

Expectations of Middle-aged and Elderly Persons towards using Telecare Technologies and eHealth Applications in Primary Care

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Abstract—The aim of this study was to investigate general expectations of middle-aged and elderly persons towards using care technologies and eHealth applications in primary care. Participants were recruited at an event about health and exercise for elderly people. Persons aged fifty years or older and who were able to provide informed consent were eligible for inclusion. A cross-sectional mixed method approach was used; participants could choose whether they wanted to participate in this study by filling out a questionnaire or by participating in a short structured interview. Fifty-seven participants rated 22 items of a questionnaire on a five-point Likert scale. The questionnaire consisted of seven subscales: experiences with general technology, experiences with care technology, perceived barriers, perceived benefits, external cues to take action, attitude towards using and intention to use technologies in primary care. Furthermore, six interviews were conducted. The questionnaire revealed that participants had a positive attitude towards using technology in primary care and that their behavioral intention to use technology in primary care was high. In addition, the mean score of perceived benefits was higher than the mean score of perceived barriers. Time-saving, comfort and a higher degree of expected safety were the most frequently mentioned advantages in the structured interviews. The lack of personal contact and usability difficulties were the most frequently reported disadvantages of care technology. Based on the results it can be concluded that middle-aged and elderly persons have a positive view towards primary care technologies. However, the mentioned barriers should be taken into account during the implementation and development of technologies in primary care.

Keywords—eHealth; telecare, expectations, intention to use, primary care, middle-aged adults, elderly persons

I. INTRODUCTION

The number of elderly persons is increasing. The number of persons aged sixty years or older tripled between 1950 and 2000, and is expected to increase threefold again by 2050, up to nearly two billion [1]. Mainly as a result of this, the number of chronically ill patients is increasing. Parallel to these increasing numbers, there is a relative decrease in the number of staff working in the healthcare sector. Due to these reasons, a fundamental change is necessary in the healthcare process [2]. Telecare technologies and eHealth applications could facilitate a shift from intra-institutional care to more home-based care. It is expected that these

technologies, which support self-care and self-management, can reduce healthcare costs and can improve health outcomes among chronically ill patients [3, 4].

Despite these positive expectations, a recently published review by Peeters et al. [5] showed that most studies which explored the effects of technology in home-based care were pilot-studies with small samples e.g., [6-8]. In addition, the majority of these studies had short durations with only one follow-up assessment and no control group. Although positive effects of technology in primary care are expected, up until now there is not enough convincing evidence for these effects. Furthermore, many studies explored the effects of care technologies in controlled conditions. Due to this, it is difficult to guarantee that these technologies will also work in real life environments, when embedded in daily care procedures. Large-scale studies in care practices are needed to investigate the effects and consequences of using technology in primary care on a general level.

Before large-scale studies in care practices can be set-up, it is important to investigate users' needs and expectations regarding the use of telecare products and services, since taking these into account during the development and implementation process will increase the level of user satisfaction and user acceptance [9-12]. However, studies exploring patients' needs and expectations towards large-scale use of telecare technologies and eHealth applications in the Dutch primary care setting are scarce.

Middle-aged and elderly persons are a major group of primary care users. Therefore, the aim of this study was to investigate general expectations of persons aged fifty years or older towards using telecare technologies and eHealth applications in primary care. This provides important input for the implementation of care technologies in primary care. Since the data collection is still ongoing, this paper will discuss the preliminary results of this study.

The paper describes the methodology (Section II) and presents the preliminary results of this study (Section III). In Section IV the results are discussed and the conclusion and future work are presented in Section V.

II. METHODS

This methods section describes the recruitment of the participants, setting, study procedure, measurements and analyses which were utilized for this study.

A. Design, setting, and participants

The study has a cross-sectional, mixed methods design. Questionnaires and structured interviews were used for data collection.

Participants were recruited at an event regarding health and exercise for elderly persons that took place at a large sports hall in Nederweert (the Netherlands). Inclusion criteria were: fifty years or older and Dutch-speaking, since the information letter and questionnaire were in Dutch. Exclusion criteria were: serious visual impairments for the study with questionnaires, and serious hearing impairments for the interviews.

At the stand at the event the researchers showed movies and presentations about examples of telecare technologies and eHealth applications. In addition, the stand was decorated with posters which presented several examples of primary care technologies. Furthermore, two I pads with a medication management app, a physical activity monitoring and feedback system for chronically ill patients [13, 14], a physical functioning monitoring and feedback system for elderly persons [15] and an online platform for care and wellbeing for elderly persons (including functions regarding social contacts, comfort, and health and safety) were demonstrated. The study was carried out in the first week of October 2013.

B. Study procedure

Visitors of the event were asked by the researchers whether they wanted to participate in this study by filling out a questionnaire or by participating in an interview. If people were willing to participate, they signed an informed consent form after reading the information letter. In both the questionnaires and the interviews everyday language was used.

On the first page of the questionnaire several examples of telecare technologies and eHealth applications in primary care were described. This was done to ensure that participants were aware of the following possibilities that such technologies provide: planning an online appointment with a general practitioner, online video consult with a general practitioner, online coaching program to quit smoking, online revalidation program, physical activity monitoring and feedback system, medication management program, and Ambient Assisted Living (AAL) motion tracking systems. Next, participants filled out their demographical data. Then, they filled out questions regarding their expectations of technologies in primary care. Filling out the entire questionnaire took approximately fifteen minutes.

People who preferred to participate in an interview sat down with the researcher at a separate/quiet corner of the stand. The interviews took approximately fifteen minutes and were recorded with a voice recorder.

C. Measurements

Information regarding demographical data (gender, age, highest level of education, marital status and living

situation) and health status (general health status, physical fitness, (chronic) diseases, and illness in last three months) were collected using the first part of the questionnaire.

The second part of the questionnaire was largely based on previous research regarding the possibility of using concepts of the Health Belief Model to predict the intention of the general population and chronically ill patients to use telecare products and services [16, 17]. The items were translated into Dutch and adapted to the topic of this study. In addition, several items about technology usage were added. The adapted questionnaire consisted 22 items divided over seven subscales: general technology usage (3 items), experience with technology in healthcare (1 item), perceived benefits (4 items), perceived barriers (3 items), external cues to take action (4 items), attitude towards using (3 items) and behavioral intention (4 items) to use telecare technologies and eHealth applications in primary care. An overview of the items is provided in Table I. Participants rated each item on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). In addition, the following open-ended question was added: "What kind of technologies in primary care would you like to use at home, and why?". Participants could write down additional comments at the end of the questionnaire.

To gather more in-depth information about expectations of technology in primary care, interviews were conducted. The structured interview consisted of the following questions: "Do you use a lot of technology in daily life?", "When I speak of technologies in primary care, what kind of technologies do you think of?", "What are the advantages and disadvantages of technology in primary care?" and "What kind of technologies in primary care would you like to use?".

D. Analyses

The scores of the questionnaire were quantitatively analyzed. First, mean scores and standard deviations of the seven different subscales were calculated for the whole study sample. Furthermore, the spread of participants on the different subscales was explored using boxplots. Moreover, differences between men and women, participants aged below 65 years and aged 65 years or older, and participants with or without chronic diseases were investigated for each subscale independently. In addition, differences between participants with high general technology experiences (mean scores of 3.5 or higher on that subscale) and low general technology experiences (mean scores below 3.5 on that subscale) were explored on experiences with technology in healthcare, perceived benefits, perceived barriers, external cues to take action, attitude towards using and intention to use. These differences were investigated using independent sample t-tests. The statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) 21.0 for Windows [18].

TABLE I. ITEMS OF THE QUESTIONNAIRE

<p>General technology experience</p> <p>1. I use many technological devices in daily life (think about computers, mobile phones, tablet etc.).</p> <p>2. I like to discover new technologies.</p> <p>3. I have mainly positive experiences with technological devices.</p> <p>Experiences of technology in health care</p> <p>4. I have experience with technology in health care.</p> <p>Perceived benefits</p> <p>5. I think that using technologies in primary care are helpful in monitoring my health.</p> <p>6. I think that using technologies in primary care increases my safety in daily life.</p> <p>7. I think that technologies in primary care can enhance my level of convenience in accessing medical care services.</p> <p>8. I think that technologies in primary care can enhance the quality of my life.</p> <p>Perceived barriers of taking action</p> <p>9. I am concerned that technologies in primary care are not adequately secure and that it might lead to the leak or abuse of my personal information.</p> <p>10. I am concerned that technologies in primary care would violate my privacy.</p> <p>11. I am concerned that the accuracy and reliability of technologies in primary care are not high enough.</p> <p>External cues to action</p> <p>12. I think that relatives will encourage and support me to use technologies in primary care.</p> <p>13. I think that friends will encourage and support me to use technologies in primary care.</p> <p>14. I think that medical care personnel will encourage and support me to use technologies in primary care.</p> <p>15. Media endorses the use of technologies in primary care.</p> <p>Attitude towards using</p> <p>16. I think I will like using technologies in primary care.</p> <p>17. Overall, I consider technologies in primary care to be just right.</p> <p>18. In my old age, using technologies in primary care would be ideal.</p> <p>Behavioral intention to use</p> <p>19. Overall, I am highly willing to use technologies in primary care.</p> <p>20. If necessary, I would use technologies in primary care often.</p> <p>21. In my old age, I am willing to use technologies in primary care.</p> <p>22. In my old age, I would use technologies in primary care often.</p>

The interviews were transcribed verbatim. Afterwards, the researcher (MH) checked the transcripts against the audio recordings. Field notes from the interviews were also included in the analyses if they were available. The researcher (MH) independently coded the transcripts of the interviews using open coding. The following codes regarding technologies in primary care were used: first opinions, advantages, disadvantages and preferences.

III. RESULTS

This section provides the preliminary results of this study. First, an overview of the characteristics of the participants is given, followed by the mean scores of the subscales of the questionnaire, the spread of participants on

the different subscales, the differences between groups, and participants' preferences for using specific primary care technologies. Furthermore, the main results of the structured interviews are described.

A. Characteristics of study participants

In total, sixty-three participants filled out the questionnaire. Six participants were excluded from the analyses because their age was below 50 years. The mean age of the remaining fifty-seven participants was 67 (SD: 9.26, range: 51-85). Twenty-one of them (37.5%) were male and twenty-eight (49.1%) had one or more chronic diseases (including diabetes type I and II, cardiovascular diseases, diseases of the joints, cancer, diseases of the nervous system, respiratory diseases, depression and/or anxiety disorders).

Six participants agreed to participate in an interview, of which 4 (66%) were male. The mean age of the interviewed participants was 64.4 (SD: 10.16, range: 52-76).

B. Scores subscales questionnaire

Figure 1 shows the mean scores of subscales of the questionnaire. The mean score of general technology experience was 3.42 (SD: .95), the mean score of experience with technology in healthcare was 2.22 (SD: 1.17). The mean score of perceived benefits was 3.88 (SD: .77), the mean score for perceived barriers of taking action 2.85 (SD: .93). External cues to action scored 3.56 (SD: .86). The mean scores of attitude towards using and the behavioral intention to use were respectively 3.83 (SD: .82) and 3.79 (SD: 1.00).

Figure 2 shows the spread of participants on the different subscales. It can be seen that 50% of the participants had a mean score between 3.5 and 4.25 on perceived benefits. The mean scores were lower for perceived barriers: 50% of the sample had mean scores between 2.0 and 3.67. Furthermore, 50% of the participants scored between 3.0 and 4.13 on external cues to action. In addition, half of the participants had mean scores between 3.33 and 4.67 on attitude towards using and scores between 3.0 and 4.63 on intention to use.

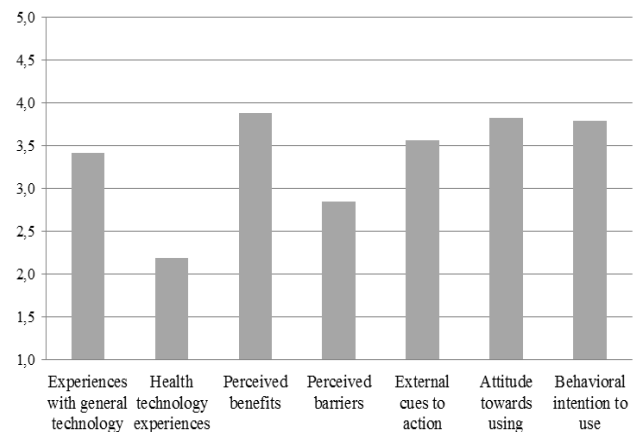


Figure 1. Mean scores of the different subscales of the questionnaire.

Looking at the differences between groups there was a significant difference ($p: .050$) between age groups on general technology experience, with a mean score of 3.66 (SD: .90) for participants with an age below 65, compared with a mean score of 3.15 (SD: .95) for participants aged 65 years or older. In addition, there were significant differences between participants with low general technology experience and high general technology experience on perceived benefits ($p: .013$), attitude towards using ($p: .001$) and intention to use technology in primary care ($p: .001$), with higher mean scores for participants with high general technology experiences (respectively 4.14, SD: .54; 4.19, SD: .70 and 4.25, SD: .67) compared with participants with low general technology experiences (respectively 3.63, SD: .86; 3.48, SD: .80 and 3.38, SD: 1.10). Furthermore, no significant differences were found between the other subgroups.

C. Preferences for specific care technologies

At the end of the questionnaire the open question “What kind of technologies would you like to use at home? And why?” was asked. The most frequently mentioned technology was an AAL motion tracking system (n: 11), followed by self-monitoring systems to monitor blood pressure, heartbeat or glucose level (n: 5), online appointments (n: 5) and online video consults (n: 5). In addition, six participants responded that they did not want to use care technologies in care at that moment, five participants mentioned that they had no idea, and twenty-three participants did not answer the question.

D. Structured interviews

In general, at the start of the interview participants had some ideas about what kinds of technologies could be used in primary care. Most participants linked these technologies with using a computer.

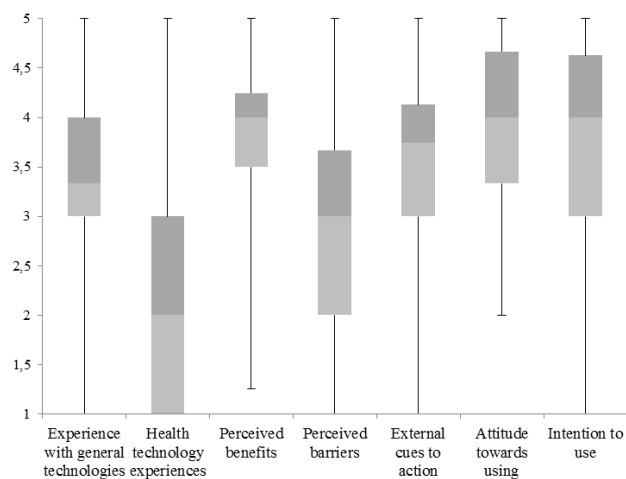


Figure 2. Spread of participants on the different subscales. The boxplots are demonstrating extremes, interquartile range (25%-50% light grey; 50%-75% dark grey) and median.

“Today, when my blood pressure needs to be measured, I first have to make an appointment with the general practitioner, and I have to take some time off. That’s a hassle...” (Female, 54 years)

“If you don’t feel quite well at night, and you call the doctor, it would be good if they could give you advice on the basis of self-measured data. Then, you feel more reassured...” (Male, 52 years)

“Nowadays, if there is something wrong I have to call my neighbors. If I can contact caregivers with just one push on a button I don’t have to call them. That’s a big advantage, and I can receive help quicker. (Male, 75)

“Many elderly persons have difficulties with walking. It is a great advantage if you only have to push a button to directly contact a care institution. Just with a simple connection...” (Male, 52 years)

Besides these positive responses, many participants doubted if care technologies were not too difficult in use.

“But that is just too difficult for us. It’s the age, we did not grow up with technology... Reading an email is already too difficult for us...” (Male, 75)

The participants with an age over seventy linked technology immediately to difficult to use computers and mobile phones. When we showed them an Ipad, they were surprised about the small size and the user-friendly design.

“I really don’t want to have a computer, I just don’t want to.” After showing her the Ipad: “Is this the entire device? Is everything included? Internet as well? So this doesn’t have to be connected to a wire?... If I push on this button I can send a message? This is not difficult, for this I don’t have to follow a computer course. I was thinking about a big screen...” (Female, 76)

In addition, participants doubted if personal contact will not disappear when using primary care technologies.

“I think using technologies in primary care is positive, however, if you need care, you need human contact. Not only devices, it should be a combination between technology and personal attention...” (Female, 54)

“I hope that technology can accompany care, but that contact will always exist. That is really important...” (Male, 52)

Furthermore, some participants mentioned that getting feedback from the care giver is important.

“If I take the effort to measure my blood pressure and send the data to my general practitioner, I would like to get a message like: you’re blood pressure is okay, in three months you get a new message...” (Female, 54)

“At this moment I write my blood pressure results on a note.... However, if I take the results with me to the general practitioners or specialist, they do nothing with these data. With these new technologies, you sent a lot of data to the general practitioner, however, they should do something with it...” (Male, 65)

IV. DISCUSSION

Overall, participants had a positive attitude towards using technologies in primary care and their behavioral intention to use technology in primary care was high. These results are in line with studies investigating attitude and intentions regarding telecare and eHealth [19, 20]. In addition, scores of perceived benefits were higher than scores of perceived barriers. Participants with a high degree of general technology experiences had significantly higher scores on perceived benefits, attitude towards using and intention to use technology in primary care, than participants who had less experience with general technology use. Similar results were found in a study by Wilson et al. [21] that showed that participants who already relied on the internet in daily life, were more likely to accept eHealth.

Structured interviews revealed that time-saving, comfort and a higher degree of safety were the most expected advantages of using technologies in primary care. On the other hand, the possible lack or decrease of personal contact and usability difficulties were the most frequently expected disadvantage of using primary care technologies. Time-saving as advantage and less face-to-face contact as disadvantage were also found in previous research [22] investigating patients' expectations and experiences towards an online appointment booking system. In a study investigating the risks and benefits of home telecare [20], trust of the equipment was found to be a concern among patients. This was not found in the present study.

In a recently published eHealth monitor in which the development and progress of eHealth in the Netherlands was described [23], it was indicated that the Dutch population is still relatively unfamiliar with eHealth and the use of eHealth applications. eHealth applications that can monitor health data are not commonly used. This is in line with the low scores we found on experiences with technology in primary care.

A. Strengths and limitations

A strength of this study is that it aimed to investigate the expectations towards using care technology on a larger scale in primary care in an important 'potential user group' of this technology. By not focusing on the expectations regarding one specific technological innovation but on the broad use of telecare technologies and eHealth applications, this study provided insights that could be taken into account when implementing such technologies in primary care.

In this study a cross-sectional mixed method approach was used, combining quantitative and qualitative data. Besides questionnaires, interviews were conducted to gather

more in-depth information about expectations of care technologies in primary care. These interviews were conducted with different participants than the people who filled out a questionnaire. Therefore, a cross validation of the data could not be made.

Another possible limitation of this study is that the number of currently included participants is small and therefore no generalizations can be made based on the preliminary results reported in this paper. In addition, in studies by Huang et al. [16, 17] in which the Health Belief Model was used to predict the intention to use telecare, a distinction was made between chronically ill patients [16] and general public [17]. The factors which had an influence on intention to use telecare differed between the two samples according to Huang et al. [16, 17]. In the current study no differences were found between patients with a chronic disease and patients without a chronic disease. This could also be caused by the small sample size of the present study. In addition, more than half of the participants did not respond to the question which technologies they would like to use at home or answered that they do not need it at this moment. This might be the result of the fact that these people currently do not have any complaints for which these technologies could be used.

Furthermore, the study took place in a sports hall during an event about health exercises for elderly people. Because of this event, the noise level was quite high which could have influenced the data collection process to some extent. However, the noise level did not seem to disturb the study and it created an informal atmosphere.

V. CONCLUSION AND FUTURE WORK

This paper discusses the preliminary results of this study. In the upcoming months, the data collection will be continued. Based on the preliminary results it can be concluded that middle-aged and elderly persons have a positive view towards primary care technologies.

Recently the project eLabEL [24] has started within the Centre for Care Technology Research [25]. In this three-year program 'living labs' within primary care centers will be established in which new care technologies can be implemented and evaluated in 'real life' environments on a substantial scale. Ten large primary care centers in the Netherlands will be equipped to adopt existing state of the art technologies as part of their standard care routines.

Before eHealth applications and telecare technologies can be implemented, several other factors should be further investigated. For example, privacy and security are important issues while sharing personal health related information [26]. In addition, connecting and integrating different technologies to one database will be a challenge [27]. These factors will be further explored in the eLabEL project during the next two years.

The present study provides insights in the views of Dutch middle-aged and elderly persons towards using telecare technologies and eHealth applications in primary

care, which should be taken into account during the implementation of primary care technologies.

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