

The Assessment of Differences in Acceptance of e-Health Applications Between Physicians and Patients with Chronic Diseases

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Abstract—The implementation of e-health solutions targeting patients and citizens as users is an important aspect of national policies of development of information technology infrastructure in health care in Poland. The success of these plans is related not only to political decisions but also to the response of potential users. The main objective of the study was the comparison of the level of acceptance of the use of e-health solutions for accomplishment of specific activities demonstrated by physicians and patients with chronic diseases. The analysis presented in the paper was based on the results of two surveys dedicated to the assessment of the views of medical personnel and patients on the importance of e-health in Polish health care system. The survey for physicians was performed among participants of speciality trainings in the period from November 2011 to December 2012 in Krakow, Poland. The survey for patients was carried out among the patients diagnosed with chronic disease who were hospitalized or attended ambulatory visit at three health care centers in Krakow, Poland in the period from mid-December 2011 to mid-February 2012. From 200 questionnaires distributed to physicians, 186 were returned by respondents. The questionnaires for patients were filled by 207 respondents from 230 who were approached. The level of acceptance for specific e-health applications was higher among physicians. The differences were statistically significant in case of all but one application. Interestingly, the applications with highest acceptance in both groups of respondents included online appointment with physician, access to the results of laboratory tests and access to educational resources. In conclusion, it should be stated that physicians reveal significantly higher acceptance of e-health use, but the perception of priorities among specific e-health applications is convergent between physicians and patients.

Keywords—e-health acceptance; Internet; information and telecommunication technologies; physicians; patients.

I. INTRODUCTION

Chronic care remains one of the greatest challenges for modern health care systems. Patients suffering from chronic disorders require support on long-term basis. There are estimations which indicate that even 40% of citizens living in modern societies are afflicted with chronic medical conditions [1]. Furthermore, the budgets used for support of chronic patients reveal growing trends [2].

As close cooperation and communication between patients and physicians are prerequisites of efficient care, both groups of users should be ready to use proposed e-health solutions. The use of such solutions may enhance repetitive interactions between patients and providers. Nowadays, it is also obvious that patients should be involved in activities related to controlling and treating of disease [3,4]. All these circumstances result in search for more efficient models of care which could be offered to patients with chronic disorders [5-8].

The main objective of the study was the comparison of the level of acceptance of the use of e-health solutions for accomplishment of specific activities demonstrated by physicians and patients with chronic diseases.

The paper consists of five sections. The Introduction section indicates rationale and objective for the study. In the Methods section the methodology of the surveys carried out among patients and physicians is described. The Results section brings the characteristics of both respondents' groups as well as results of comparison of acceptance of specific e-health applications between them. In the Discussion section, short discussion about significance of results is provided. In the final section, the conclusion summarizing obtained results is given. Furthermore, the plans for future research are revealed.

II. METHODS

The comparison of the acceptance of specific e-health applications among patients and physicians was carried out on data obtained from surveys targeting both groups.

The survey designed for physicians was focused on the general use of computers and Internet, the perception of importance and circumstances of e-health in modern health care, and finally, the acceptance for performance of specific health care services in e-health environment. In total, 30 items were included in the questionnaire. The methodology of the survey performed among physicians was described in detail elsewhere [9].

The survey realized among patients covered the issues related to coping with chronic condition, general issues of computer and Internet literacy, the use of information technology (IT) for health-related activities, the perception of e-health feasibility for support of health care and finally, the acceptance of specific functionalities delivered with e-health applications. Further details on the patients survey may be

found in an earlier published paper [10], focusing exclusively on patients with chronic respiratory diseases.

The items targeting the assessment of the acceptance of concrete e-health applications were compatible both in term of the set of enlisted applications and response scale. Both questionnaires included predominantly closed questions. The responses to the items focused on the opinions of the respondents were based on 5-point Likert scale with neutral option in the middle (from 'decidedly yes' to 'decidedly no').

The survey for physicians was performed among participants of the courses on public health obligatory to participants of all specialities training and organized by Medical Centre of Postgraduate Education, Jagiellonian University, in Krakow, from November 2011 to December 2012. The survey for patients was carried out among the patients diagnosed with chronic disease who were hospitalized or attended ambulatory visit at three health care centers in Krakow, Poland in the period from mid-December 2011 to mid-February 2012. Only patients with established diagnosis of chronic disease were recruited to the survey. Patients, who were hospitalized or admitted to polyclinics for diagnosis of new symptoms, were not included in the study, unless they had previously been diagnosed with a chronic disease.

Both surveys were assessed by Bioethical Committee at Jagiellonian University in Krakow, Poland (decision No KBET/226/B/2011 dated October, 27, 2011 for physicians' survey and decision No KBET/107/B/2011 dated June 30, 2011 for patients' survey). The questionnaires were filled by physicians anonymously. The patients were asked to fill informed consent form. The respondents were informed before the survey that they can withdraw from the study in any moment.

Statistical analysis was carried out with Statistica v.10 PI (StatSoft Inc, Tulsa, OK, USA) [11]. The descriptive analysis was performed for the variables included in this paper. If not stated otherwise, the frequency of a given response to a specific item was given as a percentage of all valid responses excluding missing responses. The level of acceptance was assessed with 5-point Likert scale. Definite negative option of response was assigned with value of 1, and the most positive opinion with value of 5. The differences in the acceptance level for specific e-health applications were assessed with non-parametric test for independent samples (Mann-Whitney U test).

III. RESULTS

A. Physicians

Characteristics of respondents

Questionnaires were distributed to 200 respondents; filled ones were returned by 186 of them. Five questionnaires were excluded from further analysis due to considerable deficiencies of responses. Women made 65.7% (n=119) of the group of respondents. The mean age of physician who filled the questionnaires was 34.9 (SD=6.4) years,

34.7(SD=6.7) among women and 35.5 (SD=5.9) among men.

There were 29.8% (n=54) of respondents with speciality certificate in internal medicine, 5.5% (n=10) in surgery, 3.9% (n=7) in anesthesiology, 10.5% (n=19) in pediatrics, 2.2% (n=4) in gynecology, and 3.9% (n=7) in family medicine. Other specialities were declared by 27.1% (n=49), and none by 20.4% (n=37) of them. As many as 75.7% (n=137) of respondents were employed in hospitals with at least 200 beds, 6.1% (n=11) in hospitals with 100-200 beds, and 7.2% (n=13) in hospitals <100 beds. Furthermore, 33.1% (n=60) of them worked in polyclinics, and 15.5% (n=28) in private practices.

The use of Internet was confirmed by all participants of the survey (n=181). Among respondents, 2.2% (n=4) used Internet not longer than for 2 years, 7.8% (n=14) for above 2 to 5 years, 30.2% (n=54) for above 5 to 10 years, and 59.8% (n=107) for more than 10 years. Every day use of Internet was declared by 82.3% (n=148) respondents; several times a week but not every day by 16.2% (n=29), and only once a week by 1.1% (n=2). The use of Internet at home was indicated by 96.1% (n=174) of physicians and at work site by 88.4% (n=160). Wireless access to Internet was utilized by 27.1% (n=49) respondents. Detailed characteristics of the physicians who participated in the survey was covered elsewhere [9].

TABLE I. ACCEPTANCE OF SPECIFIC E-HEALTH APPLICATIONS AMONG PHYSICIANS (% , n)

E-health applications	decidedly no	rather no	I'm not sure	rather yes	decidedly yes
Teleconsultation with physician	7.7 (14)	24.3 (44)	18.8 (34)	30.9 (56)	18.2 (33)
Contact with health care providers in case of doubts	5.0 (9)	6.1 (11)	15.0 (27)	46.7 (84)	27.2 (49)
Telemonitoring of physiological parameters	6.8 (12)	10.2 (18)	15.3 (27)	32.2 (57)	35.6 (63)
Making appointment with physician	0.6 (1)	1.1 (2)	0.6 (1)	16.2 (29)	81.6 (146)
E-diary for chronic patients	1.1 (2)	2.9 (5)	2.9 (5)	34.9 (61)	58.3 (102)
Personal Internet health account	0.6 (1)	2.8 (5)	6.6 (12)	23.8 (43)	66.3 (120)
Access to profiled educational resources	0.6 (1)	1.1 (2)	3.3 (6)	27.1 (49)	68.0 (123)
Reporting health status to physician	5.0 (9)	16.7 (30)	16.1 (29)	36.1 (65)	26.1 (47)
Contact with health professional during exacerbations	3.6 (6)	12.3 (22)	10.1 (18)	42.5 (76)	31.8 (57)
Access to laboratory test results	0.6 (1)	1.7 (3)	2.2 (4)	23.5 (42)	72.1 (129)
Renewal of prescriptions	1.7 (3)	7.2 (13)	12.2 (22)	25.0 (45)	53.9 (97)

The acceptance of specific e-health applications potentially feasible for patients with chronic diseases

The results of the survey related to the acceptance of specific e-health solutions feasible for care of patients were included in the Table I. The physicians showed the highest

acceptance for the use of Internet for making appointments for visit in physician's office or polyclinics by patients (4.76, SD=0.58), for access to the results of laboratory tests (4.64, SD=0.68), for access to educational resources (4.62, SD=0.67), and for the use of personal health account (with repository of medical documentation) (4.56, SD=0.76).

B. Patients

Sociodemographic characteristics of respondents

The survey was carried out in the group of 207 patients receiving care in health care institutions located in Krakow, Poland. There were 65.4% (n=134) women in this groups. Mean age of respondents (n=197) was 49.6 (SD=17.6) years, 48.2 (SD=17.2) among women and 52.4 (SD=17.2) among men. Further sociodemographic data were included in the Table II.

Among patients participating in the survey, 55.1% (n=114) suffered from one chronic disease, others were afflicted with more chronic conditions. The most frequent chronic diseases occurring in respondents were related to cardiovascular system (49.8%, n=103). Other frequent disorders included diabetes (38.2%, n=79), bronchial asthma (18.4%, n=38), diseases of musculoskeletal system (21.3%, n=44), diseases of nervous system (11.1%, n=23), and chronic obstructive pulmonary disease (10.6%, n=22).

TABLE II. SOCIODEMOGRAPHIC CHARACTERISTICS OF PATIENTS RECRUITED TO THE SURVEY

Sociodemographic variables	Category	N	%
Sex	women	134	65.4
	men	71	34.6
Place of residence	rural	68	33.7
	urban <100 000	45	22.3
	urban >100 000	89	44.1
Education*	category A	68	32.9
	category B	65	31.4
	category C	74	35.7
Family status	married	130	64.0
	unmarried	43	21.2
	widow/widower	22	10.8
	partnership	8	3.9
The number of persons in the household	1	22	10.7
	2	75	36.4
	3	40	19.4
	>3	69	23.6

*Categories established on the basis of Educational, Scientific and Cultural Organization (2011) Revision of the International Standard Classification of Education (ISCED): category A – education lower than 'upper secondary', category B – from 'upper secondary' to 'post-secondary non-tertiary', category C – higher than 'post-secondary non-tertiary' [12]

Computer and Internet use

The use of computer was declared by 65.7% (n=136) of respondents. The duration of computer use above 10 years was indicated by 41.2% (n=56), above 5 to 10 years by 24.3%, and not longer than 5 years by 34.6% of them.

Internet browser, e-mail software and text processor were types of applications used most frequently by computer users (87.5%, n=119; 72.1%, n=98; 52.9%, n=72, respectively). More rarely the respondents indicated spreadsheet programs

(30.1%, n=41), data bases (30.9%, n=42) and software supporting company activities (23.5%, n=32).

The use of Internet on their own was declared by 57.5% (n=119) patients, and with help of other person by 11.1% (n=23). No use of Internet was indicated by 31.4% (n=65) of them.

TABLE III. ACCEPTANCE OF SPECIFIC E-HEALTH APPLICATIONS AMONG PATIENTS (% , n)

E-health applications	decidedly no	rather no	I'm not sure	rather yes	decidedly yes
Teleconsultation with physician	13.1 (22)	15.5 (26)	21.4 (36)	33.9 (57)	16.1 (27)
Contact with health care providers in case of doubts	10.4 (17)	12.8 (21)	18.9 (31)	39.0 (64)	18.9 (31)
Telemonitoring of physiological parameters	18.8 (30)	17.1 (29)	27.8 (46)	23.8 (38)	10.6 (17)
Making appointment with physician	7.2 (12)	9.6 (16)	10.2 (17)	25.3 (42)	47.6 (79)
E-diary for chronic patients	8.8 (14)	11.9 (19)	25.2 (40)	26.4 (42)	27.7 (44)
Personal internet health account	9.8 (16)	8.6 (14)	23.3 (38)	27.0 (44)	31.3 (51)
Access to profiled educational resources	7.5 (12)	9.3 (15)	19.9 (32)	29.8 (48)	33.5 (54)
Reporting health status to physician	12.5 (20)	18.1 (29)	23.8 (38)	22.5 (36)	23.1 (37)
Contact with health professional during exacerbations	10.3 (17)	15.8 (26)	23.6 (39)	29.1 (48)	21.2 (35)
Access to laboratory test results	8.6 (14)	9.9 (16)	21.0 (34)	22.2 (36)	38.3 (62)
Renewal of prescriptions	11.2 (18)	12.4 (20)	19.3 (31)	20.5 (33)	36.6 (59)

Among Internet users, there were 25.0% (n=29) of respondents who used it above 10 years, 37.1% (n=43) above 5 to 10 years, and 37.9% (n=44) not longer than 5 years. Daily use of Internet was confirmed by 67.0% (n=79) of patients using Internet without help of other person, several times a week but not every day by 22.0% (n=26), once a week by 8.5% (n=10) and more rarely by 2.5% (n=3) of them. In the group of independent Internet users, access to Internet at home was indicated by 98.3% (n=117) of respondents, in the work place or at school by 49.6% (n=59), in friends by 6.7% (n=8) and in Internet café by 1.7% (n=2).

The acceptance of specific e-health applications potentially feasible for patients with chronic diseases

The structure of responses on acceptability of specific e-health applications among patients participating in the survey were shown in the Table III. Patients revealed the highest acceptance (mean, SD) for e-health applications enabling appointments to physician's office (3.77, SD=0.57), access to educational resources (3.57, 0.66), access to the results of laboratory tests (3.56, SD=0.67) and renewal of prescriptions (3.49, SD=1.03). The acceptance for the teleconsultation with physician was the lowest from all potential solutions (3.20, SD=1.23).

C. The comparison of the acceptance of e-health applications between physicians and patients

The comparison of the acceptance of specific e-health applications feasible for patients with chronic diseases between physician and patients revealed uniformly higher level of acceptance among physicians. The differences in the level of acceptance were significantly higher for all but one application (teleconsultation with physician). The details of the analysis were shown in Table IV.

TABLE IV. THE COMPARISON OF THE ACCEPTANCE OF E-HEALTH APPLICATIONS BETWEEN PHYSICIANS AND PATIENTS

E-health applications	Physicians [mean (SD)]	Patients [mean (SD)]	corr. Z	p value
Teleconsultation with physician	3.28 (1.15)	3.20 (1.23)	0.688	0.49
Contact with health care providers in case of doubts	3.85 (1.11)	3.34 (1.05)	4.999	<0.001
Telemonitoring of physiological parameters	3.80 (1.11)	2.92 (1.22)	7.376	<0.001
Making appointment with physician	4.77 (1.20)	3.77 (0.57)	9.389	<0.001
E-diary for chronic patients	4.46 (1.12)	3.40 (0.79)	9.687	<0.001
Personal internet health account	4.52 (1.16)	3.48 (0.79)	9.416	<0.001
Access to profiled educational resources	4.61 (1.13)	3.57 (0.66)	9.840	<0.001
Reporting health status to physician	3.62 (1.18)	3.20 (1.18)	3.648	<0.001
Contact with health professional during exacerbations	3.87 (1.14)	3.28 (1.10)	5.429	<0.001
Access to laboratory test results	4.65 (1.19)	3.56 (0.67)	9.726	<0.001
Renewal of prescriptions	4.22 (1.24)	3.49 (1.03)	6.287	<0.001

IV. DISCUSSION

The surveys performed in the group of physicians participating in the speciality courses and in the group of patients with chronic conditions revealed significant differences in the level of acceptance between these two groups. Physicians demonstrated higher acceptance for specific application than patients and most differences were statistically significant.

It should be noted that the differences could be attributed not only to perception of e-health feasibility among both groups of respondents but also to the fact that the mean age of physicians was lower than of patients.

V. CONCLUSIONS AND FUTURE WORK

Despite significant differences in the acceptance levels for specific applications between physicians and patients, the

e-health applications which were top-ranked by both groups included making appointments with physician, access to the results of laboratory tests and access to educational resources profiled for patients. The author plans to proceed with assessment of the acceptance of e-health solutions by other patients and health professionals groups as well as identification of barriers for e-health growth in Poland.

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