Chapter 17
A Reconfigurable Supporting Connected Health Environment for People with Chronic Diseases

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ABSTRACT

Digital healthcare is becoming increasingly important as the ageing population and the number of people diagnosed with chronic diseases is increasing. The face of healthcare delivery has changed radically and at its core is a digital and customer revolution. Connected health is the convergence of medical devices, security devices, and communication technologies. It enables patients to be monitored and treated remotely from their home or primary care facility rather than attend outpatient clinics or be admitted to hospital. This chapter discusses the recent advances in connected health technologies and applications. The authors investigate a reconfigurable supporting connected health solution for people with chronic diseases using reconfigurable hardware and intelligent data interpretation and analysis. In addition, a thorough review of the existing information and communications technologies and challenges in the area of connected health including embedded medical devices, sensors, social networking, knowledge management, data fusion, and cloud computing is presented in this chapter. Finally, future directions and ongoing research in the area of connected health are presented.

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INTRODUCTION

The number of elderly is increasing over the world. It is estimated that by the year 2020 the proportion of people aged 60 and over will be 25% worldwide. The ageing process in Europe is even at a higher level. By the year 2020, forecasts say that the percentage of people aged 60 and over will be about 50% in Europe (World, 2003), (UN, 2013).

The ageing of the society comes along with several specific problems. The increased frailty of the elderly, the increasing prevalence of diseases and the increasing resources used per patient have a major impact on the health systems. The ageing of the society comes along with several specific problems. The increased frailty of the elderly, the increasing prevalence of diseases and the increasing resources used per patient have a major impact on the healthcare systems. The awareness of the impact of the growing numbers of elderly has increased. The ageing society has been one of the key actions of the research programs worldwide and in Europe, UK in particular. Within those programs, much attention is paid to effective and efficient delivery of health and social care services to older people diagnosed with chronic diseases (CD) such as Dementia (incl. Alzheimer's disease) and Parkinson disease.

Monitoring different vital signs of patients with CD such as ECG (heart rate), SpO2, blood pressure for example – provides an important source of information to the doctor for defining treatment and planning and for the patients to manage their diseases. It is also an aid for prevention and early diagnosis. Recent advances in information technologies offer the possibility of a new generation of lightweight monitoring systems that a patient diagnosed with CD for example can wear while going about his/her daily business, or which can be carried around easily and used regularly. Such new systems and tools can now provide much more reliable data on multiple parameters, and transmit them to remote locations, so that medical professionals can make better decisions on treatment without having to meet the patients face-to-face. Visual information and remote monitoring of patient's behaviour can also be combined with different vital signs monitored using wireless medical devices for early diagnosis and thus limit the development of the symptoms of CD.

Furthermore, social networks have become a powerful tool for healthcare and helps patients to find remedies and seek advice from other patients with similar conditions or medical experts. For some individuals limited access to healthcare and information on the disease could lead to more severe consequences such as paralysis. Patients often look to the internet to find other people with similar illnesses to aid and advise them where their medical condition is concerned. Patients like these rely on online social media such as Facebook, Twitter, TuDiabetes and PatientsLikeMe Patientslikeme (2013) to find social support. The social networking sites are a powerful and cost effective communication tools.

In addition, modern ICT is increasingly used in healthcare aiming to improve and enhance medical services and reduce costs. In this context, cloud computing has become very appealing when managing the computation and storage resources. E-health clouds offer new possibilities, such as easy and ubiquitous access to medical data, and real-time transmission of heterogeneous data. However, they also bear new risks with respect to security and privacy aspects.

This book chapter discusses an integrated solution for reliable, secure and real-time e-health service delivery at homes and remote locations. It will cover state of the art technologies which can be deployed in a connected health environment such as embedded systems, social networking, data fusion and pattern recognition, cloud computing, security and knowledge management.

We aim to address the following issues required for the development of a complete connected healthcare system: