S-DiaSelMan

Smart Diabetes Self-Management Care
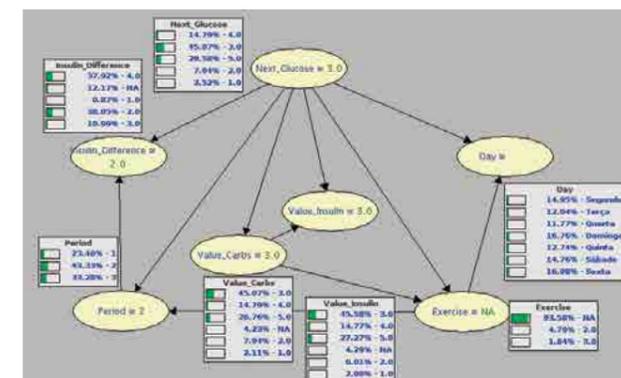
S-DiaSelMan aims to provide a mobile application assistant that embeds medical knowledge and pattern analysis to provide feedback and suggestions to improve patients' diabetes management. We enabled diabetes data registration, analysed medical protocols and embedded them on a logical engine to provide feedback, collected initial data and did preliminary data analysis to discover simple patterns.

Main Project Team

Pedro Brandão	**NS-Po**
Miguel Coimbra	IMM-Po
Inês Dutra	CRACS-INESC
Celestino Neves	Hosp. S. João/FMUP
João Fonseca	CINTESIS/FMUP
Eduardo Soares	NS-Po
Diogo Machado	NS-Po
José Ornelas	NS-Po
Dalila Lima	NS-Po
João Maia	NS-Po
João Terrível	NS-Po
Ana Azevedo	NS-Po
Ricardo Faria	NS-Po

Indicators

Funding	38k €
Conference Papers	2
Concluded MSc:	6

Two Main Publications

Carla Leite, Pedro Brandão, "Gestão Pessoal de Diabetes – Sistema de Aconselhamento", Inforum, Setembro 2014, Porto, Portugal

Diogo Machado, Vítor Santos Costa, Pedro Brandão, "MyDiabetes - Rule Based Advice System", ConfTele, Setembro 2015, Aveiro, Portugal

PROJECT WEBPAGE URL
https://mydiabetes.dcc.fc.up.pt/

Fig. 1 The smartphone application and Online visualization.

Fig. 2 Initial tests for mining user data.

GENERAL MOTIVATION AND OBJECTIVES

Diabetes is a rising disease in terms of number of people affected and the costs associated with its treatment. 439 million adults and USD 490 billion are estimated by 2030. Portugal had, in 2011, 11.7% of the population between 20 and 79 with the disease. Diabetics may have uncontrolled glycaemic values, which in turn can seriously decrease their quality of life, leading to amputations, blindness or heart problems in the worst scenarios. However, if glycaemia is correctly controlled the patient can lead a normal life without complications. To achieve this, type 1 diabetics (insulin dependent) require a very strict control of their disease. This implies registering glucose levels, carbohydrate intake, insulin, exercise, stress, illness and other factors that influence glycaemic values. The ultimate goal of this work is to provide a mobile application assistant that embeds medical knowledge and pattern analysis to provide feedback and suggestions to improve the disease management. This results in advices given when specific records are added, discovering correlations between events/records and improving patient engagement for data acquisition.

CHALLENGE

Patient and physician usually discuss the cause-effect of some of the events to review patient's decisions, evaluate their results and discuss the treatment. Embedding these medical protocols, which are sometimes well defined but mostly arise from experience, in a logical framework for the application is one of the challenges of the project. These rules should take into account the context provided by the records entered (e.g.: going to do an exercise; made an exercise 2h ago).

The data registered by the patient can provide patterns that show incorrect control of glycaemia by pointing to problems or ultimately providing reasons. However, the diversity of factors that influence glycaemic control makes it especially difficult to uncover.

Patient engagement is another factor that determines the amount of data available for being able to provide feedback and mine the data. As such, the ease of use for a diverse population (teens to elders) is of concern.
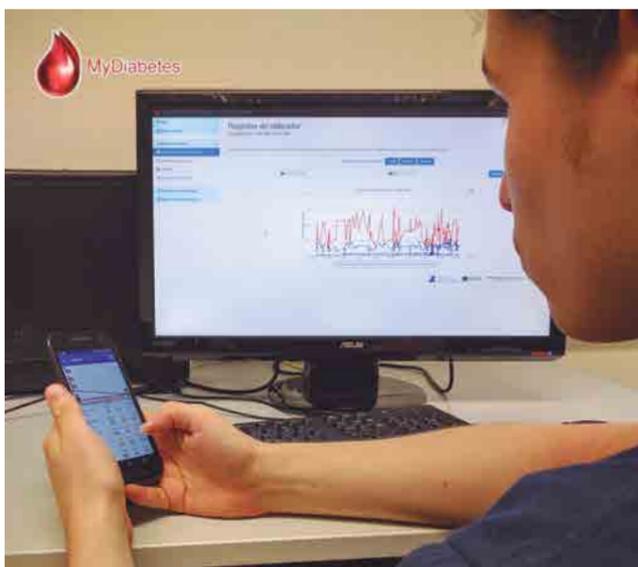
The project is multidisciplinary, with CRACS-INESC providing guidance on the logical framework and pattern analysis. S. João's Hospital and CINTESIS provide the medical background and knowledge. The IT team is responsible for the development of the full framework, involving the translation of medical protocols to logical rules, mobile application and visualization system, connectivity to glucometers (to ease patient's use) and interacting with patients. This with the help of the partners in the appropriate areas.

WORK DESCRIPTION AND ACHIEVEMENTS

The project addressed the above goals by developing an Android application that allows diabetic patients to register the factors mentioned. We developed a Windows application for visualization to counter the limitations of the smartphone's screen, this evolved to a web-based solution that eases installation and usage. Wireless interconnection with a specific glucometer was also achieved. This development effort and testing with patients aimed at maximizing patient commitment/engagement and data registration.

The endocrinology department from Hospital S. João enabled patient recruitment and the knowledge to define some medical rules. These are 'translated' to a defined Prolog framework (logical rules' engine) for diabetic guidelines. These clauses embed counsels for patients based on their context. Initial offline pattern analysis has been done with the data collected to detect simple individual pattern for the patients.

The project provided the stepping stones to: understand patients' needs and commitment, availability of medical information for diabetics counselling, simple patterns that usually occur in a diabetic's week, and to develop an application and cloud based solution to collect data regarding factors that influence glycaemia control.