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User Satisfaction and Experience with a Telehealth System for the Danish TeleCare North Trial: A Think-Aloud Study

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Abstract. The aim was to evaluate a redesigned version of Telekit – a telehealth system developed for the Danish TeleCare North Trial. Telekit is used in the management of care in patients diagnosed with chronic obstructive pulmonary disease (COPD). This paper summarises the experience and the feedback received from six COPD-participants in terms of usability and satisfaction. Participants were asked to think-aloud while performing some system specific tasks. After each session, participants completed a post-test questionnaire. The think-aloud test was recorded, and notes from the tests were categorised and analysed. All tasks were completed by participants. Difficulties were observed concerning monitoring of measurements and use of the touchscreen. User feedback was mainly positive, and nearly all participants perceived Telekit as very easy to use. The study provides important insight regarding use of Telekit by patients suffering from a chronic illness and increased understanding about, how similar systems can more effectively be used in such home health initiatives.

Keywords. Handheld computer, user-computer interface, usability, chronic obstructive pulmonary disease, telemedicine

Introduction

Chronic obstructive pulmonary disease (COPD) is an important cause of morbidity and mortality worldwide. The disease has a significant impact on patients' quality of life and imposes a significant burden on healthcare resources. Consequently, there is need for new COPD management to meet factors influencing the disease [1].

Telehealth technologies are used in home and community settings to enable monitoring of chronic patients' well-being (for example, by measuring vital signs) and communication with health care providers using synchronous or asynchronous communication platforms [2]. Given that the patients are going to operate these tools, their experiences of and satisfaction with these devices must be evaluated. Furthermore, there seems to be a need for usability evaluation in older adults with chronic diseases using telehealth solutions, as the technology is expected to pose considerable challenges [3,4]. Elderly's physical and cognitive capabilities are limited compared to

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younger adults and this may interfere with the elderly's use of telehealth technologies [5].

A large-scale Danish project, TeleCare North, has developed a telehealth system (Telekit) to all COPD patients in the North Denmark Region. All eleven North Jutland municipalities, the North Denmark Region, general practitioners and Aalborg University are taking part in the project. The project attempts to develop a technology and educational environment, which will empower patients to retake responsibility for their own lives. Approximately 600 of the 1,225 patients are in possession of the Telekit system at home, and use it as support in monitoring and treatment of their disease [6,7].

A heuristic evaluation, performed by usability experts, has been used to evaluate an early version of the Telekit system in order to refine the usability and elucidate the factors that affect the implementation to operation. Findings from the evaluation indicated that Telekit needed improvements. The most serious problems included the inability of the system to inform users of how to perform measurements correctly and to "speak the users' language". The usability problems found in the heuristic evaluation have led to several significant changes in the telehealth system, and the system is ready for a user test planned to involve COPD patients [8].

In this present study, we used a simple think-aloud test to determine user's experience and satisfaction with the revised version of the Telekit system. Such research is needed to address potential gaps in the use of technology by chronic-care patients.

1. Methods

1.1. Participants

Test participants were recruited through the list of 17 pilot patients from the project TeleCare North. Six (three women, three men) participants were randomly selected to participate in the think-aloud test. The average age was 69 (min 65, max 73). They constituted different stages of disease severity (one mild, one moderate, four severe). Those in the severe stage were in the need of oxygen therapy [9]. The participants had various technology experiences; three novices, two users with some knowledge, one expert (daily user). The participants had received the Telekit system and an introduction six months earlier.

1.2. Telekit

The Telekit system consists of a tablet (Samsung Galaxy TAB 2, 10.1, Samsung Electronics, Seoul, South Korea), a fingertip pulse oximeter (Nonin, Onyx II % SpO_2, A&D Medical, Tokyo, Japan), a blood pressure monitor (Model UA-767, plus BT-C, Nonin Medical, Minnesota, USA), and a Precision Health Scale (UC-321PBT-C, A&D Medical, Tokyo, Japan). The scale is not included in the test. The Telekit system version 1.11.3 was tested.

The COPD patients perform measurements and ask questions related to their disease. The measurements and questions are transferred wirelessly to health care providers. Health care providers respond if data show deviations from expected values [10].

1.3. Study design and data collection

The participants performed the think-aloud test in their own homes, because they usually use Telekit in that environment. They were handed six tasks, representing typical user goals. This included; 1) login, 2-3) perform measurements (blood pressure, oxygen saturation), 4) find graphical images of their measurements 5) write a message to health care providers and 6) logout. The observer wrote notes about what was being verbalised and observed, including aspects in need of clarification (see Table 1). Additionally, demographic data was collected to provide descriptive information about the test participants. The test was audiotaped to create a set of audio recordings for back up, and each task was timed during the test. Each think-aloud session took approximately 40 minutes including introduction, tasks and debriefing.

Participant satisfaction with Telekit was assessed using a satisfaction and usability questionnaire, which we developed to determine the underlying facilitators or barriers to adoption. The questionnaire was in two parts; 1) nine questions about satisfaction and 2) ten Likert Scale usability questions from a modified translated version of the System Usability Scale (SUS) [11]. The questionnaire and observations were categorised and analysed.

Table 1. Test procedure.

Pre-test arrangements	System specific tasks	Post de-briefing
Written consent	Login on tablet	Follow up questions
Participant information	Measure oxygen saturation	Satisfaction and usability questionnaire
Background questionnaire	Measure blood pressure	
Introduction to think-aloud test	View measurements	
	Write a message	
	Logout on tablet	

2. Results

2.1. Satisfaction and usability questionnaire

The majority of participants considered Telekit easy to use. Five out of the six participants used it on a weekly basis. All agreed that most people could learn to use the system, and they felt quite confident using Telekit.

Differences in how much time they spent on the system were found. Four participants used up to half an hour on Telekit weekly, and the rest spent more time. Five participants used the system for more than measuring blood pressure, pulse and oxygen saturation, e.g. for weight measurements. Three participants had involved other relatives in the use of Telekit. Two participants had never contacted health care providers in the use of Telekit, while the rest had contacted health care providers for assistance between 1-3 times (n=2), 3-6 times (n=1), or more than 9 times (n=1).

There were different answers to the question about the need for technical assistance. Just one participant needed support. The other five participants were neutral or refused the question with “strongly disagree”. The functions in the user interface of the Telekit were perceived as well-integrated, and three participants agreed that there was not any kind of inconsistencies. The other half answered neutral.

2.2. Think-aloud test and observations

All six tasks were completed. The women had difficulties obtaining a reaction from the touchscreen because of long fingernails or perhaps cold fingers. This often required several attempts, before the tablet responded. If there was no reaction to commands, the participants reacted by pressing the touch screen multiple times. This could result in incorrect answers to questions being selected.

Some keys were difficult to identify on the keyboard, which prevented them to move on in the system. Several of the participants did not press the key [next] before they took measurements, even though, this was evident to the user. This resulted in incomplete measurements. Additionally, one participant made mistakes in the sequence of actions so that the measurements were taken too early or too late because of the location and naming of buttons.

Half of the participants could not remember their user name and password enabling them to login. Due to the lack of memory, the codes were written on paper, or the tablet was constantly on stand-by mode. One participant had to call the health care providers to get a new code, and they responded by calling a technician, who could solve the problem. One participant had mistyped username and password leading to password locking.

Two of the participants could not send their oxygen saturation, and even though they knew the problem in advance, they had not reacted. The problem was that the battery condition of the fingertip pulse oximeter was not sufficient to send the measurements.

Some comments, concerning the design and application of the system were obtained from the participants. One commented that there was too much writing in the application. The size and readability of the screen was considered appropriate but some keys caused difficulties.

3. Discussion

This study has gathered some important insight of, whether the Telekit system is user-friendly and satisfying from the patient's point of view. Usability testing on telehealth systems like Telekit needs to be tested in COPD patients, who are suffering from exacerbations. The technology experience differed between the participants. This provided a comprehensive picture of the overall use of the system. The overall feedback was positive and they were satisfied with the functionality of Telekit. However, it should be considered, whether the textual material can be shortened in order to obtain a more flexible system for experienced users.

Different issues indicate a need for a call center, so that the users can easily call for technical assistance or ask questions, if they experience problems using the system. For instance, there were problems using the login-function, as more of the participants had forgotten their password. In these situations, they doubted which person to call.

The previous heuristic evaluation of Telekit uncovered user interface design problems, and was used to improve the usability of Telekit before planning a potential user test [8]. The findings of this user test turned out to be different compared to the problems identified in the heuristic evaluation. The experts had focus on the design of the system. Participants in the think-aloud were more interested in whether Telekit could help them manage measurements and disease. This indicates the importance of

using both user testing and inspection methods - an aspect, which is also recommended by Nielsen [12].

It is a challenge to test technologies in older adults with COPD, as it is likely a new situation. This is caused by lack of formal education, and the situation can be confusing, if they do not know what is going to happen [13]. To eliminate confusion and uncertainty, we focused on explaining participants the plan beforehand. We timed each task during the test but we did not use these measures, because in most cases the recording contained stories unrelated to the test. There was in turn created a pleasant atmosphere by listening to the participants' historical narratives. It created an environment of trust and security that enabled the expression of feelings.

The think-aloud test was tested on participants that had received education a half year before. Therefore, they were all familiar with Telekit and more experienced in the use of the system compared to new users. These users may have overlooked basic problems and acquired habits in the use of the equipment. The results from the think-aloud test will probably be different, if we test it on new users. Also, this test was fairly small sized, which may limit external validity. A larger size would be required to assess COPD patients' opinions. Though, it is common knowledge that five test subjects are enough in the use of usability methods, as it is expected that five persons will detect approximately 75-80% failures, problems and shortcomings [14].

In conclusion, this article has provided information about how COPD-patients use Telekit by assessing the overall usefulness of and satisfaction with the system. The patients' satisfaction and experiences of new technologies is important information in the improvement of the design of current and future systems, and it help predict the level of their success. The results confirm that Telekit is a useful tool that fits COPD patients' needs. Though, there is still need for improvements, and Telekit will still be updated to new versions.

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