Introduction

PEPPER (Patient Empowerment through Predictive PERsonalised decision support) is an EU-funded research project to develop a personalised clinical decision support system for Type 1 diabetes self-management. The tool provides insulin bolus dose advice and carbohydrate recommendations, tailored to the needs of individuals. The former is determined by Case-Based Reasoning (CBR, Fig. 1), an artificial intelligence technique that adapts to new situations according to past experience. The latter uses a predictive computer model (Fig. 2) that also promotes safety by providing glucose alarms, low-glucose insulin suspension and fault detection.

Method

The user-centred design methodology aims to ensure that the tool meets patient needs and improves clinical outcomes. A dual architecture (Fig.3) accommodates insulin dosing either by insulin pen or via the Cellnovo patch-pump (Fig. 4). Data are gathered wirelessly in real-time from multiple sources including a continuous glucose monitor, capillary glucose monitor and physical activity monitor. The design ethos is to offer maximum benefit for minimum effort, so additional manual data entry is strictly limited.

Results

The first prototype system has been designed, using feedback from patients and clinicians, and tested using the UVA/Padova Type 1 diabetes simulator. Three subsequent phases of clinical tests are planned. The first two will study safety, feasibility and usability in situ; the last is a randomised control trial, in 2018.

Conclusions

The first milestones have been reached towards the integration of multiple types of real-time data into a mobile decision support system that uses artificial intelligence and predictive modelling to adapt its advice according to the needs of the individual.

Partners

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