Putting the Patient at the Centre

Making Telemedicine Services Personal Again

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***Abstract*— In aging societies, healthcare innovations are becoming increasingly important. ICT is a key factor in many of these innovations, as it possesses great potential for increasing efficiency in the healthcare domain. We stress the importance of both attention for the complete patient health status, and framework adoption for telemedicine applications. This is achieved through the adoption of a holistic health model such as the ICF (International Classification of Functioning, Health and Disabilities) and the provision of care support wherever and whenever possible to assist patients in their social context. In the U-Care project, which we describe as our use case, we adopt these ideas. In this paper, we elaborate a holistic view on telemedicine application design, involving the context of the end-users, to develop evolvable and tailorable care services.**

Keywords-telemedicine; care services; context awareness; electronic health; healthcare frameworks.

I. INTRODUCTION

Western countries are facing similar trends in healthcare: populations are aging, life expectations are growing, the number of healthcare professionals is decreasing, cost pressure on healthcare systems is increasing, and urbanization is taking place. All these factors limit the scope for local care [1]. ICT support is frequently mentioned as a countermeasure, because it can provide routes to more efficient healthcare solutions: it may provide both quantitative and qualitative improvements for future healthcare by improving access, reducing costs and raising quality [2].

Telemedicine is a particularly interesting field in healthcare innovation. It enables the delivery of remote healthcare services, monitoring and treatment, either in home care situations or outside the house. Though generic telemedicine architectures exist, many developments in telemedicine are bound to single applications or services for specific problems or diseases. We argue that individual patient needs should be addressed, based on their complete health status. This is achieved by combining and tailoring evolvable service components. The key point is that when aiding the patient, a holistic view on health should be the starting point; in this paper we argue why. We discuss the U-Care project as a case in which this vision is elaborated, researching both business and technical barriers to implementation of this vision.

The remainder of this paper is structured as follows. In Section 2, the patient focus and related models and concepts are described and we argue why these concepts are so important. Section 3 discusses the U-Care project, which is currently conducted in the Netherlands. This paper ends by drawing conclusions and presenting future work in Section 4.

II. THE PATIENT CONTEXT

Until now, telemedicine research primarily focused on very specific target groups. The ICT systems that have been designed, prototyped and trialed to support those groups, are therefore dedicated to specific health conditions.

We argue for an end-user driven approach in which telemedicine systems are designed to meet and adapt to evolving needs. Regarding high-risk persons or patients, ICT not only addresses current health problems; it also contributes to their experience and wellbeing. The patient context consists of the current and future health status, social relations (e.g. the relation with informal caregivers), and surrounding factors, e.g. the living environment. An effective telemedicine design process should take this wide patient context into account, to enable adaptation to an evolving context; to assist or enable whenever and wherever possible; and to provide confidence to the user. This approach is different from other methods because evolvement, tailoring and (social) wellbeing requirements are taken into account.

The International Classification of Functioning, Disability and Health (ICF) is a framework that positions patients in their bio-psycho-social context. This framework not only covers the status of the body's functioning and structure, but also considers activities and social participation. These four components are influenced by both personal and external factors, as shown in Figure 1. Using the ICF in telemedicine enables holistic patient assessments, gives input to classification and quantization of factors in all health domains, and provides a clear ontology for storage and exchange of information. Moreover, using ICF in interview sessions aids in capturing user requirements from the components and factors.

We adopt the vision that telemedicine services should not only provide body function or structure support, but also assist in the social context of users. Indeed, when the goal is to assist people as good as possible in their daily life, services should not stop at the front door, but also support and stimulate the user outside. Improving mobility is therefore a key aspect.

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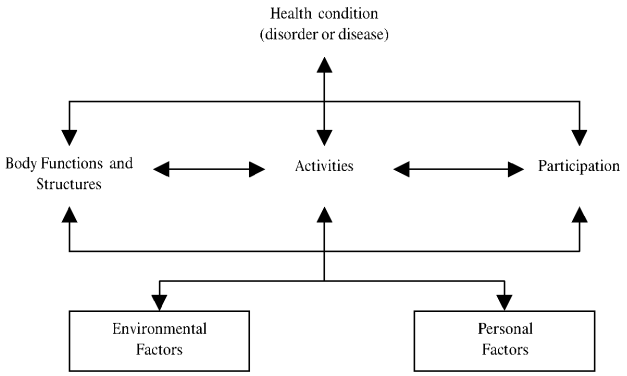

Figure 1. ICF component relations [4].

Using various sensors and context information, intelligent ambient services can be offered to the end-users, both inside and outside their homes [3]. This approach to service provisioning is in line with the two concepts described below:

1) The rapid emergence of virtual communities (VCs) enables social network creation and retention of both near and distant people, through advanced media. They aid a growing group of people in their social life and needs. VCs or even Mobile VCs (MVCs) can also be used for healthcare purposes [5]. For example, MVCs can be used for alarm services as shown in [6]. It is challenging to harness the general popularity of this concept in telemedicine application development [7].

2) *eInclusion*, which is the access to information and telecommunication, is considered crucial to support the independent living of all European citizens [8]. Not only should ICT technology be available throughout all generations, but ICT should also be used to achieve wider inclusion objectives, such as the accessibility to information in the information society. The aim is to enable active participation in society by all generations, bolstered by suitable ICT support.

III. USE CASE

User-tailored Care (U-Care) is a home care collaboration project running in the Netherlands. Started in November 2008, it combines domain expertise of industry, SMEs, healthcare and academia for care innovation. The goal is to provide care support whenever possible, in order to encourage, support, and maintain activities and participation of elderly in their social context. Hence, a services layer for integrated homecare systems is under development, which will provide tailorable, evolvable and non-intrusive home care services. This services layer, the U-Care Platform, includes context awareness. This will be achieved by utilizing both biosignals and environmental sensors. Biosignals include for example activity level, blood rate, blood pressure and weight; environmental sensors include location, temperature, humidity etc. Ideally, the platform assists in a prolonged staying of patients at home, which is preferred over moving them to more intensive care forms. Examples of applications running on the U-Care Platform are monitoring, alarm services, activity suggestion and social support functions.

The project has a duration of 4 years. It will address the following four aspects: (1) business and overall architecture; (2) integration; (3) tailoring; and (4) applications. Business aspects that are studied include the development of a viable business model. Service integration is needed to orchestrate the building blocks and core services of the platform. Tailoring addresses development of individual services and user-specific composition of more general components. Applications include those mentioned before, but also the inclusion of existing applications and services is foreseen, as our industry partners already have some of them available. Trials and evaluations will be conducted during the course of the project.

IV. CONCLUSIONS AND FUTURE WORK

We argued for the importance of (1) the adoption of an end-user driven approach, (2) taking the holistic patient context into account and (3) improving mobility, evolvement and tailorability in care services. This approach provides ambient assistance, support for patient-specific solutions, and enables both health and social support. The ICF, especially its bio-psycho-social patient model, facilitates this viewpoint. The concepts discussed in this paper are relevant when developing telemedicine services and applications that address more than a single specific disease. In home care, a holistic approach is also in line with attention to social life and needs, and the increasing importance of ICT in society.

In our future work, we will assess patient's health status and needs by interviews based on the ICF framework. Subsequently scenario development and stakeholder analysis are conducted to get better insight in the circumstances in our testbed premises in Parc Hoogveld, Sittard. Then, we will design the U-Care platform corresponding to our vision, addressing business viability, integration, tailoring and applications aspects of home care in a social context. Finally, we will develop this user-centric platform, providing ICT-enabled care support for patients in their holistic context.

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