



Evaluation of the Implementation of the Personal Electronic Health Record by Family Doctors In Greece

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Received date: January 01, 2022; Accepted date: January 14, 2022; Published date: January 25, 2022

Abstract

E-health is a key pillar of planning and implementation of programs in the Health Care Sector, both at national and international level. It encompasses ICT based tools and services that can improve the prevention, diagnosis, treatment, monitoring and management of citizens' health. In addition, it can be beneficial for society as a whole, by improving accessibility and quality of care and enhancing the efficiency of the healthcare sector. Finally, it includes the exchange of information and data between patients and healthcare providers, hospitals, healthcare sector professionals and health information networks, electronic health records, telemedicine services, patient monitoring devices, surgery planning software, robotic surgery and basic research for virtual human physiology.

Keywords: E-Health; Personal electronic health record; Questionnaire; Assessment; family doctor; General practitioner.

Introduction

E-health evolves as a rapidly developing component of health in the 21st century. [1] It encompasses the transfer of resources and health related information to both healthcare professionals and consumers via the internet and telecommunications, and is related to healthcare services, patient care, education and research in the healthcare sector. [2] It plays a very important role in the context of modern healthcare services. In 2004, the European Union sent to its member states an action plan regarding e-health (the EU eHealth Action Plan) [3], in which specific interventions were clearly identified- and most importantly those that concerned the implementation and operation of the electronic health record [4, 5]. The aforementioned action plan has been updated in 2012, in line with the new developments in electronic health (eHealth Action Plan (2012-2020- Innovative healthcare for the 21st century). [6]

E-health has multiple benefits including better and more properly organized and coordinated patient care, improved quality of health for both individuals and populations, as well as a more efficient operation

of the administrative work. [7] A multitude of services and tools are involved in e-health, mainly summarized in electronic health records, e-prescription, [8] electronic referral systems [9], information exchange systems [10], telemedicine services and personal health records. One of the most basic tools of e-health is the personal electronic health record, which is defined as the ensemble of recorded data regarding citizens' demographic data and health. It aims to record and monitor citizens' health over time and thus indirectly improve the quality of provided healthcare services. [11] It includes a set of healthcare information parameters (such as habits and addictions, prevention programs, etc.) that go beyond the disease and the healing process per se. It is considered to be the epicenter of clinical information systems and provides a service and information resource that is complete, continuous, integrated, electronic, secure and authorized user-accessible. [12] In Greece, the term PEHR (Personal Electronic Health Record) was adopted, which is in fact a mixture of the terms electronic health file and citizen health file.

The development and implementation of the PEHR has for many years been a strategic goal for the Greek NHS, however, the whole venture has been delayed by the lack of relevant infrastructure, the lack of a computer culture and the lack of flexibility to keep an electronic or handwritten file. Several isolated attempts have been made to create and operate electronic filing systems but these have been characterized as fragmented and spatially limited [13]. The most significant of these efforts was the EPIRUS net system and the hygieianet system. [14,15] Secure telecommunications networks were developed in both the primary healthcare network and in the hospitals, named "SYZEFXIS" and "IASIS" respectively, which allowed the interconnection of units and the provision of medical and insurance services to all health regions. [16]

On 2017 the Greek NHS ran a pilot phase of the personal electronic health record, which entered a normal phase in the spring of 2018 and now operates in a national network. The PEHR application runs under the responsibility of IDIKA SA, on behalf of the Greek state, and is accessible to all certified and authorized physician-users of the e-prescription system. According to the Greek law 4486/2017 on primary health care, the PEHR and all other electronic applications for the NHS are described in a very detailed way. More specifically, the purpose, content, operation by the family doctor, safety and storage of the data, as well as accessibility and consensus regarding the PEHR are mentioned. Implementation of this venture is a challenge for the health care system per se as well as its employees, and it needs to be reevaluated over time in order to identify the problems and propose solutions to address them, towards the ultimate goal of improving the healthcare services provided in all levels (prevention, treatment and rehabilitation).

In Greece, the PEHR is a new tool for family doctors and primary care physicians and there are no studies that evaluate its function and usability. This study, in spite of the restrictions imposed by its short period of use, aims to assess the use of the PEHR application by family doctors, and at the same time identify possible problems and obstacles it would need to overcome in order to improve its functionality.

Main Part of the Study

Aim of the study

The aim of this research was to identify the range of use of the PEHR application as well as the facilitating of various functions via this new feature. Moreover, we aimed to investigate the doctors' satisfaction regarding its functionality and usability.

Materials and Methods

For the purposes of our research, we adapted and translated a preexisting PEHR assessment questionnaire that was developed and used in Norway, with the permission of its authors ("Evaluation of electronic medical records", Hallvard Lærum and Arild Faxvaag, BMC medical informatics and decision making, 2004). [17] The translation process of the questionnaire consisted of three phases and was conducted according to international translation procedures and criteria [18, 19, 20] while minor changes were made to the original questionnaire regarding its adaptation.

In the first phase, two healthcare professionals that were Greek native speakers with certified english proficiency translated the questionnaire in Greek independently. Subsequently, in the second phase, the two independent translations were synthesized in a questionnaire, following a consensus decision by a group of experts. Regarding its adaptation, the final questionnaire had minor changes to the original focusing mainly on its adaptation for primary health care, and the fact that the emphasis was put on citizens-system users rather than patients. In the final third phase of the translation, a reverse translation of the final adapted questionnaire was performed in english by a bilingual native english speaker who was also an english teacher and has been living in Greece for the last 20 years. The reverse translation questionnaire was then compared to the original one by a group of experts that found no significant difference among them except for the parts that were adapted.

The final questionnaire consists of 73 close ended questions. It is divided into five parts depending on the content of the questions. The first part consists of the demographic characteristics of the participants, the second part consists of 24 questions concerning the frequency of use of the PEHR application by doctors for various medical issues. The third part of the questionnaire consists of the same questions as the previous section but this time the focus is on the doctors' views of the extent to which the processes involved have changed through the PEHR. In the fourth part of the questionnaire the physicians are asked about their satisfaction with the content of the PEHR, the accuracy of the system, the ease of its use and whether the information is provided in a timely manner. The fifth and final part of the questionnaire concerns the overall satisfaction of physicians by the PEHR. The process was completed by weighting and checking the reliability of the questionnaire, which was found to be very strong, as all cronbach a coefficients were greater than 0.8 and almost all exceeded the value of 0.9.

In order to meet the research objectives and obtain answers to the research questions, the questionnaire was shared with family physicians across the country, working in the Greek NHS. The choice of only family physicians appointed by the ministry of health and working in the NHS was made because they are the only ones who have full access to the PEHR for their registered citizens. Family pediatricians working in the NHS were excluded from the sample due to their very small number.

More specifically, the questionnaire was distributed in printed form to the NHS family physicians of the region of pieria and in electronic form (via google forms), to family physicians all over greece working in the NHS. The link for the google forms was distributed via e-mail and in all relevant to primary health care greek networks on social media. All e-mail addresses were obtained from the primary health care units database of the 3rd healthcare region, under permission.

Altogether, 310 questionnaires were sent for completion and the questionnaire was answered by 175 doctors across Greece in February 2019 (56%). Specifically, 91 men (52%) and 84 women (48%) participated in the survey. The overwhelming majority consisted of general practitioners (162 people), the rest were internists and doctors without specialty. Almost half of respondents working in a primary health care post (82 persons), while the percentage of people working in public primary health care centers (35.4%) was also significant. The statistical analysis was made using the SPSS statistical package 23.

Results

Some interesting results emerged from our analysis; more importantly, we found that the Greek doctors who participated often did not use the PEHR for any of the activities described in the questionnaire. Both patient referral and test results, as well as patient information and bureaucratic procedures, are procedures that were not widely applied through the PEHR. Also, the low application of the PEHR for various procedures related to test results and patient information was linked to the doctors' view that NHSP does not particularly facilitate the performance of these procedures. In addition, doctors have shown moderate satisfaction with the content of the PEHR and the accuracy of the information it provides. Ease of use is another issue that concerns the participating doctors and they have a negative perception about this feature of the new system.

Gender, age and specialty did not appear to have a significant effect on physicians' responses to the frequency of use of the PEHR and their views on the facilitation of various procedures. Moreover, the doctors' groups that are formulated on the basis of the above demographic characteristics do not differ significantly in the reported satisfaction they receive from the use of the new system and their global assessment of the PEHR.

The physicians 'status and the time that passed from acquiring the specialty, however, appear to have a significant influence on the doctors' frequency of use of the PEHR and their views on the facilitation it provides regarding the handling of various tasks. Moreover, the overall satisfaction of doctors appears to be significantly influenced by these two factors. The percentage of registered citizens in which the PEHR is used is the only factor that affects almost all the research factors regarding the use of PEHR. (Table 1)

Factors / Questions	Value	p*
Frequency usage of PEHR		
Reference and Results	10.276	0.006
Seeking information about patients	42.261	0
Bureaucracy affairs	14.792	0.001

Performance of clinical tasks		
Seeking information about patients	5.936	0.051
Reference and seeking information	0.709	0.701
Bureaucracy affairs	22.198	0
Satisfaction		
Content	17.434	0
Accuracy	19.282	0
Easy of use	17.433	0
Timeliness	24.307	0
Global assessment of PEHR		
PEHR is worth the time and effort required to use it	11.815	0.003
How would you rate your satisfaction with PEHR	24.855	0
The performance of the department's work has become	18.459	0
The performance of my own tasks has become	18.746	0
The quality of the department's work has become	18.791	0
How would you rate the success of the PEHR	18.466	0

Table 1: Results according to the percentage of registered citizens and usage of PEHR * $p < 0.05$.

In each case of procedures done through the PEHR, it was found that the physicians who are most using the PEHR for this specific task are also those who believe that work is facilitated through the use of the new system the most. (Table 2)

Statement	r	p*
Review the citizens' medical problems	0,361	0,000
Seek out specific information from citizens' records	0,494	0,000
Follow the results of a particular clinical examination or investigation over time	0,417	0,000
Obtain the results from clinical examination or investigation.	0,328	0,001

Enter daily notes	0,389	0,000
Obtain information on investigation or treatment procedures	0,364	0,000
Check and enter information about daily habits	0,477	0,000
Produce data reviews for specific patient groups, e.g. complication rate, diagnoses	0,231	0,026
Order laboratory analyses	0,400	0,001
Obtain the results from laboratory analyses	0,333	0,011
Order X-ray, ultrasound or CT investigations	0,248	0,043
Obtain the results of X-ray, ultrasound or CT investigations	0,097	0,489
Order other supplementary investigations	0,158	0,199
Obtain the results from other supplementary investigations	0,128	0,338
Refer the patient to other departments or specialists	0,326	0,001
Check and enter immunizations	0,357	0,000
Write prescriptions	-0,116	0,249
Write sick-leave notes	0,212	0,046
Collect patient information for various medical declarations	0,303	0,001
Give written individual information to patients, e.g. about medications, disease status	0,426	0,000
Give written general medical information to patients	0,441	0,000
Collect patient info for discharge reports	0,492	0,000
Check and sign typed dictations	0,128	0,337
Register codes for diagnosis or performed procedures	0,385	0,000

Table 2: Results according to usage frequency and the performance of clinical work tasks when using the PEHR * $p < 0.05$.

Finally, the perceived ease of use of the computer seems to have a significant influence on the doctor's reported frequency of use of the PEHR and on their views regarding the facilitation offered in specific procedures. (Table 3) In addition, doctors who reported greater overall satisfaction from the PEHR are also those who considered the improvement of the quality of work through its use as more important. (Table 4)

	Co	UF_1	UF_2	UF_3	CP_1	CP_2	CP_3
Co							
UF_1	0,201						
UF_2	0,213 *	0,791 **					
UF_3	0,216 *	0,821 **	0,791 **				
CP_1	0,167	0,125	0,388 **	0,361 **			
CP_2	0,308 *	0,070	0,025	0,063	0,724 **		
CP_3	0,201 *	0,844 **	0,941 **	0,870 **	0,253	-0,03 2	

Table 3: Correlation between usage frequency of PEHR, performance of clinical work tasks when using PEHR and competence in computers * $p < 0,05$ ** $p < 0,01$.

UF (Usage Frequency) 1,2,3: Reference and Results, Seeking information about patients, Bureaucracy affairs A

CP (Performance of clinical work tasks) 1,2,3: Seeking information about patients, Reference and seeking information, Bureaucracy affairs Referral and test results, Search for patient information, Bureaucratic procedures.

	Sa_1	Sa_2	Sa_3	Sa_4	G_A_1	G_A_2	G_A_3	G_A_4	G_A_5	G_A_6
Sa_1										
Sa_2	0,8 81 **									
Sa_3	0,7 20 **	0,6 78 **								
Sa_4	0,8 44 **	0,8 08 **	0,7 05 **							
G_A_1	0,2 62 **	0,2 15 **	0,2 69 **	0,2 39 **						
G_A_2	0,6 90 **	0,6 19 **	0,6 28 **	0,6 65 **	0,4 16 **					
G_A_3	0,5 15 **	0,4 12 **	0,6 47 **	0,5 04 **	0,3 37 **	0,6 25 **				

G_A_4	0,5 08 **	0,3 84 **	0,6 48 **	0,4 72 **	0,2 99 **	0,6 36 **	0,9 20 **			
G_A_5	0,5 07 **	0,3 93 **	0,5 82 **	0,4 44 **	0,3 92 **	0,5 53 **	0,7 23 **	0,7 26 **		
G_A_6	0,6 98 **	0,6 78 **	0,6 16 **	0,7 29 **	0,4 47 **	0,8 05 **	0,5 87 **	0,5 70 **	0,6 50 **	

Table 4: Correlation between satisfaction factors of PEHR usage and global assessment of PEHR * $p < 0,05$ ** $p < 0,01$.

Sa (User Satisfaction) 1, 2, 3, 4: Content, Accuracy, Easy to use, Timeliness

GA (Global Assessment) 1, 2, 3, 4, 5, 6: Time and effort, Satisfaction, Departments' performance, Personal performance, Quality, Overall success

Conclusion

The research we carried out regarding the use of PEHR reveals a current inability for its widespread use. There have been many doctors who have stated in several sentences that they are not using the PEHR for the action mentioned in the questionnaire. But even those who do use the PEHR, report a moderate satisfaction.

A significant limitation of the study is the relatively small sample of family physicians who participated in the study compared to the overall number reported by the ministry of health (circa 2000), although they exceed the 10% of the total. This is likely to be due to the fact that the PEHR application is a relatively new tool that has been very recently applied to the greek primary health care system and has not yet been widely accepted by greek family physicians, many of whom are not even aware of its existence and operation. Despite the fact that the printed health booklets have recently been abolished, the use of the PEHR has not yet become compulsory, which leads to information gaps in relation to citizens' health.

In addition, a significant problem regarding the use of the PEHR is the fragmentation of the computerized systems that exist in our country, which discourages users from using them, with the exception of the e-prescription system which is compulsory and an essential part of their daily work. The PEHR cannot be used by other healthcare professionals, which means that the burden of integrating the information falls onto the family physicians. As a result, saving time and resources is not feasible.

Moreover, there are no clinical decision aid tools built in the PEHR, so that the medical practitioner is not alerted to possible medical errors, drug interactions or other malpractice issues, which may be detrimental to the quality of the services provided. Finally, a significant problem of the PEHR as shown by the questionnaire and the users' comments is the lack of integration with other healthcare facilities (hospitals, clinics, laboratories), leading to the fact that there is no direct recording of the data. The direct linking of the units ensures quality in health care and it is imperative to apply it as quickly as possible despite the number of obstacles (system interoperability, resistance of providers etc.). In this context, it is the responsibility and duty of service providers to cooperate efficiently and contribute to the expansion of the national Primary Health Care network in our country.

Discussion

The next step in this research would be to re-review the results after some time to see if doctors' attitudes have changed, since the PEHR is an innovative application at the time. In addition, qualitative research could be carried out to investigate in depth the doctors' opinions regarding the causes of the ineffectiveness of the PEHR, as well as their suggestions for improvements. In this way, corrective action can be taken to broaden the PEHR application, and more and more doctors can cope with the new requirements of the electronic health system. While making the use of PEHR mandatory would spread its use, we believe it is more important in this phase to optimize the system performance, functionality and integration based on the needs of its users. We also believe that making the PEHR accessible to all primary health care providers would alleviate some of the burden that falls on the NHS physicians.

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