IMPLEMENTATION OF E-MEDICINE SOLUTIONS IN THE CARE OF PATIENTS WITH DIABETES MELLITUS IN LATVIA: E-MEDIC PROJECT EXPERIENCE

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Abstract

Number of patients with diabetes mellitus increases constantly all over the world, and also in Latvia. Treatment of diabetes and care of diabetic patients requires extensive financial sources, which is a growing burden for economy. Quality of care in treatment of diabetes is of crucial importance, as it is associated with development of diabetic complications, which are linked to increased morbidity and mortality. However, long waiting time for endocrinologist or diabetologist visit interferes with efficient diabetes care process. Therefore, e-medicine solutions have been proposed for development of new algorithms in communication between doctors and patients, as well as improvement of patients' education and quality of diabetes control and self-treatment. The pilot study has been initiated in January 2013 and will last till December 2013. The objective of the project is to develop new practices for virtual consultation in medicine. eMedic pilot study develops new technological applications and monitoring tools to increase understanding of need and requirements of eHealth services. The preliminary results show that applied techniques can be used in order to improve quality of care for diabetic patients with the help of the virtual visits.

Keywords

diabetes mellitus, distance self-monitoring, mobile applications

Introduction

Self-monitoring of blood glucose (SMBG) plays an important role in improving metabolic control in patients with diabetes. It is recommended for diabetes patients treated with insulin. Judicious use of SMBG data can help to improve glycemic control, select an anti-diabetic regimen, and provide powerful feedback to patients wishing to improve metabolic control [1].

There are various methods that support management of intensive insulin therapy, such as individual treatment plans, patient education, and consultations with diabetic nurse, personal diabetes diaries, glucometers that support uploading of blood glucose values on personal computer and analyze the data. However, studies show that only less than a half of diabetes patients with intensive insulin therapy perform routine everyday self-monitoring of blood glucose [2].

Various telemedicine solutions have been applied for use of management of chronic diseases, both improving access to more qualified health care professionals, as well as ensuring patient empowerment and better tools for patient's disease management. Studies suggest that some of the proposed telemedicine solutions are showing successful results and improvements in also diabetes management [3, 4]. Currently promising approaches involve use of mobile communication devices with software that supports glycaemia control and interactive internet solutions that ensure communication between health care provider and patient and provide motivational support [5].

With an expanded use of mobile technologies in everyday life new methods for diabetes control and management, as well as self-monitoring tools are developed.

This study was focusing on the use of mobile application for diabetes patients' self-monitoring and its influence on disease management.

Methods

A prospective randomized controlled trial design was applied over 9 month period. All together 53 patients were randomized in two groups: GA – active group (N=30), GC – control group (N=23). The study

population was diabetes patients with intensive insulin therapy and HbA1c > 8,2±1,6 in control group, 8,5±2,2 in active group. Age of GA - 33,6±13,8, age of GC - 34,8±12,8. Diabetes duration in GA - 11,2±8,4, in GC - 9,7±9,9.

Patients from GA received a set of self-monitoring devices – a mobile device with an application for diabetes management, blood glucose measuring device with Bluetooth connection for transmitting blood glucose values to mobile device and blood pressure measurement device. Patients from control group received blood glucose measuring devices and preceded with a conventional treatment, which involves face to face visits to endocrinologist and keeping a paper diabetes diary.

Control group (GC) patients had an onsite visit with an endocrinologist and diabetes nurse every 3 months.

Active group (GA) patients during the first visit received the set of self-monitoring devices. Together with physician patient's care plan was designed and physicians were provided with access to patient's personal health record - diabetes diary (PHRbox) that collected the data from mobile devices. During the first visit, patients were educated in terms of devices usage and necessary self-monitoring data that needs to be controlled and input in the mobile application, such as blood glucose values, bread units and amount of insulin injected. The next onsite visit to endocrinologist was planned after 6 months

Furthermore, endocrinologists were following patient's course of treatment via the data available in PHRbox, if necessary, treatment plans were changed or adjusted. Diabetes nurse was monitoring patients' compliance via PHRbox. PHRbox also provided means for communication with patients.

System usability score (SUS) and modified Kaplan 4C questionnaires were used to asses user experience with self-monitoring devices. Interviews with physicians and were conducted to evaluate health care provider's perspective on distance self-monitoring solution.

Results

During the study, several sets of data was collected and evaluated: data about patients' compliance, clinical data about diabetes compensation, frequency of hypoglycaemia, number of unplanned visits to the doctor, sick leaves and hospitalizations because of diabetes, life quality assessment.

Altogether one GA patients withdraw from the study, two patients were transferred to GC and three patients were inactive users of the self-monitoring system.

Technology evaluation was conducted after 3 month of study, SUS and Kaplan 4C questionnaires were sent to GA patients.

User evaluation for self-monitoring system – patient perspective

68% from GA patients provided their responses to the questionnaires. Average SUS score for eMedic self-monitoring solution was 75 points. However, in Kaplan 4C questionnaire and individual interviews patients expressed dissatisfaction with technological difficulties experienced while using the solution such as slowly working application, problems with synchronization of data, malfunctioning glucometers (two cases), limited possibilities to register physical activities and a short battery life for mobile phone.

User evaluation for self-monitoring system – healthcare personnel perspective

Health care personnel were asked to evaluate PHRbox which was used for assessing patient self-monitoring data. During interviews health care personnel pointed out several disadvantages of the system:

- Slowness of PHRbox data base;
- Double or triple data;
- Difficulties with creating minor changes in treatment plan;
- Difficulties with creating reports and overviewing and analyzing the data;
- Inconvenient tool for patient/physician communication;

Overall conclusion during the evaluation is that such solution can be applied for certain groups of patients, such as first time diagnosed patients, short term glycemic control up till two week period. Need for improved user interface and more advanced data analyses tools were expressed.

Conclusion

During pilot study new algorithms in communication between doctors and patients were tested, as well as technology was evaluated for being a convenient tool for diabetes patients' self-monitoring. Both human and technological factors make the pilot study more challenging.

The preliminary results show that applied techniques can be used in order to improve quality of care for diabetic patients with the help of the virtual visits. However, implementation of e-medicine solutions in Latvia requires specific education for medical personnel and patients. Testing of devices, data input, data output and analysis had to be done before the pilots, because technical problems interfere with data interpretation.

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