Older Adults' Perceptions of Home Telehealth Services

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Abstract

The success of home telemedicine depends on end-user adoption, which has been slow despite rapid advances in technological development. This study focuses on an examination of significant factors that may predict the successful adoption of home telemedicine services (HTS) among older adults. Based on previous studies in the fields of remote patient monitoring, assisted living technologies, and consumer health information technology acceptance, eight factors were identified as a framework for qualitative testing. Twelve focus groups were conducted with an older population living in both urban and rural environments. The results reveal seven predictors that play an important role in perceptions of HTS: perceived usefulness, effort expectancy, social influence, perceived security, computer anxiety, facilitating conditions, and physicians' opinion. The results provide important insights in the field of older adults' acceptance of HTS, with guidelines for the strategic planning, developing, and marketing of HTS for the graying market.

Key words: home telehealth services, older adults, telehealth adoption predicting factors

Introduction

The telemedicine industry and technology have been developing rapidly for over a decade, with its benefits being lauded. However, implementation and adoption processes are still in their infancy.^{1,2} The adoption of telemedicine has so far been modest, if not disappointing, as several interconnected barriers have yet to be overcome. Although inpatient care is a stable environment for implementing telemedicine solutions,³ the adoption of home telemedicine services (HTS) remains a relatively unexplored area. For the older population, because of the rise of chronic disease and other age-related health disorders, HTS are a promising option for increasing life quality, decreasing healthcare costs, and offering more independent living.^{4,5} This makes older adults the main target of efforts to implement HTS.⁶ HTS include three main groups of

services: home access to the healthcare system (access to personal health records); assisted living technologies; and remote patient monitoring and chronic disease management (vital signs measurement and online communication). The conceptualized HTS in this study included functionalities from all three groups, which are presented in Table 1. Although previous studies tested the user's perception of a specific function of HTS (typically a specific service involved in remote patient monitoring or a specific Internet health information exchange), the main objective of this study is to analyze the user's perception of the broad concept of HTS adoption.

This is challenging for several reasons. HTS are complex services with technical solutions either not yet existing or unknown to the target population. The target population (older adults) has less understanding of new, innovative, and information technology-based solutions and concepts. Introducing the concept of HTS to the conservative users in a conservative field of healthcare involves special challenges. Potential additional predictors related to older users' specifics and the adoption of healthcare services should be investigated to ensure a more reliable prediction of the acceptance of HTS. An important question is how those factors can be influenced to facilitate the adoption of a particular type of HTS by the older population. We thus conducted 12 focus groups to analyze older adults' perceptions of both the acceptance of general technology and additional, context-specific predictors.

We begin by reviewing behavioral predictors of the acceptance of information technology by older consumers and describe the specific features of healthcare services. In the next section we present the methodology, the results, and their implications. In the conclusion, theoretical and practical implications are extracted along with directions for HTS development and marketing as well as future research directions.

A Review of Potential Predictors TECHNOLOGY ACCEPTANCE PREDICTORS

Telemedicine solutions are technology-based services. Several theories try to explain users' intention to adopt technology. The most widely used theory is the technology acceptance model, using perceived usefulness and perceived ease of use as the main construct when measuring the intention to use new technology or services.⁷ The unified theory of acceptance and use of technology model by Venkatesh et al.⁸ offers an improved model for testing the acceptance of technology. Since its introduction, the unified theory of acceptance and use of technology model has been tested extensively, including in the context of health information technology, providing a rigorous framework for testing its acceptance.⁹ Its root constructs are perceived usefulness, effort expectancy, social influence, and facilitating conditions.

Table 1. Assessment of Usefulness of Home Telemedicine System Functionalities

HOME TELEMEDICINE SYSTEM FUNCTIONALITY	MEAN ^a
E-prescription and e-prescription extension (for chronic disease patients)	6.01
Online referrals for examinations and laboratory testing	5.90
Communication with personal doctor's/GP's office (consultations)	5.82
Updates about recent changes, received medical reports and laboratory tests	5.67
Overview of waiting lists	5.59
Access to information in case of traveling (vaccination, preventive interventions, etc.)	5.53
Access to general health-related information (published articles, updated information, etc.)	5.14
E-pharmacy (for ordering medications and pharmaceuticals)	5.11
Communicating with other users who have similar problems (sharing experience, opinion, etc.)	4.98
Access to personal health record	4.95
Access to second medical opinion	4.87
Home monitoring (vital signs measuring, for example, blood pressure, glucose, weight, etc.), with using computer	4.83
E-medical triage (after hospital discharge)	4.68

^aMeasured with a seven-point Likert scale from 1=not useful to 7=very useful. *n*=87.

GP, general practitioner.

Perceived usefulness is the degree to which an individual believes that using the system will help him or her attain gains.⁸ In the context of using HTS, the construct of perceived usefulness can be defined as the degree to which a user believes using HTS can improve one's quality of life. Effort expectancy is the degree of ease associated with using the system.⁸ Effort expectancy is conceptualized as the extent to which patients/users believe HTS will be easy to use. Perceived usefulness and effort expectancy are the most common constructs used for testing technology acceptance.

Social influence is the degree to which an individual perceives that important others believe he or she should use the system.⁸ Its root constructs include subjective norm, social factors, and image.¹⁰ Facilitating conditions are defined as the extent to which an individual believes that an infrastructure exists to support use of the system.⁸ This includes technical support, price, and organizational support.¹¹ In this study, social influence is conceptualized as the influence of important others on older users' decision to use HTS. Perceived price and technical and organizational supports are considered as facilitators.

CONTEXT-SPECIFIC PREDICTORS

In the context of older users' acceptance of HTS, an overview of previous studies reveals four major factors as additional predictors for HTS acceptance: computer anxiety, perceived security, self-efficacy, and doctor's opinion.^{11–18}

Computer anxiety refers to a negative affective reaction toward computers such as an apprehension or fear of using computers.^{19–21} Studies testing information technology acceptance by older users report computer anxiety is the most consistent predictor with a negative impact on attitude and intention to use technology.^{16,20,22} Computer anxiety has an even more important role among seniors.²³

Perceived security is conceptualized as the level to which transacting with the system is perceived as secure, enabling data integrity and reliability. Initial trust formation is particularly relevant in the information system adoption context because users must overcome perceptions of risk and uncertainty before using a novel technology.²⁴ The use of electronic services such as e-commerce and e-banking shows consumer trust in secure transacting with the system plays an important role in the acceptance of such services.^{25,26} Older adults have negative views about health information technology performing accurately and dependably, and therefore perceived security is predicted to exert an important influence on older users' acceptance of HTS.²⁷

Self-efficacy is defined as the belief that one has the capability to perform an action.²⁸ Especially in the context of older people using computer technology, computer self-efficacy has proved to be an important influence on attitude and intention to use.^{29,30}

The incentive and recommendation of one's physician have been shown to play a pivotal role in enrollment in preventive health care services (such as vaccination) and in using the Internet as a resource for medical information.³¹ According to the theory of five forces of power, the influence of a doctor's opinion on a patient's decision can be regarded as an expert power influence and can be applied in different contexts: manager–employee, salesman–customer, or, in the HTS context, a doctor–patient relationship.³² The doctor's opinion is predicted to have an important influence on a user's acceptance of HTS.

The identified eight predictors were used for testing the acceptance of HTS. Factors consist of two basic subgroups of predictors. Group 1 represents universal technology acceptance predictors and includes perceived usefulness, effort expectancy, social influence, and facilitating conditions. Group 2 are context-specific predictors, which include computer anxiety, perceived security, doctor's opinion, and computer self-efficacy.

Research Methodology

CONDUCTING FOCUS GROUP DISCUSSIONS

Because of the exploratory nature of our research, 12 focus group interviews (FGIs) were conducted with the first author acting as a moderator. These FGIs were used to survey the needs, expectations, and problems of older adults with respect to using HTS. Conducting focus groups is a useful method when analyzing consumerism and attitudes to various themes and can reveal the beliefs, attitudes, experience, and feeling of the participants through interaction, which would not be feasible via individual interviews or questionnaires.^{33(p.16)} A topic guide

was developed and used to match the concepts of the eight preliminarily defined predictive factors. Forming a theme for discussion, each predictor was analyzed to confirm the majority criteria.

STUDY SAMPLE

Each of the 12 FGI groups had 6–12 participants. In total, 87 subjects living in Slovenia participated: 22 men and 65 women, all of whom were retired. The study sample's age distribution was between 55 and 75 years, including retired participants living in households in both rural and urban environments. In the context of consumer behavior, the lower boundary for defining an older consumer usually ranges from 50 to 55 years, including the population with a need for a wide variety of products and services.³⁴ This segment has also often been used in testing the adoption of telemedicine among the older population.³⁵ The FGI settings were in centers for older people's daily activities and education in Slovenia. Such centers organize social, educational, and cultural activities for healthy older citizens. This is an active and independent living segment of older people with financial autonomy. Most important is that all participants were living at home, and thus the population included was not in palliative care, residential homes, or hospital care. Furthermore, most participants had previously been involved in programs for computer literacy and education and were familiar with basic use of computers and the Internet. As HTS are targeted at the older population with a tendency for independent living and increased quality in their older life, with financial autonomy and higher risks of health hazards,^{36,37(p.8)} the selected sample represented a target population for the implementation of HTS and solutions.

CONTENT AND PRESENTATION MATERIALS FOR THE FOCUS GROUPS

The FGI participants had no prior experience with HTS, and the challenge was to introduce the concept to them without improperly influencing their attitudes. For this purpose, a PowerPoint® (Microsoft, Redmond, WA) computer presentation with graphic materials concerning the conceptualized HTS was used. The presentation alone proved to be an insufficient method for presenting the concept. In addition, the participants rated the usefulness of HTS functionalities on a 7-point Likert scale (from not useful to very useful), as shown in *Table 1*. They were thereby given an incentive not only to listen but also to actively form opinions about various HTS. This combination of introductory methods enabled an efficient start to the discussion of the FGIs.

Results

The analysis of the FGIs indicated the importance of all four universal technology acceptance predictors: perceived usefulness, effort expectancy, social influence, and facilitating conditions. Perceived usefulness, effort expectancy, and facilitating conditions were consistently mentioned in all FGIs. Two main dimensions of facilitating conditions were identified; costs were exposed as the most important part of facilitating conditions, with participants expressing great concerns about financing the HTS with statements like “even 10 euro a month for us seniors can represent a price many people cannot afford” or “I think these services would have to be free of charge.” The

participants revealed a willingness to pay for additional special services such as home monitoring or home intervention but believed that the general technology services (e.g., access to their personal health record and health care information) should be free.

As a second facilitator, technical support was consistently identified. Participants exposed a need to access a call center, technical guidelines, and/or workshops for using HTS. Related comments were “I think we would be able to use the system, especially if there was somebody we could call if we needed technical assistance” or “it is important that technical assistance is organized if I have problems using the system.”

HTS were presented as being as secure as e-banking services. Most participants had prior experience with e-banking services and perceived them as a secure means of transacting. The participants commonly rely on the help of their close relatives for e-banking services, at least at the beginning. However, security issues regarding data integrity and reliability when using HTS were still a major question: “it is important that I am the only one with access to my personal health data,” “it would be important to control who to give permission to see my personal data, and which part,” “I would not want my family to access my information if I had cancer or similar,” and “I think only my personal doctor should be able to see this information, at least in complete form.”

At least one participant in each FGI expressed anxiety about using computers, even though it had been explained that no computer knowledge is required to use the services: “it is different with you young people, we are not so keen on using computers” and “but still, this means we would have to use a computer, wouldn't we?” A preference to use a tablet PC rather than a standard PC was most often revealed.

The physician was reported as an important source of information in the FGIs. Especially in terms of using remote monitoring, recommendations by the physician and other healthcare professionals are an important source of information when deciding to use the system: “in this case, it would probably be wise to ask my doctor whether it is really appropriate to use this system” and “Of course, my doctor would have to approve the use of HTS, after all, he will be the one examining the results.” Similarly, this refers to the influence of their colleagues and people they trust (social influence): “I think I would ask somebody I know who already uses the system for opinion and recommendations.” It is interesting that social influence was related more to a colleague's opinion and not to family members as an important source of information. With doctor's opinion and social influence mentioned in 9 of 12 and 8 of 12 FGIs, respectively, these two factors show lower consistency in the FGIs. Still, the exposed factors proved to have a relevant role in predicting perceptions of HTS usage.

However, computer self-efficacy was only mentioned in one FGI and therefore cannot be confirmed as a relevant predictor. A common statement was “I think we can usually learn if we have support and motivation” or “If one has motivation to use it, then most probably he/she will learn to use it.”

Discussion

Our article confirms that it is not easy to present telemedicine to the older population. The use of a demo presentation can in itself cause a

biased perception of participants. A short questionnaire with a list of key functionalities enabled an efficient introduction without the need for an additional explanation. Results of the analysis indicate seven key predictors for the acceptance of HTS by older adults: perceived usefulness, effort expectancy, facilitating conditions, and social influence, including three additional factors of perceived security, doctor's opinion, and computer anxiety. With computer self-efficacy not confirmed, the results indicate four universal technology acceptance factors and three (HTS) context-specific factors. Seven predictors can be used as a framework for quantitatively testing older adults' acceptance of HTS.

The results of the analysis also offer further insights into older users' behavioral specifics. The security questions expose the concern older people have regarding access to their personal health data by an unauthorized person and their need to be able to control authorization for third-party access. It is interesting that they also expressed the need to be able to limit access by close family members.

Family members are the primary and preferred source of help for older individuals regarding the use of computer and e-services.^{38,39} Older users' reluctance to allow family members access to their own health data combined with their lower ability to use electronic services influences their anxiety about the use of computers for HTS. Because they would probably be reserved in asking for assistance from their own family members, they want to feel autonomous even in the initial phase of using HTS. Therefore, technical support will also be very important to facilitate such use.

In addition, the costs of using HTS are important for older users. General HTS were perceived as infrastructural services for the delivery of healthcare and were therefore perceived as something that needs to be free of charge. This requires innovative business models to be able to provide free basic services.

PRACTICAL IMPLICATIONS

In terms of service design and development, some practical implications can be drawn as guidance for the development of HTS. The influence of computer anxiety will most probably result in the need to use different visual equipment, such as a tablet PC, to reduce the effect of HTS as a computer-based service. Furthermore, the presence of secure mechanisms must be clearly visible so as to create a trustworthy environment. The simplicity and intuitiveness of graphical user interfaces, price of using HTS, and technical support will probably be the most important facilitators determining the success of the initial adoption of HTS. Further on, marketing interventions and technical support will moderate the scale-up process in the follow-up phase. Marketing interventions can focus on promoting HTS services among health professionals in the scale-up process, using healthcare professionals as social agents. As suggested by the perceived usefulness of functionalities in *Table 1*, HTS providers should first focus on information technology support for existing processes. The "offline world" users will perceive less effort expectancy for using the adjusted existing services (e.g., e-prescription and online referrals), while the adoption of more advanced services may follow only later.

The research presented here offers insights to help predict older users' perceptions of the HTS solutions and general guidelines for

further development. More important is that it offers an approach for performing a preliminary analysis and prediction of older users' preferences/demands when it comes to using HTS. Using a short list of functionalities in the introduction to the questionnaire proved to be an excellent way of introducing the new concept to the participants and also gave us additional insights into the preferred functionalities.

Our research suffers from the usual limitations of qualitative research and should be viewed as exploratory rather than confirmatory. The sample size does not allow the generalization of the findings, and all the FGI participants come from the same country with a homogeneous cultural background. Further research should address these issues by considering a more quantitative approach to analyze the level of influence of individual predictors and to evaluate cultural influences. Further quantitative testing should also enable a more in-depth understanding of the relationships among individual factors and their correlations, such as the influence of prior experience and education on the technical support needed.

Still, this and further similar studies should contribute to a better understanding of the ways in which older adults adopt HTS and which benefits they expect. Such studies can contribute to the development of sustainable business models for technology and services providers and, most importantly, to the higher quality of life for older adults.

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REFERENCES

- Koch S. Meeting the challenges—The role of medical informatics in an ageing society. *Stud Health Technol Inform* **2006**;124:25–31.
- Bensink M, Hailey D, Wootton R. A systematic review of successes and failures in home telehealth: Preliminary results. *J Telemed Telecare* **2006**;12:8–16.
- Liu C-F. Key factors influencing the intention of telecare adoption: An institutional perspective. *Telemed J E Health* **2011**;17:288–293.
- Onor ML, Trevisiol M, Urciuoli O, Misan S, Bertossi F, Tirone G, et al. Effectiveness of telecare in elderly populations—A comparison of three settings. *Telemed J E Health* **2008**;14:164–169.
- Finkelstein SM, Speedie SM, Potthoff S. Home telehealth improves clinical outcomes at lower cost for home healthcare. *Telemed J E Health* **2006**;12:128–136.
- Chiu K-H, Yang YY. Remote monitoring of health status of the elderly at home in Taiwan. *Telemed J E Health* **2010**;16:717–726.
- Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Q* **1989**;13:319–340.
- Venkatesh V, Morris MG, Davis GB, Davis FD. User acceptance of information technology: Toward a unified view. *MIS Q* **2003**;27:425–78.

9. Janz BD, Hennington A. Information systems and healthcare XVI: Physician adoption of electronic medical records: Applying the UTAUT model in a healthcare context. *Commun Assoc Inform Syst* **2007**;19:60–80.
10. Taylor S, Todd P. Assessing IT usage: The role of prior experience. *MIS Q* **1995**;19:561–570.
11. Or CKL, Karsh B-T. A systematic review of patient acceptance of consumer health information technology. *J Am Med Inform Assoc* **2009**;16:550–560.
12. Agarwal R, Angst C. Adoption of electronic health records in the presence of privacy concerns: The elaboration likelihood model and individual persuasion. *MIS Q* **2009**;33:339–370.
13. Agarwal S, Lau CT. Remote health monitoring using mobile phones and Web services. *Telemed J E Health* **2010**;16:603–607.
14. Jen W-Y, Hung M-C. An empirical study of adopting mobile healthcare service: The family's perspective on the healthcare needs of their elderly members. *Telemed J E Health* **2010**;16:41–48.
15. Or CKL, Karsh B-T, Severtson DJ, Burke LJ, Brown RL, Brennan PF. Factors affecting home care patients' acceptance of a web-based interactive self-management technology. *J Am Med Inform Assoc* **2011**;18:51–59.
16. Rahimpour M, Lovell NH, Celler BG, McCormick J. Patients' perceptions of a home telecare system. *Int J Med Inform* **2008**;77:486–498.
17. Steele R, Lo A, Secombe C, Wong YK. Elderly persons' perception and acceptance of using wireless sensor networks to assist healthcare. *Int J Med Inform* **2009**;78:788–801.
18. Botsis T, Hartvigsen G. Current status and future perspectives in telecare for elderly people suffering from chronic diseases. *J Telemed Telecare* **2008**;14:195–203.
19. Beckers JJ, Schmidt HG. The structure of computer anxiety: A six-factor model. *Comput Hum Behav* **2001**;17:35–49.
20. Ellis D, Allaire JC. Modeling computer interest in older adults: The role of age, education, computer knowledge, and computer anxiety. *Hum Factors* **1999**;41:345–355.
21. Rosen LD, Weil MM. Computer anxiety: A cross-cultural comparison of university students in ten countries. *Comput Hum Behav* **1995**;11:45–64.
22. Phang CW, Sutanto J, Kankanhalli A, Li Y, Tan BC, Teo H-H. Senior citizens' acceptance of information systems: A study in the context of e-government services. *IEEE Trans Eng Manage* **2006**;53:555–569.
23. Laguna K, Babcock RL. Computer anxiety in young and older adults: Implications for human-computer interactions in older populations. *Comput Hum Behav* **1997**;13:317–326.
24. Li X, Hess TJ, Valacich JS. Why do we trust new technology? A study of initial trust formation with organizational information systems. *J Strategic Inform Syst* **2008**;17:39–71.
25. Chellappa RK, Pavlou PA. Perceived information security, financial liability and consumer trust in electronic commerce transactions. *Logistics Inform Manage* **2002**;15:358–68.
26. Suh B, Han I. The impact of customer trust and perception of security control on the acceptance of electronic commerce. *Int J Electron Commerce* **2003**;7:135–61.
27. Welsh S, Hassiotis A, O'Mahoney G, Deahl M. Big brother is watching you—The ethical implications of electronic surveillance measures in the elderly with dementia and in adults with learning difficulties. *Aging Mental Health* **2003**;7:372.
28. Bandura A. Self-efficacy: Toward a unifying theory of behavioral change. *Psychol Rev* **1977**;84:191–215.
29. Igbaria M, Iivari J. The effects of self-efficacy on computer usage. *Omega* **1995**;23:587–605.
30. Lam J, Lee M. Bridging the Digital Divide—The roles of internet self-efficacy towards learning computer and the internet among elderly in Hong Kong, China. *Proceedings of the 38th Annual Hawaii International Conference on System Sciences, 2005*, City University of Hong Kong. HICSS'05. **2005**:266b.
31. Abramson ZH, Cohen-Naor V. Factors associated with performance of influenza immunization among the elderly. *Isr Med Assoc J* **2000**;2:902–907.
32. Asherman I, Asherman S. *The negotiation sourcebook*. Indiana University: Human Resource Development, **2001**:70.
33. Litosseliti L. *Using focus groups in research*. London: Continuum International Publishing Group, **2003**.
34. Moschis GP, Lee E, Mathur A. Targeting the mature market: Opportunities and challenges. *J Consumer Marketing* **1997**;14:282–293.
35. Shea S, Weinstock RS, Starren J, Teresi J, Palmas W, Field L, et al. A randomized trial comparing telemedicine case management with usual care in older, ethnically diverse, medically underserved patients with diabetes mellitus. *J Am Med Inform Assoc* **2006**;13:40–51.
36. European Commission, Directorate General for Information Society and Media. ICT & ageing, European study on users, markets and technologies. **2010**. Available at http://ec.europa.eu/information_society/activities/einclusion/library/studies/docs/ict_ageing_final_report.pdf (last accessed January 15, 2013).
37. Morris MG, Ozanne E, Miller K, et al. Smart technologies for older people. **2012**. Melbourne, Australia: Institute for a Broadband-Enabled Society, **2012**. Available at <http://broadband.unimelb.edu.au/resources/Smart-technologies-for-older-people.pdf> (last accessed January 15, 2013).
38. Chu RJ. How family support and Internet self-efficacy influence the effects of e-learning among higher aged adults—Analyses of gender and age differences. *Comput Educ* **2010**;55:255–264.
39. Jacko JA, Sears A. *The human-computer interaction handbook: Fundamentals, evolving technologies and emerging applications*, 3rd ed. London: Routledge, **2003**:417.

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