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Investigation on the awareness of Greek Citizens regarding the Electronic Health Records

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Abstract:

Purpose *- This paper aims to examine Greek citizens' awareness regarding the necessity of transitioning from the traditional medical record to the Electronic Health Record. The present study attempts to investigate the degree to which the citizens of Greece know the use and the value of the Electronic Health Record and to study their opinion that the EHR can ensure data security and increase their knowledge regarding their health.*

Design/methodology/approach - The research methodology was based on bibliographic and qualitative tools to achieve the above purpose. As a research tool was chosen a questionnaire with closed-ended questions. The sample consisted of 100 Greek citizens who were selected through a random sampling method. For the data analysis, the statistic software SPSS (Statistical Package for Social Sciences) version 23 was used.

Restrictions *- The study is subject to certain restrictions, in particular, due to the way the questionnaire is distributed via e-mail, which means that it is aimed at citizens who have access to the internet and the use of e-mail. Another limitation is that the sample comes from the region of Attica and not from all regions of Greece, a fact that may have affected the results of the research, as the citizens of the decentralised areas may be less informed about the Electronic Health Record. In addition, another limitation is the inability of health professionals to collect data, which does not allow clear conclusions to be drawn regarding the use of EHR and the benefits of using it to upgrade health services.*

Findings *- Women agree more than men that the Electronic Health Record will contribute to saving time, cost, and error reduction in the medical system (p-value=0,008) and that the Electronic Health Record guarantee a better, more reliable and faster organisation of health care. (p-value=0,005). An interesting finding is that the younger participants with higher education levels had a more positive opinion about the advantages arising from the implementation of the Electronic Health*

Index Terms — *Medical Record, Electronic Health Records, Records Management*

I. Introduction

The Medical Record refers to the total amount of information relating to the patient's medical history. It is the cornerstone for diagnosis and treatment, also used for epidemiological studies. It provides information on administrative, financial, and statistical issues while being a quality control criterion. Patient data management has evolved in modern times, attributed to the advancement and widespread use of computers and new technologies.

The term "Medical Record" refers to the file in which documents related to medical information are recorded and relate to the complete picture of a person's illness. The data from the Medical Record can be used to inform the treating physician about the disease's diagnosis, treatment, and outcome or to be used for statistical and research purposes **[1]**. There is no universally accepted framework regarding the type of information and its detailed analysis that a Medical Record should contain. It is, of course, known that the Medical Record is the instrument of communication of the patient with the specialised personnel involved in managing his disease. At the same time, it contains vital data necessary for the planning of the patient's medical plan, without the required direct communication of the scientific team with the patient himself **[2].** The Medical Record is used as a memory bank, referred to by the health professional

who needs a complete picture of the patient's course during hospitalisation. It is often "commonplace" for the scientific team, each member of which completes, depending on its capacity, instructions for dealing with the medical problem **[1]**. The information provided by the medical record can also be used for administrative decisions and, in general, for formulating health policy and prioritising health system needs **[3]**.

The improved evolution of the Medical Record was recording one or more health issues for each patient. The SOAP model was used for the registration, the name of which is the acronym of the words:

- Subjective
- Objective
- Assessment
- Plan

The structure of SOAP includes the existing medical problem and the corresponding plan for treating and restoring health. The problem-oriented model was widely accepted, but in practice, it turned out that the requirements for its implementation were too great, especially in matters of discipline for the observance of this method, as data related to more than one problem needed to be recorded many times **[4]**.

The traditional Medical Record was preserved for many decades, contributing to the storage of medical information in many health systems; however, its use was unprofitable, as the cost of maintenance and upkeep is high **[3]**.

The progress of computer science and telecommunications marked the revolution in medical data recording and enabled electronic recording and high-speed communication to exchange medical information **[5]**.

A. Medical data

The most fundamental medical data which can be recorded in the medical file are patients' symptoms, vital signs, laboratory test results, biomedical signals recorded during routine testing, imaging test methods presented in the form of images and videos, as well as data from the patient's lifestyle (smoking, sedentary lifestyle), heredity or by any factor that can be considered aggravating for the occurrence of the disease **[5]**.

B. Coding of medical data

Codifying medical data is how information and health data are organised into categories with specific codes. The purpose is to shorten, store and retrieve data with a single system. A codification system presupposes that the terminology that refers to a disease and its synonyms will be imprinted with a single code **[6]**.

Thus, the systems of classification and codification of medical information were invented. The most well-known international coding and classification systems that are widely used for medical data are HL7, ICD-10, ICD-9-CM, MeSh, SNOMED, UMLS and ATC **[6]**.

C. Keeping a medical record in healthcare organisations

The basic ways of keeping medical records or medical records of patients in health care organisations are either in printed or electronic form. Their primary function in any form, either hardcopy or electronic, is to accumulate data collected during the patient's course, which is a "memory" for future use **[7]**. In addition, the health record contributes to the coordination of activities between different parts of the health organisation, even between health units located in different geographical locations **[7]**.

D. Printed patient medical file

In healthcare, the printed file system has been widely used to preserve patients' medical information **[8]**. Although it has helped the health care system from antiquity to the present day, Coeira **[9]**, argues that printed records have many disadvantages, making them unsuitable method of recording health data. Thus, many professionals believe the printed system cannot cope with modern challenges. More specifically, it presents the following weaknesses:

- Difficulty accessing and exchanging patients' medical history
- The improper organisation of patient records
- Prescribing errors
- Unable to back up information
- Violation of sensitive data **[10, 11]**.

E. Electronic Health Record - Electronic Patient Record (EPR)

The internationally recognised definition of electronic health records was given by the International Organization for Standardization (ISO). ISO (2005) defined the Electronic Health Record (EHR) as a "*repository of information about a caregiver's health care, in the computer-editable format*". According to Coiera **[9]**, EHRs should be perceived as consisting of retrospective, concurrent and prospective information with the primary objective of supporting the continuous, effective, and quality-integrated healthcare provision. Luo (2006) also argues that EHRs include integrated management of data required for patient care, while Bernstein et al. **[12]** agreed that EHRs play a more diverse role in healthcare delivery than just being an electronic medical record system.

In a qualitative study by Hammack-Aviran et al. (2020), in a sample of four American states with wide differences in demographic and socioeconomic characteristics, it was found that the potential benefits of research use of EHR data outweigh the risk of a confidentiality breach. These benefits include improving the participant's health, family, and society **[13]**.

Devkota & Devkota (2014) argue that implementing the EHR helps reduce morbidity and mortality rates, improve efficacy, reduce adverse drug interactions, and reduce healthcare costs **[14]**. A literature review by Ben-Zion et al. (2014) found that the critical success factors for EHR adoption are the external environment, the organisation's strategy, business objectives and infrastructure **[15]**. In their study, Hägglund & Scandurra (2017) found that many of the EHR applications, although developed for patients, were designed from the perspective of healthcare providers without considering patient involvement in their design **[16]**.

F. Healthcare and Technology

Healthcare, which in some cases can be said to touch the industry, is considered one of the largest sectors worldwide. Hospitals continue to spend many resources on processing medical data and administrative records **[16]**.

As all activities are based on data interconnection, so does healthcare. On the other hand, these changes require high infrastructure costs and additional training requirements **[17]**. Therefore, changes in healthcare are slower. The evolution of e-health applications and their ability to improve healthcare practices has positively impacted health **[18]**.

Health-related IT promises many benefits and is already paving the way for personalised diagnosis. This technology also allows for real-time patient monitoring, fitness and wellness monitoring, drug distribution and data collection for healthcare research **[17]**.

II. METHODS

A. Purpose and objectives of the research

The purpose of the survey is to determine the extent to which Greek citizens are aware of the electronic health record. Within the framework of this research's central goal, the work's objectives include capturing citizens' opinions on whether they believe the electronic health record ensures data security and whether it is helpful regarding health information.

B. Research questions

The research questions are as follows:

- To what extent are Greek citizens aware of the electronic health record?
- What is the public perception of the security of electronic health record data?
- How useful do they consider the electronic health record?
- How do their perceptions differ concerning the gender, age, occupation, and education of the participants?

C. The research tools

In the present research, the creation of a closed-ended questionnaire with dichotomous questions and graded questions was chosen to obtain the views of a representative sample of the Greek population with clear and specific answers to achieve neutrality and objectivity. Simple random sampling was applied for sample selection.

D. Conducting the research

The survey was conducted during April - May 2021 through an electronic questionnaire on a sample of 100 citizens aged 18 - 65+ years, with an electronic questionnaire of the google form platform, which was sent via e-mail. The questions are 33 and arose from the study of Greek and foreign literature. This tool was based on the questionnaire of Jorge Tavares and Tiago Oliveira (2016) and secondly investigated the factors that lead individuals to adopt the use of Electronic Health Records **[18]**.

The answers to four of the questions are two-dimensional. In contrast, for most questions, the answers are given on a five-point Likert scale (1: Strongly disagree 2: Disagree 3: Neither disagree / Disagree 4: Agree 5: Strongly agree).

E. Data analysis

The statistical data analysis program SPSS (Statistical Package for Social Sciences) version 23 was used for this analysis. Qualitative variables are presented as frequency (N) and percentage (%). Quantitative variables are presented as average value - standard deviation. The chi-square test was used to test two categorical variables, while the Fisher exact test was used where the conditions were not met. The non-parametric Mann-Whitney U test was used to test a quantitative variable and a qualitative one with two categories. In contrast, the Kruskal – Wallis one-way analysis was used to test a quantitative variable and a qualitative one with multiple categories.

III. RESULTS

Regarding gender, participants were 45% male and 55% female. Of the total respondents, 47% were aged 18-30,

followed by those aged 31-45 with 23%, 46-60 with 20%, while only 10% were aged 61 and over. Most of the sample had a high level of education. Only 15% were Lyceum graduates, and 11% IEK graduates. 59% were University Degree graduates, and 15% had a master's degree. Regarding professional activity, the largest percentage of respondents, 33% were students, 28% were private employees, and 5% were civil servants. The self-employed were 5%, the unemployed 10% and the retirees 9% (Table 1).

Table 1. Demographic characteristics of the sample

	Frequency	Rate
GENDER		
Man	45	0,45
Woman	55	0,55
Total	100	1
AGE		
18-30	47	0,47
31-45	23	0,23
46-60	20	0,20
61 plus	10	0,10
Total	100	1,00
EDUCATION LEVEL		
Vocational training institute	11	0,11
High school	15	0,15
University	59	0,59
Master's degree	15	0,15
Total	100	1
PROFESSION		
Student	33	0,33
Private employee	28	0,28
Public servant	15	0,15
Freelance	5	0,05
Retired	9	0,09
Unemployed	10	0,1
Total	100	1

The Pearson Chi-Square test for the question: "Do you know or have you heard about the Electronic Patient File" showed a statistically significant relationship with gender (p-value = 0.001) (Table 2).

Table 2. Bivariate analysis of the question "Do you know or have heard about the Electronic Patient File" by gender

			"Do you know or have you heard about the Electronic Patient File"			
			NO	YES	Total	
	Gender	Man	1	44	45	
		Woman	6	49	55	
	Total		7	93	100	
Chi-Square Tests						
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	10,243[a]	1	0,001	0,002	0,001	
N of Valid Cases	100					

a. 0 cells (0,0%) have an expected count of less than 5. The minimum expected count is 10,80.

b. Computed only for a 2x2 table

c. The standardised statistic is -3,184.

For the question: "Do you know or have you heard about the Electronic Patient File" showed a statistically significant relationship with age (p-value = 0.008) (Table 3). However, no statistically significant relationship was found with respect to the occupation and educational level of the survey participants.

Table 3. Bivariate analysis of the question "Do you know or have heard about the Electronic Patient File" by Age

"Do you know or have you heard about the Electronic Patient File"					
			NO	YES	Total
	AGE	18-45	22	48	70
		46 Plus	2	28	30
		Total	24	76	100
Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7,059[a]	1	0,008		
N of Valid Cases	100				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 7,20.

In addition, the Pearson Chi-Square test showed that the answers to the questions "Do I have a computer and an internet connection and can I access the Electronic Health Record", "Have you been treated before", "Would you give your data in research or pharmacy for studies" and "Which of the hospital staff handled your medical record", are independent of the gender, age, occupation and educational level of the participants (p-value > 0.05).

Table 4. Variable analyses in relation to gender

	Gender	Mean	SD	Mann-Whitney U	p-value
HR will contribute to saving time and costs and to the reduction of errors in the health system	Man	3,36	1,048	868,5	**0,008**
	Woman	3,87	0,982		
EHR serves the best and fastest organisation of health care	Man	3,69	0,848	863	**0,005**
	Woman	4,15	0,65		

Women agree more than men that the Electronic Health Record will help save time, costs and reduce errors in the health system (p-value = 0.008), and that the Electronic Health Record serves the better and faster health care organisation. (p-value = 0.005) (Table 4).

Table 5. Variable analyses in relation to age

	Age	N	Mean	Sd	Mann-Whitney u	P-value
EHR will contribute to saving time and costs and to the reduction of errors in the health system	18-45	70	3,84	0,942	674	**0,003**
	46 plus	30	3,17	1,117		
EHR will contribute to my faster service and reduction of my waiting time in the health system	18-45	70	4	0,901	501	**0**
	46 plus	30	2,93	1,112		
EHR will serve in future visits to hospitals and doctors	18-45	70	4,21	0,778	798	**0,038**
	46 plus	30	3,93	0,64		
	18-45	70	4,59	0,648	822	**0,028**

EHR is useful because it gathers your entire health history	46 plus	30	4,87	0,346	

Table 6. Variable analyses in relation to the level of education

	Education level	N	Mean	Std. Deviation	Mann-Whitney	p-value
I have the know-how to use the PC to use the EHR	Secondary	26	3,69	1,158	671,5	**0,013**
	Higher	74	4,27	1,024		

Participants aged 18-45 are more likely to agree that the Electronic Health Record will save time, costs and reduce errors in the health system (p-value = 0.003), will contribute to my faster service and reduce the waiting time in the health system (p-value <0.001) and will serve in future visits to hospitals and doctors (p-value = 0.038), in relation to the participants who were 46 years old and over. In contrast, participants aged 46 and over agreed more that the Electronic Health Record was useful because it compiled the entire health history (p-value = 0.028), compared to participants aged 18-45 (Table 5).

Participants who had a higher education level, agreed more that they have the know-how to use the PC to use the Electronic Health Record, compared to participants who had a secondary education level (p-value = 0.013) (Table 6).

Table 7. Variable analyses in relation to the profession

	PROFESSION	N	Mean	SD	Kruskal-Wallis H	p-value
I have the know-how to use the PC to use the EHR	Student	33	4,03	1,159	13,325	**0,004**
	Employee	48	4,42	0,964		
	Retired	9	3,33	0,707		
	Unemployed	10	3,7	1,252		
I believe that EHR usage will be easier for the citizens	Student	33	3,7	0,728	8,276	**0,041**
	Employee	48	3,25	0,812		
	Retired	9	3,22	0,441		
	Unemployed	10	3,3	0,823		
EHR will contribute to saving time, costs and to the reduction of errors in the health system	Student	33	4,09	0,914	12,244	**0,007**
	Employee	48	3,46	1,091		
	Retired	9	3	0,707		
	Unemployed	10	3,6	0,966		
EHR will contribute to my faster service and reduction of my waiting time in the health system	Student	33	4,06	0,966	9,216	**0,027**
	Employee	48	3,65	1,021		
	Retired	9	2,89	1,364		
	Unemployed	10	3,3	1,059		

Employees agree more than the other groups that they have the know-how to use the PC to use the Electronic Health Record (Student M: 4,03 SD: 1,159, Employee M:4,42 SD: 0,964 Retired M: 3,33 SD: 0,707 Unemployed M: 3,7 SD:1,252). The students agree more than the other groups that they believe that the use of the Electronic Health Record will be easy for the citizens (Student M: 3,7 SD: 0,728 Employee M: 3,25 SD: 0,812 Retired M: 3,22 SD: 0,441 Unemployed M: 3,3 SD: 0,823), that the Electronic Health Record will help save time, costs and reduce errors in the health system (Student M: 4,09 SD: 0,914 Employee M: 3,46 SD: 1,091 RetiredM: 3 SD: 0,707 Unemployed M: 3,6 SD: 0,966), as well as that the Electronic Health Record will contribute to the faster service and reduction of the waiting time in the health system (Student M: 4,06 SD: 0,966 Employee M: 3,65 SD: 1,021 Retired M: 2,89 SD: 1,364 Unemployed M: 3,3 SD: 1,059) (Table 7).

IV. Discussion

This survey showed that EHR is a useful service, and most citizens are interested in accessing available information about their health. The findings align with the Andersen & Davidson **[19]** study conducted to analyse the use of e-health services and the individual determinants of access to them. Specifically, demographic characteristics (gender, age) and other factors related to society, such as education, were found to be significant. The present research does not cover other factors like income; thus, no relationship to the use of services can be investigated. In this study, positive attitudes regarding the use of IBS were found to be related to gender, age, level of education and professional background **[20, 21]**.

Older patients are more likely to suffer from chronic diseases, so they find access to their medical records extremely useful **[22]**. Even though users of all age groups have access to the internet, citizens over the age of 45 consider that they can use the service to a lesser extent than the rest of the population due to a lack of know-how. Initially, this can be explained by the fact that those older citizens need to become more familiar with the use of computers; thus, it is less likely to use digital services **[23]**. In addition, these older patients are likely to get sick very often, possibly developing health conditions that may affect their ability to use technology and understand the information in digital format **[23, 24]**. Therefore, those who can use the advantages of the EHR may be the least who can use it **[24]**. Therefore, the providers of the HER need to focus on this group of patients so that more older people can have access to exams like PCT in the future. In the present study, women were the most informed about PCT, which is quite similar to findings in recent large-scale studies related to this topic **[25, 26]**. A recent European study on citizens of seven countries related to e-Health services also proved that women and people with higher education were more likely to use online health services **[27]**.

Technical and privacy issues and issues reported in previous studies **[28, 29]** affect few users and do not appear to be a barrier to the use of services. Another interesting finding from studies in Norway conducted is that there are several clinical, including advanced health knowledge and improved self-preservation, greater patient empowerment and easier communication with healthcare providers **[20]**

V. Suggestions

On the part of the state, there is a need for continuous investment in the security of the network and information systems, implementing appropriate technical and organisational measures to ensure the maximum possible protection of personal data. Given that the study's findings show the citizens need more information about the EHR, the state needs to develop targeted information campaigns for the public. These campaigns should emphasise the benefits that result from the use of Electronic Health Records for the individual but also for the health system. Primary care professionals can make a significant contribution in this direction. Nationwide research is also considered important, focusing on the attitudes and opinions of the doctors who are called to apply the EHR.

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VII. AUTHORS

Nikos Kareklas holds an MSc in Information Science from the CITY University of London, England (School of Mathematics, Computer Science and Engineering) and is a graduate of the Department of Library Sciences and information systems of the Technological Educational Institute of Athens. From 2016 until today, he has been a laboratory collaborator of the Department of Archives, Library and Information Systems of the University of West Attica and, since 2019, a PhD candidate in the Department, investigating the use and the value of new technologies in Records Management which is his field of expertise. He has a prosperous professional career operating as an Information Manager in many innovative projects in Greece, such as the modernization and upgrading of the Elefsis Refinery, which is considered, until today, the most significant private industrial investment in Greece. For many years he was the Director of the Records Management department of WWW, one of the few companies in Greece engaged in the professional management of archive material. Since 2019, he has been the General Manager of GreenFence Company, which operates in the confidential destruction of data and recycling. His current research interests relate to integrating new technologies such as Blockchain and Artificial Intelligence into Records Management, implementing GDPR in Greek Companies, and creating a new model for processing active documents.

Aggelos Beleris is a graduate student of the Department of Archival, Library and Information Studies of the University of West Attica. His thesis was about the medical record of patients in Greece. His current research interests relate to information science in conjunction with museums. Currently he works as volunteer in the Goulandi Museum while he is very interested to work for The **Freud Museum** in London which is a museum dedicated to Sigmund Freud, located in the house where Freud lived with his family during the last year of his life.

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