

eLabEL: Technology-supported Living Labs in Primary Care

Joan Vermeulen, Martine Huygens, Luc P de Witte

Department of Health Services Research

Maastricht University

Maastricht, The Netherlands

j.vermeulen@maastrichtuniversity.nl,

m.huygens@maastrichtuniversity.nl,

l.dewitte@maastrichtuniversity.nl

Ilse Swinkels

NIVEL (Netherlands Institute for Health Services Research)

Utrecht, The Netherlands

i.swinkels@nivel.nl

Wendy Oude Nijeweme – d'Hollosoy, Lex van Velsen

Biomedical system and signals group

University of Twente

Enschede, The Netherlands

w.dhollosy@utwente.nl, l.vanvelsen@rrd.nl,

Yvonne Jansen

Behavioral and societal sciences

TNO

Leiden, The Netherlands

Yvonne.jansen@tno.nl

Abstract— Telecare technologies and eHealth applications can support patients and care professionals. However, these technologies are currently not being implemented in primary care. The eLabEL project aims to contribute to a solution for this problem by establishing Living Labs in which patients, healthcare professionals, entrepreneurs and researchers collaborate during the selection, integration, implementation and evaluation of such technologies in primary care. So far, seven primary care centers across the Netherlands have been included. Needs and requirements of healthcare professionals and patients regarding telecare technologies and eHealth applications were studied using semi-structured interviews and focus group interviews respectively. Healthcare professionals and patients were positive towards the use of technologies that can improve accessibility of care for the entire patient population and also expressed a need for technologies that can support self-management in patients with chronic conditions. Requirements voiced by care professionals were the need for clear organization of the user-interface, availability of workflow directives for eHealth usage, minimal steps to perform a task, and integration with their current information system. Patients indicated that care technology should be easy to use and easy to learn, should provide real-time feedback based on self-measured data, and should improve communication between patients and healthcare professionals. Entrepreneurs from the eLabEL consortium will integrate their eHealth and telecare services to meet the requirements of the end-users. The large scale implementation of these technologies will be monitored and the impact on experiences of patients, professionals and organization of care will be studied during a two-year follow-up study. Stakeholders of the eLabEL consortium will join forces to advance the large scale implementation of telecare technologies and eHealth applications in primary care.

Keywords- eHealth, Co-creation, Living Labs, Primary Care, Implementation

I. INTRODUCTION

The number of older adults and persons with chronic conditions is increasing in Western societies [1]. At the same time, the labor force that provides care to this growing

group of patients is decreasing [2]. Due to these societal changes, the focus has shifted from intramural and curative care towards extramural care and prevention. As a consequence, the role of primary care will become more important. A large variety of telecare technologies and eHealth applications exist that can be used in primary care practice to support patients in their independence and self-management, to improve accessibility of care services, and to increase quality of care. Such technologies can also facilitate a shift from care provided in care practices to care provided at home [3][4][5].

Previous (small-scale) studies have shown that telecare technologies and eHealth applications can have positive effects [6][7]. However, many of these technologies are currently not being implemented in primary care practices in a structural way [8] because there is a suboptimal ‘fit’ between the needs in care practice and the technical solutions. In addition, the supply of care technologies is very fragmented; many applications are stand-alone solutions that are not connected with each other nor are they integrated with information and communication systems that are being used in primary care centers [9].

The eLabEL project, that is conducted by the Centre for Care Technology Research (CCTR), aims to contribute to a solution for these issues that impede the implementation of telecare technologies and eHealth applications by establishing ten primary care ‘Living Labs’ in which such technologies will be implemented on a large scale. According to Bergvall-Kareborn et al. (2009) a Living Lab is “a gathering of public-private partnerships in which businesses, researchers, authorities, and citizens work together for the creation, validation, and test of new services, business ideas, markets, and technologies in real-life contexts” [10]. During the first phase of the eLabEL project, patients, healthcare professionals, entrepreneurs and researchers collaborate to select telecare technologies and eHealth applications that meet the needs of end-users and to integrate these devices and services so that they can be implemented seamlessly in a primary care

context. This could be technologies which can be used by the general patient population, such as online appointment planning and e-consultation as well as technologies that can support patients with a chronic condition, such as e-coaching and self-monitoring applications. During the second phase, these integrated technologies will be implemented in the primary care Living Labs to facilitate the transition from ‘traditional care’ to ‘technology-supported care’. The implementation of these technologies on a large scale will be monitored during a two-year follow-up study to investigate the impact that this has on experiences of patients and professionals and organization of care. During the third phase of the eLabEL project, effective implementation strategies for telecare technologies and eHealth applications in primary care will be developed based on the findings from the longitudinal study and experiences of partners that are involved in the eLabEL consortium. In addition, the telecare technologies and eHealth applications and related services will be optimized throughout and at the end of the project based on the (interim) results of the follow-up study. This paper gives an overview of the current state of the eLabEL project. Section II describes the establishment of the Living Labs. Section III describes the methods and results of needs assessment of healthcare professionals and patients. Section IV and V describe the integration and implementation of technologies and how this will be monitored during a two-year follow-up study. A short note about the development of implementation strategies is described in section VI. Finally, in the last section several barriers and challenges that have been identified so far are discussed.

II. ESTABLISHING LIVING LABS

Recruitment of primary care centers who wanted to be involved in the eLabEL project as Living Lab started in September 2013. Inclusion criteria were that at least 5,000 patients should be registered in the center and the following healthcare professionals should work in the center: General Practitioner (GP), Practice Nurse (PN), and Physiotherapist (PT). Potential primary care centers were recruited via the professional and informal network of the researchers using snowball sampling. So far, seven primary care centers, with patient populations ranging from 3,500 to 13,000 patients, have been included in the project. These primary care centers are scattered across the Netherlands. Primary care practices that were included vary in: type of organization, experience and implementation of eHealth applications, average age of the patient population and social economic status of patient population.

III. NEEDS ASSESSMENT HEALTHCARE PROFESSIONALS AND PATIENTS

From March 2014 healthcare professionals’ and patients’ needs regarding care technology have been explored. This has been done for healthcare professionals using semi-structured interviews and for patients using focus group

interviews. The process of needs assessment is still ongoing and will be continued till January 2014.

A. Healthcare Professionals

In total, 9 GPs, 8 PNs, and 9 PTs participated in a semi-structured interview. Interview schemes were based upon six themes: demographics, computer skills, organizational management, organizational IT infrastructure, professionals’ understanding of eHealth and its possibilities, and finally, personal experiences with and future expectations of eHealth usage.

During the interviews healthcare professionals mentioned several technologies that their primary care practice could benefit from and that they would like to implement, such as: online appointment planning, online prescription refill, e-consult, video-consult, and online triage. Such services can potentially improve the accessibility of care and increase efficiency. Preferences for these services differed across centers and professionals. In addition, healthcare professionals also expressed a need for technologies that can facilitate remote monitoring of health conditions in patients with chronic conditions in order to support self-management. Requirements voiced by care professionals were the need for clear organization of the user-interface to encourage intuitive usage, availability of workflow directives for eHealth usage, minimal steps to perform a task, single sign on, and integration of eHealth applications with the information system that they currently use in their practice.

B. Patients

To explore patients’ needs regarding care technology, patients from eLabEL Living Labs will be sorted in different groups for the focus group interviews based on the following chronic conditions: COPD, Diabetes, Cardiovascular condition and patients with an enduring condition who are treated by a physiotherapist. The aim of these focus group interviews is to investigate if care technology can support self-management in patients with a chronic condition and which requirements should be met to stimulate the uptake and usage of care technology.

Up to now, one focus group interview has been conducted with seven persons with Diabetes (mean age 70,0 years; 71,4% male). Patients indicated that care technology should be easy to use and easy to learn, should provide real-time feedback based on self-measured data and should improve communication between patients and healthcare professionals. At least seven more focus group interviews are scheduled in the upcoming months.

IV. INTEGRATION AND IMPLEMENTATION OF TECHNOLOGIES

Entrepreneurs from the eLabEL consortium are integrating their telecare products/services and eHealth applications based on the outcomes of the semi-structured interviews with healthcare professionals and the focus group interviews with patients from the seven Living Labs. In this process, they also take into account the most recent

standards and guidelines that such an integrated and interoperable eHealth architecture should comply with. In addition to this, the entrepreneurs will develop a joint business model for the exploitation of the architecture and associated services. Researchers from the eLabEL project will monitor the process of technology integration and business development to study the possibilities, barriers and facilitating factors that occur.

V. MONITORING IMPLEMENTATION AND EXPERIENCES

In 2015, the selected technologies will be implemented in the primary care centers. During a two-year follow-up study, the implementation process will be closely monitored. During two years the impact of using technology as part of the care process on a general level will be studied. This will be done by monitoring the experiences during and consequences of the transition from 'traditional care' to 'technology-supported care', from a patient, professional and organizational perspective. The study can be divided in four sub-studies that were approved by the Medical Ethical Committee Atrium Orbis Zuyd (NL 14-N-107).

A. Overall patient panel

To study the experiences during and consequences of the implementation of care technology of the general patient population, a panel of 250 patients will be established in each primary care Living Lab. Acceptance, usability and use of implemented technologies that are available for the entire patient population of the primary care practices will be monitored in this panel. In addition, experienced quality of care will be measured in this patient panel. To measure these constructs questionnaires will be handed at baseline and one and two years after the technologies have been implemented. To investigate actual usages of technology, log data will be gathered and analyzed on the level of the general patient population.

B. Patients with chronic conditions

We will also study the experiences during and consequences of the implementation of care technology that can support self-management of persons with a chronic condition. Technology acceptance, use and usability of the implemented technologies will be measured in patients with COPD, Diabetes, and Cardiovascular condition who are offered eHealth by their healthcare professional. In addition, self-management, experienced quality of care, and care consumption will be monitored in these patients. These patients will fill out questionnaires at baseline and after they have used a telecare technology and/or eHealth application for six and twelve months. To investigate data regarding care consumption (contacts with care professionals, number of referrals to specialists and prescription rate), data will be extracted from the information system of the general practitioners on the level of individual patients. These data will be compared with Dutch general practices which are not participating in the eLabEL project [11].

C. Healthcare professionals

A panel of healthcare professionals will be established to study the experiences of general practitioners, practice nurses, and physiotherapists during the implementation and use of different care technologies in their primary care practice. Acceptance, usability, and use of the technologies as well as job satisfaction and fit between the technology and tasks that these healthcare professionals have to perform, will be monitored. Questionnaires will be sent to the healthcare professionals at baseline and one and two years after the implementation of the technology. Parallel to the questionnaires, interviews will be conducted with at least one general practitioner, practice nurse, assistant and physiotherapist of each primary care center to gain more in-depth insight into their experiences with the technologies and the consequences of using these technologies on job satisfaction, care procedures and organizational changes that were needed or happened because of the increased offer of technology.

D. Organisation of care

This study will focus on the experiences during and consequences of the implementation of care technology on an organizational level. Interviews will be conducted with at least one director, manager or senior staff member of each primary care Living Lab to investigate changes in care logistics and procedures, organizational aspects, efficiency of care and financial aspects. These interviews will be conducted at baseline and one and two years after the implementation of care technology. Furthermore, to investigate changes in care consumption in the overall patient population, data regarding characteristics of the center (number of patients, number of patient visits, and number of staff) and care consumption (contacts with care professionals, number of referrals to specialists and prescription rate) will be extracted from the information system of the general practitioners.

VI. IMPLEMENTATION STRATEGIES

Since most relevant stakeholders were involved in the eLabEL project from the start onwards, attention has been paid to issues that are related to implementation and valorization from the start onwards. Perspectives from patients, healthcare professionals, and entrepreneurs were taken into account during all phases. Based on the experiences of all stakeholders during the eLabEL project and the outcomes of the two-year follow-up study, effective implementation strategies will be developed that can be used to advance the use of telecare technologies and eHealth application in primary care.

VII. DISCUSSION

Thus far, many primary care centers across the Netherlands showed an interest to collaborate in the eLabEL project. Implementation and use of telecare technologies and eHealth applications appears to be a prominent topic.

Using a Living Lab approach to ensure that input from relevant stakeholders is incorporated in the plans from the beginning onwards is appealing according to patients, professionals, and entrepreneurs that collaborate in the project.

Despite the fact that many primary care practices were enthusiastic about the ambition and approach of the eLabEL project, several of them choose not to participate yet. The main reason for this was that general practices need to invest quite a lot of resources and time (e.g., for purchasing and installing new equipment, training staff, training patients, etc.) to facilitate a shift from 'traditional care' to 'technology-supported care' and that it was unclear to most practices whether healthcare insurance companies would facilitate this. Many eHealth and telecare applications for primary care are currently not included in the regular healthcare financing system of healthcare insurance companies which makes it difficult for healthcare professionals and patients to find out or estimate whether the 'technology-supported care' that they provide/receive will be reimbursed or not. An issue that is related to this topic is that entrepreneurs who collaborate in the eLabEL project indicated that, partially due to the uncertainties surrounding reimbursement of eHealth applications, it is difficult for them to decide on a fair price for their products and services once they start providing these in an integrated way on a larger scale. A solution for this issue might be forthcoming since healthcare insurance companies in the Netherlands are currently in the process of developing financing structures for the use of telecare products and eHealth applications in primary care. The eLabEL project will most likely be influenced by introduction of these new financing structures in the beginning of 2015.

Since several large primary care centers decided not to participate, the eLabEL consortium decided to include smaller general practices that were not officially a multidisciplinary primary care center but a GP practice combined with a PT practice. This facilitated the inclusion process and in addition it also increased the variability between the eLabEL Living Labs which can provide valuable input for the development of effective implementation strategies.

Based on the experiences so far, several challenges have been identified that the eLabEL consortium will encounter in the near future. Firstly, integration of telecare technologies and eHealth applications with information systems that are currently being used in general practices is a very important requirement for the successful implementation and adoption of these technologies according to healthcare professionals. This requires

cooperation of companies that deliver such healthcare information systems. Involving these companies and getting their commitment will be a challenge that deserves high priority in the next phases of the eLabEL project. Secondly, interoperability standards for telecare technology evolve quickly on both a national and an international level. For example, HL7v3 has been launched in 2005 and already its follow-up HL7FHIR has been introduced in April 2014. Such quick developments make it difficult to create the basis for interoperability in healthcare information systems. Stakeholders of the eLabEL consortium will join forces and combine their strengths, expertise, experiences, and contacts to face these challenges to advance the large scale implementation of telecare technologies and eHealth applications that support patients and healthcare professionals in primary care.

REFERENCES

- [1] United Nations. "World Population Ageing 2009," New York: United Nations, 2010.
- [2] R. Fujisawa and F. Colombo, "The Long-Term Care Workforce: Overview and Strategies to Adapt Supply to a Growing Demand," OECD Publishing, 2009, doi: 10.1787/225350638472.
- [3] G. Pare, M. Jaana, and C. Sicotte, "Systematic review of home telemonitoring for chronic diseases: the evidence base," *J Am Med Inform Assoc*, vol. 14, 2007, pp. 269-77, doi: 10.1197/jamia.M2270.
- [4] N. van den Berg, K. K. Schumann, K. Kraft, and W. Hoffman, "Telemedicine and telecare for older patients--a systematic review," *Maturitas*, vol. 73, 2012, pp. 94-114, doi: 10.1016/j.maturitas.2012.06.010.
- [5] K. H. Bowles and A.C. Baugh, "Applying research evidence to optimize telehomecare," *J Cardiovasc Nurs*, vol. 22, 2007, pp. 5-15.
- [6] J. M. Peeters, T. A. Wieggers, and R. D. Friele, "How technology in care at home affects patient self-care and self-management: a scoping review," *Int J Environ Res Public Health*, vol. 10, 2013, pp. 5541-64, doi: 10.3390/ijerph10115541.
- [7] A.D. Black et al., "The impact of eHealth on the quality and safety of health care: a systematic overview," *Plos One*, 2011, doi:10.1371/journal.pmed.1000387.
- [8] S. De Rouck, A. Jacobs, and M. Leys, "A methodology for shifting the focus of e-health support design onto user needs: a case in the homecare field," *Int J Med Inform*, vol. 77, 2008, pp. 589-601, doi: 10.1016/j.ijmedinf.2007.11.004.
- [9] M. Vitacca, M. M. Mazzù, and S. Scalvini, "Sociotechnical and organizational challenges to wider e-Health implementation." *Chronic respiratory disease*, vol. 6, 2009, pp. 91-97, doi: 10.1177/1479972309102805.
- [10] Bergvall-Kareborn, B., M. Hoist, and A. Stahlbrost, "Concept design with a living lab approach. in System Sciences," 2009. HICSS'09. 42nd Hawaii International Conference on. 2009. IEEE, pp. 1-10, doi: 10.1109/HICSS.2009.123.
- [11] Nivel Primary Care Database, <http://www.nivel.nl/en/dossier/nivel-primary-care-database> Accessed on 23 October 2014.