News from the REACTION project

Stay abreast with developments in closed-loop diabetes monitoring

Video on safe glycaemic control in hospital

REACTION has produced a video showing safe glycaemic control in the hospital ward. View it by clicking the image.

The video features a presentation of the in-hospital demonstrator prototype developed by REACTION. Since good glycaemic control of patients with diabetes can help prevent instances of hyperglycaemia, the in-hospital care application of the REACTION platform features a range of services aiming at safe glycaemic control. It monitors a range of parameters including glucose level, nutritional intake as well as measures of administered drugs, using an individual target level commensurate with the history and actual state of the patient.

The in-hospital demonstrator has been developed by MUG, MSG, FORTH-ICS and FHG-SIT and the video has been provided by MUG. The REACTION project will produce a number of videos as part of the project's dissemination of results to the public so stay tuned.

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First REACTION online demonstrator

Test the REACTION prototype which retrieves and processes blood glucose data in order to extract meaningful patterns.

As part of the REACTION dissemination activities, the project will create online demonstrators to show REACTION work. Partner ALL has developed a pattern recognition tool in diabetes care for online risk assessment and decision support which is now available on the REACTION website. Try the demonstrator on the REACTION website.

Automated data processing

Self-monitoring of blood glucose can provide large amounts of data which may be hard to interpret both for patients and health professionals and therefore, automated data processing can add valuable information to the interpretation of the data.

Pattern recognition is a systematic approach to helping patients and healthcare providers identify patterns in blood glucose readings to determine whether changes are needed to optimise their glucose

control. By entering a patient ID and a date interval it is possible to see a list of identified patterns, including:

• The number of hypoglycaemic or hyperglycaemic events exceeding a preset threshold in a 7-day period
• Common hypoglycaemia or hyperglycaemia events at a specific time of day
• Dawn phenomenon or Somogyi effect
• Excessive excursions between two consecutive meal times

A detailed description of the demo including the full list of patterns can be downloaded from the REACTION website.

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In other news

Dissemination Events:

International Conference on Machine Learning - ICML 2012
26 June-1 July 2012, Edinburgh, Scotland
ICML is the leading international machine learning conference, supported by the International Machine Learning Society (IMLS). Partner FORTH-ICS has submitted a paper which will be presented at the conference. The title of the paper is: 'Incorporating Causal Prior Knowledge as Path-Constraints in Bayesian Networks and Maximal Ancestral Graphs'

8th IFAC Symposium on Biological and Medical Systems
29-31 August 2012 - Budapest, Hungary
The Symposium provides a forum for the presentation of new developments in the important interdisciplinary field of biomedical systems involving the application of concepts, methods and techniques of modelling, informatics and control of complex biomedical systems. Partners BTS and MUG have submitted a paper.

New Project Deliverables Released:

The following deliverables have been completed:
- D1-2-2 Interim progress reports for the commission M18 (Confidential)
- D1-4-2 Periodic activity, management and financial reports Y2 (Confidential)
- D2-2 Clinical watch report (Public)
- D2-3 Technology watch report (Public)
- D2-4 Market and regulatory-standards watch report - updated (Public)
- D2-6 Prototype application specification (Restricted)
- D2-8 The requirement engineering process (Public)
- D3-1 Concept for disposable ePatch platform (Confidential)
- D3-8 Report on glucose sensor development (Confidential)

Clinical evaluation of REACTION field trial at the Medical University of Graz

In a study of 74 patients at the Medical University of Graz, insulin treatment was performed using the REACTION algorithm, which is based on a basal–bolus insulin regime. The preliminary results of the trial are very encouraging, indicating that the algorithm is ready to be implemented in a software application.

The aim of the clinical trial was to investigate the efficacy, usability and safety of the REACTION algorithm to control glycaemia in hospitalised patients with type 2 diabetes and to compare the results obtained with standard care. The preliminary evaluation of the trial shows that the REACTION algorithm received positive feedback from nurses and physicians.

Hyperglycaemia not well addressed

Hyperglycaemia in hospitalised patients is a common and costly health care problem with profound medical consequences. In patients with diabetes admitted to general medicine wards, hyperglycaemia is commonly not well addressed. The consensus panel of the American Diabetes Association concluded that hospitalised patients should have a target glycaemic pre-meal/fasting level of <140 mg/dL (7.8 mmol/L). However, the analysis of 50 patients, who were treated with insulin at the general wards of endocrinology and cardiology at the Medical University of Graz, revealed an average blood glucose level of 181 mg/dL.

To bring the average blood glucose levels closer to the target, REACTION partners implemented an insulin titration protocol to provide decision support for optimal glucose management for nurses and physicians. The preliminary evaluation of the field trial indicates that the REACTION algorithm has reached a mature enough stage to be implemented in a software application in the next step.

The final results from the clinical trial will be made available in the public deliverable D8-3 Clinical evaluation of general ward clinical field trial, due in February 2013.

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Validating REACTION in primary care field trials

To validate the REACTION platform in primary care, a series of field trials will be conducted at Chorleywood Health Centre (CHC), using existing clinical infrastructures.

With the expectation that the REACTION platform can greatly help reduce the risk of developing the long-term complications typically associated with diabetes and therefore the rate of hospital admissions, REACTION partners have developed manuals and deployment plans for the primary care setting, describing the procedures for the installation and configuration of the REACTION prototype.

Chorleywood Health Centre is a medium sized general practice with 6000 patients of which 145 are on

the disease register for Diabetes – 27 Type 1, 118 Type 2 and 45 are currently on insulin therapy. REACTION will develop the platform to support the healthcare professionals in the management of these patients and to support the patient and carers of CHC.

The primary care prototype is based on a set of application specifications of which the general platform requirements include control and management of patients outside hospitals. The platform will facilitate therapy compliance and support for self-management, personalised feedback to clinicians and patients and medium-term risk assessment for patient education and lifestyle change support.

The aim of the primary care application is to provide clinicians with a tool for glycaemic control and risk assessment and to help patients manage their diabetes better.

Simultaneous monitoring

Emphasis is on the complex patient which means that the co-existence of other (chronic) illnesses must be taken into account in managing and treating diabetes. Therefore the REACTION project will aim to specify and validate a suite of services looking at simultaneous monitoring of blood glucose, blood pressure, physical activity, diet and co-morbidities to achieve comprehensive protection against diabetic complications and promote pro-active disease management.

The REACTION primary care application will also support medication compliance, adherence to clinical pathways, education and self-management health services for diabetes related conditions.

Primary care client, patient portal and clinical portal

The primary care prototype consists of three main components:

• The hub and devices which will be located in the patient's home and used to collect physiological data

• The patient portal, which will be used to collect activity, diet and other lifestyle data while also providing a

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Public deliverables can be downloaded from the project website after they have been reviewed and approved by the EC: www.reaction-project.eu
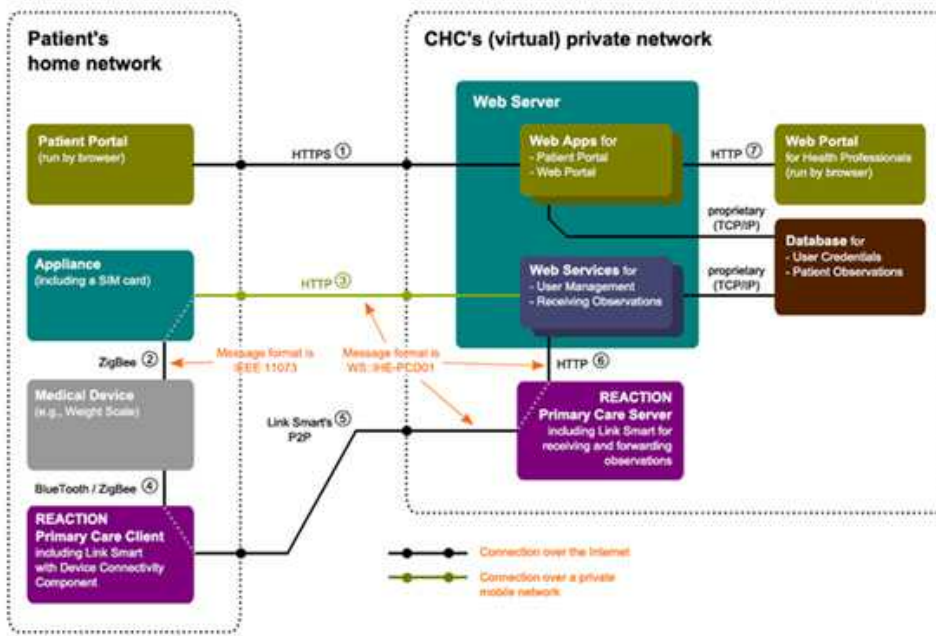
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way for the clinician to give feedback to the patient

• The clinical user web interface, which will be used by health professionals to manage patients, users and physiological data received from the patient

When the REACTION Primary Care Client application has been configured and deployed in the patient's home, the patient can simply turn on the PC and start taking measurements from his devices e.g. for blood glucose, blood pressure and weight. The results will automatically be sent to the clinical staff via a gateway, plugged into a wall socket.

By using the Patient Portal it is possible for the patient to access data which have been submitted. The data are displayed either graphically or in tables.

To support lifestyle management and support medication compliance, it is also possible for the patient to enter additional data on diet, physical activity, medication and other manual measurements and get general advice. The patient can submit the amount of insulin units and watch the history of dosage, thus keeping a medication diary.

Through the REACTION Clinical Portal, the clinician can view the readings from patients. Data are displayed by priority e.g. patients who have missed data or if data are outside of set parameters, the patient involved will feature at the top of the webpage, highlighted in red. The clinician can also view all expected readings of the day, a list of all patients and details of the individual patient such as risk level, educational content, monitoring data and disease category. It is also possible to specify monitoring thresholds for a patient and assign equipment and questionnaires to the patient.

The evaluation of the clinical field trial will be published in the public deliverable D8-4 Clinical evaluation of primary care clinical study which is due in August 2013. Partners involved in the development of the primary care prototype are FORTH-ICS, FORTHNET, UBRUN, CNET, CHC.

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