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Knowledge, use and attitude toward eHealth among patients with chronic lung diseases

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ABSTRACT

Background: Despite high expectations and numerous initiatives in the area of eHealth, implementation and use of eHealth applications on a national level is no common practice yet. There is no full understanding of patients' attitude on eHealth yet. Aim of this study is to gain insight into the level of knowledge and experiences with eHealth of people with chronic lung diseases.

Method: A telephone survey among 400 people with a medical diagnosis of asthma or COPD was conducted. All patients participated in the larger research program National Panel of people with Chronic diseases or Disabilities (NPCD) conducted by NIVEL.

Results: Eight percent of the asthma and COPD patients knew of the term eHealth. Knowledge of specific eHealth applications (e.g. electronic medical record, electronic consultations, monitoring from a distance) was higher and ranged from 21 to 88%. Most available applications were used by less than 20% of the patients, although figures differ by age and educational level. People who have used applications were in general rather positive about their use. Non-users did not see clear advantages of using eHealth applications. A majority thought that eHealth decreases human contact in health care and will not contribute to a higher quality of care. On the contrary, almost half of the patients considered eHealth as a possibility to take more responsibility in their own care. Asthma and COPD patients were unanimous that the use of eHealth should always be a free choice.

Conclusion: Although most asthma and COPD patient know of one or more eHealth applications, actual use remains low. Patients who do have experience with the use of eHealth are on the whole positive. However, patients without experience have no clear ideas about the advantages. They should be convinced first, and stressing the possibilities for more personal control might be an important argument to persuade them.

1. INTRODUCTION

With the aging population and changing lifestyles, the prevalence of chronic diseases such as diabetes, heart diseases and chronic lung diseases is increasing [1]. This results in greater demands for health care services and improvements in effectiveness and efficiency, and thereby in a rapid increase in costs of health care. Given these developments, it is becoming more challenging to deliver health care according to these increasing demands and an efficient health care organization is needed [2].

A promising solution to this problem that is advocated by European governments and industries might be eHealth [2] and [3]. eHealth is the use of information and communication technologies (ICT) to support health and the health care system [4], also referred to as telehealth or telemedicine [5]. It includes a wide range of initiatives and applications, e.g. electronic health records, electronic consultations with care givers, monitoring from a distance and online contact with other patients [6].

The expectations of eHealth are high. It has been mentioned as a solution for the shortage of health care professionals as eHealth has the potential to increase self-management and empowerment of patients, for example by giving patients insight into their own health condition, enabling them to make informed choices and engaging them in self-care activities, and thereby diminishing the need for face to face contact with the health care professionals [7]. eHealth is also expected to improve the quality of care, increasing patient safety and improve continuity of care [2]. The European Commission has unveiled an Action Plan on eHealth in 2012, which aims to improve healthcare for the benefit of patients, give patients more control of their care and bring down costs [8].

However, the benefits of eHealth have not been fully proven yet, which leads to significant discussion around this topic. Evidence on the effectiveness of eHealth is limited and heterogeneous. Interventions that are performed around eHealth differ widely in population, type of intervention and outcomes measured [9], [10] and [11].

A group in which eHealth could have a beneficial effect is patients with a chronic lung disease, such as asthma or chronic obstructive pulmonary disease (COPD). Self-management could play an important role in controlling chronic lung diseases (i.e. prevention of further health deterioration and acute attacks of dyspnea) [12], and therefore the utilization of eHealth is of great interest [11]. Although inconclusive, literature suggests that eHealth (e.g. health care at a distance, home telemonitoring, telephone support) has the capacity to reduce exacerbations and rates of hospitalization and has a positive effect on the quality of life in chronic lung disease patients [13], [14] and [15].

While the interest in eHealth is growing, the implementation of eHealth is no common practice yet [5]. Initiatives for eHealth applications are mainly regional and collaboration between regions is necessary to reach national coverage [16]. In the Netherlands, upscaling the implementation of eHealth by joint actions is highly advocated by the national government [17]. The National Implementation Agenda

(NIA) has been developed as a collaboration of care givers, care takers and health insurances in 2011. Their activities are focused on creating more awareness of the possibilities of eHealth, increasing the use of eHealth applications and promoting further research and development around eHealth [18]. In concordance with NIA, an action plan for eHealth implementation research has been developed to accelerate implementation and wide application of eHealth innovations in daily health care [19].

A crucial factor for successful implementation of eHealth is a positive attitude toward eHealth of its intended users, e.g. the patients. Currently, there is no clear understanding of what patients know about eHealth and what their attitude about its use is. This study is conducted to gain insight into the level of knowledge and experience of patients with chronic lung diseases with eHealth applications as well as their general attitude toward the use of these applications in the daily care for their lung disease. Understanding these aspects may be helpful to further implement eHealth applications and to target eHealth interventions more specifically to subgroups of chronic lung disease patients given their knowledge, former experiences and attitudes toward eHealth.

2. METHODS

2.1. Participants

Patients were selected from the ‘National Panel of people with Chronic illness or Disability’ (NPCD), a nationwide ongoing panel study on the effects of chronic illness, conducted in the Netherlands since 1998 [20]. Selection criteria for inclusion in this panel are a diagnosis of a somatic chronic disease by a certified medical practitioner, being 15 years or older, being non-institutionalized, being aware of diagnosis, not being terminally ill (life expectancy more than 6 months according to general practitioner), being mentally able to participate and having a sufficient mastery of the Dutch language [21] and [22]. Before enrollment in the panel, informed consent of the patients is obtained. The NPCD is registered with the Dutch Data Protection Authority and data are collected following privacy protection guidelines of this Authority.

For this study, patients with a medical diagnosis of asthma or COPD were selected from the panel according to codes of the International Classification of Primary Care [23]; R96 (asthma), R91 or R95 (COPD).

2.2. Procedure

Data were collected by means of a telephone survey in October 2012. A pool of 908 patients from the NPCD was available for this study. Recruitment from this pool was continued until 400 interviews had been completed. To reach this number, 655 patients were randomly approached: 75 patients could not be reached within the study period, 180 refused to participate and 400 agreed to participate (response rate 61%). Those who refused to participate were slightly lower educated than the participating patients, but they did not differ in gender, age, type of chronic lung

disease, living situation, comorbidities or severity of disability. Interviews were taken during the daytime and in the evenings and the average duration was 19 min per interview. This survey was not announced in advance, to prevent selection bias and bias to baseline knowledge regarding eHealth.

2.3. Backgrounds characteristics

Information about age, gender, highest level of education and living situation was taken from the NPCD database. Because of the small percentages of patients who were living alone, divorced, or widowed, living situation was dichotomized into living together (with a partner and/or children or other family members) versus living alone. Educational level was divided into three categories: low (vocational training), middle (high school), and high (college or university). The medical diagnosis of chronic diseases was registered by their general practitioner using the International Classification of Primary Care. Based on the number of registered medical diagnoses, we computed a dichotomous variable 'comorbidity', distinguishing patients diagnosed with asthma or COPD only from those with other chronic diseases next to their lung disease. At inclusion in the NPCD, patients reported the presence and severity of long-term functional disabilities. Patients were divided into three groups: those without or with mild disabilities, those with moderate disabilities and those with severe disabilities. Patients with moderate disabilities have difficulty with several activities, for example walking or dressing, but still can carry out these activities independently. Patients with severe disabilities are unable to perform one or more activities independently.

2.4. Questionnaire

The semi-structured interview consisted of three parts: (1) knowledge of eHealth, (2) actual use and evaluation of eHealth applications and (3) general opinions about eHealth and the use of internet in health care. Knowledge of eHealth was measured by asking whether the respondent had ever heard or read about the term eHealth or a specific eHealth application (12 items). Additionally, they were asked if they would like to receive (more) information about the application, independent of knowledge. The list of applications was constructed on the basis of literature and in collaboration with the Dutch Lung Foundation to select relevant applications for patients with chronic lung diseases. A full description of the applications as used in the telephone survey can be found in Appendix I. Questions about actual use and experiences with the applications were restricted to those who had indicated to have a computer, laptop or smartphone (83%). Information on actual use was obtained by the question whether the respondent (or someone from their household) had experience with using the specific application (13 items). When answered affirmatively, we asked whether the respondent evaluated this experience as positive or negative and respondents were asked to motivate this answer (open question). For patients without experience with a specific application, the subsequent question was whether it could be beneficial to them, providing that it would be available to the respondent. General opinions about eHealth and the use of internet for lung care were assessed by means of 11 statements, covering advantages and disadvantages for patients in relation to eHealth.

2.5. Statistical analysis

Descriptive statistics were used to conduct the analyses. Differences between subgroups were tested by ANOVA, with $p \leq 0.05$ considered statistically significant. Knowledge and experience with eHealth applications were dichotomized to be able to make a comparison between subgroups. Cut-off points were based on median values, which were knowledge of six or more applications and experience with two or more applications. The item of experience with online search for health complaints was not included in the analysis for total experience with eHealth, as this is an application one could do already before diagnosis of a disease. It therefore differs from the other applications as they are more applicable post-diagnosis. All analyses were performed using STATA version 12.1.

3. RESULTS

Baseline characteristics of the 400 chronic lung disease patients are shown in Table 1. Almost half of the patients (46%) were male and 90% was older than 40 years. 56% was diagnosed with COPD; 44% with asthma. A total of 83% indicated to have a computer, laptop, tablet or smartphone.

[TABLE 1]

3.1. Knowledge of eHealth

Only 8% of the respondents knew of the term eHealth. This percentage was considerably higher for the specific applications, as displayed in Fig. 1. Patients with asthma and COPD had heard most of the electronic patient record (88%) and online purchase of medication and devices (74%). The knowledge of other applications varied from 21% to 61%. Half of the study group had heard of six or more different eHealth applications. The interest in (more) information about the different eHealth applications was 15–38%, depending on the application. Respondents who knew of a specific application were slightly more interested in additional information compared to those who had never heard of it before.

[FIGURE 1]

3.2. Actual use of eHealth applications

Fig. 2 shows the percentage of asthma and COPD patients who had actually used a particular eHealth application. Two-thirds (68%) had searched online for health complaints. The other applications were less commonly used: less than one third had experience with the single applications. Notably, only few respondents had accessed their electronic patient record (4%), whereas this application was most well-known by the respondents. The actual experience with the other applications was also considerably lower than the knowledge of the applications. In total, 41% of the respondents had experience with using two or more of the specified eHealth applications (online search for health complaints not included).

[FIGURE 2]

The majority of users was positive about the eHealth applications (varying from 58 to 97% for different applications). The main reasons for positive evaluation were that care via the application is less time-consuming, user-friendly and that care could be planned when needed. Up to 25% of the respondents was negative about the use of the specified eHealth applications. Main reasons for the most commonly used application (online search for health complaints) were that patients become worried about their health complaints and the fact that information on internet is, in their opinion, not always clear and reliable. Of the patients without experience with a specific application, 8–41% thought they could benefit from its use, depending on the application, provided that it would be available. Having access to own medical results (40%) and the electronic patient record (41%) were found most beneficial.

3.3. DIFFERENCES BETWEEN SUBGROUPS

Subgroup analysis revealed that age and educational level were significantly associated ($p < 0.05$) with knowledge and experience with eHealth (see Table 2). Respondents with a lower age or with a higher educational level had more often heard of the term eHealth or its applications and were more likely to have experience with eHealth. No significant association was found between type of chronic lung disease, existence of comorbidity or the severity of disability and knowledge and experience with eHealth (data not shown).

[TABLE 2]

3.4. Attitude on use of internet in health care

Table 3 shows the attitudes about the use of internet in health care: 70% of the total study population thought it decreases human contact and only 16% believed it could lead to higher quality of health care. Additionally, it was thought to be unsafe by 60%. On the other hand, almost half of the patients believed that internet could give patients more responsibilities and that it could enable patients to participate more actively in making decisions about the health care they need. Almost all patients agreed that internet in health care should never become obligatory but always a free choice.

[TABLE 3]

Differences between subgroups in attitudes toward the use of eHealth are also presented in Table 3. Younger patients were more positive about the use of internet in health care compared to older ones. Significant differences between the age groups were found for 5 out of 11 statements. Similarly, patients who had experience with two or more applications were significantly more positive about half of the statements than those who had experience with no more than one application. Younger patients and those who had experience with two or more applications agreed more often that the use of internet makes health care cheaper, results in higher quality of health care and that it provides better communication between patients and

health care professionals. In addition, they agreed less often that internet in health care is only for people who know how to use a computer. Differences between subgroups based on educational level were also present, but less consistent.

4. DISCUSSION

This study was conducted to gain insight into the level of knowledge and experience of patients with chronic lung diseases of eHealth applications as well as their general attitude toward the use of these applications in the daily care for their lung disease.

Where the term eHealth is widely used in research and policy documentation, only 8% of the end-users (i.e. patients in this study) have heard of this term. Therefore, it is questionable whether this term is most appropriate to be used in campaigns to advocate its use.

Other than the term, most asthma and COPD patients are familiar with one or more eHealth applications, but actual use remains low. Patients who do have experience with the use of eHealth, are as a whole positive about it. Patients without experience have no clear ideas about the advantages either. Those with experience are more positive about the various statements on eHealth too. However, there are still some negative thoughts on the use of internet in health care, also among the patients who do have experience with using eHealth. The general view is that it decreases human contact and that it is unsafe.

A widely used model to predict the intention to use technology is the 'Technology Acceptance Model' (TAM) [24]. This model describes that one of the factors influencing the intention to use is perceived usefulness, which is in this study shown to be low among non-users of eHealth. The extended version of the model (TAM2) adds external factors to the model that could influence the perceived usefulness [25]. One of those factors is experience, which is clearly demonstrated in this study, as patients with experience with eHealth are more positive about its use. Another factor which is an important determinant of the intention to use is 'perceived ease of use'. We do not have data on the ease of use of the specific eHealth applications in this study. However, we do know that patients included in this study do not experience many difficulties with using modern electronic devices or with internet (data not shown).

Older patients and those with lower educational level have less experience with eHealth and older patients are also less positive about using it. Simultaneously, these patients may benefit most from extra support since they experience more problems with accessing and understanding health information [26] and generally experience more problems in self-management for their chronic disease [27]. Because eHealth could provide support to patients in terms of disease management, largest effect of the benefits of eHealth could be reached in these patient groups.

An essential precondition for successful eHealth implementation is the presence of technological devices such as a computer or smartphone and internet. In this study, over 80% indicated to have one or more of these devices. Yet, not all patients may be

using it as much as others do. This problem will partly solve itself over time, as the next generation of society will be more familiar with using those modern devices.

Even though these modern technologies are available for most of the patients, a limitation in this study is that we have no information about the provision of eHealth services. In other words, what are the possibilities for patients to use eHealth (e.g. do doctors offer online consults and is the equipment to measure lung function at home actually available for patients?).

The population included in this study was limited to people with a chronic lung disease. This patient group is part of the NPCD, which is a representative sample of Dutch people with a chronic illness. Another ongoing project that investigates the perspectives on telehealth among patients with all kinds of chronic and non-chronic conditions on European level is the Chains of Trust. Their results yielded similar outcomes as only a small part of the patients had used it in the past and users were generally more positive than non-users [28].

To successfully introduce eHealth to patients, worries among the patients must be taken away and patients must be convinced of the benefits of using eHealth. Further research should investigate how patients' perception toward eHealth could be changed. As shown by Cranen et al., patients' attitude on eHealth changes positively after brief use [29], so first introduction in an easily accessible way is important. Stressing the possibilities for more personal control might be an important argument to persuade patients to start using eHealth applications.

Authors' contributions

JH performed the data analyses, contributed to the interpretation of the data and drafted the manuscript. JdB contributed to the interpretation of the data and revised the manuscript. BvW was involved in the development of the questionnaire, contributed to the interpretation of the data and revised the manuscript. MH was involved in the development of the questionnaire, in conceptualizing the manuscript, contributed to the interpretation of the data, revised the manuscript and supervised the project.

Conflict of interest

The authors declare no conflicts of interest.

Summary points

What was already known on the topic

- High expectations of eHealth, e.g. with regard to increase in patient self-management, increase in quality of health care and improved health outcomes.
- Implementation and use of eHealth on national level is no common practice yet.

What this study added to our knowledge

- Most patients with a chronic lung disease know of one or more eHealth application.
- Actual use of eHealth applications by patients remains low.
- Users of eHealth are on the whole positive about its use, where non-users have no clear ideas about the advantages.

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Appendix I. Description of eHealth applications as used in the telephone survey

Have you ever heard of or read about ...

Making appointments with health care professionals via internet.

Purchasing medication and devices via internet.

Asking questions to a general practitioner (or other health care providers such as physiotherapist, medical assistant, pharmacy) via internet instead of face to face contact of a telephone consult.

Contact with other patients via internet (for example on a forum, chat room, social media).

Electronic patient records in which your data will be saved digitally instead of on paper. The electronic patient record enables GPs, pharmacy's and specialists to quickly and reliably exchange medical information.

Self-diagnosis of a particular disease via information on internet. There are websites that can help, such as "diagnosisihelp", "consultation hour at home", or tests as the "COPD risk test".

Determining whether or not to go to a doctor by information on internet.

Treatment and support of your lung condition at a distance. You could receive advice from your health care professional via the computer or telephone at home in order to visit the doctor's office or hospital less frequently.

Self-completion of questionnaires about your health or performing measurements such as a lung function assessment. The results will then be send to the health care professional via internet.

Keeping track of daily physical activity or weight by specialized scales or monitoring devices.

The use of automatic reminders for medication intake.

Contact with health care professionals via camera, for example a webcam.

Have you ever ...

Made an appointment with a health care professional via email or internet.

Ordered repeat prescriptions via email or internet.

Purchased medication, medical devices or health products via internet.

Had insight in your medical results on a computer? For example blood or urine values or results of a lung function test.

Asked questions to health care professional via internet instead of face-to-face appointment or by telephone.

Had insight in your own electronic patient record via the computer at home.

Visited or used a website that provided help to cope with your lung condition in daily life (for example “My COPD” “My health net” or “patient 1”).

Performed health measurements at home (for example lung function measurements or blood pressure) and send the results via computer or telephone to a health care professional or the hospital.

Received treatment or support from a health care professional via the computer at home, the telephone or another device.

Had contact with other patients via internet (for example on a forum, chat room, social media).

Made use of an automatic reminder for medication intake.

Completed an online questionnaire in preparation of a consult with a health care professional.

Searched for health complaints on internet.

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TABLES

Table 1. Baseline characteristics ($n = 400$).

Background characteristic	
Gender – n (%)	
Male	182 (45.5)
Age, in years – mean (SD)	
Age, in groups – n (%)	
15–39 years	39 (9.8)
40–64 years	180 (45.0)
≥65 years	181 (45.3)
Chronic lung disease – n (%)	
Asthma	176 (44.0)
COPD	224 (56.0)
Educational level – n (%)	
Low	114 (36.6)
Medium	169 (42.9)
High	81 (20.6)
Living situation – n (%)	
Alone	110 (27.6)
Together	289 (72.4)
Comorbidities – n (%)	
None	154 (38.5)
One or more	246 (61.5)
Severity of disabilities – n (%)	
None or mild	228 (59.8)
Moderate	108 (28.4)
Severe	45 (11.8)
In possession of computer, laptop, tablet or smartphone – n (%)	331 (82.8)

Fig. 1. Knowledge of eHealth applications and interest in (more) information ($n = 400$).

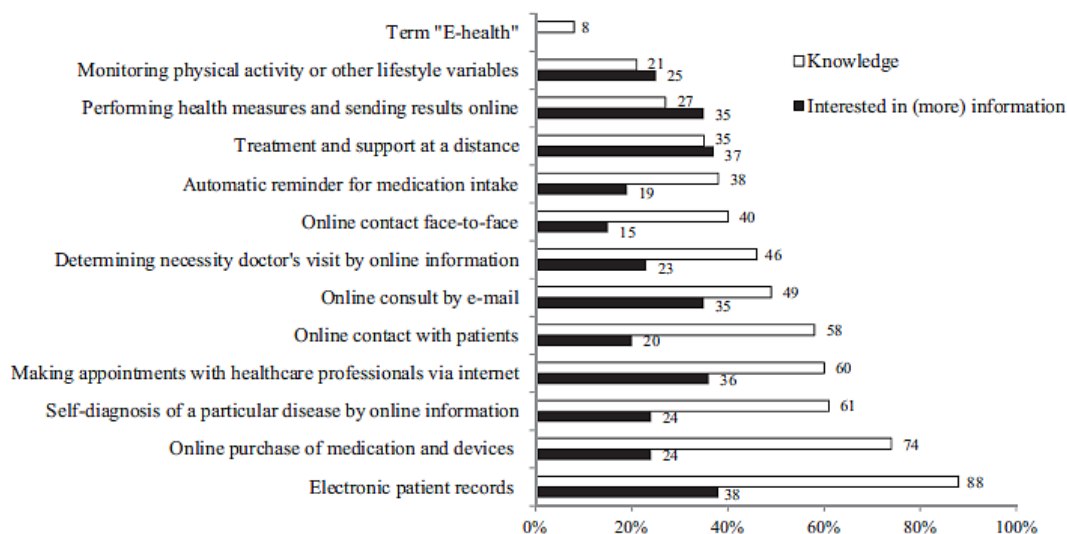
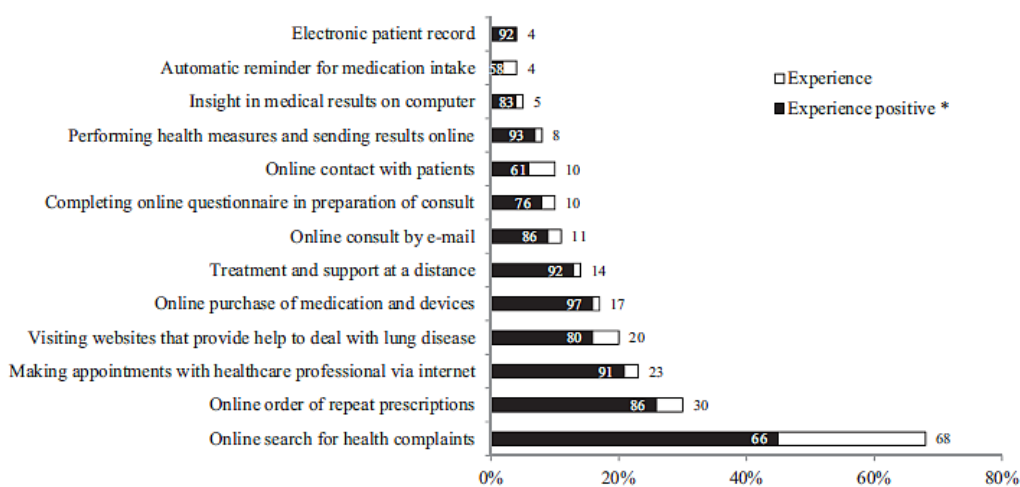


Fig. 2. Experience and evaluation of eHealth applications ($n = 331$). *The black line indicates the percentage of patients that are positive about the specific application, of those with experience with the application.



* The black line indicates the percentage of patients that are positive about the specific application, of those with experience with the application

Table 2. Knowledge and experience with eHealth by age and educational level.

	Age			Educational level		
	15–39 <i>n</i> = 39	40–64 <i>n</i> = 180	65+ <i>n</i> = 181	Low <i>n</i> = 144	Medium <i>n</i> = 169	High <i>n</i> = 81
Knowledge						
Knows of the term eHealth (%)	18	11	3	5	4	23
Knows of at least 6 eHealth applications (%)	69	53	42	38	50	69
Experience						
Experience with at least 2 eHealth applications (%)	46	47	32	27	40	58

Table 3. Attitude on the use of internet in health care (*n* = 400); Percentage that agrees with the statement. ^a

The use of internet in health care	All <i>n</i> = 400	Age			Educational level			Experience ≥2 items	
		15–39 <i>n</i> = 39	40–64 <i>n</i> = 180	65+ <i>n</i> = 181	Low <i>n</i> = 144	Medium <i>n</i> = 169	High <i>n</i> = 81	No <i>n</i> = 203	Yes <i>n</i> = 139
Decreases human contact in healthcare	70	62	73	69	67	72	70	73	70
Gives patients more responsibilities in own healthcare	49	69	47	47	45	50	54	48	56
Enables patients to participate more in making decisions about their own healthcare	41	41	42	40	42	39	43	38	46
Gives patients a more equal position with respect to healthcare professionals	25	23	23	26	35	18	21	24	23

The use of internet in health care	All <i>n</i> = 400	Age			Educational level			Experience ≥2 items	
		15–39 <i>n</i> = 39	40–64 <i>n</i> = 180	65+ <i>n</i> = 181	Low <i>n</i> = 144	Medium <i>n</i> = 169	High <i>n</i> = 81	No <i>n</i> = 203	Yes <i>n</i> = 139
Makes health care cheaper	43	64	45	36	36	44	53	40	53
Results in higher quality of healthcare	16	33	13	15	19	11	21	10	24
Provides better communication between patients and healthcare professionals	27	46	22	28	28	24	30	23	34
Increases patients' personal attention in healthcare	15	21	12	17	21	11	11	11	17
May never become obligatory for the patient but should always be a free choice	95	100	97	92	90	98	98	96	99
Is unsafe, you do not know what happens with your data	60	49	61	61	69	57	47	68	45
Is only for people who know how to use a computer	74	64	70	80	72	79	69	78	66

^a Values in bold indicate statistically significant differences between subgroups ($p \leq 0.05$).