Projects news & results: 14/03/2013

# Managing diabetes with data and ingenuity

An EU-funded project has developed a device which can predict sugar highs and lows for people with diabetes and provide them with advice on how to manage their glucose levels.

With our increasingly sedentary lifestyles and populations' rising 'body mass index' (BMI), diabetes is on the rise. When patients can control and reduce their symptoms they still enjoy a good quality of life. But even with self-monitoring of blood glucose levels, insulin injections and careful management of diet and exercise, patients find it a challenge to manage this chronic disease.

Poorly controlled diabetes is a risk factor for many other medical conditions, from cardiovascular disease to blindness, so health professionals are keen to help people with diabetes to manage their disease well; early intervention and disease management prevents the disease from triggering other medical problems.

A diet of data

'The secret to managing diabetes is data and knowing how to interpret it,' says Jens Poulsen, from the Danish pharmaceutical firm Novo Nordisk, the world's largest manufacturer of insulin. 'At the moment, although the data is made available to patients, they don't really know how to use it to make on-the-spot decisions.'

Today most patients rely simply on the results from their own finger-prick tests. If their blood glucose goes up they inject insulin. If it goes down, they eat a biscuit. But Mr Poulsen looks forward to a day when diabetes management is proactive, rather than reactive. 'What patients really need is something that tells them their glucose is going to spike unless they take preventative measures,' he says. 'This proactive fine tuning would keep glucose levels steady and avoid all the ups and downs in sugar levels that can be so frustrating for the patients and damaging to the body in the long term.'

The 'Personal glucose-predictive diabetes advisor' (Diadvisor) project was funded by the EU to investigate how patient data could be used to forecast their glucose levels. 'The Diadvisor consortium wanted to develop a system which would capture the most crucial patient data, then use this to provide the patient with useful information and guide them in their diabetes management,' explains Mr Poulsen, who coordinated the project. 'Short-term forecasts of blood sugar levels allow a patient to take action and improve the management of their disease.'

Vital signs

In the first phase of the project a group of 90 diabetes patients volunteered to wear and carry a range of devices which continuously monitored their vital signs, not just blood sugar levels but also breathing, heart rate etc. These volunteers spent three days in hospital and seven days at home.

The wealth of data collected from these patients provided the project partners with its crucial data set from which researchers tried to find correlations. From the patient data they developed

algorithms and models which would predict the course of blood sugar levels based on current values.

The research confirmed that the three most important parameters for their predictive modelling were blood sugar levels, insulin levels and food intake. By monitoring these three parameters the researchers are able to predict the blood sugar levels for patients 20 minutes into the future with an acceptable accuracy in more than 90 % of cases. Forecasts for 40 and 60 minutes ahead had acceptable accuracy in more than 80 % of cases.

Help at hand

The project partners have created a prototype handheld device which allows patients to enter their readings and record their meals. The device's software integrates the forecasting algorithms with a decision management module, developed in close collaboration with diabetes professionals, which guides patients in how they can manage their blood sugars. Surprisingly the device needs little or no calibration to individual patients.

An extreme example illustrates the process. A patient has a low glucose reading and then eats a chocolate bar. When you plug these values into the system, the predictive algorithm shows that within 20 minutes blood sugars are going to spike perilously high. After telling the device they have just eaten some chocolate, the system recommends an insulin shot, which will prevent the spike from occurring.

'Using ICT to predict what will happen if no action is taken is just one side of the story,' Mr Poulsen remarks. 'What is most useful to a patient is some advice on what they can do about it.'

The project has been careful to demonstrate the clinical safety of their system. 'We are talking about people's lives,' Mr Poulsen observes. 'We cannot develop a system which makes dangerous and inappropriate recommendations, so we have set very high safety criteria.'

The project trials show that the predictive power of the system is clinically useful up to two hours ahead. The advisory component is also safe: its recommendations perfectly matched those of real doctors 88 % of the time and out of almost 1500 recommendations during testing it never provided any harmful advice.

These were achieved in a final trial that in which 55 patients spent three days following the recommendations of Diadvisor and three days following their normal routines.

'A large-scale trial in the future is crucial to show whether Diadvisor actually makes a difference in the daily lives of patients,' says Mr Poulsen. 'Our preliminary short-term results are promising: the time people spent in debilitating hypoglycaemia was reduced by Diadvisor. Up until now people have speculated that automated advice for patients would improve control. The Diadvisor consortium has now demonstrated this can be achieved. Partners in the consortium are now considering how to proceed to exploit the results of the Diadvisor project and develop something to help patients maintain tighter control of their blood sugar and keep it in the normal range.'

Link to project on CORDIS:

- FP7 on CORDIS [1]
- Diadvisor project factsheet on CORDIS [2]

Link to project's website:

- 'Personal glucose predictive diabetes advisor' project website [3]

Links to related videos / audios:

- News report on Euronews featuring the Diadvisor project [4]

## Recommended reading

## Our Targets:

- Pillar V: Research and innovation [5]

## Newsroom:

- Projects news & results [6]

## See also:

- eHealth and Ageing [7]
- Science and Technology [8]

**Source URL:** https://ec.europa.eu/digital-agenda/en/news/managing-diabetes-data-and-ingenuity

**Links:**
[1] http://cordis.europa.eu/fp7/home_en.html
[2] http://cordis.europa.eu/projects/rcn/85459_en.html
[3] http://www.diadvisor.eu/
[4] http://www.euronews.com/2012/01/11/over-hygienic-parents-could-be-cause-of-diabetes
[5] https://ec.europa.eu/digital-agenda/en/our-goals/pillar-v-research-and-innovation
[6] https://ec.europa.eu/digital-agenda/en/newsroom/all/projects-news-%26-results
[7] https://ec.europa.eu/digital-agenda/en/living-online/ehealth-and-ageing
[8] https://ec.europa.eu/digital-agenda/en/science-and-technology