



Public and physician's expectations and ethical concerns about electronic health record: Benefits outweigh risks except for information security



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ARTICLE INFO

Keywords:

EHR
Electronic health record
Ethics
Expectations
Perceptions
Public opinion
Physicians' opinion

ABSTRACT

Introduction: Electronic Health Record systems (EHRs) offer numerous benefits in health care but also pose certain risks. As we progress toward the implementation of EHRs, a more in-depth understanding of attitudes that influence overall levels of EHR support is required.

Objectives: To record public and physicians' awareness, expectations for, and ethical concerns about the use of EHRs.

Methods: A convenience sample was surveyed for both the public and physicians. The Public's Questionnaire was distributed to the public in a printed and an online version. The Physicians' Questionnaire was distributed to physicians in an online version. The questionnaires requested demographic characteristics followed by close-ended questions enquiring about awareness, perceived impact, perceived risks, and ethical issues raised by EHR use.

Results: In total, 46% of the public and 91% of physicians were aware of EHRs. Physicians' and public opinions were comparable concerning the positive impact of EHRs on better, more effective, and faster decisions on the patients' health, on better coordination between hospitals/clinics and on quality and reduced cost of health care. However, physicians were concerned that an EHR system would be a burden for their finances, for their time concerning training on the system, for their everyday workload and workflow. The majority of the public generally agreed that they would worry about the possibility that a non-authorized, third party might gain access to their personal health information (48.8%), and that they would worry about future discriminations due to possible disclosure of their health information (48.8%). Most physicians disagreed that EHRs will disrupt the doctor-patient relationship (58.1%) but they would worry about the safety of their patients' information (53.1%). Overall, both the public and physicians were in favor of the implementation of an EHR system, evaluating that possible benefits are more important than possible risks. The majority of the public believed that physicians should have full access to an EHR (90.9%), whereas nursing staff, pharmacists, laboratory staff, and other healthcare professional should have partial access.

Conclusions: The factors identified in the present study present actionable insights that may increase awareness about EHRs. The survey illustrates that both the public and physicians acknowledge the benefits and support EHRs on the condition that sufficient guarantees are provided about privacy and security.

1. Introduction

A basic Electronic Health Record (EHR) is an electronic database with information concerning a patient's (or citizen's) health. An EHR may include data concerning identification of the patient, demographic characteristics, medical history, family history of diseases, previous hospitalizations, previous and current therapies, possible allergies and intolerances, as well as laboratory results, genetic test results, and diagnostic imaging results. In addition, it may include data about

healthcare professionals and hospitals/clinics that provided any kind of health care to the patient in the past. [1] An EHR's data may be the basis for epidemiological studies or a source for comparative effectiveness research, and also contain information of administrative, economic, and statistical nature. In order to facilitate better management of patient treatment, clinical care and welfare, most EHR systems (EHRs) that are currently used are integrated with additional functions, such as Computerized Physician Order Entry (CPOE) that allow medical professionals to enter medication orders electronically and Clinical

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Decision Support (CDS) that facilitate decision making. [2,3]

Most countries in Europe and the USA are increasingly using EHRs to help improve health care quality. The benefits and risks of using an EHR system have been extensively studied and reviewed in the literature. [4,5] Briefly, expected benefits include: a) immediate and better access to health data facilitating immediate clinical decision making of good quality, [6] b) prevention of allergic reactions and harmful interactions with other pharmaceutical substances, c) continuity in the health record, which is particularly important for the chronically ill, d) better communication and coordination between different physicians, clinics and hospitals, e) a quality control mechanism to evaluate the efficacy of healthcare professionals, clinics and hospitals, f) a valuable repository of health data for use in epidemiological studies, administrative analyses and research purposes, g) a valuable repository of patient data that may facilitate patient recruitment for clinical studies, [7] and h) economic benefits. [8]

However, the use of EHRs imposes privacy concerns, legal and social issues [9–11] including: a) privacy issues, such as identity theft and data falsification, [12] b) issues of ownership and management of the stored health data, [13] c) access of employers to health information and risk of stigmatization, d) access of private insurance companies to health information, e) practical barriers to the implementation of EHRs in the clinics and practices, and f) lack of standardization in EHRs that does not facilitate exchange of clinical data. [14]

To promote cross-border health care in the European Union (EU) and anticipating the aforementioned benefits, the EU initially set the basis for the implementation of EHRs in the EU member States with Directive 2011/24/EU on the application of patients' rights in cross-border health care. Greece has set the legislative framework for the adoption of an EHR system with the 2014 Law 4238/2014, under the auspices of the Ministry of Health. According to Law 4238/2014, Article 5(d), the family doctor is responsible for the creation, maintenance and management of an EHR record for each citizen. A system of Patient Summaries is currently being developed by the Ministry of Health based on the eSOS Patient Summary. [15] Details of how the EHR will be created and applied remain to be specified by Ministerial Decisions. Until then, a thematic review and a policy-analysis for EHRs in the Greek National Health System showed that the implementation of EHRs in the Greek healthcare setting has been widely fragmented. [16]

To date, there has been no study of the public's or physicians' perceptions about EHRs in Greece. The present survey is a pilot study that aimed to record the public's and physicians' awareness, expectations and ethical concerns about the use of EHRs. As we progress toward an EHR system implementation, a more in-depth understanding of attitudes that influence overall levels of EHRs support is required.

2. Materials and methods

2.1. Participants and questionnaires

A convenience sample was surveyed for both the public and physicians. A printed version of the Public's Questionnaire was distributed to the public, with no selection criteria. The authors E. E. and E. M distributed in person the Public's Questionnaire to students and staff of the Technological Educational Institution of Athens, extended family and social circle. Subsequently, an online version of the questionnaire was developed using Google docs, which was sent to student university mailing lists of 736 students, as well as personal mailing lists, asking the recipients to complete the questionnaire and forward it, at their discretion. The Public's Questionnaire was completed by 421 participants in total.

An online version of the Physicians' Questionnaire was developed using Google docs. The online list of physicians contracted with The National Organization for the Provision of Healthcare Services (EOPPY) in Greece was used, [17] and 7754 physicians with available email addresses were identified and received the Questionnaire by email. The

Physicians' Questionnaire was also sent to 36 Medical Associations which are available in Greece, asking the recipients to complete the questionnaire and forward it to their colleagues, at their discretion. In total, 225 physicians from various specialties completed the Physicians' Questionnaire.

For both questionnaires, the questions were carefully chosen after a review of the relevant literature, [18–26] and many of them were common in the two questionnaires. At the start of each questionnaire, demographic characteristics of the participants were requested. This demographics section was followed by brief questions to probe participants' awareness about EHRs. After a brief introduction on EHRs, the participants were asked to complete closed-ended questions, including Likert and dichotomous questions, which assessed attitude and perception on the impact of EHRs on a patient's health, advantages, risks and ethical issues raised. Approximately 12–14 min were needed to complete each questionnaire.

The questionnaires were completed voluntarily and anonymously by all study participants, between December 2014 and April 2015. For the electronic questionnaires, e-mail addresses or IP addresses of participants were not visible to the research team.

2.2. Statistical analysis

Statistical analysis was performed using the SPSS software (v17.0) (IBM, Armonk, NY, USA). Descriptive statistics were calculated to summarize the characteristics and the answers of the responders. The Pearson's chi-square test was used to compare differences between answers at $p \leq 0.05$ level of significance.

3. Results

3.1. Characteristics of participants

Most of the responders from the public were less than 40 years of age (84.1%), females (69.8%) and received tertiary (university) education (73.6%), with 40% coming from the professional field of biology and health sciences. Most of the responders from the public assessed their state of health as good (26.4%), very good (33.6%) and excellent (19%) although the vast majority visited their doctor at least once in the past six months (71.1%) (Table 1).

Most of the physicians who responded were more than 40 years of age (80.1%), males (81.3%), the majority were general practitioners (19.6%) or cardiologists (16.1%), who mostly used a computer for professional reasons at their private practice (62.5%). Most of the physicians had used an EHR system in the past (66.1%) (Table 1).

3.2. Awareness of EHRs

Only 46% of the public were aware of EHRs and 21% knew that according to Law 4238/2014, the family doctor of each citizen is responsible for creating and maintaining an EHR.

The vast majority of physicians were aware of EHRs (91%), but only 58% knew that the Law 4238/2014 sets the legislative framework for the adoption of an EHR system (Fig. 1).

3.3. Perceived impact of EHRs

The vast majority of the public and the physicians agreed (somewhat agreed/agreed/strongly agreed) about the positive impact of EHRs on better, more effective (public 76.9%, physicians 87%) and faster decisions (public 75.7%, physicians 79.5%) on the patients' health. Most of the participants also agreed that EHRs will have a positive impact on better coordination between hospitals/clinics (public 80.9%, physicians 91.9%), on quality of health care (public 67.2%, physicians 77.7%), as well as on reduced cost of health care (public 58.1%, physicians 62.5%) (Table 2). Despite the perceived positive

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