**Marie Curie Actions**

**Final Publishable Summary Report**

**Project No:** 275571

**Project Acronym:** LTe-health

**Project Full Name:** Long-Term e-Health Evolution for Improving Diabetic Social and Behavioural Change Management

**Start date of project:** 16/01/2012

**Project coordinator organisation name:** Kingston University Higher Education Corporation

**Summary:**

Recent technological advances and societal changes have contributed to a shift in traditional care models and an increase in the patient-carer physical distance. These factors impose changes in the relationship between patients and their carers as well as changes in the models of access to relevant care information.

During the last decade, key advances in healthcare technology innovations have been in the emerging mobile and network technologies for disease management, especially chronic illness and in particular diabetes, which is a global health problem.

Type 1 diabetes mellitus (T1DM) is a condition caused by destruction of insulin producing beta cells in the pancreas by the immune system. Patients are completely reliant on injections of insulin to survive, and have to monitor blood glucose levels regularly to determine correct doses. According to the “DIABETES IN THE UK 2012, Key statistics on diabetes” report, in the UK there are about 265000 children and youths with diabetes. The current estimate prevalence of T1DM in children in the UK is one per 700 – 1000. The peak age of diagnosis of diabetes type 1 is between 10 and 14 years of age.

When diabetes is not well managed, it is associated with serious complications including heart disease, stroke, blindness, kidney disease and amputations leading to disability and premature mortality. Good diabetes control, particularly early in the disease, is known to dramatically reduce the incidence of long-term complications of diabetes with big impacts on the psychological, medical and economic consequences of these. The cornerstone of good diabetes control is self-management (i.e. the patient taking an active involvement with regular capillary glucose testing, evaluation of results and adjustment of doses in response to exercise of illness), which unfortunately many children find challenging, especially during adolescence. Adolescence in particular is a very difficult time for people with diabetes, with changes in physiology and psychology occurring at this time making diabetes very challenging to manage.

Because children are still developing cognitively and emotionally, self-management is challenging. Especially when developing the need for independence and autonomy in adolescence, it is important that children are well aware of their disease and know proficiently how to care for it themselves. Recent studies showed that children could benefit from social robots offering motivation, training, monitoring and support.



Figure 1. Overview of LTe-health platform.

LTeHealth is an ambitious project, as shown in Figure 1, funded by the EU to support the self-management of Type 1 diabetes . In this project, a novel e-health platform (LTe-health) which incorporates humanoid robots is developed to support diabetes self-management through improving interactivity between young diabetics and their health carers over a distance. The end-to-end functionality of this platform is tested and seamless secure data exchange sessions between its internal layers and external stakeholders has been demonstrated successfully. Unlike the existing platforms, it is designed to support self-management of diabetes not only through remote monitoring of patients data, but also by offering a technical platform for long-term social and behavioural change support through improving the patient-carer interactions over a distance. This is achieved through development of new applications which facilitate building and delivery of highly flexible patient-robot dialogues that exploit the concept of “Information-Motivation-Strategy” of the long-term behavioral change support model. These dialogues which can be tailored to the individual needs of patients are built by health care professionals and delivered to the patients via their in-home robots.

The developed LTehealth platform was tested and evaluated via an exploratory pilot clinical study that is designed to investigate various aspects relevant to patients and clinicians acceptability of the platform. Acceptability of the suggested robot-assisted therapy in diabetes care and management is considered of a particular focus in this study. In this medical scenario, the robot acts as an interface between patient and his/her medical sensors on one side and a remote health web portal and health carers on the other. A total of 37 school-aged children 6 to 16 years old with Type 1 diabetes have participated in this study. Acceptability is measured overall and also using specific services/features of the LTe-health platform. We also assessed acceptability of patients according to both age-groups and demographic characteristics – age and gender. The obtained results showed that the overall patients’ acceptability is 86.7%. However, it is interesting to note that acceptability of patients varies depending on the age group. Patients aged 6 – 9 years showed the highest acceptability level of 94.8% while higher age groups: 10 -12 years and 13-16 years showed lower acceptability levels of 85.0% and 83.6% respectively. On the other hand, the obtained results also showed that the acceptability level of male patients (87.0%) is only slightly higher than that of the female patients (86.5%).

The results obtained in this pilot study can be considered an important step forward to evaluate the primary efficacy parameters of the eHealth platform. The study has demonstrated a high level of patients’ acceptability to most of the suggested healthcare service scenarios and features of the LTe-health platform. Secondary efficacy parameters which assess improvement in physical and psychological well-being of patients are yet another important aspect to be studied prior to potential future commercialisation of the developed platform. These investigations were beyond the scope of this project. In order to conduct in order to conduct a meaningful clinical trial, more hardware resources (5-10 robots with the associated medical sensors and interfaces) and time (6-12 months or more) are required.