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Adoption of health information technologies by physicians for clinical practice: The Andalusian case

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ABSTRACT

Objectives: We investigated the level of adoption of Health Information Technologies (HIT) services, and the factors that influence this, amongst specialised and primary care physicians; in Andalusia, Spain.

Methods: We analysed the physicians' responses to an online survey. First, we performed a statistical descriptive analysis of the data; thereafter, a principal component analysis; and finally an order logit model to explain the effect of the use in the adoption and to analyse which are the existing barriers.

Results: The principal component analysis revealed three main uses of Health Information Technologies: Electronic Health Records (EHR), ePrescription and patient management and telemedicine services. Results from an ordered logit model showed that the frequency of use of HIT is associated with the physicians' perceived usefulness. Lack of financing appeared as a common barrier to the adoption of the three types of services.

For ePrescription and patient management, the physician's lack of skills is still a barrier. In the case of telemedicine services, lack of security and lack of interest amongst professionals are the existing barriers.

Conclusions: EHR functionalities are fully adopted, in terms of perceived usefulness. EPrescription and patient management are almost fully adopted, while telemedicine is in an early stage of adoption.

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1. Introduction

Health Information Technologies (HIT) comprise the application of Information and Communication Technologies (ICT) involving both computer hardware and software that deal with the processing, storage, retrieval, sharing and use of health care information, data, and knowledge for communication and decision making [1]. Several studies state that HIT can alleviate the socioeconomic challenges that healthcare systems in Europe face, like the demographic change and the increasing prevalence of chronic diseases [2,3].

According to Fonkych and Roger [4], the process of diffusion of new technologies starts with their technical development, and it culminates in full adoption when they are integrated and normalised into the health care processes. Other studies [5,6] that analyse the integration of HIT into medical practice states that they need to be embedded in the health care system and that the physicians play a key role in the process through the adoption of the technology. In addition, there is a need to adapt the HIT adoption models specifically to the health care context [7], considering its drivers and barriers. That is, which are the factors that promote or prevent the adoption of HIT for the clinical practice [8–11].

Thus, the aim of this study is to investigate the level of adoption of HIT taking the physicians' perceived usefulness of the technology, as defined in Ref. [7] as culmination of the adoption process described by Rogers [12]. For that, we consider the different technological adoption models reviewed by Holden and Karsh [7]. In addition, we assess which barriers affected this adoption. To do this, we investigate the following two questions: (1) to which extent have the physicians adopted HIT? Does the use affect the perceived usefulness? (2) Which are the remaining adoption barriers in Andalusia?

Factors for adoption of HIT have been one of the critical areas of research of the European Commission during the last decades. Its research centre, the Institute for Prospective Technological Studies (IPTS), in Andalusia has collaborated with the Andalusian Public Health System (SSPA) to analyse the eHealth integration in the area.

The choice of Andalusia as a case study is not trivial. Several studies have highlighted Andalusia as a guiding example of eHealth deployment in Europe [13–15]. Andalusia is a region situated in the south of Spain accounting for 17.8% of the Spanish population (more than 8 million citizens). The Andalusian health system is a public integrated system [16] managed and governed by the SSPA that has made the integration of HIT a top priority of the Andalusian health policy since its foundation in 2000. Concretely, it managed the deployment of *Diraya* [17] in primary and specialised care whose services portfolio includes both preventive activities and chronic care for the Andalusian population. Some examples of these services are the electronic health record (EHR), electronic prescription (ePrescription) and appointments made via a call centre or through an online service. This deployment started in 2004, and it covered more than 94% of the whole population by January 2010. The political stability of Andalusia, whose parliament has been held by the same political party for the last 30 years, has permitted the presence of the main facilitators to ensure the full integration into the system [18], such as

a strong policy commitment, a reorganisation of services and new governance mechanisms to guarantee the care continuum and the provision of funds coming mainly from Europe as structural funds to cover the up-front costs.

The paper is organised as follows. Section 2 describes the survey and its instruments, the data collection process, data analysis methodology and econometric models. Section 3 contains detailed descriptions of the results, which are discussed in Section 4. Finally, Section 5 contains the conclusions of the study.

2. Methods

2.1. Survey design and data collection

The research was conducted by the IPTS with collaboration from the SSPA. Both institutions provided appropriate ethical approval, piloted the survey and approved the final version.

The survey instruments were supported by previous questionnaire [6] and the literature review carried out by Holden and Karsh [7]. In addition, both experts from both institutions discussed the instruments to adapt it to the Andalusian context. The questionnaire is organised into three sections: section (A) population demographics by age and workplace; section (B) use of the Internet in clinical practice; section (C) use of HIT in clinical practice; including remote monitoring and telemedicine.

In section C, the survey contained an instrument querying the availability and frequency of use of 16 HIT functionalities. Another instrument assessed the perception of usefulness of the same HIT services. In addition, physicians assessed the presence of several barriers that may hamper the adoption of such services. A detailed description of the above instruments may be seen in [Table 1](#).

The survey was sent to the whole population of primary and specialised care physicians of the SSPA with institutional e-mail addresses, a total of 12,500, in July 2011. The invitation outlined the objective of the study and contained a link to an online questionnaire. The confidentiality of individual responses and ethical issues were guaranteed, and there was no financial incentive to take part in the survey. Two reminders were sent before October 2011.

2.2. Data analysis

The analysis consisted of two steps. First, a principal component analysis of 16 questions (i.e. items) related to the perceived usefulness of HIT services for clinical practice. This is a multivariate analysis which classifies all items into groups maximising the variance of the answers. We considered an item to be saturated if (1) the size of its loading was over 0.45, as suggested by Comfrey and Lee [19]; (2) its communality was over 0.4; and (3) the difference between the main loading size and the cross-loading sizes was over 0.15. All chosen factors contained at least two saturated items, and the amount of total variance explained by all factors was necessary over 50%.

The second step was to measure the association between the frequency of use and the perceived usefulness within each factor by fitting an ordered logit model to our dataset. This is a

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