Exploring Challenges of Self-Monitoring for Senior Adults

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Abstract

In this paper we discuss some of the challenges and opportunities for the implementation of self-monitoring technologies in senior adults everyday lives. We present our experiences from a self-monitoring case study. We further describe our design process as part of the ongoing Lev Vel Project, a cross-disciplinary Danish initiative for increasing participation in citizen's own care management.

Author Keywords

Healthcare, home monitoring, senior adults, blood pressure

ACM Classification Keywords

H.5.m [Information Interfaces and Presentation (e.g., HCI)]: Miscellaneous.

General Terms

Design, Human Factors, Management, Measurement

Introduction

It is well known that the european population will increase rapidly over the next decades. Chronic diseases and age-related illnesses will affect the senior population having a considerable effect across different healthcare actors. Diverse self-management strategies are available to sustain elderly citizens in their everyday lives. One

a. *Lung Function*
- Peak expiratory flow
b. *Heart Function*
- Systolic Pressure
- Diastolic Pressure
- Heart Rate Pressure
c. *Glucose Tolerance*
- Blood Glucose Level
- Glycosilated Hemoglobin
- Hemoglobin
d. *Cholesterol*
- Low-density lipoprotein, LDL (bad) cholesterol
- High-density lipoprotein, HDL (bad) cholesterol
- Triglycerides
- Total Cholesterol
e. *Weight and Body Mass Index (BMI)*
- Weight
- Height
- BMI
- Waist

Table 1: Sample of Cure4You Health Data

strategy is preventive self-monitoring of health parameters. The Lev Vel Consortium [2] is a Danish initiative that investigates how to increase participation in citizen's own care management through self-monitoring by establishing a strategic partnership between companies, research institutions, and municipalities .

This paper describe our initial steps towards a better understanding about the possibilities to introduce self-monitoring technologies in senior adult's home. The Consortium is focusing on senior adults who are healthy enough and able to participate in their own healthcare activities such as medication management and self-monitoring of health parameters. Furthermore, it is important to empower citizens to take an active role in their personal health management [4]. In addition, healthcare technology should consider ageing of the population, chronic diseases and lifestyle guidance [6]. According to this, several challenges have been identified during our ongoing design process that are discussed in the next sections.

Health Parameters Candidates for Self-Monitoring

We analyzed what health parameters that are provided by the web-based Cure4You [1] platform. Cure4You registers temporal (date, time) and limit (max, min and ranges) values per each parameter category. Table 1 summarizes the parameters provided by Cure4You (categories a-e) that are used for diagnosis and monitoring of different medical conditions such as: a) Asthma and COPD, b) Hypotension, Prehypertension, Hypertension and Hypertensive Crisis, c) Hypoglycemia and Hyperglycemia, d) Hypercholesterolemia, and e) Obesity. All these parameters are considered as early candidates for self-monitoring activities in the home of elderly citizens.

Guidelines for Measuring Health Data
It is important that measurement of health parameters is conducted in a correct manner in both clinical and non-clinical settings. This introduces challenges when measurements are performed in a non-supervised setting as the home. Therefore, health professionals provide citizens with guidelines for measuring health parameters in non-supervised settings such as the home. Each type of measurement is assigned a different number of guidelines. For instance, the number of instructions that a citizen has to follow for measuring heart function parameters using a blood pressure (BP) device is more complex compared with the other parameters in Table 1.

The World Health Organization (WHO) has identified BP as one of the most prominent risk factors in developed countries [3] among others such as obesity, high cholesterol, and tobacco consumption. High BP increases the risk of heart diseases or stroke [8], and it is placed in the top five list of health risk factors in Denmark. A summary report about risk factors and public health was published in 2007 describing the impact[1]of high BP on the health of the Danish population [7].

In the Lev Vel Consortium, BP is considered a good candidate for analysis of self-monitoring due to its complexity (number of instructions) and importance (relationship with other risk factors) in the Danish context. However, a comprehensive description of this analysis is out of scope of this paper.

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[1]16% of the men and 19% of the women in Denmark had severe hypertension, and 2) more than 2000 Danes die due to hypertension (under 4% of all deaths) every year, reducing the life expectancy of Danes by almost 9 months for men and 6 months for women.

Figure 1: Workshop 1

Figure 2: Workshop 2.

Figure 3: Workshop 3.

Methodology - Specific case study

We have set up a case study in order to investigate the role of self-monitoring by senior adults. We have studied BP measurement and our process is described in the following subsections.

Participants
The Lev Vel target group is senior adults who are healthy and active enough to develop health self-care activities over 50 years old. Therefore, we visited an activity center for senior citizens in Aarhus to recruit 8 users over 60 years old that have an active lifestyle. Moreover, a nurse from the Aarhus Municipality was involved during the first workshop of our process.

Workshop 1: Understanding Blood Pressure Measurement
We had two sessions on different days at KlostergadeCenteret. Participants were four senior adults for each session and three researchers. The workshop activities were as follows: 1) A brief introduction to the project, 2) A BP presentation about causes, symptoms, treatment, and monitoring, 3) Measurement of BP - figure 1, and 4) Questions and Answers.

Workshop 2: Exploring Daily Routines
Similarly, we had two different sessions with six and two senior adults respectively. Participants were asked to: 1) Identify their daily routines in their home using sketches, 2) Share experience regarding their sketches and routines, and 3) A group discussion about possibilities and implications of using self-monitoring technologies during their daily life. In addition to the workshop activities, participants were requested to perform a task of self-measurement of BP at home during one week.

Workshop 3: Validation of preliminary findings
To validate our findings from our previous workshops, participants were invited to a third workshop in order to share their experience regarding the self-monitoring task at home. Due to the Christmas holidays, only two participants were able to attend, and they did the following activities: 1) Share experience about the self-measurement task, 2) Review and discuss BP visualizations using eight image-pairs - overview and details (see figures 4 and 5).

Key Design Challenges - Findings

Our workshop activities pointed out some key design challenges. First, we perceived difficulties when active senior adults tried to introduce health technologies in their daily activities due to the complexity of BP guidelines. Developing and adjusting routines was complicated, for example during evenings due to an active lifestyle. Second, senior adults have privacy issues regarding self-monitoring activities. Third, senior adults had difficulties understanding and getting meaning from the BP visualizations. The validation of our visual encoding reported that senior adults rely more in values than icons. They preferred a visual encoded bar of BP levels - low, normal, borderline, high, very high - for details and a line graph with encoded values as an overview. Finally, motivation turned out to be important -as soon as senior adults understood the importance of the BP information, they became more motivated to engage in our activities.

Our Vision of Self-monitoring

We are envisioning a digital frame that shows citizen's health status using several health parameters. This digital frame shows current and target values providing citizens with a range of options and needed information to help them to manage their conditions. For instance, the idea of

Date: Sunday, 4 December - 2011
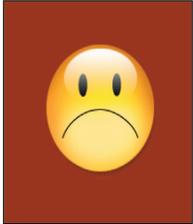

Figure 4: BP - Iconic visualization
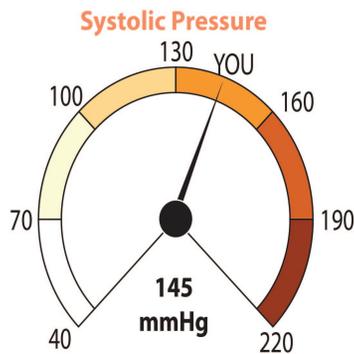

Figure 5: BP - Speedometer
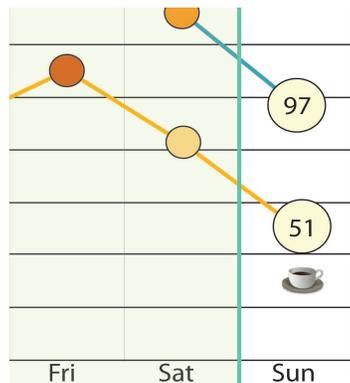
Figure 6: BP - Overview

tagging specific circumstances[2] in which a new measurement is taken - figure 6 - can help us to understand the dynamic nature of several illness trajectories, and bridge clinical and non-clinical practices. As we gained a better understanding about the domain and data characterization of BP, we have identified challenges and two major barriers for self-monitoring that should be addressed: citizen's lack of health information and their active lifestyle.

Discussion and Conclusion

Understanding BP and how our body responds to different situations is one first step in gaining control over our health [5]. Different techniques can be used to improve an individual's BP[3] and a discussion between citizens and physicians should take place to find one or more healthcare activities suitable for each citizen's conditions.

We have presented some challenges of self-monitoring activities for senior adults at home. We experienced a good dialog between the participating senior adults, nurse and researchers. The participating senior adults shared their experiences and asked questions. They were able to monitor their own blood pressure and came to understand the value of preventive self-monitoring. Active citizens have to deal with several activities in everyday life. Thus, understanding those activities and their home - as a new environment for self-management of health parameters - plays an important role when designing healthcare technologies for the home.

This work can therefore be applied in several directions. For instance, getting reliable information at home can

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[2]For example, smoking, caffeine, alcohol, etc.

[3]For example: self-monitoring, follow a healthy diet, learn relaxation strategies and do exercises.

help physicians to get a complete overview regarding citizen's health status. Moreover, citizens should be able to acquire the necessary skills for health management and self-monitoring can help them to gain control over their own health situation.

References

[1] Cure4You platform. http://www.cure4you.eu/.

[2] The Lev Vel Consortium. http://www.lvvl.dk/.

[3] World Health Report 2002. Reducing risks. Promoting healthy life. *WHO* (2002).

[4] Arnrich, B., Mayora, O., Bardram, J., and Tröster, G. Pervasive healthcare: paving the way for a pervasive, user-centered and preventive healthcare model. *Methods of information in medicine 49*, 1 (Jan. 2010), 67–73.

[5] Bellingham, R., and Cohen, B. *The Complete Guide to Wellness*. HRD Press, Inc., 2003.

[6] Codagnone, C. Reconstructing the Whole : Present and Future of Personal Health Systems. *Risk Management*, August (2009).

[7] Juel, K., Srensen, J., and Brnnum-Hansen, H. Supplement: Risk factors and public health in denmark. *Scandinavian Journal of Public Health 36*, 1 suppl (2008), 1–227.

[8] Lo, T. O. Adherence to Long-Term Therapies: Evidence for Action. World Health Organization 2003. *World Health* (2003).