

Continuous Multi-parametric and Multi-layered analysis of Diabetes Type 1 & 2

COMMODITY12 aims to design, build, and validate an intelligent system for the analysis of multi-parametric medical data. It will uptake the existing cutting-edge technologies and extend these technologies by integrating state-of-the-art networks, software interoperation, and artificial intelligence techniques in order to realize the concept of translational medicine by means of a Personal Health System.

Objectives of the project

In COMMODITY12 we are motivated by diabetes type 1 and 2 and their interaction with cardiovascular co-morbidities. In particular, we are interested in understanding the behaviour of diabetes with respect to the multi-parametric physiological measurements of the patient as put in relation to his genetic data, his life-style and surrounding environment.

The objectives that we want to reach are summarised as follows:

- **Improve:** current medical care of diabetes and diabetes guidelines.
- **Develop:** a system that can perform an intelligent analysis of the data of the patient and provide relevant advice to the healthcare provider.
- **Empower:** the patient to have full power on his own medical data.
- **Enable:** the patient to have the desired life-style by keeping a high standard of care.
- **Identify:** relationship between Diabetes and Cardiovascular diseases and between treatment and well-being of the patient.
- **Incorporate:** artificial intelligence techniques in day to day medical care
- **Disseminate:** scientific results in industry, healthcare centers and medical informatics conferences.

By achieving the objectives proposed above we hope to change the traditional approach to handle diabetes and cardiovascular diseases and propose a medical device that will enable doctors and patients to facilitate their day to day activities.

Project Description

In COMMODITY12 we will build a multi-layered multi-parametric infrastructure for continuous monitoring of diabetes type 1 and 2. The COMMODITY12 system will exploit multi-parametric data to provide healthcare workers and patients, with clinical indicators for the treatment of diabetes type 1 and 2. COMMODITY12 will focus on the interaction between diabetes and cardiovascular diseases. For that purpose, we propose a four-layered platform structured as follows:

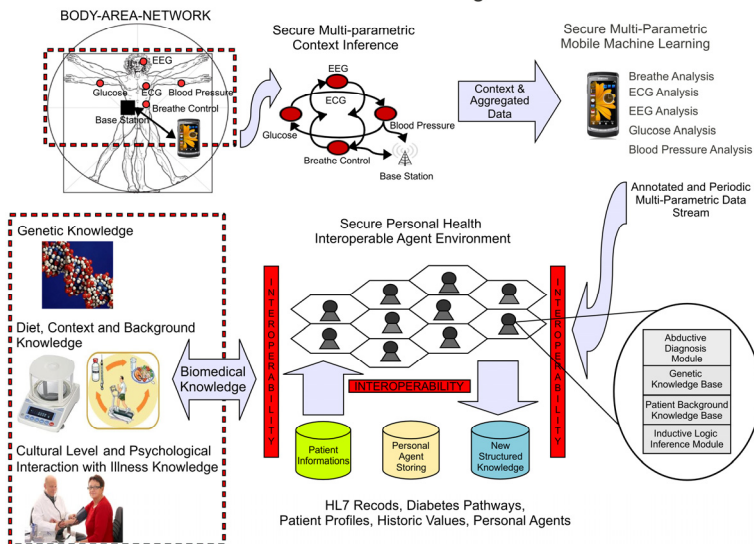
- **Body Area Network Layer (BAN):** this layer will employ sensors from the BodyTel Personal Health System (PHS) and additional Bluetooth sensors to monitor the patient physiological signals. This layer will perform multi-parametric aggregation of data for the Smart Hub layer.
- **The Smart Hub Layer (SHL):** the BodyTel PHS at this layer receives aggregated data from the BAN and applies machine learning to classify the signals and provide indications about abnormalities in the curves. SHL will communicate with DRR over the cell-phone network.
- **The Data Representation And Retrieval Layer (DRR):** this layer, based on the Portavita PHS to manage Electronic Health Records (EHR), interfaces to the SHL and utilises existing medical data to perform information retrieval and produce structured information for the agents at the AIL.
- **The Artificial Intelligence Layer (AIL):** this layer uses the DRR layer to retrieve structured background knowledge of the patient for intelligent agents applying diagnostic reasoning to the patient's condition.

The system will be validated with diabetes (type 1 and 2) with a pilot in the form of a trial in Poland and Switzerland.

SCENARIO

Mr Lisowski is a 55 years old Polish carpenter that has developed diabetes type 2 due to his lifestyle. His medical doctor, Dr Nowak, decides to monitor him closely by using the COMMODITY12 system. Although Mr Lisowski lives far away from the hospital, his doctor is able to check his glucose, blood pressure, weight, breath and ECG with the use of point-of-care sensors and a smartphone enabling remote communication with the COMMODITY12. Thanks to these sensors, the body area network and the smart hub of COMMODITY12, an irregular breathing and ECG disturbances are observed. The AI layer of COMMODITY12 correlates this data with existing patterns for sleep apnoea and arrhythmia, helping to early diagnose and cure these conditions in this patient.

COMMODITY12 : The Big Picture



The main focus of the COMMODITY12 platform will be on correlating the multi-parametric data with established biomedical knowledge to derive clinically relevant indicators.

Expected Results

COMMODITY12 will improve the management of multi-parametric medical data for the daily care of diabetes. It will improve the healthcare workers' interpretation of the patient medical status, and support the coordination of the care. The early warning functionality will improve the emergency care process, and reduce hospitalization rate.

COMMODITY12 will allow for continuous monitoring of physiological signals as related to the status of disease, current treatment, and patient lifestyle. COMMODITY12 artificial intelligence will produce new knowledge about the management of diabetes, advancing the state-of-the-art.

The system will take the benefit of built-in medical algorithms, Artificial Intelligence, and accumulation of knowledge. In particular, it will allow for cross-comparisons, and benchmarking of different approaches used for the management of diabetes, and its co-morbidities.

Using an ICT system that manages the personalized medical treatment protocol, COMMODITY12 will support task delegation from doctors towards nurse practitioners and even patients and so it will reduce the need for meetings between the care giver and his patient.

COMMODITY12 will improve standards applicable for multilayered multi-parametric systems for the treatment of other chronic diseases. The COMMODITY12 consortium will be a perfect starting point for further development of European engagement in cutting-edge technology, and reinforcement of European leadership and innovation capability in the area of PHS.



COMMODITY12

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- Imperial College of Science, Technology and Medicine (United Kingdom)
- Royal Holloway and Bedford New College (United Kingdom)
- Uniwersytet Medyczny w Lodzi (Poland)
- BodyTel Europe (Germany)
- Hospices Cantonaux CHUV (Switzerland)
- Centre National de la Recherche Scientifique (France)
- Portavita BV (The Netherlands)

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KEYWORDS

Advanced mobile systems, Biomedical sensors, Personalised health, eHealth networks and architectures, Mobility of patients, Telemonitoring