SMART: Technologies to Facilitate Home Based Rehabilitation and Self Management

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Introduction

- In the UK, stroke is the most significant cause of adult disability
- DOH figures report that 50% of stroke survivors do not receive sufficient rehabilitation during the first six months.
- Self-management and self-care is a central theme in a new approach to care for long-term conditions
- A new research area of interactive computing technologies for home-based rehabilitation and self management of long term conditions has emerged
- Fundamental questions remain about the extent to which use of technologies can facilitate benefit

Objectives

- To examine the scope, effectiveness and appropriateness of systems to support home-based rehabilitation programmes for older people and their carers
- To investigate how technology can be used to construct tailored plans of interventions to be undertaken by individuals to meet specific needs
- To identify how relevant signs, symptoms and lifestyle consequences of long term conditions can be effectively monitored, modelled and analysed
- To identify how information on signs, symptoms and lifestyle consequences can be fed back to users in a meaningful and useable way in order to support self management

Home-based rehabilitation system

The SMART rehabilitation system (Fig. 1) has been develop to monitor upper limb movements for stroke patients at home rehabilitation.

Two MT9 motion sensors are used to track patient's movements during the rehabilitation exercises (Fig. 2). One is placed on the wrist and the other one is attached on the elbow.

An MT9 sensor consists of a three axis accelerometer, a three axis gyroscope, and a three axis magnetic field sensor, which can measure the movement information including position and rotation.

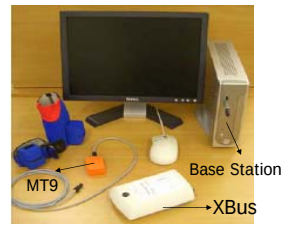

Fig.1 SMART rehabilitation system

Fig.2 Upper limb movement exercise at home

SMART Self Management

Long Term Conditions

SMART self management for chronic diseases focuses upon three very different conditions, namely stroke, chronic pain and congestive heart failure (CHF).

- chronic pain – monitoring timing of activities of daily living
- stroke – monitoring gross motor activity / wrist sensor for upper limb activity and seep monitoring
- CHF - monitoring gross motor activity / sleep patterns / activities of daily living with the measurement of weight, blood pressure and heart rate respectively

Personalised Self Management System (PSMS)

The proposed PSMS system, illustrated in Fig. 3, consists of four main components, namely 1) client specific monitoring, 2) decision support expert system, 3) patients' database 4) and telecommunication infrastructure.

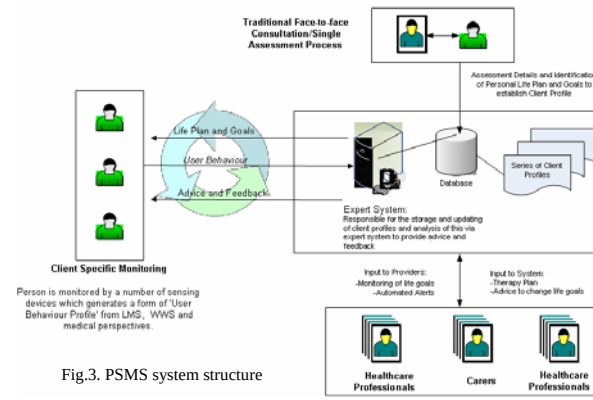

Fig.3. PSMS system structure

Patients are monitored by a number of sensing devices and all the information monitored is used to generate a user profile for each patient, together with other information provided by therapists. The series of user profiles are stored in the database. An expert system running on the sever analyses each profile and provides advice and feedback to the users, monitors their life goals and sends alerts when necessary. The therapists and health carers can then access the system from remote locations to review the care plan, and to advise changes in life goals.

Summary

Our research on monitoring rehabilitation movement for post-stroke patients have demonstrated the feasibility of applying ICT on the support of long term home rehabilitation. The PSMS system is proposed to support self care of three long term conditions (stroke, chronic pain and chronic heart failure). Currently, work is carried out on systematic literature reviews of technologies, systems and policies.

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