

# STC 2006. *Integrating Biomedical Information: from e-Cell to e-Patient*

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## ABSTRACT

The paper describes the current trends in medical informatics, as discussed at the Special Topic Conference (STC) 2006 held in Timisoara. The general topic, “Integrating Biomedical Information: from e-Cell to e-Patient” was subdivided into five main streams, corresponding to the main sessions of the conference.

## INTRODUCTION

**W**e live in a world of information. All day long we produce or receive information, we store or lose it, we process or transmit it, we show or hide it, we use or misuse it. And this happens also in medical and healthcare activities. However, most often the information we handle is made of pieces stored in different places, not always accessible, in different formats not always easily understandable. And when this information has to be used for saving lives it becomes clear why “integration” was chosen as the title keyword of the Special Topic Conference (1,2) organized recently in Timisoara by the European Federation for Medical Informatics EFMI (3).

### Data, Information and Knowledge

**H**andling information lies at the core of medical activity, as in most intellectual activities. Analyzing the information flows in healthcare systems, one can notice that information, in a general sense, passes through different stages, bearing different names and carrying different values. The raw information about the patient state, specific for each

individual, called *data*, makes sense only if interpreted, becoming *information* for the physician (this time the term “information” is used in a more restrictive sense). For the interpretation the physician uses his *knowledge* – another type of medical information, with general character. An important field of research in medical informatics is dedicated to the study of information flows and properties within healthcare information systems. It is considered as a step towards “theoretical medicine” and was presented by the keynote speaker of the conference, Jan H van Bommel from Erasmus University in Rotterdam (4). □

### INTEGRATION OF BIOMEDICAL INFORMATION

The most consistent session was dedicated to the modern topic of “information integration”.

The current medical activity generates a large amount of information usually stored (on a classical (paper) or electronic support (computer)) at the place where it was collected: family physicians, hospital, clinical laboratory, pharmacy etc. In present conditions, when individual mobility shows a marked increase, the continuity of medical care requires a

ubiquitous access to medical information. This access can be achieved only by a specific type of integration, known as *horizontal integration* (5). It raises several problems: preserving the integrity and confidentiality of patient data, providing technical and semantic interoperability, various standards etc. A comprehensive survey on the conditions for interoperability of Hospital Information Systems in Romania was presented by Dan Farcas (6).

Another dimension is brought by the *vertical integration*, defined on structural levels, from molecular level to the entire body level. The list of all types of information about a patient is extending day by day. Today's technical and scientific advent offers new investigations, higher resolution medical images, more refined acquisition systems for biosignals and physiological parameters, genetic patterns from DNA and protein structures etc. By vertical integration all these pieces of information are cross-related and offer a deeper understanding of patient's medical state and a more solid base for the best treatment (7). There are also several challenges in vertical integration as well: each level requires a specific storage format and advanced algorithms have to be introduced for data processing. Interesting results are expected to be brought by using mathematical modeling and computer simulation of various biological processes. New terms like "virtual cell" or "e-cell" have been introduced to designate the computer model of a cellular process which simulates the real phenomenon (8).

But, while there is a common acceptance on the concept of "e-cell", the term "e-patient" is still controversial. Its most common meaning is defined as "a person who needs and seeks for health related information, social support, support to change life styles, systems that help him/her to monitor and maintain his/her health status when discharged or anyway far from the healthcare provider" (9). However, as the discussions revealed, the same term is also used to designate "the computer model of a patient, with individualized values for the parameters, able to simulate the individual's possible behavior or evolution under certain conditions". Such models will play an important role in personalizing the patient's treatment and in preventive medicine. Actually, the method of

modeling and simulation will become an important tool in the biomedical research within the European Frame Programme 7, as outlined by the recent conference organized by the European Commission (10). □

## ELECTRONIC HEALTH RECORD

The topic which mostly attracts today not only the specialists in medical informatics, but all health professionals refers to the „classical" subject of Electronic Health Record (EHR). Despite the large amount of work and innumerable seminars, workshops or conferences, there are still several disputable items which keep the topic on the top interest. A couple of such items have been discussed in the workshop organized by Bernd Blobel, chair of the EHR Working Group:

- the identifier – for both the patient and the physician, which have to assure the confidentiality of patient's data
- structural archetypes, specific for various pathologies; on overview of CEN/TC251 (European Commission for Standards/ Technical Committee for Medical Informatics) standardization activities in this domain was presented in the workshop
- the interoperability of data exchange between the family physician and the hospital or other ambulatory medical facilities, including the accessibility rules, procedures for emergencies etc.

Romania, represented by Prorec-Romania (11), has just joined the Eurorec Institute and became a partner in the European Q-REC Project on the Electronic Health Record (12). □

## CLINICAL TERMINOLOGY AND CLASSIFICATION

The Workshop on the Foundations of Clinical Terminology and Classification was organized by a European Network of Excellence – Semantic Mining (13). A complete integration requires full interoperability, not only technical but also semantic interoperability in communication between healthcare information systems. A key component in support of intero-

perability is ontology by which information is semantically well defined. The research is focused around some major areas like: principles in ontology engineering, terminology systems, impact on health statistics, construction of a multi-lingual medical dictionary, information retrieval and the semantic-based EHR (14). □

## IT & C MARKET AND SOLUTIONS FOR HEALTHCARE IN ROMANIA

The Conference was preceded by the seminar "IT & C Market and Solutions for Healthcare in Romania". The audience comprised mainly medical staff, including healthcare managers and other decision persons from the healthcare system. The presentations, made by several representatives from Romanian and international companies producing healthcare information systems (1), showed the interest paid by the industry towards the rapidly growing Romanian market. Besides the seminar, the large audience could also visit an exhibition presenting a large diversity of information systems applicable in healthcare, starting with individual telemonitoring devices, up to hospital information systems. □

## CONCLUSION

### European Trends

The Conference had EFMI rapporteurs for each session and ended with a set of conclusions highlighting both the major problems encountered in implementation of healthcare information systems in Romania and the trends in European Medical Informatics:

- the development of Electronic Health Record has to be paralleled by a set of standards and the interoperability has to cover all facets, including the semantic interoperability;
- the fundamental research, which builds the theoretical base for all future developments, proved to be essential (ex study of genome and proteome in bioinformatics), and has to be extended, to include higher structural levels; an important example would be the use of modeling and simulation for studying physiological processes („physiome”);
- the need of an extended approach of quality assessment, to cover also health information systems certification and risk analysis;
- education and training in medical and health informatics must include the new topics: medical ontology and semantics, bioinformatics, specific methods for genome, proteome and physiome studies, modeling and simulation, data mining etc; the need for HIPs (Health Informatics Professionals) is increasing faster than the present educational systems offer. □

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