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The Electronic Health Record adopters: a typology based on patients' privacy concerns and perceived benefits

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Author contribution

EC were responsible for overall study design. EC and MM conceived the theoretical background and prepared the methodology and questionnaire. EC was responsible for data collection, analysed and interpreted the data. EC and MM write and conceive the original Draft.

Electronic Health Record adopters: A typology based on patients' privacy concerns and perceived benefits

ABSTRACT

Objectives: Patients' adoption of electronic health records (EHRs) varies substantially. While some countries, such as Estonia and Denmark, are sufficiently advanced in terms of EHR generalization, others, such as France, are figuring out how to implement and disseminate EHRs. These governments must respond to patients' disparities to achieve the expected performance for health care systems and improve the quality of care delivery. This study investigates patients' perceived benefits and privacy concerns related to EHRs to develop a typology of patients, identify the characteristics of different clusters, and propose practical measures for public policy-makers.

Study design: We conducted a cross-sectional study using online questionnaires.

Methods: An online quantitative survey was carried out in France. The final sample of EHR non-users (N=1076) was fitted to be representative of the French population by age and gender, region, and socio-professional status. Hierarchical and nonhierarchical cluster analyses were performed. Several robustness check analyses were also performed.

Results: Cluster analyses identified four patient clusters: *the worried*, who show the highest mean privacy concern and risk levels related to health data disclosure; *the ready adopters*, who lack privacy concerns and risk and are the most motivated by EHR benefits; the *concerned adopters*, who express far fewer privacy concerns and perceive EHR benefits more favourably than *the worried adopters*; and *the balanced adopters*, who are relatively similar to *the ready adopters* in their EHR motives and are still concerned about their health data, suggesting a segment that is easier to convince. Comparing clusters regarding the intentions to create EHRs and willingness to disclose health data confirm that *ready adopters*, followed by *balanced adopters*, are more likely to create an EHR and disclose health data. *The concerned adopters* and, finally, *the worried* exhibit the lowest intentions for EHR creation and data disclosure.

Conclusions: The results provide meaningful insights into patient profiles and expectations. The findings underscore the need to implement targeting policies for each cluster and design concrete solutions for improving EHR performance.

Keywords: Electronic Health Record; patients' typology; privacy concerns; trust; usefulness, control

INTRODUCTION

The increasing use of information technology in health care services provides important opportunities for improving the quality of care delivery. Specifically, the electronic health record (EHR) is expected to be an efficient enabler of a safe and high-performing health system. ¹⁻³ It stands as a major technology for health data exchange among the triad: health policy-makers, health care providers, and patients. Previous studies report that EHRs increase patients' engagement in their care follow-up and the relationship they have with their physicians ⁴⁻⁵, reduce health care-related organizational and innovation costs, ⁶⁻⁹ support accurate diagnoses and treatment decision-making, and improve research as well as preventive and chronic illness care. ¹⁰⁻¹⁵

While health care providers and governments agree on the usefulness and benefits arising from EHR implementation, the understanding of patients' adoption and extent of use remains an important challenge in many countries. That is, the EHR dissemination may depend on the system type: opt-in vs opt-out. Some countries such as Estonia have adopted an out-out system in which patients are automatically enrolled through an implicit consent, while others such as France have implemented an opt-in system in which patients give an explicit consent when they need to create an EHR ¹⁶⁻¹⁷ For instance, although countries such as Estonia and Denmark are sufficiently advanced in terms of EHR generalization ^{12-15,18}, others are still figuring out how to implement and disseminate EHRs.

In the United Kingdom, the National Health Service (NHS) is trying to reintroduce the nationwide EHR system after the dismantling of the first attempt in 2011. The NHS explains that previous attempts to disseminate comprehensive EHRs have failed due to issues concerning patient confidentiality, among other issues. The Information Governance Review recognizes that even if the sharing of personal health information is in the patient's interest, it is as important as the duty to ensure confidentiality and protect patients' privacy. ¹⁹⁻²⁰

Moreover, in an attempt to make the EHR succeed, the Australian federal government made the EHR system opt-out in 2018/19. However, although more than 90% of Australians have an EHR created for them, just half of those records contain medical data ²¹. For instance, prior studies argued that the Australian EHR opt-out system has created an ethical dilemma for the implementation of an effective consent model, beyond the main privacy issues such as risk and security and concerns about third-party illegitimate access to data ¹⁶⁻¹⁷.

Additionally, the French Health Ministry is facing large-scale patient reluctance, with less than 9.5% having an EHR and only a few of them completing their personal health data. ²² To handle patients' disinclination, French authorities have defined a specific legal framework to encourage EHR dissemination and adoption by French users. Thus, the Section L. 1111-11 of the Act of Public Health Code ²³ states that the creation, as well as the closure, of an EHR is an optional and voluntary process to be undertaken by the patient himself. The EHR is provided by the government through the NHS, and each patient can choose whether to create an EHR and disclose his medical history. It is a free, standardized and secured online portal that may combine all patient's personal health information.

Only attending physicians and emergency medical services are allowed to access the entire 's content. Other care providers must ask for patients' consent. Furthermore, to evade privacy issues, health insurance and occupational medicine organizations are prohibited from accessing EHR data. Finally, the French government insists on consent that provide patients the opportunity to block or remove any health care provider from the list (more details on the French context are provided in supplementary material).

Extant research reports conflicting results regarding patients' attitudes towards EHR adoption. Some studies highlight that patients could support EHRs for personal health usefulness as well as for research. ²⁴⁻²⁵ Recent studies have also shown that patients using EHRs feel more engaged in their care follow-up and their relationships with their physicians. ⁴⁻⁵.

However, medical data collection and rapid advancements in computing analyses may draw sensitive inferences about individuals from their health data.²⁶⁻²⁸ . Thus, a range of concerns has been reported as major impediments to EHR adoption, including privacy, perceived risk (security), and control over access.^{24, 29-31} Pang et al.¹⁶ have identified nine type of privacy concerns for the several stakeholders involved with the EHR implementation. They particularly found that risk, control over access and trust are determinant factors of privacy concerns for the patients' group and the privacy advocates.

Given the disparities in patients' attitudes, governments and policy-makers need to better understand the attitude of patients towards EHR adoption. This need is extremely important because the EHR's effectiveness and the improvement of the quality of care require patients' involvement and consent in the health data exchange process.³²⁻³⁵

Therefore, the objective of this research is to develop a typology of patients based on a set of motives and concerns related to EHR adoption and use.

Indeed, although the number of studies investigating the potential benefits and hindrances to EHR development is steadily growing, to the best of our knowledge, no researchers have investigated patients' perceived benefits and privacy concerns of EHRs to develop a typology of patients. Thus, this research makes an important contribution to the current literature by extending knowledge of patient attitudes, helps researchers establish congruency of empirical findings, and anticipate and understand patients' behaviour. Moreover, while some nations have succeeded in establishing an indefectible data infrastructure for health information exchange (e.g., Estonia), many others struggle for EHR dissemination and still have insufficient knowledge about patients' characteristics to respond to their resistance and design concrete and targeted solutions for improving EHR performance.

Thus, the intention of this study is to provide an overview of patients' profiles regarding EHR adoption to propose practical measures for public policy-makers in many countries to implement targeting policies for each cluster.

The empirical typology developed is based on a set of variables and characteristics to assign individuals to homogeneous groups. We mainly focus on factors that influence levels of EHR adoption and use, namely, patient privacy concerns, perceived risk, perceived control, trust, perceived usefulness and perceived ease of use.

Personal health data are more sensitive than other types of personal information, making patients more likely to worry about their health data ³⁶⁻³⁷ and to engage in privacy-protective behaviour. ^{33, 38-39}

Particularly, for many countries, health data collection may disrupt the relationship among health care providers and patients since they could be extended to several entities, such as insurance companies, pharmacists, advertising sponsors, and so forth. Concerns may also arise from possibilities of data abuse for manipulation, hidden influence, or discrimination against those with pre-existing medical issues. ²⁶

Previous studies show that privacy concerns are considered as a major barrier to health care-based technology use ^{28, 40-43} and personal information disclosure. ⁴⁴⁻⁵⁴ Thus, patients' privacy concerns provide the first theoretical basis for examining the underlying reasons for EHR adoption (for a review, see ^{44, 55-56}). Moreover, the extant literature suggests that patients' privacy concerns are closely related to perceived security risk ⁵⁷⁻⁶⁰ and control. ^{45, 57, 61-62}

Consistent with past research, we consider these variables as a part of the overall adoption intention process. Moreover, considering patient segmentation solely on the basis of the factors that hinder EHR adoption provides a limited understanding of patient characteristics. Thus, we complete our model by including trust, perceived usefulness and perceived ease of use as enablers for EHR adoption and personal health data exchange. Existing findings have

shown that trust in health care providers mitigates patients' privacy concerns and health data disclosure.^{57-58, 63-65} Finally, we incorporated the Technology Acceptance Model (TAM)⁶⁶ to better understand patients' intentions towards EHR. TAM is widely used in health care-based technologies to predict individuals' behavioural intentions through two main antecedents: perceived usefulness and perceived ease of use (for a review, see²). However, both of these factors were used to explain EHR adoption in varied contexts (e.g.⁶⁷⁻⁷⁰). Therefore, to successfully tailor discourses addressed to patients and appropriately define incentives, we integrated these specific variables into the typology analysis (see supplementary materials for concepts definition).

Typologies serve as a basis for people's segmentation and targeting strategies. Thus, health care providers and policy-makers could rely on this typology to effectively tailor their discourse to these patient segments. Through the identification of the main patient profiles, we intend to provide governments and health care providers with a set of recommendations to increase EHR adoption. Furthermore, the outcomes of this study would be helpful for many countries that are trying to introduce and disseminate EHRs.

METHODS

Data collection and sample

A cross-sectional study was conducted between December 2019 and February 2020. A reminder was sent to increase the response rate. Participants were invited to voluntarily answer an online questionnaire sent by e-mail to the authors' networks and posted on generic social network groups (see supplementary materials). We collected 2953 questionnaires. After excluding incomplete questionnaires, participants under 20 years of age and carelessly completed questionnaires from the sample (IMC)⁷¹, we validated 1076 nonusers of EHRs, which represents a response rate of approximately 37%. Carelessly completed questionnaires

were identified using the Instructional Manipulation Check (IMC) developed by Oppenheimer et al. (2009).

Owing to our recruitment procedure, based on online dissemination of the questionnaire and on voluntary participation, we reweighted the sample size to be representative of the French population and reduced selection bias (INSEE) (Table 1).

This study was approved by the University Clermont Auvergne (IRB00011540-2020-42).

Table 1

Measurement scales

All the measurement scales used in this study are derived from existing studies and were slightly adapted to fit the context of this research (Table 2). Participants reported their responses on a five-point Likert scale ranging from “strongly disagree” to “strongly agree”. Details on the factor analysis, reliability and validity assessment are provided in the supplementary materials.

Table 2

Cluster analysis and validation

First, we performed a hierarchical cluster method to explore the possible number of clusters that can be extracted. We used squared Euclidean distances and Ward's method to determine the number of clusters that we should keep. Examination of the dendrogram and cubic cluster criterion plots suggested a four-cluster solution. Second, to determine the characteristics of each cluster, we applied a nonhierarchical cluster method using k-means clustering.

We defined a four-cluster solution as input for cluster optimization. The results of the k-means clustering ANOVA supported the solution and all the variables used in this research for the clusters' identification were significant (Table 3). Robustness check observations performed to confirm the four-cluster solution are provided in the supplementary materials.

Table 3

RESULTS

The cluster analyses suggest a four-cluster solution. The characteristics of each cluster regarding 1/privacy concerns, 2/perceived risk, 3/perceived control, 4/trust, 5/ease of use, 6a/usefulness for personal health improvement and 6b/usefulness for health data access and management are detailed below (see Table 4).

Table 4

Additionally, we analysed for each cluster the demographic characteristics in terms of gender, age, education and socio-professional category. We used Chi-square tests to identify the demographic characteristics that distinguish each cluster (Table 5).

Moreover, to strengthen the comprehension of each cluster, we measured participants intention to create an EHR and willingness to disclose personal health data – as profiling variables. ANOVA analysis were performed to compare the means of each cluster on these two variables (see supplementary materials).

Cluster 1: The worried (N=41)

The first cluster was termed *Worried* since they show the highest means of the two factors related to privacy concerns and perceived risk. This group is greatly concerned with the

negative consequences arising from the use of EHRs to the point of no longer considering the benefits of EHRs. These patients report the lowest perceptions of trust, usefulness for personal health improvement, usefulness for health data access and management, and ease of use and control. Patients in this group report the highest education levels and socioprofessional categories and are mostly in their forties. *Moreover, the worried* exhibit the lowest intentions for EHR creation and personal data disclosure.

Cluster 2: The balanced adopters (N=118)

This cluster is close to the *ready adopters* because it exhibits similar scores in terms of trust, perceived control and usefulness. Patients in this group, however, simultaneously gather negative and positive factors regarding EHR use. They express, on the one hand, some privacy concerns and perceived risk and reports, on the other hand, trust, usefulness for personal health improvement, usefulness for health data access and management, ease of use and control. Patients in this cluster are predominantly male, older than average (between 40 and 49, and mostly in their fifties). They have the second-lowest levels of education and socioprofessional categories. Patients also show high scores regarding the intention to create an EHR and willingness to disclose personal health data.

Table 5

Cluster 3: The ready adopters (N=366)

This cluster possess a typical feature: no worry about personal health data collection and risks. They present the lowest levels of privacy concerns and perceived risk. Moreover, this group expresses high levels of EHR benefits: trust, usefulness for personal health improvement, usefulness for health data access and management and control. The patients were older than average (over 50 and mainly between 60 and 69). They are predominantly female and have

below-average levels of education and socioprofessional categories. Moreover, the ready adopters are among those who are more likely to create an EHR and disclose their personal health data.

Cluster 4: The concerned adopters (N=551)

Patients belonging to this cluster report lower levels of privacy concerns and perceived risk than patients in Cluster 1. Moreover, this cluster scored higher on the factors related to the benefits of EHRs: trust, perceived control, ease of use and usefulness for personal health improvement and usefulness for health data access and management. Patients report the second-highest education levels and socioprofessional categories and are younger than average (between 20 and 49). Concerned adopters also show low scores regarding the intention to create an EHR and willingness to disclose personal health data.

DISCUSSION

The clustering findings suggest the presence of four distinct patient profiles. *The ready adopters*, followed by *the balanced adopters*, are more likely to create an EHR and disclose their personal health data. This is because they express the lowest privacy concerns levels, compared to *the worried*, followed by *the concerned adopters*, who exhibit the highest mean of privacy concerns and perceived risk factors. In fact, patients' concerns of these two clusters are very close to the privacy advocates concerns in Pang et al. ¹⁶ study. Accordingly, *the worried and the concerned adopters* develop the lowest intentions for EHR creation and data disclosure. Demographic characteristics somewhat explain the results. *The worried and concerned adopters* are younger than average and have the highest education levels and socioprofessional categories. Conversely, *the ready adopters and the balanced adopters* are older than average and have below-average levels of education and socioprofessional categories.

This study extends our understanding of patients' concerns and motives, particularly in countries trying to disseminate EHRs. It provides governments with meaningful insights to implement targeting policies and design concrete solutions for improving EHR performance. While privacy concerns and perceived risk were found to be significant hindering factors, trust, perceived usefulness and perceived control were significant motives for EHR adoption, suggesting that these factors may serve to differentiate the patients' profiles. Furthermore, this study supports and contributes to research on health data exchanges. It indicated that privacy issues are major inhibitors of patients' adherence and willingness to disclose their personal information.^{20, 44-46}

It also extends our current knowledge of EHR adoption through the patients' perspective beyond the health care providers' and policy-makers' vision. The current results shed light on of the conflicting literature findings between antagonists^{24, 29, 33} and supporters.²⁴⁻²⁸

Public policies should first deploy great efforts to reassure patients about the use of their personal information and, at the same time detail the benefits of EHRs. For example, the French government should follow Estonia's successful example and communicate more about the technologies used to safeguard data. The Estonia EHR system is extremely secure and difficult to breach since it incorporates both Keyless Signature Infrastructure blockchain technology and biometric linking (e.g. fingerprints). Such communication initiatives should be oriented towards the *worried and concerned adopters*.

Policy-makers should undertake a strategy that clearly dispels confusion and concern regarding ethical and legal dimensions of data processing and consent. First, all stakeholders (the NHS, physicians, etc.) should detail all reasonable steps to inform patients about the potential direct and indirect purposes of the EHR. They should precisely detail the kinds of data to be stored on the EHR, how it would be stored, types of health care providers likely to access personal data and how it is likely to be used. Moreover, even though the opportunity to

opt-in or opt-out is possible according to law, this is not sufficiently explained to patients, and the decision to opt in or out is not included in the official booklets and website. Thus, enlightening patients that the EHR is managed in compliance with regulations and reassuring them about data confidentiality would help them in trusting health data exchange and continue in adhering to an EHR program. Regarding security risk, the government must be inspired by the established practices in Estonia, for example, and explain to patients that their data are secured by highly advanced technologies such as blockchain, which is extremely difficult to breach.

This research presents some limitations that could indicate directions for future research. First, the main limitation lies in the recruitment process based on the online dissemination of the questionnaire and voluntary participation. Despite this limitation, this research provides new information and exploratory results that might help guide future research and public policy-makers. It would be interesting to duplicate the survey to other European countries facing the same challenges with EHR implementation to increase the validity of the results. Future studies would take into consideration that two different systems do exist, an opt-in *vs* an opt-out model.

Moreover, extending this typology based on perceived concerns and benefits by including other factors is recommended.

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Conflicts of interest None declared

Ethics approval

This study received approval from the Research Ethics Board at the University Clermont Auvergne (IRB00011540-2020-42).

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TABLES

Table 1: Users sample characteristics

Characteristics		French population quotas*	Nb participants (N=1076)
Gender	Male	48.4%	521
	Female	51.6%	555
Age	20-29	14.67%	158
	30-39	16.14%	174
	40-49	16.71%	180
	50-59	17.18%	185
	60-69	15.60%	168
	>70	19.67%	211
Education	High school	53%	570
	Undergraduate	23%	248
	Graduate	22%	236
	Postgraduate	2%	22
Socio-professional category	Student, Retired, Disabled	4.1%	45
	Middle manager	26%	279
	Executive	24.9%	268
	Employee	25.7%	277
	Worker	19.2%	207
Region	Auvergne-Rhône-Alpes	12,40%	135
	Bourgogne-Franche-Comté	4,27%	47
	Bretagne	5,17%	56
	Centre-Val de Loire	3,99%	43
	Grand Est	8,47%	92
	Hauts-de-France	9,16%	99
	Île-de-France	18,89%	204
	Normandie	5,07%	55
	Nouvelle-Aquitaine	9,20%	99
	Occitanie	9,18%	98
	Pays de la Loire	5,88%	64
	Provence-Alpes-Côte d'Azur	7,80%	84

* French population quotas are extracted from the French National Institute for Statistical and Economic Studies (INSEE) <https://www.insee.fr/fr/accueil>

calculate the proportion of participants that would be sufficient to meet the characteristics of

the population in terms of gender, age, education, and socio-professional categories

Table 2: Measurements scales and items used for each construct

Constructs & Items	Extracted variance	α	Standard λ	SMC*	Reliability	pcv
Privacy Concerns (Kim et al. and Ponte et al. ⁷¹⁻⁷²)						
I am concerned that EHR collects too much personal information from me.	75.04%	0.933	0.761	0.579	0.934	0.704
I am concerned that unauthorized persons (i.e., hackers) have access to my personal information.			0.826	0.682		
I am concerned that the EHR will not take security measures to prevent loss and unauthorized access to my personal data.			0.821	0.674		
I am concerned that EHR will share my personal information with other entities without my authorization.			0.88	0.775		
I am concerned that EHR will use my personal information for other purposes without my authorization.			0.903	0.816		
I am concerned that the EHR will sell my personal information to others without my permission.			0.835	0.696		
Perceived risk (Malhotra et al. ⁷⁵)						
There would be too much uncertainty associated with giving my personal health information on the EHR.	76.23%	0.895	0.837	0.7	0.899	0.692
Providing the EHR with my personal health information would involve many unexpected problems.			0.854	0.729		
In general, it would be risky to give my personal health information on the EHR.			0.898	0.806		
There would be high potential for loss associated with giving my personal health information on the EHR.			0.728	0.530		
Perceived control (Dinev and Hart, and Xu, Dinev, Smith and Hart ⁷³⁻⁷⁴)						
I believe that I have control over who can access my personal health data on EHR.	83.37%	0.932	0.797	0.636	0.929	0.767
I believe that I have control over which of my personal health data are visible on EHR.			0.814	0.662		
I believe that I have control over how my personal health data are used on EHR.			0.937	0.878		
I believe that I have control over which personal health data I provide on EHR.			0.945	0.893		
Trust (Malhotra et al. ⁷⁵)						
Persons who can access my EHR would be trustworthy in handling my personal health data.	77.60%	0.928	0.827	0.684	0.928	0.720
Persons who can access my EHR would tell the truth and fulfil promises related to health data I provided.			0.842	0.710		
I trust that persons who can access my EHR would keep my best interests in mind when dealing with my personal health data.			0.887	0.787		
Persons who can access my EHR are in general predictable and consistent regarding the usage of my personal health data.			0.812	0.660		
Persons who can access my EHR are always honest with patients in regard to using health data that they would provide.			0.873	0.762		
Ease of use (Davis, and Venkatech et al. ⁷⁶⁻⁷⁷)						
Using the EHR would be easy for me.	69.33%	0.875	0.64	0.41	0.891	0.627
I wouldn't encounter any problems using the EHR.			0.644	0.414		
I would easily find how to use the EHR interface.			0.752	0.565		
The interface of the EHR would be clear and understandable.			0.951	0.904		

The interface of the EHR would be easy to learn.			0.916	0.84		
Usefulness has raised two factors: usefulness for personal health improvement and usefulness for health data access and management.						
Usefulness a: Usefulness for personal health improvement (Davis, and Venkatech et al. ⁷⁶⁻⁷⁷)						
The EHR improves my health monitoring and follow-up by health care providers.	68.63%	0.905	0.854	0.729	0.908	0.623
The EHR helps me monitor my health more effectively.			0.818	0.67		
The EHR makes it easier to monitor my health.			0.846	0.716		
The EHR helps health care providers to make decisions more easily about my health.			0.734	0.539		
The EHR helps me to better follow-up with my health.			0.746	0.557		
The EHR facilitates your medical procedures.			0.727	0.528		
Usefulness b: Usefulness for health data access and management (Davis, and Venkatech et al. ⁷⁶⁻⁷⁷)						
The EHR helps sharing and exchanging health data faster.	62.84%	0.847	0.851	0.724	0.854	0.544
The EHR allows to easily find my medical history.			0.815	0.665		
The EHR helps health care providers who see me for the first time.			0.758	0.575		
The EHR improves saving my health data and documents.			0.623	0.389		
The EHR gives access to my health data and documents to the health care providers I selected.			0.607	0.369		

Table 3: **Significance of the segmentation variables**

Variables (Standardized factors)	F	Sign.
1/ Privacy Concerns	194.43	,000
2/ Perceived risk	270.59	,000
3/ Perceived control	181.79	,000
4/ Trust	289.09	,000
5/ Ease of use	379.15	,008
6a/ Usefulness for personal health improvement	222.75	,000
6b/ Usefulness for health data access and management	289.91	,000

Table 4: Means and standard deviations for each cluster

Type	The worried	The balanced adopters	The ready adopters	The concerned adopters	F value	Pairwise contrasts**
Cluster no.	1	2	3	4		
n	41	118	366	551		
%	3.81	10.97	34.01	51.21		
Privacy concerns *	1.30 (0.96)	0.10 (1.11)	-0.77 (0.81)	0.39 (0.70)	194.43***	1>2; 1>3; 1>4; 2>3; 4>2; 4>3
Perceived risk*	1.47 (0.89)	0.12 (1.20)	-0.85 (0.74)	0.43 (0.61)	270.59***	1>2; 1>3; 1>4; 2>3; 4>2; 4>3
Perceived control*	-2.36 (0.68)	0.96 (0.84)	0.16 (0.89)	-0.14 (0.75)	181.79***	1<2; 1<3; 1<4; 4<2; 4<3; 3<2
Trust*	-1.62 (1.03)	0.45 (0.94)	0.77 (0.81)	-0.48 (0.60)	289.09***	1<2; 1<3; 1<4; 4<2; 4<3; 2<3
Usefulness for personal health improvement*	-2.65 (0.85)	0.53 (0.66)	0.42 (0.69)	-0.20 (0.85)	222.75***	1<2; 1<3; 1<4; 4<2; 4<3**
Usefulness for health data access and management*	-2.71 (1.59)	0.46 (0.60)	0.55 (0.58)	-0.26 (0.76)	289.91***	1<2; 1<3; 1<4; 4<2; 4<3**
Ease of use *	-0.04 (1.38)	2.04 (0.97)	-0.25 (0.59)	- 0.26 (0.60)	379.15***	2>1; 2>3; 2>4**

* Means and (standard deviations) of privacy concerns, perceived risk, perceived control, trust, usefulness for personal health improvement, usefulness for health data access and management, and ease of use

*** p<0.000

* Pairwise contrasts results do not show a significant difference for ease of use between *the worried* (Cluster 1) and *the ready adopters* (Cluster 3), *the worried* (Cluster 1) and *the concerned adopters* (Cluster 4) as well as between *the ready adopters* (Cluster 3) and *the concerned adopters* (Cluster 4). This is probably because patients do not have any experience with the use of EHR and are unable to evaluate its ease of use.

In addition, *the ready adopters* (Cluster 3) and *the balanced adopters* (Cluster 2) did not differ in usefulness for personal health improvement and usefulness for health data access and management. This could be explained by the fact that both clusters exhibit similar positive perceptions.

Table 5: Clusters' demographic profiles

Characteristics		The worried (N=41; 3.81%)	The balanced adopters (N=118; 10.97%)	The ready adopters (N=366; 34.01%)	The concerned adopters (N=551; 51.21%)	Pearson ChiSquare Sig.
Gender	Male	20 (48.8%)	67 (56.8%)	156 (42.6%)	278 (49.5%)	Chi-square =9.12, p value =0.027
	Female	21 (51.2%)	51 (43.2%)	210 (57.4%)	273 (49.5%)	
Age	20-29	5 (12.2%)	6 (5.1%)	27 (7.4%)	120 (21.8%)	Chi-square =298.61, p value =0.000
	30-39	5 (12.2%)	10 (8.5%)	42 (11.5%)	117 (21.2%)	
	40-49	21 (51.2%)	37 (31.4%)	40 (10.9%)	182 (33%)	
	50-59		52 (44.1%)	88 (24%)	39 (7.1%)	
	60-69		11 (9.3%)	105 (28.7%)	52 (9.4%)	
	>70		2 (1.7%)	64 (17.5%)	41 (7.44%)	
Education	High school	2 (4.9%)	75 (63.6%)	250 (68.3%)	243 (44.1%)	Chi-square =313.57, p value =0.000
	Undergraduate	7 (17.1%)	21 (17.8%)	103 (28.1%)	117 (21.1%)	
	Graduate	20 (48.8%)	20 (16.9%)	12 (3.3%)	184 (33.4%)	
	Postgraduate	12 (29.3%)	2 (1.7%)	1 (0.3%)	7 (1.3%)	
Socio-professional category	Student, Retired, Disabled	4 (9.8%)	8 (6.8%)	25 (6.8%)	8 (1.5%)	Chi-square =388.07, p value =0.000
	Middle manager	8 (19.5%)	14 (11.9%)	23 (6.3%)	234 (42.5%)	
	Executive	19 (46.3%)	17 (14.4%)	37 (10.1%)	195 (35.4%)	
	Employee	5 (12.2%)	52 (44.1%)	155 (42.3%)	63 (11.4%)	
	Worker	5 (12.2%)	27 (22.9%)	126 (34.4%)	51 (9.3%)	