Users' attitude towards personal health records: A cross-sectional study

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Abstract

Background: Prevention and management of chronic conditions is a priority for many healthcare systems. Personal health records have been suggested to facilitate implementation of chronic care programs. However, patients' attitude towards personal health records (PHRs) can significantly affect the adoption rates and use of PHRs.

Objectives: to evaluate the attitude of patients with Type II diabetes towards using a PHR to manage their condition.

Methods:

We used a cross-sectional exploratory pilot study. Fifty-four (54) patients used a PHR to monitor and record their blood glucose levels, diet, and activities for 30 days, and to communicate with their clinician. At the end of the study, patients responded to a survey based on three constructs borrowed from different technology acceptance frameworks: relative advantage, job fit, and perceived usefulness. A multivariate predictive model was formed using partial least squaring technique (PLS) and the effect of each construct on the patients' attitude towards system use was evaluated. Patients also participated in a semi-structured interview.

Results:

We found a significant positive correlation between job fit and attitude (JF→ ATT = +0.318, $p < 0.01$). There was no statistical evidence of any moderating or mediating effect of other main constructs or any of the confounding factors (i.e., age, gender, time after diagnosed) on attitude.

Conclusion:

The attitude of patients towards using PHR in management of their diabetes was positive. Their attitude was mainly influenced by the extent to which the system helped them better perform activities and self-manage their condition.

Chronic disease, Diabetes Mellitus, Personal Electronic Health Records

1. Background

Web-based personal health records (PHR) are becoming increasingly popular in client-centered healthcare systems (1). According to the Markle Foundation (2) a PHR is "an electronic application through which individuals can access, manage, and share their health information in a secure and confidential environment". The content of a PHR is usually controlled by the patient, and it might or might not be tethered to a patient's electronic health records (1). Use of PHRs has the potential to expand a patients' role in self-managed care (3); in addition, PHRs can improve quality of care, reduce health care costs, and improve access to health information (4). Kahn et al. (5) suggested that an ideal PHR could facilitate productive interactions between patients and clinicians by providing a secure and reliable platform for communication and information exchange. Further, PHRs have the potential to support preventive measures by way of patient reminders for screening tests (1).

Prevention and management of Type II diabetes is a priority for many health care systems as the number of individuals with diabetes and the projected costs of care for this condition are increasing (6). On the other hand, patients with Type II diabetes may benefit significantly from using a PHR. Contemporary diabetes management programs require active participation of patients in management of their condition through measuring their blood glucose levels and reporting this data to their care providers regularly (7). PHR have the potential to assist patients with all of these tasks and provide a secure way to collect, store, and transfer health related data.

Several PHRs are available in Canada, some of which were developed by provincial health care systems and are available to the residents free of charge. In Province of Alberta, for example, "MyHealth.Alberta.ca" will be introduced to the public soon. Private sector PHRs

have also been developed and operate on a fee-for-service basis. However, little is known about patients' attitude and perceptions towards using PHRs in self-monitoring programs (8). This knowledge is of interest to the following groups: (1) developers of PHRs, to help them improve their products and explore new markets; (2) health care providers, to increase their knowledge about the potential of using health information technology in chronic-disease management programs; and finally (3) patients with chronic conditions, who are interested in better management of their health condition.

2. Objective

The objective of our study was to evaluate the attitudes of patients with a chronic condition (Type II diabetes) towards using a PHR for the purpose of self-monitoring and diabetes management. Unlike other studies that have only used qualitative evaluation of individuals' perceptions about PHRs (9, 10), we used both quantitative and qualitative approaches to answer the following research questions:

(1) What is the attitude of patients with Type II diabetes toward using a PHR?

(2) What are the perceptions of patients with Type II diabetes toward using a PHR to self-monitor their blood glucose levels?

3. Methods

3.1. Design

We used a cross-sectional design, using a self-administered paper-based survey and a semi structured interview. From a theoretical perspective, we based our evaluation on the Theory of Reasoned Action and its expansion, the Theory of Planned Behaviour(11). According to these theories, beliefs are determinants of an individuals' attitude. In turn, attitude, along with subjective norms, determine an individual's behaviour (11) (here, using a PHR). Attitude toward

behaviour is defined as "an individual's positive or negative feelings (evaluative affect) about performing the target behaviour" (11). While attitude refers to a person's favourable or unfavourable evaluation of a certain object, it is an individual's beliefs that represent what information he or she has about an object. Therefore, beliefs link an object with its attributes that influence attitude.

For measures of belief, we used three constructs from different theories of usability and technology acceptance: *perceived usefulness* (PU) from Technology Acceptance Model (12), *relative advantage* (RA) from Rogers' Innovation Diffusion Theory (13), and *job fit* (JF) from Model of Personal Computer Utilization (14). The first construct, "*perceived usefulness*", is a person's belief that using a system may improve his performance at a task(13). The second one, "*relative advantage*", refers to one's belief that a device works better than a previous version of the same device (13). Finally, "*job fit*" refers to how a system can improve the way a person does his job (13) that is self-monitoring blood glucose levels in our study.

3.2. Description of the THS-PHR

The PHR used was TELUS Heath Space personal health record (THS-PHR), developed based on the Microsoft Health Vault ™. This PHR provides a secure web-based portal, enabling patients to enter, store, manage, and share health information with selected caregivers. It also offers a secure messaging system that allows patients to communicate directly with caregivers. THS-PHR has the potential to be used in monitoring and self-management of chronic conditions such as cardiopulmonary diseases, mental health issues, diabetes, and obesity. It has different tabs for each condition, under which relevant data such as blood glucose levels, blood pressures, or body dimensions can be entered by the patients. THS-PHR was not available to the residents of

Alberta prior to this study, which minimized chances of prior exposure to the system that could potentially influence their attitude towards the PHR.

3.3. Sample

A non-probability convenience sampling method was used for this study. Participants were recruited from the Diabetes Management Clinic at Sherwood Park primary care network (SP-PCN) in Alberta, Canada (15). Patients were recruited based on the following inclusion criteria:

1) At least 40 years of age (16),

2) Diagnosed with Type II diabetes,

3) Living at home,

4) Willingness to measure their own blood-glucose levels using a glucose meter or have a designated care taker to do this, and

5) Access and familiarity with a personal computer and internet.

6) English speaker only

Individuals with vision impairment or inability to provide informed consent were not included. The minimum sample size required for this study was 40 subjects, enough to achieve a statistical power of 0.80 with a large effect size (f^2=0.35) (17).

3.4. Procedures

The case manager at diabetes management clinic of SP-PCN reviewed the list of patients with Type II diabetes and identified those who met the inclusion criteria for the study. She contacted each patient and explained the purpose of the study. The case manager then obtained verbal consent from patients who agreed to volunteer for the study and provided their contact information to the research team. A researcher (P.A) contacted each patient and met with them at

their home or at SP-PCN office. During this meeting, the researcher provided complete information about the study, obtained their written informed consent, and trained each patient to use the PHR on their personal computer or, if not available, on a computer at the PCN office.

Each patient was assigned a password-protected account on the THS-PHR. On the homepage, patients could view their most recent data entries and any messages from their clinicians. Patients were able to edit their profile information, password, account settings, and grant access to their clinicians to view their information. Patients could use secure online messages to communicate with their clinician. Participating clinicians were also assigned a username and password to a secure dashboard that could connect to patients' PHR with patients' consent. They could monitor patient-entered data and also use a secure messaging system to communicate with them. They were also able to download and print reports and graphs of patients' data for record keeping. Patients were requested to record and enter the blood glucose levels, date, and time of each reading in their PHR account as suggested by their clinician for 30 days. Technical support was available by phone to patients to solve any problems with their PHR account.

After 30 days, the researcher (P.A.) met with patients at the PCN office or at patients' home and provided them a quantitative survey to complete. The survey was designed by the research team using standard questions, based on constructs from three theoretical frameworks of usability and technology acceptance. Participants answered 13 questions: four questions on relative advantage (RA) from Rogers' Innovation Diffusion Theory, four questions on job fit (JF) from Model of Personal Computer Utilization, three questions on perceived usefulness (PU) from Technology Acceptance Model, and finally, two questions on attitude. Patients used a 5-point Likert scale, ranging from "1" (*strongly disagree*) to "5" (*Strongly agree*) to respond.

Patients also specified their gender, age, time since diagnosed with diabetes, and if they used insulin to manage their blood glucose level. The items used in the questionnaire were adopted from a list of standard questions developed by Venkatesh et al. (13). These questions have been validated and can be used as standard questions for evaluation of constructs that influence the attitude towards technology. The items were also reviewed by a panel of experts on the research team from different disciplines such as computer science and health care.

To evaluate the perception of patients about the PHR, all patients participated in a short (30 minute) semi-structured face-to-face interview immediately after completing the survey. The researcher used an interview guide which consisted of 15 open-ended questions (Appendix A). The goal of the interview was to collect more information about the positive and negative perceptions of participants about using THS-PHR to self-monitor their blood glucose level.

3.5. Data analysis

3.5.1. Quantitative data

In order to evaluate the attitude of patients with Type II diabetes towards using the THS-PHR, a multivariate model was developed using the partial least squaring (PLS) technique. Smart PLS V 3.1.6™ statistics package was used to generate PLS path modeling (18). The Validity and reliability of the PLS model were evaluated using the following criteria:

(1) Reliability of each construct was evaluated using the Cronbach's alpha (CA> 0.7) and Internal Composite Reliability (ICR>0.708) (19).

(2) Convergent validity of each set of items with respect to their associated construct was assessed by examining the factor loadings of the items, which should be greater than 0.7, and the value of Average Variance Extracted (AVE), which should be greater than 0.5 (19).

(3) Discriminant validity was evaluated by using the Fornell-Larcker criterion, based on which the square root of the AVE value for each construct should be greater than its highest correlation with any other construct(19).

The PLS structural model was evaluated by means of paths coefficients (β), the explained variance (R^2) and the effect size (f^2) for each path segment of the model. A hierarchical, multiple-regression method was used for the development of the model, in which all variables were entered in the model and deleted one by one until a combination was found with highest explained variance (R^2). The Bootstrapping re-sampling method was employed to verify the statistical significance of (β) paths coefficients (19). The level of statistical significance was set at $p < 0.05$.

3.5.2. Qualitative data

To identify the patients' perceptions about THS-PHR, the interviews were digitally recorded and transcribed verbatim and then analyzed qualitatively suing directed content analysis method. The research team developed a list of codes related to patients' perceptions through a deductive coding approach (20). The top level categories for coding system were "perceived ease of use", "perceived impact on self-managed care", "Perceived quality of care", "user retention", and "suggested improvements". Two authors (PA and PB) used this classification scheme to code the data and summarized the results independently in separate tables. After that, they compared their findings and discussed the differences until consensus was achieved.

4. Results

4.1. Participants' characteristics

Fifty-four patients participated in the study. The mean age of participants was 54 years (SD 7.5). The majority of participants were male and diagnosed with diabetes for less than 10

years (Table I). Overall, patients reported that the THS-PHR improved their involvement and interest in self-managing Type II diabetes. They perceived that using this technology would improve service-delivery efficiency. Patients reported that they had confidence in the technology and as a result of using this technology they perceived that they did not need to visit their health care provider as frequently as before (Table II).

4.2. Multivariate analysis: Patients' Attitude toward technology (PHR)

Tables III and V show the path model and the bootstrapping procedure ran with 5000 samples. The multivariate model in PLS (Table III, and Figure 1) shows that there is a statistically significant and positive correlation between *job fit* and *attitude* toward the use of the PHR (JF$\rightarrow$ Att[1] = +0.318, *p*<0.01); there is no statistical evidence to support that *relative advantage* has a positive influence on *attitude* toward the use of the PHR (RA$\rightarrow$ Att=+0.274, *p*<0.097); and there is no statistical evidence to support the assertion that as *age* of participants increases the *attitude* toward the use of the PHR decreases (Age $\rightarrow$ Att = -0.121 *p*<0.255). The effect of *perceived usefulness* on attitude was positive and significant. However, we eliminated this construct from the model because of its co-linearity with job fit.

4.3. Model Validity and Reliability

In general, the validity and reliability of the PLS model are good. The results of the construct correlations, internal composite reliability and Cronbach's alphas values , and average variance extracted of the reflective constructs showed that all item loadings were statistically significant at the 0.001 level and most of item loadings (80%) were greater than 0.70. Only two item loadings (9%) were in the interval between 0.6 and 0.4, indicating acceptable convergent

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[1] The symbol "$\rightarrow$" is the path between two variables, similar to the correlation or beta coefficient in a regular multivariate regression. The number (+0.318) is the beta coefficient of the path; the p-value is the statistical significance of the correlation.

validity at the indicator level (19). All internal composite reliability values were greater than 0.70, indicating acceptable reliability of the model. The square root of each average variance extracted (AVE) was greater than the related inter-construct correlations in the construct correlation matrix, indicating adequate discriminant validity for all reflective constructs (see Table IV for more details).

The Stone–Geisser's Q^2 values for attitude to use the THS-PHR was 0.167 (i.e., $Q^2 > 0$), indicating good predictive relevance of our model. The explained variance of the model was $R^2 = 0.324$, which appears to be strong for behavioral sciences research (17) (See table III for details). Finally, power analysis indicated that the power of the multivariate model was high (greater than 95%), which represents a reasonable protection against Type II error (21).

4.4. Qualitative Findings

4.4.1. Perceived ease of use.

In general, patients reported that the PHR was easy to use and submitting the information online was more efficient and convenient than travelling to the clinicians' office:

"It was easy, very easy, it's very straightforward"; "It was easy, efficient, saved me time making an appointment and waiting for that appointment and getting to the appointment".

Many participants emphasized on the significance of the initial face-to-face training that they received at the beginning of the study: "It was very good, otherwise you wouldn't know where to go and what to do you did a good job of the training for sure"; "It was very useful I wouldn't have had a clue what I was doing if I did not receive any training".

4.4.2. Perceived impact on self-managed care

Patients either reported that there was no impact or a positive one. About one third of the participants said that the technology had not significantly impacted the way they managed their

diabetes. These patients also mentioned that they were diagnosed for several years and believed that they were already successful at managing their diabetes. One patient for example said: "None, I guess as I say I didn't have any concerns, you know, and it wasn't that I was newly diagnosed or that I needed a lot of support, so I think it really didn't impact very much". Another patient said: "Well, it was pretty well managed before I did it, so it really didn't change anything".

On the other hand, patients who were newly diagnosed or for some reasons were not successful at managing their blood glucose levels using the conventional methods said that using THS-PHR positively impacted their self-managed care: "It made me more aware that I should be taking my measurements more often". According to these patients, the impact was mostly because of the feedback they received from the visual presentation of blood glucose data: "With the chart and everything it was better than just putting down numbers because you could actually see if you were in your range and what you had to do to change it if it went out".

4.4.3. Perceived quality of care

About half of the participants stated that they perceived an increase in the level of support that they received while they were using THS-PHR. Most of these patients were the same who perceived a positive impact on self-managed care. They mentioned "facilitated communication" with their clinician as the main reason for this:

"I got comments back, whereas typically I wouldn't see them for the month, so I guess it impacted the care a little bit. I guess it improved it"; "I get some feedback from the healthcare worker, that I probably would not have been looking for, so I guess that the impact [was] positive I would say"; "A positive impact because as I was saying earlier we were able to get feedback in a much shorter time and control my blood sugar much better than prior to the

program". Similarly, patients who did not perceive a positive impact on their self-managed care did not perceive a positive impact on quality of care either. However, none of the participants reported any negative impact on perceived quality of care as a consequence of using THS-PHR.

4.4.4. User retention

The majority of patients (90%) said that they were willing to continue using the system. Among those who did not want to continue using THS-PHR, two patients said they were not comfortable with computers, and two other patients simply preferred a pen-and-paper method of recording data. One participant preferred to use Microsoft Excel spreadsheets:

"I am more comfortable with the pen and paper method".

"I'm thinking probably at this stage no, I think it's pretty well under control, so at this stage I think they [clinicians] would just get bored with reading this on and on".

Although the majority expressed their willingness to continue with the program, only five participants agreed that they would be willing to pay an annual or monthly service fee to use THS-PHR: "Depends how much it was. If it was a very significant fee I don't think it'd be worth using". The majority of the patients believed that the costs should be covered by the public health care system: "I think it should be picked up by the healthcare. It's hard to think of how much a day or how much a month it would be worth".

4.4.5. Suggestion to improve THS-PHR and limitations

Patients made a number of suggestions to improve the THS-PHR:

(1) Reducing the number of steps needed to open the data entry page

(2) Designing a mobile app for the PHR

(3) Providing wireless connection between the glucose meter and the PHR

(4) Being notified through e-mail or text message when their clinician leaves a message for them on the PHR.

On the other hand, several participants did not have any suggestions and considered the current system useful as it was: "Actually with what I used it worked really [well], I can't see anything on how it can be improved, it took the readings, graphed everything for me, no I thought it worked really well".

5. Discussion

According to our multivariate model, there was a positive correlation between the job fit and attitude towards using the THS-PHR. In other words, since the capabilities of the PHR system enhances the individual's job performance (i.e., it improved the self-management of patients' medical condition) their attitude toward the PHR use was positive. This means that patients are more likely to use a PHR, if they perceive that the system can help them with the tasks of a chronic disease self-management program such as self-monitoring, recording the data, and communicating with clinicians. This finding was confirmed by the qualitative interviews. The majority of patients (49 of 54) responded positively when they were asked if they were willing to continue using the system. In other words, the PHR "fits" with their "job" in diabetes self-management program.

Our results indicate that age was not a determinant of the THS-PHR use. Other studies have reported mixed findings. For example, Logue and Effken (22) reported that age has a negative correlation with PHR adoption. On the other hand, Archer et al. (23) reported older adults as one of the age groups that have the potential for better adoption of PHRs. We believe that, to better explain the role of age in adoption of PHRs, we have to consider other confounding factors, computer literacy being the most important among them. Perhaps the

perceived negative effect of age reported by some authors is because there are generally more computer savvy individuals among younger adults (24). In our study, we controlled for this confounding factor by purposefully recruiting patients who were familiar with computer use. As a result, we found no correlation between age and attitude towards using the THS-PHR. In other words, if users have the skills necessary to use the system, their attitude will not be influenced by age.

The multivariate model also indicated that there was no significant correlation between the relative advantage and attitude towards using the THS-PHR. This means that although patients found the system useful and to fit their needs, they did not believe that the THS-PHR had considerable superiority compared to other methods of self-management. However, we propose a careful interpretation of this finding. The analysis of the patients' interviews revealed that patients who had recently been diagnosed and referred to the program found the system very useful. On the other hand, patients who were managing their condition successfully for a long time believed that they were able to perform their self-management tasks without using the THS-PHR.

Another factor that might have influenced their perception about relative advantage is patients' expectations. According to patients' responses to the interview questions, those who were satisfied with options currently available in the THS-PHR such as data repository, data graphs, and instant messaging, perceived THS-PHR as useful to help them control their blood glucose levels. On the other hand, patients who expected to see more features in the system may have perceived that THS-PHR was not relatively more useful than the conventional methods. These patients expressed their expectations under the category of "suggestions to improve the system". However, we suggest that although the findings did not show a relative advantage, it

did not provide evidence that using the THS-PHR negatively impacted patients' ability to self-manage their condition either. We suggest conducting studies with larger samples and for longer durations to investigate any negative or positive effects.

An interesting observation was the difference between the perceived impact on care between patients who were new to self-managed care and those who were engaged in the self-managed program for several years. Generally, the inexperienced patients were more positive about their use experience and reported a positive impact on their care. On the other hand, patients with more self-managed care experience said that the system did not impact the way they managed their condition. The positive impact perceived by less experienced patients might have been a secondary effect of beginning a self-managed care program and not necessarily the impact of the system. It could also be associated to the fact that inexperienced patients were generally younger and had a more positive attitude towards using new technologies. At this point we do not have enough evidence to conclude that PHR was perceived relatively more advantageous compared to the contemporary methods. Any existing relative advantage is also not large enough to convince patients with more experience in self-managed care to change their habits or routines and adopt THS-PHR. This is especially true if it requires them to pay additional costs in the form of service fees that are not covered by the public health care system.

Many previous studies have mentioned perceived usefulness as one of the main determinants of users' attitude (12, 25). Our results also indicated a significant and positive correlation between these two factors. However, we eliminated perceived usefulness from the final PLS model because of the co-linearity between this construct and job fit. This probably happened because job fit construct "captured" all the variance explained by perceived usefulness

(13). In other words, the questions pertaining to perceived usefulness and job fit measured the same "beliefs" among patients, or at least patients perceived them as measuring the same beliefs.

5.2. Limitations of the study

We recruited a small and non-random sample size that restricts the generalizability of the results. We only recruited patients with Type II diabetes, within a certain age group, who lived in a small town. This sampling limits the generalizability of the findings to patients with other conditions and from other socioeconomic backgrounds. For the convenience we limited our sample to English speakers only. Moreover, these results only apply to users who have basic familiarity with computer and internet use. Because of the nature of this study we kept the length of the survey short to minimize the burden on the participants. For this reason we only focused on effect of attitude on use behaviour and postponed evaluation of other determinants of use behaviour to future studies. Finally, Clinicians' perceptions were not included in this study. This was basically because very few clinicians volunteered to monitor their patients using the system. Since successful implementation of a PHR depends on acceptance of this technology by both clinicians and patients, further studies are suggested to evaluate clinicians' attitudes and perceptions.

5.3. Future Research

Future studies with larger sample sizes that consist of patients with different chronic conditions are recommended. Development of a standardized questionnaire according to a more comprehensive usability framework, such as the unified theory of acceptance and use of technology (UTAUT) (13), is advised. Such a questionnaire would make it possible to evaluate multiple factors that influence patients' use behaviour towards PHRs.

6. Conclusion

      According to this study the attitude of patients with Type II diabetes towards PHRs is positive. PHRs can be more useful to patients who are either new to self-managed care or have difficulties with adopting the contemporary methods (i.e., pencil and paper log books, regular visit to the clinic, etc.). On the other hand, PHRs may not have any relative advantage compared to other contemporary methods of self-managed care for experienced patients or those who are already comfortable with the contemporary methods. Further studies are needed to evaluate other factors that may influence patients' use behaviour towards PHRs.

Clinical relevance Statement

      The findings of this study are of interest to developers of PHRs to help them improve their products and explore new markets. On the other hand, health care providers can use these findings to increase their knowledge about the potential uses of PHRs in chronic-disease management programs.

Conflict of interest

      None of the investigators derived personal benefit linked to the outcomes of the study. 3 of the investigators' (P.A., P.B., and A.M.) salary or studentships were funded by the collaboration grant.

Protection of Human and Animal Subjects

The study was performed in compliance with the World Medical Association Declaration of Helsinki on Ethical Principles for Medical Research Involving Human Subjects. All procedures involving human participants were approved by the University of Alberta Research Ethics Board, under protocol number Pro00021480

Acknowledgement

Tables

Table I. Demographics	
Gender n (%)	
Female	22 (40.7)
Male	32 (59.3)
Age (years) mean ± SD	54 ±7.53
Years since diagnosis mean ± SD	8 ±9.48
Using Insulin n (%)	22 (40.7)

		Table II. Patient responses to questionnaire regarding use of THS-PHR.		

Question #	Question	Patients' response statistics (n=54)	
		Mean ±SD	Median
Attitude Construct			
Q1	THS has made me more interested/involved in self-managing my medical condition	4.26 ± 0.89	4
Q2	I have confidence in the THS technology	4.37 ± 0.62	4
Relative Advantage Construct			

Q3	THS could be more time efficient than having my care givers come to house to take my blood glucose readings	4.81 ± 1.12	5
Q4	THS Could provide for a more efficient process overall than having a care giver come to my home	4.65 ± 1.03	5
Q5	THS could improve the overall efficiency of health care staff resource use	4.44 ± 0.60	4.5
Q6	THS could save health care staff time over the traditional home visit	4.7 ± 0.63	5
Job Fit Construct			
Q7	THS could increase health care provider's access to my health information	4.41 ± 0.57	4
Q8	THS could increase the efficiency of how my health information is communicated with other members of the health care team	4.46 ± 0.54	4
Q9	THS could reduce the time spent by healthcare workers to access my health information	4.46 ± 0.67	4
Q10	THS could allow health care staffs to more effectively communicate my health information with one another	4.63 ± 0.53	5
Perceived Usefulness Construct			
Q11	THS could decrease the number of required home visits	4.65 ± 0.68	5
Q12	THS could decrease time spent delivering care to the individuals in an emergency situation	4.37 ± 0.65	4
Q13	THS Could improve the quality of patient care	4.41 ± 0.57	4

Table III. Structural Model Table

Path[a]	Path Coefficient β	95 % CI	t-value	f^{2b}	Q^{2c}	R^{2d}
RA→ ATT	+0.274	(-0.046,0.558)	1.79	0.048		
JF→ ATT	+0.318	(0.057,0.671)	2.09*	0.064	0.167	0.324
AGE→ATT	-0.121	(-0.316,0.099)	1.13	0.022		

[a] The path between the constructs: Relative Advantage (RA), Job Fit (JF), and Attitude (ATT).
[b] f^2: Effect Size
[c] Q^2: Stone Geisser indicator
[d] R^2: Squared multiple correlations, representing the explained variance by the model
* $p<0.05$

Table IV. Construct Correlations.

Construct[a]	Mean	±SD[b]	CA[c]	ICR[d]	AVE[e]	Age	ATT	JF	RA
Age	62.46	7.53	SIC	SIC	SIC	SIC[f]			
ATT	4.31	0.77	0.50	0.800	0.666	-0.123	**0.816**		
JF	4.49	0.58	0.836	0.887	0.668	-0.007	0.526[g]	**0.817**	
RA	4.51	0.63	0.710	0.872	0.773	0.004	0.514[g]	0.756[g]	**0.879**

[a] Constructs: Attitude (ATT), Job Fit (JF), Relative Advantage (RA), and age of patients.
[b] SD: Standard deviation
[c] CA: Cronbach alpha
[d] ICR: Internal composite reliability
[e] AVE: Average Variance Extracted
[f] SIC: Single item construct
[g] Latent Variable correlations (Inter-construct correlations)
The bold values are the square root of AVE. According to the Fornell- Larcker criterion, the bold face values should be greater than latent variable correlations.

Table V. Measurement Model

Item or	Item	T-stat	ICR[a]	AVE[b]

Question	loading			
Relative advantage (RA)				
Q3 - RA	<0.4	NA[c]		
Q4 - RA	<0.4	NA[c]	0.872	0.773
Q5 - RA	0.901	23.250**		
Q6 - RA	0.856	14.536**		
Job Fit (JF)				
Q7-JF	0.906	22.476**		
Q8-JF	0.923	25.416**	0.887	0.668
Q9-JF	0.607	2.768**		
Q10-JF	0.794	14.386**		
Attitude (Att)				
Q1-Att	0.818	8.464**	0.800	0.666
Q2-Att	0.814	8.703**		

**: $p < 0.01$

[a] ICR: Internal composite reliability

[b] AVE: Average variance extracted

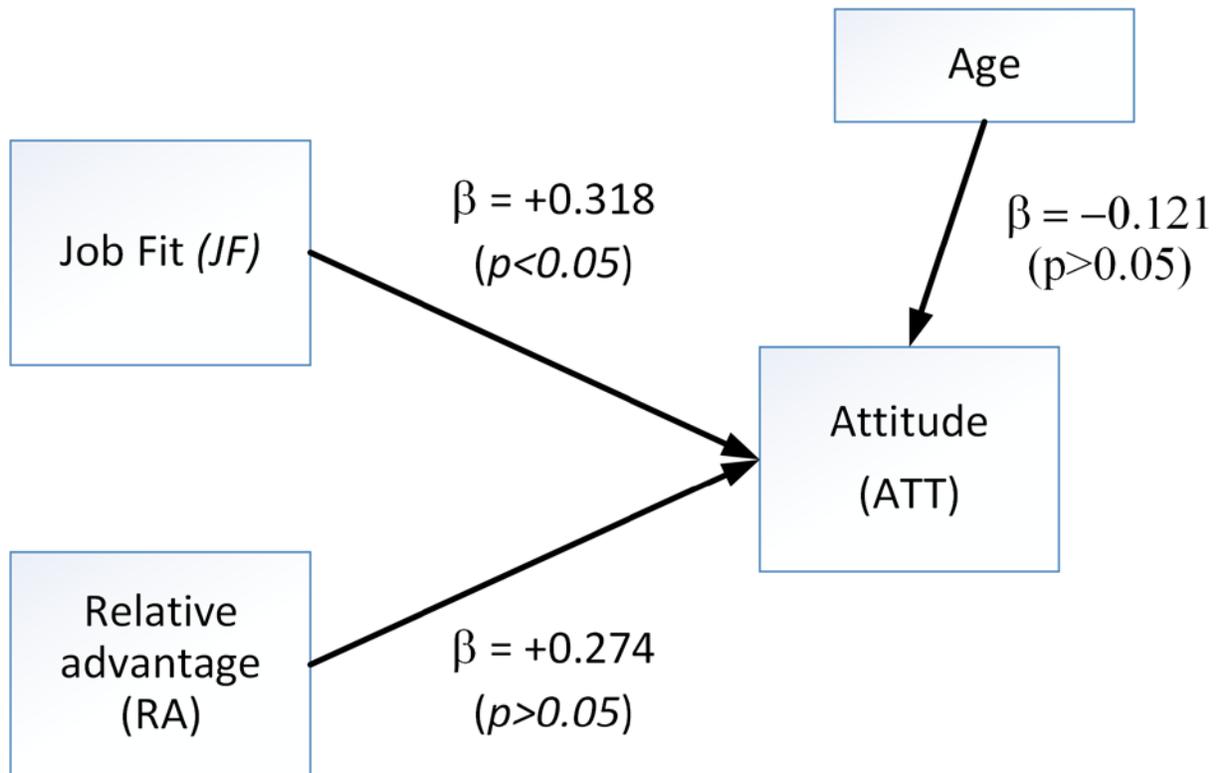[c] NA: Not applicable, items with loading less than 0.4 were not included in the model.

Figures

Figure 1. The Measurement Model

Appendix A

Interview Guiding Questions

1. Was it easy or difficult for you to take you own blood glucose levels?

2. Was it easy or difficult for you to enter and submit this information to the TELUS Health Space using your computer? What part of the procedure made it easy and what parts made it difficult?

3. What are the benefits and challenges (pros and cons) of you taking your own readings and submitting the results using your computer?

4. At the beginning of the study, you received training on using this technology. Comment on the usefulness of this training.

5. Do you have any suggestions on how to improve the training regarding the THS-PHR?

6. Did you find any limitations in using the PHR?

7. What impact has the technology had on your ability to manage your diabetes?

8. What was the impact of using your computer to submit your blood glucose levels to your health care provider?

9. Did you use the messaging system?

10. Compared to the other means of communication (telephone, fax, etc.) what was it like to use the messaging?

11. Did using messaging system affect your ability to manage your diabetes?

12. What was the impact of this technology on the quality of care you received?

13. Did this technology change the level of support you received from Sherwood Park PCN clinicians?

14. Would you continue using this technology as a way to share your blood glucose results and communicate with your health care provider?

15. Do you have any suggestions to improve this technology?

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