wait in the crowded waiting room for a long time until the nurse call them. Patients sometimes miss their turn as they don't hear the nurses call due to noise and crowdedness. So, they have to wait more time making them bored and exhausted.

When doctors order lab investigations, patients have to take the results back to them. They became reluctant to submit these lab investigations as they have to wait again longer time which can reach more than two or three hours. Sometimes patients skipped doing the lab investigations. Or after doing them they took the investigations results and leave the facility without returning back to the doctor which means not receiving their complete medical care. Also, this would result in failure of recording the lab investigations in their files and incomplete filling system. Similar situations occurred while receiving any other service from the facility such as medications, immunization or family planning. The patients may leave before taking these required services.

While the patient in the waiting room, the clerk responsible for the files search for the patient's file and gave it by hand to the physician. That was taking a long time and sometimes the clerk didn't find the file of the patient. This made all the procedures done to the patient weren't recorded, hence affecting the quality of service in providing continuity of healthcare.

Patients who didn't have files receive a small booklet included the patient's name, complaint, diagnosis, and the treatment prescribed. The health provider may add extra notes as diagnoses, test results, etc. The patients took these booklets home and supposed to bring them in their subsequent visits but sometimes they forgot them. The center have very poor technology infrastructure. There was no connection between different departments of the center.

### 2. Physician practice

Physicians were working in a stressful healthcare environment. They had a lot of paper work that consumed time which could be better allocated in providing quality services to the patients. Due to disorganization and crowdedness there was no time to respond quickly or listen to patients. Physicians weren't fully willing to help patients or to give them prompt services, assurance, personal attention, health education or convenient consultations

### A Model that can be implemented in omrania Fhc

The researchers believe that the electronic medical records can be used to improve health care in developing countries. It can help to improve efficiency and effectiveness of the health services especially in the scarcity of medical and financial resources. For choosing the software that will be implemented in the FHC its simplicity and to be inexpensive are fundamental domains to ensure implementation, sustainability and generalizability of the methods.

The introduction of Electronic Medical Records (EMR) software requires computers and Network connection. The computers will all be connected together by crossover cable through

the network ports.

The EMR software is password protected. Each patient had a unique ID. The data entry screen contained tabs for demographic data, patient history, clinics that the patient visited the laboratory findings, medications, or any specific information. Each tab selects a sub screen that contains all the fields relevant to the section.

Each section in the software will be filled in the corresponding place in the FHC, such as the demographic data, reason of visit filled by clerk in the registration room, the clinical information by the physician in the examination room, the medications by the pharmacist and laboratory results will be filled by the lab technicians. After the patients finish their visit the file will then be transmitted to the head of the health facility and stored at his computer device.

All the FHC staff has to be trained on the software for a period of at least six months to break their fears and distrust in computers and making them familiar with the new system. To practice before implementation they can enter all the data of the files in the electronic software.

Based on the findings of the observation, the researcher made a model for organization that can be implemented in the FHC as seen in the flow chart Figure 1. First the patient will visit the registration office then, depending on each patient's age and clinical problem, the patient will be directed to the right clinic. There will be establishment of interconnections between the clinics and departments of the FHC.

At the end before leaving, the patient will receive a printed copy of his detailed management and health education materials will be sent on his mobile phone according to each case.

**Table 1:** Demographic characteristics of the patients

Demographic characteristics of the patients	No N=2500	%
Age in years		
20-29	825	33
30-39	1225	49
40-49	250	10
50and over	200	8
Gender		
Male	700	28
Female	1800	72
Marital status		
Single	175	7
Married	2050	82
Widow	275	11
Occupation		
Worker	1275	51
Retired	325	13
Not working	900	36
Educational level		
Illiterate	223	8.92
Read and write	171	6.84
Primary/preparatory	257	10.28
Secondary	1549	61.96
University and above	300	12

**Table 2:** Demographic characteristics of the patients

Items	Mean percent score
Organization and ease of admission	92% dissatisfied
	6% satisfied
	2% highly satisfied
Waiting time	93% dissatisfied
	4% satisfied
	3% highly satisfied
Adequacy	84% dissatisfied
	9% satisfied
	7% highly satisfied
Process of medical care	74% dissatisfied
	18% satisfied
	8% highly satisfied
Staff performance	61% dissatisfied
	24 satisfied
	15% satisfied

As shown in the table the majority of the patients are dissatisfied especially from waiting time.

**Table 3:** Mean percent score of patients' satisfaction with communication skills of the physician

Items	Mean percent score
Respond quickly	70% dissatisfied
	19% satisfied
	11% highly satisfied
Willing to help patients	65% dissatisfied
	30% satisfied
	5% highly satisfied
Offer prompt services to patients	78% dissatisfied
	20% satisfied
	2% highly satisfied
Ensures privacy	12% dissatisfied
	74% satisfied
	14% highly satisfied
Skill and Competence	19% dissatisfied
	65% satisfied
	16% highly satisfied
Attention with the patient	78% dissatisfied
	14% satisfied
	8% highly satisfied
Proper listening	79% dissatisfied
	2% satisfied
	19% highly satisfied
Address concerns of the patients	90% dissatisfied
	1% satisfied
	9% highly satisfied
Address Need of the patients	89% dissatisfied
	6% satisfied
	5% highly satisfied
Reassure the patients	85% dissatisfied
	14% satisfied
	1% highly satisfied
Give sufficient information about disease	92% dissatisfied
	4% satisfied
	4% highly satisfied

Explain the treatment in easy comprehended way	89% dissatisfied
	6% satisfied
	5% highly satisfied
Clarity information	87% dissatisfied
	6% satisfied
	7% highly satisfied
Convenient consultation	81% dissatisfied
	17% satisfied
	2% highly satisfied

**Table 4:** Percent of agreement of patients regarding their general experience in the health facility

Item	No	%
Say positive things about the hospital to other people	312	12.48
Encourage friends and relatives to use the services of the health center	122	4.8
Intend to continue using the services of the center	272	10.88
Have strong preference in the health center	165	6.6
I am comfortable with the facility services	373	14.9

**Discussion and conclusion**

A large sector of the Egyptian population uses the primary healthcare centers which are the first line of contact to the health care services. The Egyptian Health Sector Reform Program initiated a new primary care strategy in accredited facilities, known as Family Health Centers (FHC). These centers provide a newly introduced Family Health Model (FHM) that brings high quality Basic Benefit Package of services to the patients [11].

In order to fulfill its function the family health facility should have proper and effective managerial system. Health providers have to work together in integration and harmony to meet the health facility goals [31]. Unfortunately, it was shown that Omrania FHC lack proper management, organization, integration and staff communication in its various departments. There was also defect in patient flow leading to patients overcrowding creating bottle necks which could harm patients, prolong waiting time or fail to deliver his/her needs.

The explanation of this was similar to that explained through an exploratory study done by Elden et al, 2015 in primary health care facilities in Egypt. They stated that there was no human resources plan, no training of the managers on organizational management and absence of job description .Moreover there was overwhelming repetitive and duplicative paperwork required from the physicians which waste their time needed for patient care .Additionally, the decisions taken were subjective due to under developed information system and lack of monitoring and supervision [32].

Organization in health facilities and the managerial performance have a significant impact on the service quality that reflects on patient satisfaction [33]. Patient satisfaction is a main measure of healthcare quality. It provides information on how timely and efficient the services provided. Also it measures the success of the health facility in providing patient-centered health care [34]. Assessing the patient satisfaction in Omrania FHC revealed that the majority of the patients were not satisfied with the organization and ease of admission. That was similar

to a study which concluded that patient satisfaction improved by monitoring and developing the organizational activities and processes [35].

Moreover 93% of patients were not satisfied from the prolonged waiting time. Waiting time considered an important factor in determining quality of care and represents a valuable tool for evaluating patient satisfaction [36].

In a study conducted in the United States, the patients waiting time was more than 30 minutes which wasn't accepted by patients [37]. Other studies reported similar findings and showed that patients were not satisfied with the prolonged waiting time [38].

It should be noted that time constraint is a major problem in health facilities especially if it had a high number of patients, and only a short time available for the consultation [38] as in Omrania FHC.

Improper organization, deregulation and prolonged waiting time in Omrania FHC reflected negatively on the process of medical care. It was shown that 74% of the patients were not satisfied from the medical care process.

On the other hand work satisfaction of health care providers is a fundamental parameter that influences their performance, productivity, quality of work and consequently patient satisfaction [39].

It was found that the majority of patients in the study were not satisfied from the performance of the staff. One of the reasons to explain this was overwhelmed and exhausted staff had to fill the paper medical records which are time-consuming and interrupts the communication with patients.

Effective physician patient communication is a vital component in patient-centered care. Communication with patients not only focuses on sharing medical information and treatments but also acknowledges' emotional needs of the patients [40].

The studied patients were not satisfied with the physicians' communication skills. There should be time for communication with each patient according to his needs and concerns. Patient-centered communication are not usually practiced or improved in many health facilities [41].

Since the physician had no appropriate time for proper patient care and communication this calls the need of electronic medical records. Implementing the EHR showed improvement in physician patient communication through the development of the physicians' active listening skills. The physicians had more time to discuss and explain health issues and proper usage of medications. Patients felt that it was convenient to ask questions about their health status and concerns [42]. Similar findings were reported, where patients perceived EHRs favorably, and most of them experienced that the physicians were more attentive during the medical consultation. A qualitative study done by observation of physicians during the clinical consultation, after EHR implementation demonstrated that the physicians were more able to ask encouraging questions and explaining health topics when compared to paper medical records. There was more time available for discussing various health concerns, explaining the investigations, and treatment options [43].

In the study the researcher developed a model for organizing the patient flow and the method for computerization and

implementation of EHR in Omarnia FHC. Electronic recording systems are fundamental in the health facilities and one of the essential building blocks for health sector reform [14]. EHR can overcome operational and managerial problems, support the management system, and strengthen the ability of the health facility to reduce avoidable harm, improve efficiency, productivity and promote a better health care [44]. In Australia, Health Connect is a joint Australian, State and Territory Governments initiative was for revolving paper-based health records to EHR. It was shown that it improved the quality of healthcare, safety and efficiency [45].

Similarly, EHR helped the healthcare providers in improvement and better exchange of information as laboratory results, scans reports between providers in different departments of the health facility [46]. A systemic review found that EHR has a positive impact on information sharing between different departments and between physicians and patients [47].

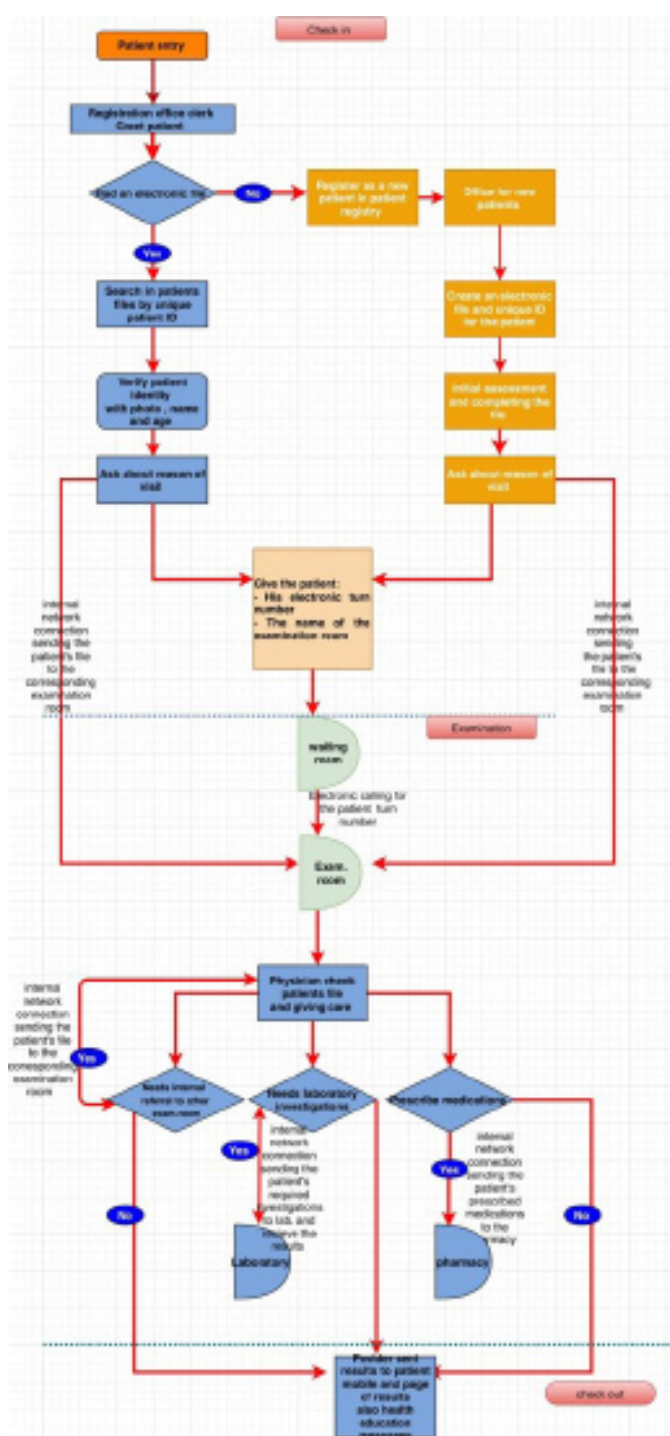
EHR system had increased patient satisfaction with the services delivered [48,49] Facilities used electronic records scored higher in organization of the patients' medical care process and in patient satisfaction [50,51]. It was believed that EHRs improved the quality of care [38].

From the ethnographic qualitative study the daily work management people interactions and dynamicity was highlighted. The study reflected the picture of Omarnia FHC in real times. It provided an overview on patient flow and doctor patient communication and the underlying operational problems that dramatically would reflect on patient health and survival. The study came up with a unique improvement model for organization and implementation of electronic health records. Future research involves testing and implementation of the modeling technique.

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Flow chart



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