Research Article

Factors Facilitating or Hindering the Implementation of Electronic Health Records at Primary Health Care Units as Perceived by the Health Care Providers

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Abstract

Background: Electronic health records (EHRs) have the potential to significantly affect the practice of primary care by improving the quality of care, reducing costs, and improving health outcomes. Many factors can influence the successful utilization and implementation of EHRs. The Aim of this study was to identify factors facilitating or hindering the implementation of EHRs at primary health care (PHC) units as perceived by health care providers (HCPs) at Alexandria city, Egypt.

Methods: A descriptive exploratory research design was conducted in 40 PHC units representing the eight districts of Alexandria City, Egypt. Four groups of the health care providers were randomly selected as the study subjects (N = 136) including staff nurses, physicians, pharmacists, and lab technicians to respond on a structured questionnaire measuring factors facilitating or hindering the implementation of Electronic Health Records. SPSS version 20 was used for data entry and analysis, descriptive statistics were calculated while t-test, ANOVA (f-test) were used for inferential statistics at $p \leq 0.05$.

Results: The result revealed that "selection of a suitable EHR system, improve information technology system, motivation and incentives of the use and conservation of health care providers time" as the major factors facilitating the successful implementation of EHRs as perceived by health care providers. On the other hand, the main reported barriers hindering the implementation of EHRs are "financial costs, lack of awareness, system maintenance, and resistance to new technologies". Statistically significant difference was found among the different categories of HCPs in the perceived facilitating factors to EHRs (F = 9.269, P < 0.001) and among the eight districts of PHC units (F = 4.581, P < 0.001). Age, years of experience and educational qualification play a significant role in HCPs' perception and adoption of EHRs.

Recommendation: Appropriate local technical support, system maintenance, backup policies and a system that allows HCPs to document problems and receive feedback are critical success factors to increase EHRs adoption and implementation. Adequate training of healthcare providers to increase knowledge, attitude, and skills toward IT and the benefits of using EHRs can alleviate resistance and the overwhelming nature of the technology and facilitate the integration of the system. With the provision of adequate human and financial resources, the challenges would likely be overcome and the adoption of the EHRs will improve.

Keywords

Electronic health records, Primary Health Care Units, Nursing, Health Care Providers, Facilitators, Hinders

Abbreviations

EHRs: Electronic Health Records; HCPs: Health Care Providers; IT: Information technology; PHC: Primary Health Care; WHO: World Health Organization

Introduction

Primary Health Care (PHC) considered as the vehicle to achieve 'health for all' and the first level of contact that individuals, families, and communities have with the healthcare system and providers [1]. Different healthcare providers are responsible for promoting health care services in PHC units including family physicians, nursing staff, dentists, and pharmacists [2]. Nurses have a substantial role in primary health care units. They work in partnership with the family physicians and other members of the health-care team to provide care to the entire patient population. This role focuses on assessment, screening, support a healthy lifestyle, education,

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and chronic disease management with a goal of improving health outcomes and facilitating access to services. Their role also includes documentation of care provided through the use of different health records [3].

Health records are categorized as paper medical records and electronic health records. The traditional paper of medical record has various shortcomings that limit the efficiency and hinder the effective and timely treatment to patients. Such shortcomings include limited availability and accessibility, poor legibility, and missing information. Other shortcomings of paper: Expensive to copy, transport and store; easy to destroy; difficult to analyze and determine who has seen it and the negative impact on the environment [4]. Advances in the technology of medical records have made it possible to replace many functions of the traditional paper-based health records with electronic health records [5].

The application of information and communication technologies to health care is a rapidly expanding domain in both developed and developing countries. Given the promise of information technologies to improve communication, sharing information between various care providers, physicians, nurses, medical residents, and others interested parties in the medical field and tracking of health care, policy-makers have begun to promote the adoption of Electronic Medical Records (EMRs). These are patient-centric health systems which have been extolled for their ability to address the storage, transport, exchange, and upkeep problems associated with paper records [6].

Meanwhile, the quality of healthcare across the continuum depends on the integrity, reliability, and accuracy of health information. Adoption of health information technology (HIT), including electronic health records (EHRs), is essential for the transformation of the current healthcare system into one that is more efficient, safer, and consistently delivers high-quality care [7]. Adoption of EHRs continues to progress rapidly within the healthcare industry. This new technology reshapes healthcare at all levels of care provision especially nursing since the use of electronic health records (EHR) facilitates healthcare professionals' access to electronically stored health information in a digital format at any time [8].

The Electronic Health Record (EHR) is a longitudinal digital record of patient health information generated by one or more encounters in any care delivery setting. This information includes patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports [9]. In primary health care, Electronic health record (EHR) systems have the potential to significantly affect the practice of care by improving quality of care, reducing costs, and improving health outcomes and many countries have provided funding/incentives to encourage their widespread adoption and use [10].

Electronic Health Records (EHRs) have various uses beyond the retrieval of patient information such as warnings of allergies and drug interactions, developing management protocols for chronic illness, generating pre-appointment reminders and establishing communication links between different levels of care [11,12]. EHRs improve quality of doc-umentation over paper-based medical records via automatic reminders to health-care providers of missed important data [12]. Moreover, EHRs facilitate healthcare delivery improvement and assess efficiency, quality and patient safety through the use of checklists, alerts, predictive tools, embedded clinical guidelines that promote standardized evidence-based practices, electronic prescribing, test-ordering that reduce errors, and redundancy. Furthermore, patients and the entire healthcare can benefit from the adaptation of the EHRs, such as medication errors, which are the most common cause of preventable injuries in the health care setting can be prevented by EHRs [12-16].

Electronic Health Records (EHR) are being touted as the perfect replacement for paper-based patient records yet many researches show that adoption and success rate of this information technology is less than satisfactory [5]. Even with these potential benefits of electronic health records, incorporating them into clinical practice require large investments in technology, in addition to changes in existing systems and processes. Also, Implementing EHRs facing many barriers and individuals and organizational constraints [13]. In this context, Ash and Bate [17] classified factors influence implementation of EHRs into two categories, namely: facilitating factors and barriers facilitating factors to EHRs reflect any adoption person or thing that make an action or process simple or easier [17,18]. In opposition, barriers to EHRs adoption reflect any fence obstacle that prevents process or access. They include personal and organizational barriers /issues affecting the adoption of EHR system [18,19].

Although various studies have been carried out globally to investigate the facilitators, barriers and factors affecting to EHR implementation, no such specific research has so far been carried out in Egypt. Most of these studies reported that EHRs implementation is a complex and multi-dimensional process that is influenced by many technical, individual, human, and organizational factors [20-24]. While in Egypt, Noureldin, et al. [12] reported High workload and system complexity were the most frequently mentioned barriers to implementation of the e-records system at primary health care units in Alexandria. Also, Diab [25] settled that the overall staff nurses' and physicians' attitude towards the use of EHRs was positive and recommended investigating factors facilitate or hinder the implementation of EHRs.

Despite PHC units was introduced the system of EHRs, not all staff adopt it and sometimes the nurses are not allowed to use the EHRs in documenting nursing care provided. As greater interdisciplinary practice is encouraged in the health

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Elsyed et al. J Nurs Pract 2020, 3(1):129-138

Open Access | Page 130 |

care system understanding and comparing the perspectives of each user group is essential to the successful implementation of EHRs [19]. In addressing this gap, this study seeks to investigate factors associated with the adoption of EHRs which can help in highlighting the facilitating factors need to maintain and hindering factors with suggestions to overcome or minimizing them to enhance the utilization of EHRs in primary health units to gain its benefits.

The Aim of the Study

To identify factors facilitating or hindering the implementation of electronic health records at primary health care units as perceived by health care providers at Alexandria governorate, Egypt.

Methodology

Design and setting

A descriptive exploratory research design was conducted in 40 primary health care (PHC) units. These 40 units were selected out of 150 PHC units representing the eight districts of Alexandria city (the second capital of Egypt). PHC units are affiliated to and operated by the Ministry of Health and provide health care to insured and non-insured patients/clients. The eight districts of Alexandria are; Shark (25 units), Gharb (17 units), Wassat (14 units), Elmontaza (21 units), Elgomrrok (25 units), Alamria (26 units), Borg El Arab (13 units), Al Agami (9 units). First, the 40 units were selected from the eight districts using the simple random method. Then, the needed sample size selected randomly from these units.

Subjects

The subjects of the study included four groups of the health care providers who work at the 40 selected PHC units. They are recruited using the simple random sampling method to represent the eight districts of Alexandria city (N = 136). They comprise staff nurses (n = 44), physicians (n = 34), pharmacists (n = 34) and lab technicians (n = 24). The inclusion criteria were having experience at work over 6 months and willing to participate and complete the questionnaires.

-Epi info 7 program was used to find the sample size, using the following parameters: Population size = 1400, Expected frequency = 50%, Acceptance error = 10%, Confidence coefficient = 95% and the expected Minimal sample size = 128.

Tool of the study

Part 1: Demographic form: A demographic and work characteristic form for health care providers was developed by the researchers including questions related to (HCPs'group, age, educational level, and years of experience).

Part 2: Factors facilitating or hindering the Implementation of Electronic Health Records questionnaire: Ash and Bate [17] developed the questionnaire to identify both facilitators and barriers of EHRs implementation. It comprises 36 items grouped under two major sections:

Section 1: EHR System Existence and Availability. This section encompasses 13 items to assess perceived facilitators of EHRs adoption such as facilitated selection of suitable EHR system, motivation and incentives of the users, demonstrated utility of EHRs, reassurance regarding confidentiality and security issues, conservation of healthcare providers' time, adequate IT resources. Responses of this section were measured using two options of three-point Likert scale from 1 to 3, ranged from (1) fully implemented (2), partially implemented, (3) implemented and stopped and/or (1) yes, (2) no, (3) I don't know. The total score ranged from 13 to 39.

Section 2: Hinders Affecting EHR System Adoption. This section contains 23 items to assess perceived barriers of EHRs adoption such as financial costs, software design, lack of adequate IT resources, lack of understanding of benefits, disruption of clinical workflow, re-designing workflows, and lack of time for training. Responses were measured on a three-point-Likert scale ranged from (1) disagree to (3) agree. The total score ranged from (23-69).

In addition, two questions ask the respondents to choose from a list of factors the main three facilitators and the main three hinders to the implementation of EHRs system at PHC units from their point of views.

Validity and reliability

The study questionnaire was translated into Arabic by researchers and submitted in both Arabic and English languages to jury consisted of nine experts in the study's field selected from the different departments of Faculty of Nursing Alexandria University. Accordingly, the needed modifications was done based on their comments. The questionnaire of the study was tested for internal consistency of the items composing each dimension using Cronbach's alpha correlation coefficient which proved the questionnaire to be reliable with a correlational coefficient value of 0.86. A pilot study was carried out on 10% of health care providers (n = 14) to check and ensure clarity and feasibility of the tool and identify obstacles and problems that may be encountered during data collection. Based on the finding of the pilot study, some statements were modified.

Data collection

Official permission was obtained from each director of the selected PCH units to collect the data. The selected health care providers were approached through hand-delivered questionnaire while they were in their work units and at the break time. Instructions were provided before the distribution of the questionnaire. The questionnaire was completed in the presence of the researchers to ensure the objectivity of health care providers' responses, no contamination of their opinions, and check that all items were answered. The time needed to fill the questionnaire was about 15-20 minutes for each study subject. The data collection phase consumed eight months from March to October 2016.

Ethical consideration

Ethical approval was obtained from the Ethics committee, Faculty of Nursing, Alexandria University. Informed consent was obtained from the study subjects of healthcare providers before participation in the study. The subjects were informed

Elsyed et al. J Nurs Pract 2020, 3(1):129-138

Open Access | Page 131 |

about the purpose of the study and they have the right to withdraw from the study at any time. The anonymity, privacy of study subjects was maintained, and confidentiality was assured in the study.

Statistical analysis

Data were coded and fed to statistical software IBM SPSS (statistical package for the Social Science) version 20. Frequency tables and cross-tabulations were used to illustrate the results of categorical data. Quantitative data were summarized by the arithmetic mean and standard deviation. Comparison between two means was done using t-test while comparison among different units and healthcare providers in relation to perceived facilitators and barriers to EHRs was done by One-Way Analysis of Variance (ANOVA) F-test. All statistical analysis was done using tailed tests and an alpha error of 0.05. P-value less than or equal to 0.05 was considered as the statistical significance value.

Result

Health Care Providers (HCPs) demographic and professional characteristics

Table 1 reveals that 32.4% of HCPs were nurses and 25.0% of them were physicians and pharmacists, while lab technicians were representing 17.6% of the total sample. The mean age was (36.92 ± 9.34) with the highest percentage of HCPs (36.0%) were in the age group 30 - < 40 while, the lowest percentage (14%) were in the age group 50-60 years-old. The years of experience mean was 14.73 ± 10.44 with the highest

percentage (45.6%) of HCPs experienced less than 10 years of experience, while the lowest percentage was (13.2%) had above 30 years of experience. For the participants' educational qualifications, out of the nurses' percentage, 29.4% of held diploma degree while 2.9% held a bachelor degree in nursing. Out of the physicians' percentage, 14.7% had a bachelor degree in medicine, while 10.3% of them had a master degree. All pharmacists had a baccalaureate degree, and all Technicians (17.7%) had laboratory diploma degree of Technical Health Institute.

Factors facilitating the implementation of EHRs as perceived by HCPs at PHCs units

Table 2 reveals the mean score of health care providers' perception of overall facilitating factors to the implementation of EHRs was on average (55.30 ± 11.92). Facilitated selection of suitable EHR system has the highest mean (60.90 ± 10.55) while adequate IT resources had the lowest score (48.88 ± 13.16). For responses to the open-ended question about the main three factors facilitating the successful implementation EHRs at PHCs units, health care providers reported 'improve the information technology system (77.9%), motivation and incentives of the users and conservation of health care providers' time (44.1%)'. Additionally, Table 2 shows statistically significant differences among HCPs regarding perceived overall facilitators as well as the entire dimensions of facilitators to the implementation of EHRs where (F = 9.269, P = 0.001). Physicians had the highest perceived total mean (63.12 ± 13.03) while pharmacists had the lowest perceived mean (50.23 ± 8.14). The same trend of the result was reflected in the different dimensions of facilitators.

Hindering factors to the implementation of EHRs as perceived by HCPs at PHCs units

Table 3 reveals the mean percent score of health care providers' perception of overall hindering factors to the implementation of EHRs was below the average (46.81 ± 8.07). Financial costs had the highest mean (67.34 ± 11.34) while lack of adequate IT resources (28.49 ± 11.85) had the lowest score. For responses to the open-ended question about the main three factors hindering the implementation of HER, health care providers reported 'lack of EHR awareness (70.6%) followed by system maintenance (46.3%) and resistance to new technologies (39.0%). Additionally, Table 3 shows that there is no statistically significant difference among health care providers regarding perceived hindering factors to the implementation of EHRs where (F = 0.046, P = 0.987).

The relationship between perceived Facilitating or hindering factors to EHRs implementation and HCPs demographic and professional characteristics

Table 4 shows a statistically significant difference among the eight districts of PHC units in the Alexandria city regarding perceived facilitators to the implementation of EHRs where (F = 4.581, P = < 0.001). Garb district has the highest mean of perceived facilitators (63.6 ± 12.52) while, Borge al-Arab had

Table 1: Distribution of the Health Care Providers (HCPs) according to their socio-demographic and professional characteristics at PHC Units, Alexandria (N = 136).

Variables	No.	%
HCPs' Group		
Nurses	44	32.3
Physicians	34	25.0
Pharmacist	34	25.0
Lab Technicians (Lab.Tech).	24	17.7
Age		
20 - < 30	37	27.2
30 - < 40	49	36.0
40 - < 50	31	22.8
50 - 60	19	14.0
Mean ± SD	36.92 ± 9.34	
Years of experience		
< 10	62	45.6
10 - < 20	29	21.3
20 - < 30	27	19.9
30 - 39	18	13.2
Mean ± SD	14.73 ± 10.44	

SD: Standard Deviation

Elsyed et al. J Nurs Pract 2020, 3(1):129-138

Open Access | Page 132 |

Table 2: Factors Facilitating the Implementation of EHRs as perceived by HCPs at PHCs units.

Variables	Total	Physicians (n = 34)	Pharmacists (n = 34)	Nurses (n = 44)	Lab.Tech (n = 24)	F (P)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	
Overall Facilitators	55.30 ± 11.92	63.12 ± 13.03	50.23 ± 8.14	55.42 ± 11.93	51.18 ± 9.43	9.269 (0.001*)
Facilitated selection of suitable EHR system	60.90 ± 10.55	67.77 ± 11.75	58.61 ± 8.98	60.91 ± 10.69	58.66 ± 9.55	2.498 (0.003*)
Motivation and incentives of the users	54.02 ± 25.30	66.08 ± 27.43	46.08 ± 20.135	54.54 ± 26.99	47.22 ± 19.46	4.618 (0.004*)
Demonstrated utility of EHRs	54.02 ± 25.30	65.63 ± 18.37	49.97 ± 14.41	55.82 ± 17.059	54.29 ± 14.04	5.554 (0.001*)
Reassurance regarding confidentiality/security issues	60.10 ± 10.50	64.77 ± 11.75	58.61 ± 8.98	60.91 ± 10.69	58.66 ± 9.55	2.498 (0.062)
Conservation of health care providers' time	51.06 ± 14.70	58.99 ± 15.77	46.57 ± 11.93	52.40 ± 14.45	43.75 ± 11.62	7.368 (0.001*)
Adequate IT resources	48.88 ± 13.16	55.46 ± 15.55	43.42 ± 10.86	50.43 ± 11.27	44.44 ± 11.38	6.643 (0.001*)

F (p) F and p values for ANOVA test. *Statistically significant at p ≤ 0.05.

Table 3: Hindering Factors to the Implementation of EHRs as perceived by HCPs at PHCs units.

Variables	Total	Physicians (n = 34)	Pharmacists (n = 34)	Nurses (n = 44)	Lab.Tech (n = 24)	F (P)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	
Overall Hinders/barriers	46.81 ± 8.07	46.50 ± 8.61	46.85 ± 6.20	46.78 ± 8.61	47.27 ± 9.04	0.046 (0.987)
Financial costs	67.34 ± 11.34	64.10 ± 11.98	65.55 ± 6.66	70.10 ± 11.98	66.67 ± 9.20	2.374 (0.073)
Software design	61.46 ± 18.76	59.31 ± 22.64	65.44 ± 14.38	60.42 ± 19.12	60.76 ± 17.80	0.714 (0.545)
Lack of adequate IT resources	28.49 ± 11.85	27.94 ± 11.94	27.21 ± 9.47	30.11 ± 13.83	28.13 ± 11.21	0.439 (0.726)
Lack of understanding of benefits	49.63 ± 23.26	52.45 ± 23.08	52.21 ± 22.97	46.40 ± 23.32	47.92 ± 24.36	0.632 (0.596)
Disruption of clinical workflow	45.10 ± 23.10	42.40 ± 21.94	50.24 ± 23.61	39.77 ± 21.56	51.39 ± 25.02	2.129 (0.100)
Re-designing workflows	40.75 ± 20.65	41.67 ± 19.78	49.82 ± 18.34	48.30 ± 21.61	50.42 ± 19.39	0.994 (0.398)
Lack of time for training	34.93 ± 17.55	31.62 ± 14.18	30.47 ± 12.57	33.91 ± 19.51	40.63 ± 21.88	1.840 (0.143)

F (p) F and p values for ANOVA test. *Statistically significant at p ≤ 0.05.

Table 4: The relationship between perceived facilitating and Hinders to EHRs implementation and HCPs demographic and professional characteristics.

Characteristics	Facilitators Mean ± SD	Hinders Mean ± SD
Work Districts/Region		
Montaza	50.5 ± 22.37	48.1 ± 3.67
Sharq	55.8 ± 16.72	45.2 ± 7.68
Gharb	63.6 ± 12.52	45.6 ± 7.05
Agami	42.3 ± 12.66	44.8 ± 5.57
Borg el Arab	39.2 ± 6.98	46.9 ± 4.87
Al-Amraya	62.7 ± 12.30	46.7 ± 2.55
Gomrok	59.6 ± 13.72	46.0 ± 2.35
Wasat	59.2 ± 17.27	46.9 ± 3.02
F (P)	**4.581 (< 0.001*)**	0.531 (0.811)
Age		
20 - < 30	50.0 ± 17.65	45.1 ± 5.10
30 - < 40	57.3 ± 17.17	45.2 ± 5.23
40 - < 50	16.17 ± 13.38	45.7 ± 4.66
50 - 60	51.8 ± 13.89	50.7 ± 5.62
F(p)	**3.489 (0.018*)**	**6.246 (0.001*)**
Sex		
Male	59.0 ± 16.51	46.3 ± 3.50
Female	54.8 ± 16.53	46.0 ± 5.73
t (p)	**1.233 (0.259)**	**0.036 (0.850)**
Education		
Master (Physicians)	61.5 ± 19.67	43.1 ± 8.78
Bachelor	52.2 ± 15.78	45.9 ± 4.50
Diploma (Lab.Tech)	57.4 ± 22.27	45.3 ± 4.58
Nursing School	59.9 ± 14.15	48.3 ± 4.31
F(p)	**1.698 (0.154)**	**2.514 (0.045*)**
Years of experience		
< 10	51.8 ± 17.71	45.6 ± 4.99

Elsyed et al. J Nurs Pract 2020, 3(1):129-138

Open Access | Page 133 |

10 - < 20	59.7 ± 16.21	44.9 ± 5.29
20 - < 30	**61.0 ± 13.56**	45.4 ± 5.06
30 - 40	53.6 ± 14.18	**50.5 ± 5.71**
F(p)	**2.824 (0.041*)**	**5.311 (0.002*)**

t: t test. F: F value for ANOVA test*: Statistically significant at p ≤ 0.05.

the lowest mean (39.2 ± 6.98). On the other hand, there was no significant difference among the eight districts regarding perceived hinders to EHRs implementation where (F = 0.531, P = 0.811).

In addition, Table 4 illustrates that there was a significant relationship between perceived facilitators to EHRs implementation and HCPs age and years of experience respectively where (F = 3.489, P = 0.018; F = 2.824, P = 0.041). HCPs in the age group 30 - < 40-years-old had the highest perception of facilitators, while HCPs in age 40 - < 50-years-old had the lowest perception of facilitators to EHRs. Also, those who had 20 - < 30 years of experience had the highest perception of facilitators while HCPs who had < 10 of years' experience had the lowest perception of facilitators.

On the other hand, Table 4 shows a significant relationship between perceived hinders to EHRs implementation and HCPs age (F = 6.246, P = 0.001), years of experience (F = 5,311 P = 0.002) and educational qualifications (F = 2.514, P = 0.045). HCPs in the age group 50 - < 60-years-old had the highest perception of hinders, while HCPs in age 20 - < 30-years-old had the lowest perception of hinders. Those who had between 30 - < 40 years of experience had the highest perception of hinders, while those who has between 10 - < 20 years of experience had the lowest perception of hinders to EHRs implementation. In addition, nurses with a diploma of Nursing School had the highest perceived hinders mean, while physicians with a master's degree had the lowest perceived hinders.

Discussion

Literature supports the notion that health information technology and electronic health system (EHRs) hold tremendous value for the healthcare system. Successful implementation of EHR systems within primary health care units depend on resolving problems connected to the interface between information technology and human being [5]. Understanding the concerns related to EHRs implementation can greatly help to cultivate management strategies to overcome difficulties and potential barriers to EHRs adoption [13]. This goes with the aim of this study, which was to identify factors facilitating or hindering EHRs implementation as perceived by HCPs in primary health care units, Alexandria.

The current study highlighted the essential factors to facilitate the successful implementation of electronic health record EHR at primary health care units which reported by HCPs including selection of suitable EHR system, improve information technology system, motivation and incentives of the users and conservation of health care providers' time. HCPs perceived electronic health record system constitutes a

key enabling technology that facilitates the creation and sharing of patient information in the health care delivery system. Thus, the availability of authorized products of computer and system that guarantee a minimum level of EHRs functionality in the study units with adequate motivation, are essential factors.

Similar results have been reported in several other studies. For instance, Jha [14] stated that the EHR system selection should be participatory, involving local leaders and clinicians to allow staff to provide input into the decision and feel that their input has been noted. Also, Health practitioners believe that Motivation and Incentives for EHR implementation and quality performance have the potential to influence EHR adoption. Also, Al-Rawajfaha and Tubaishat [21] found Incentives to use EHRs, the availability of supportive technology, and additional reimbursement for the use of EHRs were the most common facilitating factors identified would encourage their use. Moreover, Kijsanayotin, et al. [26] revealed that the most important factors to the success of implementation are the users' acceptance and use of that technology. Enhancing attitudes about the influence of computers on health care and experience with existing system can positively influence EHR adoption. In this respect, the benefits of using EHRs should be presented to different health care providers as a primary incentive for use. Noureldin, et al. [12] stated that physicians in their study agreed that they need a personal benefit to persuade them to switch from their traditional work procedures to a new system especially, financial motivating. Also, Gyamfi, et al. [20] recommended providing motivation for old and new staff of EMR end-users in various forms, including individualized rewards and full benefits of the EHR. Likewise, Financial and non-financial incentives proved to be important factors for participants, encouraging uptake and EHRs use.

On the other hand, it seems that HCPS not satisfied with IT resources which perceived as the least facilitator to EHRs. HCPs perceived that information technology resources are accessible in the PHC units but insufficient and inadequate in numbers which may be related to human and financial resources. Many technical problems and difficulties could be encountered during the use of EHRs which could trigger a negative attitude towards the use of EMR systems. The availability of technical support staff was cited as one of the essential facilitators identified by several researchers. Providing adequate IT Technical support and Resources during implementation allow HCPs to document problems and receive prompt feedback that is believed to increase EHR adoption. For example, Safdari, et al. [27] reported that employment of enough IT staff is a crucial factor for success in the process of implementing EHRs and Al-Rawajfaha and Tubaishat [21] reported that technical assistance had a major positive impact on the implementation process.

In this vein, Gyamfi, et al. [20] suggest a need to employ skilled Information Technology (IT) personnel to work around the clock and handle all emerging IT problems or emergencies promptly and data and power back up. Future studies may be needed to explore the competencies and the interaction of the IT staff with the healthcare professionals before, during, and after the implementation of EHRs. Also, Najaftorkaman

Elsyed et al. J Nurs Pract 2020, 3(1):129-138

Open Access | Page 134 |

[28] asserted, in the context of the user, the adoption of EHR systems, technical support infrastructure and technical learning programs are important issues because a lack of these factors as facilitating conditions can inhibit the user adoption of EHRs.

As for the perceived barriers hindering the implementation of EHRs, our study agreed with the growing body of literature showing that the most common organizational concern reported was around "financial cost" as the highest barrier perceived by HCPs to EHRs. This cost is associated with all stages of the EHRs implementation such as planning, consulting services, start-up, purchasing of hardware and software, and ongoing costs for training and maintenance. Similarly, Alghamdi [18] indicated cost is deemed as the greatest obstacle to the adoption of EHRs systems in many health institutions including the cost of setting up the infrastructure, training, and maintenance. Also, Gyamfi, et al. [20] reported that lack of funding could substantially limit EHRs implementation.

In addition, the current study revealed that the other main three factors hindering the implementation of EHR as reported by health care providers were lack of EHR awareness, system maintenance and resistance to new technologies. Lack of awareness of the usefulness and benefits provided by EHRs system seem to be related to factors like inadequate training and time constraints which could increase HCPs' resistance to use this technology. Previously, this speculation was addressed by Cristina [29] who stated that lack of understanding of benefits and usefulness of EHRs such as improvement in the quality of care and lack the time required to acquire knowledge about systems through training and redesign clinical workflows can lead to HCPs' resistance to change and use. Similarly, Al-Rawajfaha and Tubaishat [21] reported economic burden of EHRs, inadequate training on EHRs, and a lack of suitably qualified IT technicians, and disruption to clinical care as common barriers. Also, Jawhari, et al. [6] reported barriers of insufficient training, resistance to change, lack of communication led many participants to worry about the sustainability of using EHRs initiative. Moreover, Furst, et al. [30] revealed that a lack of training and/or preparation with computer skills hinder the adoption of technology and lead to cognitive and attitudinal barriers.

Inadequate training is a universal barrier to implementing EHRs which has been widely documented in numerous studies across the world. For example, Ajami and Arab-Chadegani [13] addressed the issue of short-term training for EHRs this could leave training gaps and implementation problems that could be unresolved in the longer term. Mahalli [23] reported a lack of continuous training and support to be a major barrier to the successful implementation of EHRs.

Healthcare providers are concerned with workflow changes, a distraction from direct patient care, and other unintended consequences of using EHRs [23]. This is parallel to those of the present study which, revealed the concerns of HCPs regarding the negative impact of EHRs might have on patient care and its potential disruption. HCPs might be unsure and anxious about EHRs technology and workflow and fear that it takes time and take them away from patient-focused and direct care so they might be likely to resist the EHRs system. Comparably, Stevenson and Nilsson [31] perceived that the negative effect of EHRs on patient care may result from the idea that excessive time spent by healthcare professionals on finding information entails less time spent on direct patient care. Also, Hui-Wah, et al. and Secginli, et al. [22,32] have suggested that complex system designs can put heavy demands on healthcare professionals' mental energy which might cause an adverse effect on their clinical performance and judgment and increase their resistance.

These findings give the impression that the complexity associated with the use of e-records, especially if providers are not well trained in their use, leads to more time allocated per patient, especially if the provider has to disrupt the clinical encounter to enter data [12]. Thus, it is crucial to train HCPs before implementing the system, and training was also the most frequently cited facilitating factor to the successful implementation of the system. In this instance, Alghamdi [18] recommended that identifying areas of training that are needed prior to the implementation of EHRs system would help to cut costs that are associated with unneeded training. Each institution should assess the knowledge, skills, and attitudes toward IT to facilitate the integration of the system. Acceptance and Training of HCPs are essential if computerization is to be successful to increase the knowledge and skill levels to use the EHRs and alleviate the frustration and overwhelming nature of the technology [33].

In relation to the perception of facilitating factors to EHR implementation by HCPs, physicians had the highest mean of perceived facilitating factors, followed by nurses while pharmacists had the lowest mean score perception. This result may be attributed to that physicians and nurses consider the use of computers to be part of their routine work in medical documentation therefore they had the highest use of the EHRs more than other HCPs. However, staff nurses reported that they don't have enough time to use a computer all the time and they may feel rather than physicians that their inability to type quickly and lack of comfort with computers could act as barriers to EHRs adoption. The relationship between computer skills and EHRs implementation is well established in the literature. Boonstra and Broekhuis [34] found a lack of computer skills to be a major cause of resistance to the introduction of EHRs. They pointed out that typing skills, which some health professionals lack, are required to enter important clinical data as the absence of these skills will further delay the successful implementation of EHRs. Correspondingly, Al-Harbi [35] showed significant differences between physicians, nurses, and other staff in their perceptions of all items measuring the benefits of information technology.

As regards the relationship between perceived facilitating and hindering factors to EHRs implementation and HCPs demographic and professional characteristics. The results showed a significant difference among the eight districts of PHC units in Alexandria governorate regarding perceived facilitators to EHRs implementation. This the result could be ascribed to the difference among these units in many factors such as; human and physical resources, the adequacy of computer in these units, the supportive structure, staff size

relative to workload, the distance between units and urban area, number of generalists and specialists in each unit and presence of primary care physicians and other health care professionals, in-service training programs to staff. Also, socio-demographic characteristics of the population are considered as other contributing factors and these factors vary from district to another, even from unit to another.

Similarly, Abou Hashish [36] stated that the possibility of a difference in perception among institutions might be due to different degrees of work, structure, resources, functions, and emphasis on following rules, laws, and policies. This speculation was also shared by Sharma and Narang [37] who illustrated some interesting differences in users' perception regarding service quality and how they varied between different primary health care units and according to patients' demographic status. It was not merely the financial and physical access that was important but the manner of delivery, the availability of various facilities, and the interpersonal and diagnostic aspects of care as well that mattered to the people [16,19]. In this respect, Ludwick and Doucette [38] concluded that the implementation process of EHEs which identifies the determinant success and risk factors and puts in place measures to insulate the IT project against the identified risks are likely to result in a successful implementation process.

Moreover, the present study showed the significant relationship between perceived facilitators as well as hinders to EHRs implementation and each HCPs age and years of experience. HCPs with average age and years of experience perceived more facilitators than younger and less experienced once. And the higher educational qualification, the lower perceived barriers. Nurses with a diploma of Nursing School had the highest hinders mean, while physicians with master's degree had the lowest perceived hinders. One reason for this could be that with age and experience, staff may have better computer skills which may facilitate and enhance their acceptance and usage of EHRs and reduce disruption to their direct patient care. Also, it seems that staff with higher qualifications are less likely to consider barriers to the implementation of EHRs. While diploma nurses might have poorer information technology skills and less access to information technology, less training, and less support than other staff.

Related and controversial findings were reported in many studies. Al-Rawajfaha and Tubaishat [21] found different factors such as gender, age, and experience could influence of usage of EHR. They found diploma nurses thought barriers to implementing EHRs higher compared to bachelor nurses. Aldosari, et al. [39] found a statistically significant difference was noted between different education levels of nurses regarding their views of perceived ease of use of EMRs. Chang and Hsu [40] reported that age and years of experience had a modifying effect on providers' intention to use EHR. While, Simon, et al. [41] reported that practitioners 'Age and Experience can affect the adoption of EHRs. They sated that Younger HPs and recent graduates have more positive attitudes towards EHRs and practices are generally more likely to adopt. The younger HCPs catch on much faster and are ready to use it. Alquraini, et al. [42] demonstrated that gender, age, education, and computer usage, previous experience in computer use and computer skills tend to remarkably affect EHR usage. These findings point out the need to develop and implement strategies that are tailored to the individual characteristics of potential EHRs users, such as age, education, and experience.

Strengths, limitations and future studies

Although this study has made its own impact on the existing literature which contributes to the knowledge of various factors associated with and can affect the implementation and adoption of EHRs. The current study opens the door for further studies that assess the educational and training needs of HCPs in relation to EHRs. Future implementation projects should consider the barriers which have been reported in this study. Moreover, decision-makers need to think of new strategies to motivate all healthcare professionals and decrease their resistance. The study is limited to HCPs' perspectives at PHC units so it can be extended to hospitals and health care institutions which have implemented similar healthcare systems to study the impact of the implementation of EHRs system on different healthcare institutions. Replication of this study in different healthcare specialty practices would be valuable in determining similarities or differences.

Conclusion and Recommendations

EHR implementation is a multi-dimensional process that is influenced by many technical, individual, human, and organizational factors. In order to ensure the successful implementation of EHR systems, healthcare providers, managers, and information technology professionals need to understand the factors that influence the use and implementation of EHRs. This permits healthcare decision-makers to address these factors in order to improve healthcare professionals' acceptance of EHRs, which will promote their effective use.

To sum up, the present study acknowledged similar facilitators and barriers that have been documented in a number of other studies Worldwide. Selecting and adopting a suitable EHR system with adequate IT Technical support and resources during implementation to improve the information technology system, with the provision of financial and nonfinancial motivation and incentives are the key factors facilitating the successful implementation of EHRs at primary health care units as perceived by health care providers. On the other hand, this study pointed to health care providers' need for more awareness and training about EHR with periodical system maintenance to overcome the potential resistance and the main barriers that hindering the implementation of EHR. Physicians have the highest mean perception of facilitating factors to EHRs followed by nurses. Age, years of experience, and educational qualifications play a significant role in HCP's perception and adoption of EHRs. Studied PHC units varied in the perceived facilitators to the implementation of EHRs. This difference could be ascribed to the variability in the provision of human and physical resources, the adequacy of computers and supportive structure, staff size relative to workload, the distance between units and urban area, and in-service training programs to staff. With the provision of adequate human and financial resources, the challenges would likely be overcome and the adoption of the EHR will improve.

Elsyed et al. J Nurs Pract 2020, 3(1):129-138

Open Access | Page 136 |

Based on the findings of the present study, the following recommendations might help in enhancing EHR systems adaption at PHC and overcoming hinders

- To address the concerns around a lack of awareness and time to attend training, it has been suggested that Periodic and follow-up training workshops or continuing education should be designed tailored to respective roles and suitable time for the users to improve HCPs perceptions of EHR compatibility with existing processes and systems.

- To avoid system difficulty and technical problems, it has been suggested that technical support should be available and users should have the ability to document system problems and receive prompt administrator feedback in the form of a responsive and "helpful" help desk. Periodic maintenance and evaluation of software programs and the quality of their products is essential.

- Baseline levels of computer knowledge and skills of using EHRs should be assessed, to estimate the length of time and amount of effort required to adopt the software completely into practice. HCPs who had previous computer experience, can be targeted as 'key people', trainers and mentors within units to assist in the orientation and development of their colleagues' skills to use EHRs.

- For a more comprehensive understanding of factors that affect the utilization of EHRs, qualitative research approaches may be applied. In-depth interview and focus group data collection approaches may be used to reveal richer data about these factors involving managers and/or informatics personnel with nurses and other healthcare professionals. Discussion of perceived benefits and limitations of the current EHR system could generate more depth information.

- Future studies should consider developing a research tool that is more comprehensive and could examine the factors that may affect the implementation of EHRs, like users' satisfaction and the link between the use of specific EHR functions and their potential effects from providers' perspectives. Also, exploring other aspects of EHR use, such as how this technology is used during patient encounters, team versus individual use of the EHR, and the different ways in which primary care practitioners use the EHRs. Also, Replication of the study with the diversity of the settings and the large sample size is likely to enhance the generalizability of findings to the wider population.

Declaration of Conflicting Interests

The Authors declare that there is no conflict of interest.

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Elsyed et al. J Nurs Pract 2020, 3(1):129-138

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