Information technology supporting diabetes self-care: a pilot study

A Halkoaho, M Kavilo, A-M Pietilä*

Summary

Although diabetes is a lifelong, incurable disease, people can live a full and normal life, provided that they receive appropriate and well-planned care. The care of people with diabetes should be organised as flexibly as possible to suit individual lifestyles.

Information technology has become a useful tool to support functional patient–professional relationships and improve care balance. The Self-Care System software tool set by ProWellness is one such tool. Users can enter blood glucose data by using a computer, modem and mobile phone and diabetes nurses can monitor the situation from their own computer and, if necessary, give instructions by sending a SMS (text) message to the patient's mobile phone.

This pilot study investigated whether the Self-Care System application supports people with diabetes and can be used as a diabetes education method. The study was carried out in the municipal consortium for healthcare of Siilinjärvi and Maaninka. Nine individuals with diabetes and three diabetes nurses were selected to participate in the study. Data were collected by questionnaire and interview. People with diabetes were sent a questionnaire and the nurses were interviewed. Content analysis was carried out on the interview data.

The results suggest that the Self-Care System software supports and motivates diabetes self-care. The nurses felt that the application was useful when changes, such as starting insulin treatment, were introduced. The application was further described as effective and motivating in short-term intensive diabetes education and monitoring; however, both nurses and patients disliked the mechanical nature of the software.

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Key words

Self-care; diabetes education; empowerment; information technology

Introduction

Diabetes is a self-managed disease with the person with diabetes usually contributing almost 100% of their daily care.[1] The purpose of empowerment-based diabetes education is to help people with diabetes to engage in their own treatment decisions. Diabetes education, based on the patients' own goals, values and motivation, will help to resolve day-to-day problems, as well as assuming responsibility for making choices. Funnell and Anderson suggest that the challenge to education services lies in encouraging people with diabetes to participate as equals in the planning of their care and in this way commit themselves to realising and assessing their own care.[2]

Information technology (IT) can support the formation of patient–professional relationships, improving care balance, and create new education methods. Present-day IT enables more active education of people with diabetes than ever before. Several studies have shown that a follow-up and guidance system based on IT and self-monitoring of blood glucose can have favourable effects on care balance. Reports suggest that effective monitoring through IT applications provides statistically significant results in decreasing HbA_{1c}.[3–6]

Kruger *et al*[7] found that patients are content with the way IT is applied to support self-care and feel that data transfer to the care institution through a modem and the use of the required equipment is easy and time-saving. The diabetes team also appreciated the precision and efficacy of the method. Meneghini *et al*[4] point out that in addition to saving time, the method is also cost-efficient and reliable.

The Diabro project[8] set out to control the increasing cost of diabetes care by designing a rationalised care system. The project tested the Self-Care System (ProWellness, Finland) in supporting the self-care of people with diabetes. Results indicate that the application improved monitoring and decreased the number of consultation visits to a physician or nurse. The greatest problem was the mechanical and inflexible nature of measuring the results.

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Moreover, the diabetes team felt that a protocol should be established for responding to the measurements sent in by the patients.[8]

This article describes the use of IT in patient education and examines its application to diabetes self-care. It focuses on patients' and nurses' experiences using the Self-Care System software tool.

Method

Description of the Self-Care System

In the Self-Care System blood glucose values are transferred into the application using a computer, modem and mobile phone (Figure 1). The application allows nurses to monitor the blood glucose levels of a patient with diabetes from their own computers and send guidance as SMS messages directly to the patient's mobile phone.[9]

The Self-Care System allows reports and graphic representation of blood glucose results to be viewed by patients, helping them to learn about advanced care balance. If the patient is in agreement, the diabetes team can view the home diary via the Internet. This information can be used in the clinic or by clinical staff when advising the patient over the phone or by e-mail.[9]

The diabetes team using the system can get a clear general overview of an individual's status, progress and medical history. Summary reports are presented according to treatment goals and an appreciation of the patient's status may be enhanced visually by using different colours and graphics.

Participants

The three nurses selected for interview work with the people with diabetes who also participated in this study. A ProWellness representative taught the nurses to use the Self-Care System application and enter data into the system; time was allowed for practice.

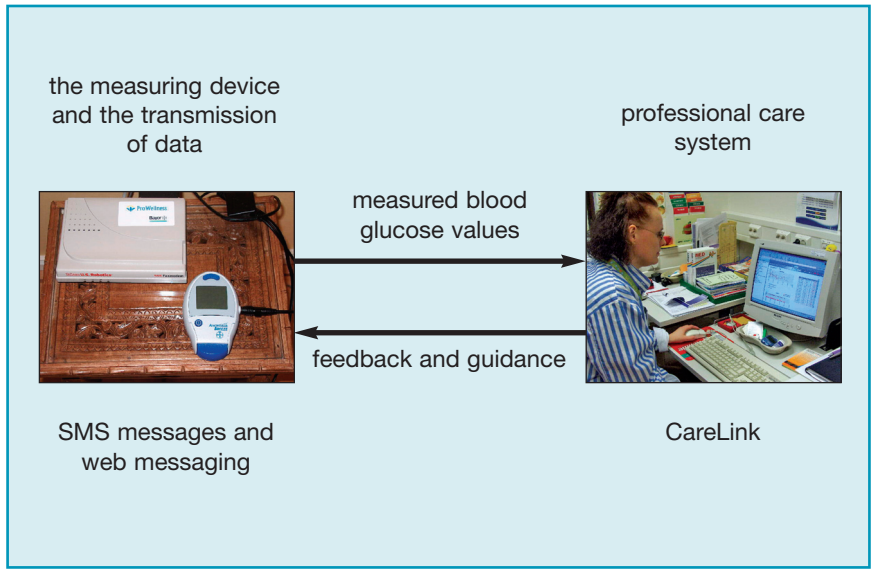

Figure 1. The ProWellness Self-Care System

Nine individuals (two female, seven male) with either type 1 (n=3) or type 2 (n=6) diabetes were selected to participate in the study. Age distribution was 35–60 and no serious complications were described. It was not essential to have previous knowledge of computers or to own a computer; only a workable telephone line was required, because of the modem. The sample taken was discretionary and informed consent was received. The selected volunteers met the following criteria: (1) of working age, (2) considered likely to benefit from using the application.

Each patient underwent a personal consultation visit to be taught how to transmit blood glucose measurement results through a modem. The process began with instructions about how to use the modem and blood glucose measurement device. The patients were shown how to send the measurement results, and they were able to practise independently using both the modem and blood glucose measurement device. The instruction meeting was preceded by deciding a schedule for sending measurement results according to the patient's needs and wishes. If necessary, the schedule could be revised during the course of the project. Preliminary patient data was entered into the system while the patient was present. Patients were given personal user identifications for the Self-Care System application; only the patients themselves had access to their own identification details.

The meetings described above were followed by discussion. The aim was to teach the patients to use the Self-Care System application and related equipment and send the measurement results to the nurse. Another important objective was to motivate patients to use the software themselves. Patients were encouraged to assess their own blood glucose level results with the help of tables and graphs included in the Self-Care System software. The purpose of these efforts was to support the patients in assuming responsibility for their own care.

Data collection and analysis

Questionnaire

The questionnaire designed for this study was tested by two individuals before being sent to the participants. It included 13 questions that addressed patient satisfaction with:

- technical aspects of using the measurement device and modem,
- the Self-Care System software,
- diabetes care education and
- their ability to affect their own treatment.

Other questions asked whether the patients had used the Self-Care System application over the Internet independently; what kind of experiences they had using the software; whether they would like to continue using the application after the end of the project; and whether they would recommend it to other people with diabetes. Three open-ended questions were also included to assist the evaluation of patients' satisfaction/dissatisfaction with the project and find out about possible targets for development of the software.

Interview

The diabetes nurses participating in the study were interviewed by means of themed interviews taking place in each nurse's office. The two-hour interviews were recorded in writing and they covered the following themes: initial instruction, schedule, applicability of the software as an education method and support for the self-care of patients with diabetes. The nurses were also asked to assess the application as a method of work.

Data analysis

The interview data and questionnaire data were analysed by qualitative description. Qualitative descriptive designs are typically an eclectic but reasonable combination of sampling and data collection, analysis and representation techniques.[10] The interview data were analysed by means of content analysis. The data were categorised according to the previously-mentioned themes and comparisons were made across the different categories.

Ethical aspects

When patients were contacted initially they were informed about the study and its purpose, the sample and intention to publish the findings. It was emphasised that participation in this study was voluntary and refusing participation would not affect the care received. They were also told that they would have the option of dropping out of the pilot study. Approval for the study was requested from the department head nurse and the head of the department of automatic data processing in the municipal consortium for healthcare of Siilinjärvi and Maaninka.

Results and discussion

There have been significant changes within the Finnish healthcare system since the late 1980s. The introduction of IT to healthcare has posed new challenges. Healthcare equipment is increasingly technical, with functions based on cutting-edge technology. Electronic medical records are the norm**,** and the public health service uses systems from several different software providers. Additionally, there are separate applications potentially incompatible with the unit's information system**,** such as diabetes register**s**, software for fundus photography, and applications for blood glucose measurement devices.

The Self-Care System was seen as extremely useful in situations involving changes in daily diabetes care. The nurses interviewed for the present study felt that the application was most useful when starting insulin treatment. Frequent communication made it easy for the patients to adjust their insulin doses, which contributed to improved blood glucose values. They thought that the SMS messages motivated the patients to assume responsibility for their own care.

The volunteers participating in this study had made use of the tables in the Self-Care System and felt that the tables, had made it easier to control their blood glucose balance:

The application was very clear and easy to use.

The graphics make monitoring the blood glucose level much more concrete than mere numbers'

The patients were also happy to participate in planning their own care during the project. Factors contributing to patient satisfaction were quick responses from the nurse, effective education without the need for appointments, fewer consultation visits, possibility of independently analysing results and overall flexibility of care enabled by the application. One patient raised the issue of preset measurement times in responding to the questionnaire:

…if one has irregular working hours and takes the measurements outside the preset time frames – the graphs will not represent the real situation.

The application requires people to take their measurements at certain times, which is inconvenient for those with different lifestyles.

The nurses generally found the measuring device, modem and Self-Care System easy to use

and to instruct the patients on their usage. However, it was indicated that should the number of patients increase, instruction would require more effort and time. Patients not sending their results according to the schedule caused problems. The nurses also, were not always able to reply to the patients within the scheduled time. The biggest shortfall appeared to be the fact that the Self-Care System could not be connected to the electronic patient information system. Another important issue was reserving enough time to study the results.

When asked about the use of the application as part of the education process, the nurses considered communication to be the biggest problem. Despite describing the related tables and graphs in the Self-Care System as clear and informative, they would have liked more information on patients' medication, diet and exercise in connection with each set of measurement results. The nurses felt that one of the threats presented by the use of the application was of patient care being left 'in the hands of technology'. Explicit rules regarding the number of necessary consultation meetings with general practice would have to be agreed with the patients.

The nurses agreed that the Self-Care System application could be adopted as a working method if a limited number of patients were involved in the process at any time. They also pointed out that it is essential to select the patients who are to be introduced to the application: some patients will benefit more from traditional education at the physician's office. All nurses were of the opinion that the application is well suited to working-age individuals, those having to make frequent business trips and patients starting or changing their insulin medication. Young people were also mentioned as likely to benefit from the application, since their blood glucose values vary typically and insulin doses must be changed frequently.

The nurses considered the Self-Care System to be an effective and motivating means to support short-term, intensive, education and monitoring. It is essential to select a monitoring method suitable for patients during diabetes education because as individuals patients must be offered the best possible type of care suited to their lifestyle. Careful planning is needed when acquiring new information systems, which should not be introduced only for the sake of technology, but to increase effectiveness and flexibility also from the patients' point of view. The ProWellness Self-Care System enables guidance without the need for frequent face-to-face meetings with the diabetes team. The working method is based on mutual trust between patient and nurse, and data privacy must also be respected. The nurse has to trust the authenticity of the replies from the patients, and has to respond to the replies within the planned schedule.

We wanted to try out the new diabetes education method on patients who may find it difficult to attend scheduled consultation meetings and adhere to the traditional, visit-based care guidance and monitoring. Due to the small number of participants, however, the results cannot be generalised. Follow-up studies of the use of IT in guidance and the guidance's effectiveness are needed in future.

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Conflict of interest statement:

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