

MULTI-KNOWLEDGE

Creating new knowledge in networks of medical research

The **MULTI-KNOWLEDGE** Project aims to integrate different biomedical information from heterogeneous sources (clinical, laboratory and metabolic) with data on gene and protein expression provided by new high throughput technologies in a system committed to cardiovascular risk profiling.

Objectives of the project

The classical approach in global cardiovascular (CV) risk assessment can be faulty: classical risk factors (such as high cholesterol, high blood pressure, smoking, etc) are able to explain only 50% cases of CV events; it is furthermore not possible to assess the differential impact of risk factors in different subjects and it is still unclear whether the correction of risk factors can fetch CV risk to zero. There arises the need to get a better prediction of the clinical events and a more efficient prevention strategy.

The **MULTI-KNOWLEDGE** Project's general goal is therefore the construction and implementation of a predictive algorithm combining clinical, laboratory, metabolic, gene and protein expression data to identify the presence of early signs of vessel wall atherosclerotic disease in subjects at different degree of cardiovascular disease (CVD) risk on the basis of traditional risk factors and insulin resistance level.

Scientific-medical objectives:

- To investigate the impact of CV risk factors on systemic inflammation using gene expression profiling
- To integrate clinical and molecular data to predict the presence of early signs of atherosclerosis

Technical aims:

- To implement multiuser collaborative instruments to manage and analyze data from high-throughput technologies and clinical data

Project Description

MULTI-KNOWLEDGE starts from the data processing needs of a network of Medical Research Centres, in Europe and USA, Partners in the Project and co-operating in researches related to the link between metabolic diseases and cardiovascular risks. These needs are mostly related to the integration of three main sources of information: clinical data (EHR), patient-specific genomic and proteomic data (in particular data produced through Micro-arrays technology), and demographic data. The general aim of the project will be the development of a knowledge management environment to allow networks of co-operating medical research cen-

“MULTI-KNOWLEDGE will create an intelligent workflow environment for multi-national multi-professional research consortia aiming at cooperatively mining, modelling, visualizing biomedical data under a single common perspective.”

Scenario

To integrate clinical and molecular data several experts in different fields of research need to create a collaborative group supported by a single system of data entry and management accessible from different locations and suitable for direct data entry, as well as data input from clinical records and from outputs of laboratory and molecular research software. After data entry, clinical researchers, epidemiologists and biostatisticians need to access the system from several locations, operate sub-sequentially different tasks of the analysis (data cleaning, quality control, etc.), implement analysis algorithms, and make clinically/statistically oriented decisions for data analysis based on their specific competences.

tres to create, exchange and manipulate new knowledge from heterogeneous data sources.

This will allow retrieval and analysis of millions of data through bioinformatics tools, with the intent of improving medical knowledge discovery and understanding through integration of biomedical information.

MULTI-KNOWLEDGE will contribute to the creation of standards to link heterogeneous data. The clusterization models produced within the project will allow discrimination between normal and pathologic and produce insight for clinical research and disease management.

The **MULTI-KNOWLEDGE** architecture and set of tools will be tested for the development of a structured system to integrate data in a single informative system committed to cardiovascular risk assessment. Therefore this project will also contribute to establish guidelines and operating procedures to manage and combine data coming from gene expression and protein microarrays and make them easily available for the imputation of study algorithms.

Expected Results & Impacts

The **MULTI-KNOWLEDGE** Project will produce

Strategic impacts on the health care ICT market:

- It will contribute to the consolidation of the EU Healthcare market, which has at the moment a fragmented supply against a growing demand
- It will constitute a crucial intellectual asset for the involved IT professionals, thanks to the knowledge it will accumulate and the contacts among researchers it will encourage

Strategic impact on the EU healthcare systems:

- It will foster the trend towards standardization of health processes
- It will help decision makers to establish more rationalized disease management policy, satisfying the need to optimize resources because of rising costs in healthcare

Strategic impact on social communities:

- It will help improve the level of health by implementing of evidence based disease management

Strategic impact on scientific research:

- For physicians: it will improve the high risk patients identification and the estimation of vascular/systemic inflammation extent
- It will represent the 1st multilevel model for the study of complex diseases
- It will improve the knowledge on cellular effects of risk factors and systemic impact of specific CVD risk factors
- It will provide novel instruments in genomic and proteomic data management and analysis



Multi Knowledge
Data Integration for Medical Insight

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- King's College London (UK)
- PCS Professional Clinical Software GmbH (AT)
- S.A.T.A. - S.R.L. (IT)
- Information Management Group Ltd. (UK)
- Datamed A.E. Healthcare Integrator (GR)
- The Stanford Leland Junior University (US)

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