

# Teaching Older Adults with Multiple Chronic Conditions to Use a Tablet and Patient Application for Health Management

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**Abstract.** Within home telehealth programs, patients often receive devices and applications which they may need to learn how to use. A user feedback study with training materials on a tablet PC and patient application, designed for older chronic patients, was conducted with fifteen USA patients from the Philips Intensive Ambulatory Care home telehealth program. Two themes emerged from the findings, in relation to the training program: (1) Relevance, appreciation and user experience, and (2) patient preferences, which had two sub-themes (a) Manner of communication and (b) designing the interaction. Participants found training materials relevant, preferred materials that allow practicing and provide feedback, especially when worded in a manner that is encouraging but not patronizing. They preferred information in audio as well as text formats due to their abilities. Training materials introducing technologies to patients, appropriate for their abilities and preferences, need to be devised and provided to promote telehealth patient engagement.

**Keywords:** Older adults · Chronic disease · Home telehealth · Tablet computer · Tutorial · Training · User feedback

## 1 Introduction

Telehealth is defined as the provision of care to patients at a distance, using audio, video and/or other telecommunications technologies [1]. Home telehealth programs for patients with chronic conditions may include various monitoring, education, coaching, communication and support components that can improve clinical [2] and patient outcomes [3], support patients to manage their conditions [4, 5], and may reduce costs [6]. Often within home telehealth programs, communication with medical professionals, education and coaching are done digitally. For example, patients may be provided a device (e.g. a tablet computer) which may include applications providing allowing communication with the telehealth professionals, educational content, surveys, and other features to support patients to manage their health.

Engagement in the devices and applications that are provided within telehealth programs is of utmost importance for program effectiveness. However, often patients in

telehealth programs are older adults who may have limited knowledge about and experience with such forms of technology, which could affect their use and engagement levels. To promote engagement with the devices, it is therefore important to teach patients how to use, and support them in gaining experience with, the devices that are provided within a telehealth program. In addition, since it is known that older adults may experience computer anxiety leading them to refrain from using new technology [7], telehealth patients could become anxious about technology which is newly introduced to them within a telehealth program, leading to less engagement in it. In order to reduce the likelihood that patients feel anxious due to the new technology they receive after joining a telehealth program, it is imperative to introduce it to them in a non-threatening manner. One possibility is to introduce the technology with a training program consisting of appropriate and non-threatening learning materials. Although the technologies could potentially be taught to patients by a human (e.g. a healthcare provider), this could be less desirable for pragmatic reasons (such as high cost, less possibility for on-demand instruction and limited technology teaching skills).

To devise an appropriate training program and materials for this patient population, it is important to take into account their unique characteristics, needs and preferences. Besides the obvious physical disabilities due to having multiple chronic conditions, also cognitive decline which needs to be taken into account when designing user interfaces for older adults [8–10]. It is also important to understand this target populations' preferences regarding training materials since incorporating their preferences into the materials would make it more likely that they would use them [11].

The aim of the current work was to devise recommendations for training materials concerning how to use a tablet and patient application for health management, targeting older adults with chronic conditions within telehealth programs. The research question was, what should be included in a training program teaching how to use a tablet and health management application for older chronic disease telehealth patients, to ensure patient needs and preferences are addressed in the program? To address the aim and answer the research question, a user feedback study was conducted with patients from the Philips Intensive Ambulatory Care (IAC) home telehealth program at Banner Health in Arizona. The IAC program targets complex chronic patients with multiple conditions, and includes an interdisciplinary care team consisting of physicians, nurses, pharmacists and social workers providing care to patients remotely, as well as health coaches providing care at the patients' homes.

### **1.1 The Importance of User Research in the Design Process of Interfaces for Older Adults**

Needs assessment is an integral part of the development of technology training programs for older adults [12]. It has been argued that researchers and developers typically find it easier to design for someone who is similar to them [13–15]. Younger people may find it difficult to understand the needs and preferences of older adults [8]. However, it is important to understand the specific needs and preferences of typical persons within the target user population when designing interfaces meant for that population of users.

There are a few reasons why it is particularly important to include older chronic patients as the target users in the design process of the (digital) training materials related to tablets, and incorporate their needs and preferences in the resulting training program. First, technology acceptance is an important factor affecting older adults' technology use [16]. It is therefore necessary to increase user acceptance of the (digital) training program by incorporating users' preferences into the program design. Second, older adults may have specific needs, different than those of younger people when it comes to learning how to use technology. Older adults often have cognitive changes that may make it more difficult for them to interact with technology [17], such as interactive training materials. Physical (motoric and sensory) disabilities are central barriers to older adult learning as well [18]. Attitudes toward technology and learning how to use technology are also important to understand and address in training materials about technology, including perceived benefits of the technology, which may be low among older adults, reactions to making errors when using the technology, and perceptions of being too old to learn to use technology [19].

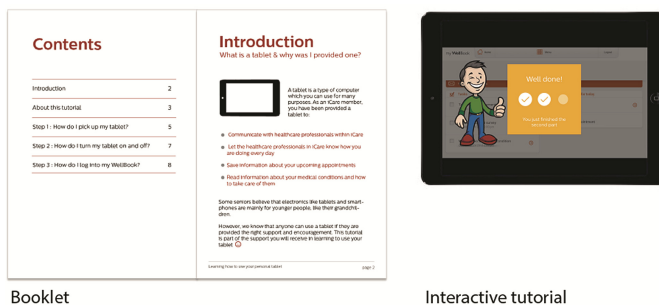
Previous research has demonstrated specific needs of older adults in relation to technology training, for example it has been found that older people may require more time than younger people to learn how to use computers [20]. Our target users were older adults who have joined a telehealth program that specifically targets complex chronic disease patients with multiple chronic conditions. This specific group may have additional needs when it comes to learning how to use technology.

## **1.2 Designing a Patient Training Tutorial for Tablet Use Within a Telehealth Program**

In the context of the current work, we designed a prototype of a training tutorial which consisted of a click-through demo containing the main interaction flow, navigation and content relevant to evaluate the first-time user experience but did not contain a full set of working interactive elements. The demo was aimed at teaching older telehealth patients how to use a tablet and patient application, and took into account the learning needs of older adults. This tutorial was used in feedback sessions and new versions were created on an ongoing basis in the study, based on the feedback received.

Before designing the first version of the tutorial, we first considered the different methods of information delivery (storytelling, chunking information and tutorial) and different types of media (printed information, on-screen and a combination of those) that can be used when devising training materials. We selected one methodology, namely the tutorial, and two types of media – paper-based and interactive. The reason we selected the tutorial methodology was that a tutorial allows information provision but also practicing the tasks, which in the case of learning how to use the tablet was deemed most suitable. We opted to use a paper-based booklet to teach about the hardware components so that patients can, as a next step engage in the interactive part after turning on the tablet and logging as the booklet supports them to do. The paper-based element was necessary because patients need to operate the hardware components to be able to interact with the software components, and therefore the training program could not be entirely digital.

The resulting tutorial (Fig. 1) included two parts: In the first part, included the paper-based booklet. In this part the tablet was introduced and an explanation why patients receive a tablet as part of the telehealth program was provided, and then the hardware components were explained as well as how to log into the application once the tablet is turned on. Within this part, patients were requested to perform various activities which allow practicing the tasks that are being taught. When patients complete this first part they have the tablet turned on and are logged into the application. At the point the patient is logged into the tablet, the tutorial automatically begins. Within the interactive part of the tutorial, patients are guided through the different features of the application, using a voiceover as well as text, in addition to different visual cues. They are asked to click buttons themselves and are guided in practicing the application.



**Fig. 1.** Training materials for telehealth patients with paper-based (left) and digital (right) elements

## 2 Method

The tutorial demo which was displayed to participants in the feedback sessions was created by the researcher (BL) on Apple Keynote. The tablet (an Apple iPad) on which the tutorial demo was provided to participants was brought by the researchers to the feedback sessions at patients' homes (Fig. 2).



All participants were enrolled in the IAC pilot program prior to their participation in the study and signed an informed consent during their recruitment to the program. During a regular scheduled visit with the health coach Potential participants were asked to participate in the feedback sessions. If they agreed, they were contacted by the

researcher (ROC) who provided more information about the study and set a date for the feedback session. The researchers (ROC and BL) both conducted the feedback sessions at the patients' homes, which were planned to be an hour in length. Upon arrival, the researchers introduced themselves, explained the study procedure and asked to conduct the study at a place that would be comfortable for the patient to use a tablet and read a booklet.

Each feedback session included four parts: (1) Introduction and patient characteristics, (2) Questions about patients' prior experience with, and use of the tablet (i.e. the device and application), (3) Patients' interaction with the training materials, (4) Obtaining feedback regarding the materials, their perceived suitability and relevance, patients' preferences regarding its content and design, user experience and likelihood of use. User sessions were audio recorded and notes were taken relating to the context of use. The researchers (ROC and BL) listened to the audio recordings after the study was completed, and took extensive notes. Then, the notes taken during the feedback sessions were added to the notes from the audio recording. Researchers analyzed their note separately discussed the results and reached consensus.

The study included three phases, with five patients in each phase. In each phase, feedback was collected through notes taken during the sessions and from audio recordings. Next, the notes were analyzed and conclusions were reached by the two researchers about the changes that need to be made to the tutorial. Finally, the tutorial was revised and redesigned based on patient feedback. In the following phase, the revised version of the tutorial was displayed to patients. When there was doubt regarding patient preferences of a certain aspect of the tutorial, more than one version was displayed to patients who were asked to indicate which version they preferred and explain why. For example, one of the aspects explored was preferences relating to an avatar for provision of feedback on task completion. Participants were presented with a few avatars, including a range of characters from friendly and even cartoon styles, to serious and figurative styles (Fig. 3).

### **3 Results**

The study included 15 participants (10 male patients, age range from 77 to 94; average age 82). Two themes emerged from the findings, in relation to the training program: (1) Relevance, appreciation and user experience and (2) Patient preferences, which had two sub-themes (a) manner of communication, and (b) designing the interaction. The results in relation to each of the themes are discussed in detail below.

#### **3.1 Relevance, Appreciation and User Experience of the Training Materials**

Results demonstrated that, in the context of a telehealth program, interviewed patients found it relevant and necessary to receive training materials about the tablet and patient application. They remarked that this type of materials could support them after joining the telehealth program, and could help them feel more confident in using the tablet

“You need to get confidence to do this thing. This material can help you to build up confidence” (IAC patient).

Many patients explained that if soon after joining the IAC program they would have been provided a training program similar to that which they completed during the current study, they would have used it. They recognized it would have supported them to learn how to use the tablet, which most did not know how to use before they joined the IAC program. Some of the patients expressed their preferences to still have a human (e.g. a formal or informal caregiver) support them in addition to the training program. However, it was observed that patients were able to complete the training program by themselves, with very minimal explanation necessary on behalf of the researchers.

Patient’s user experience of the tutorial was favorable. However, their overall experience of the digital part of the tutorial was better than of the paper-based part of the tutorial. This was despite the fact that they remarked that the booklet format was more familiar to them, and they explained they have seen similar instruction booklets before (and even received such booklets as part of the telehealth program). Specifically, participants appreciated the interactivity in the digital part of the tutorial, and the ability to try the tasks themselves after receiving instructions for tasks. Moreover, information that was provided in audio as well as text formats was preferred by participants to text only. Patients explained that they prefer to be able to read and listen simultaneously, and that on different days they may primarily use one of the modalities (e.g. if they are tired they may only listen to the audio and not read the text).

Participants remarked that information regarding how to perform troubleshooting by themselves was necessary. They expressed their satisfaction with learning what they can do to troubleshoot issues which may arise with the tablet. Patients who have been in the program for a longer time remarked that they experienced such issues in the past and called the IAC center for help, and would have appreciated being able to solve the issues themselves.

## **3.2 Patient Preferences in Relation to Aspects of the Training Program**

A few patient preferences emerged from the findings. These were specifically in relation to (a) the manner of communication within the training program, including the text, wording, and tone of voice of the materials, and (b) the interaction design of the program, including the interface design and the interactive activities within the training program.

### **3.2.1 Manner of Communication**

In relation to how to communicate with patients within a training program, it was found that patients had preferences related to the manner of communicating feedback and to the length of text in the paper-based part of the tutorial. The responses of patients were mixed in relation to avatars that could potentially be provided as a communication tool within a training program.

Participants appreciated receiving feedback on their use of the tablet and application. They specifically preferred feedback that is worded in a manner that is encouraging but not patronizing. In the first study phase, the tutorial provided positive feedback on every

task that was completed well by the user (“Well done!” or “Good job!”), but some participants did not appreciate this feedback and found it patronizing when it referred to smaller, more menial tasks. One participant, for example, explained that providing such encouragement for every simple task performed accentuates to her that she is older and less experienced with technology. Participants thus preferred to be provided positive feedback when they complete a significant task, while for smaller tasks would prefer only an indication that the task was completed.

As mentioned before, the paper-based part of the tutorial consisted of a booklet with text and diagrams. The observations of participants’ interactions with the booklets demonstrated that many did not read the text carefully and in detail. Some of the participants also did not look at the booklet pages in the right order (i.e. starting with the first and ending with the last page). As we went through the study phases, we tried to shorten the text and make sure that it is explained at the very beginning of the booklet that it is important to read the whole text as well as read the pages in the right order. This change led to more patients reading the booklet as intended, but some patients still did not read all of the text and did not read the booklet in order.

When presented with the different avatars, patients had different preferences. Some of the interviewed patients preferred not having an avatar at all and had no preference from the avatars they were presented. Most of those that did have a preference, preferred the friendly and professional-looking avatars (Fig. 2) explaining those were more relevant in the telehealth program context, but also appeared more empathic. However, a minority of patients had other preferences (e.g. one patient preferred the puppy avatar).

### 3.2.2 Designing the Interaction

Participants appreciated the fact that the training materials allowed them to practice using the device and application in a stepwise manner, and provided feedback on the use. Specifically, patients particularly appreciated the possibility to practice the actions they would need to take when they engage with the tablet and application and remarked that it would have helped them to have practiced these actions soon after they joined the telehealth program. They appreciated being able to practice even simple tasks, such as clicking a button on a touchscreen.

A few aspects of the user interface design were confusing to patients and lead to errors or misunderstandings. These were redesigned in each phase until we observed patients were comfortable with the interaction and were not making errors. It was important to visually differentiate the tutorial user interface elements from the application user interface elements to avoid confusion. In order to direct the users’ gaze to specific user interface (UI) elements on the screen, it was necessary to (1) use very a high contrast to highlight elements visually, (2) include a voice over and slow transitions to reinforce the image from different channels; and (3) sync multi-modal interactions while minding transition speed, including a timely voice over and a high-level of contrast.

## 4 Conclusion and Implications

Although telehealth is promising, there are various obstacles to telehealth implementation, including patients' knowledge and attitudes [21]. Designing and providing appropriate and accepted training materials relating to devices and applications used within the programs can facilitate optimal patient engagement in telehealth programs by increasing knowledge and experience levels and decrease fear and anxiety of the devices and application, which can thereby influence program efficacy. It has been found that some (potential) telehealth patients incorrectly assume that special skills are necessary to operate devices, leading them to reject telehealth programs [21]. Training programs that teach patients to use the devices in a stepwise manner and allow patients to practice using the devices, could help to eradicate such assumptions and increase patient acceptance of telehealth programs.

The need for technology training programs targeting older adults has been noted in literature [22]. Previous work has shown that older adults prefer receiving training before adopting a new technology [11]. Our findings are in line with previous work, demonstrating that a training program teaching telehealth patients how to use technology that is provided as part of the telehealth program and is new to them (a tablet computer and patient health management application) is regarded relevant and is appreciated by patients. Our results suggest that patients are willing to engage in such a training program, and that they would be able to do so on their own. Since some patients expressed a preference to have access to a human who can support them to navigate the training program if needed, it is advisable to have such an option available for patients. Since the results also suggest that patients are likely to be able to complete a training program designed to accommodate their needs without additional support, it is possible that the reason for the request for human support is for added confidence rather than inability to complete the program on their own.

The research question addressed in the current work was: What should be included in a training program teaching how to use a tablet and health management application for older chronic disease telehealth patients, to ensure patient needs and preferences are addressed in the program? Our findings suggest a number of preferences of older adults that should be taken into account when devising a training program about technology, related to the manner of communication and the interaction design of the training program. Although previous work has investigated among older adults the perceptions of, and preferences in relation to, a training program about a technology that is new to them (e.g. personal computers) [11], the current work is the first to investigate this in the context of a home telehealth program with older patients who have multiple chronic conditions. The results suggest that the manner in which feedback on technology use is worded is important to this user population. Based on some of the remarks provided by patients, it seems that some patients may feel that their age and limited experience with technology is accentuated, making the feedback feel patronizing to them. It is important to define user feedback provided within a training program about technology with this in mind. Interestingly the results also suggested patients prefer receiving interactive digital training materials than paper-based materials, despite their expressed greater familiarity with the latter. They appreciate the opportunity to practice the tasks and to



receive feedback on their progress. Digital training programs should provide information in audio as well as text allowing patients the choice of modality based on their abilities or their state.

## 5 Limitations

The current work has a few strengths as well as a few limitations. First, the work included in-depth feedback sessions with patients who were presented a training program. The results lead to an understanding of their preferences and perspectives and allow researchers and designers who need to devise training programs for similar populations to use the results of the current work as a guideline. The feedback sessions were conducted with the target population in their natural setting and allowed observing them interact with the training materials as they would have interacted with them in “real life”. This leads to results that are based on an understanding of the situation in which the training process would occur. On the other hand, the sample size in the current study was relatively small and the sample was not selected at random. We focused on patients within one specific telehealth program and one geographic location. The results cannot be generalized to the entire chronic disease population in different geographic locations.

Although our work demonstrates how training materials for use in a telehealth program could be designed to address preferences of older adults with multiple chronic conditions, the current work has not examined the timing within the telehealth program that such materials should ideally be provided to patients. Materials that teach patients how to use devices or services could be provided to patients immediately after joining a program, for example. However, it could be that patients who have just recently joined a telehealth program may experience an informational or emotional overload, especially if they have recently experienced an acute clinical episode and joined the program following a hospitalization. It is advised that future work establishes when is the best timing within a telehealth program to provide training materials to patients, and if multiple devices and services are provided with a program, how such materials should be ordered.

## References

1. Paré, G., Mirou, J., Sicotte, C.: Systematic review of home telemonitoring for chronic diseases: the evidence base. *J. Am. Med. Inform. Assoc.* **14**, 269–277 (2007)
2. DelliFraine, J.L., Dansky, K.H.: Home-based telehealth: a review and meta-analysis. *J. Telemed. Telecare* **14**, 62–66 (2008)
3. Polisena, J., Tran, K., Cimon, K., Hutton, B., McGill, S., Palmer, K., Scott, R.E.: Home telehealth for chronic obstructive pulmonary disease: a systematic review and meta-analysis. *J. Telemed. Telecare* **16**, 120–127 (2010)
4. Radhakrishnan, K., Cynthia, J.: Impact of telehealth on patient self-management of heart failure: a review of literature. *J. Cardiovasc. Nurs.* **27**, 33–43 (2012)
5. Davis, R.M., et al.: TeleHealth improves diabetes self-management in an underserved community diabetes TeleCare. *Diabetes Care* **33**, 1712–1717 (2010)

6. Polisena, J., Coyle, D., Coyle, K., McGill, S.: Home telehealth for chronic disease management: a systematic review and an analysis of economic evaluations. *Int. J. Technol. Assess. Health Care* **25**, 339–349 (2009)
7. Czaja, S.J., Charness, N., Fisk, A.D., Hertzog, C., Nair, S.N., Rogers, W.A., Sharit, J.: Factors predicting the use of technology: findings from the Center for Research and Education on Aging and Technology Enhancement (CREATE). *Psychol. Aging* **21**, 333–352 (2006)
8. Eisma, R., Dickinson, A., Goodman, J., Syme, A., Tiwari, L., Newell, A.F.: Early user involvement in the development of information technology-related products for older people. *Univ. Access Inf. Soc.* **3**, 131–140 (2004)
9. Czaja, S.J., Lee, C.C.: The impact of aging on access to technology. *Univ. Access Inf. Soc.* **5**, 341–349 (2007)
10. Loos, E.F., Romano Bergstrom, J.: Older adults. In: Romano Bergstrom, J., Schall, A.J. (eds.) *Eye Tracking in User Experience Design*, pp. 313–329. Elsevier, Amsterdam (2014)
11. Mitzner, T.L., Fausset, C.B., Boron, J.B., Adams, A.E., Dijkstra, K., Lee, C.C., Rogers, W.A., Fisk, A.D.: Older adults' training preferences for learning to use technology. In: Proceedings of the Human Factors and Ergonomics Society Annual Meeting **52**, pp. 2047–2051 (2008)
12. Mayhorn, C.B., Stronge, A.J., McLaughlin, A.C., Rogers, W.A.: Older adults, computer training, and the systems approach: a formula for success. *Educ. Gerontol.* **30**, 185–203 (2004)
13. Keates, S., Cherie L., Clarkson, P.J.: Investigating industry attitudes to universal design. In: Proceedings of the Rehabilitation Engineering Society of North America Annual Conference (RESNA 2000): Technology for the New Millennium, pp. 276–278. RESNA Press (2000)
14. Akrich, M.: *User representations: practices, methods and sociology*. Pinter, London (1996)
15. Oudshoorn, N., Rommes, E., Stienstra, M.: Configuring the user as everybody gender and design cultures in information and communication technologies. *Sci. Tech. Hum.* **29**(1), 30–63 (2004)
16. Or, C.K., Karsh, B.-T.: A systematic review of patient acceptance of consumer health information technology. *J. Am. Med. Inform. Assoc.* **16**, 550–560 (2009)
17. Charness, N., Boot, W.R.: Aging and information technology use potential and barriers. *Curr. Dir. Psychol. Sci.* **18**, 253–258 (2009)
18. Purdie, N., Boulton-Lewis, G.: The learning needs of older adults. *Educ. Gerontol.* **29**, 129–149 (2003)
19. Wagner, N., Hassanein, K., Head, M.: Computer use by older adults: a multi-disciplinary review. *Compt. Hum. Behav.* **26**, 870–882 (2010)
20. Kelley, C.L., Charness, N.: Issues in training older adults to use computers. *Behav. Inf. Tech.* **14**, 107–120 (1995)
21. Sanders, C., Rogers, A., Bowen, R., Bower, P., Hirani, S., Cartwright, M., Fitzpatrick, R., Knapp, M., Barlow, J., Hendy, J., Chrysanthaki, T., Bardsley, M., Newman, S.P.: Exploring barriers to participation and adoption of telehealth and telecare within the whole system demonstrator trial: a qualitative study. *BMC Heal. Serv. Res.* **12**, 220 (2012)
22. Heart, T., Kalderon, E.: Older adults: are they ready to adopt health-related ICT? *Inter. J. Med. Infor.* **82**, e209–e231 (2013)