Facilitating rehabilitation of chronic disease patients by ICT tools

Luka Celic, Member, IEEE, Ratko Magjarevic, Senior Member, IEEE

Abstract—The increasing prevalence of chronic diseases in modern society is continuing, evoking further burden to the healthcare systems. Introducing substantial improvements into the delivery of care and rehabilitation for chronic patients is possible by remote home care and monitoring system, as many studies showed. Obstacles partially lie in the human nature which after achieving initial partial rehabilitation results considers the healing process finished. Therefore, assessment of accurate data on patient status and his/her lifestyle, automatic interpretation of the results of assessment and enabling feedback to the patient and health care providers substantially improves the probability of successful continuing of the care and rehabilitation leading to healthier and independent life. In this paper, we discuss the implementation of the Personalized Intelligent Mobile Health System (PIMHS) for rehabilitation purposes. However, challenges remain in achieving standardization and sustainability of remote systems in health care.

I. INTRODUCTION

Chronic patients are often obliged to collect and monitor their data on their physiological functions and lifestyle including their daily physical activity and exercising. This paper describes in particular the parts of our remote home care and monitoring system, the Personalized Intelligent Mobile Health System (PIMHS) for physical activity and exercising assessment.

II. PHYSICAL ACTIVITY ASSESSMENT

The Personalized Intelligent Mobile Health System was primarily developed at our Department for care of diabetic patients. This system is aimed for remote home care and remote monitoring of patients, and lately it is being extended to facilitate patients’ self-monitoring of physical rehabilitation in general and in particular for exercising assessment. Physical activity and adopting of healthy lifestyle are increasingly accepted as important parts of the patient care [1, 2, 3]. However, in many studies, after the patients have left clinical/rehabilitation settings, the physical activity is self-reported to medical professionals by patients but the accuracy of such reporting is dependent on many factors, and is often very poor [4, 5].

Many patients in the rehabilitation programme are prescribed a detailed exercising schedule. The schedule consists of aerobic exercise training in order to achieve continuous endurance, include resistance training in order to achieve strength and stretching in order to improve flexibility and prepare the body for exercising. Each type of exercising is measured in terms of intensity and duration and compared to the exercise plan. Also, each exercise is analyzed for the quality of performance enabling interventions of the system in form of an alert to the patient himself, or by the medical professional/trainer in case the patient is unable to follow the instructions of the system.

Physical activity of a patient may be measured/assessed throughout the day, 24/7 a week, during any activity the patient is performing (e.g. occupational activity, leisure, house work etc). by PHIMS sensor nodes. This “free activity” is called mobility and it is assessed in three grades as passive (lying, sitting, standing) or active (walking, running).

The intention in using the PIMHS is to reduce the number of everyday actions that a patient must take for his/her health assessment (measurements and other assessed data entry). For physical activity, the body sensor network consists of one central and several sensors nodes. The motion sensors’ data are either processed on-line, transferred to the server via a data stream or stored onto a microSD card, which has turned out to be an optimal choice in case the network is not present due to its small dimension and big capacity. Small sensor node dimensions do not impede the patient in performing physical activity.

III. DISCUSSION

Analysis of continuous and on-line monitoring of exercising as a planned way of physical activity by the patient (and by health professionals or trainers) as well as on-line feedback on the performance to the patient during exercising appear to be an effective way of patients’ self-efficacy enhancement.

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REFERENCES