



The Ninth International Conference on Global Health Challenges  
GLOBAL HEALTH 2020

# Special track eHealth: Patient-centric eHealth Services Introduction



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# Short CV

## Dimitar Tcharaktchiev

Professor, MD/PhD at the Medical University, Sofia, Bulgaria

### Scientific areas of interest:

- Clinical Information Systems
- eHealth
- Telemedicine
- Clinical and Epidemiological Registries
- Big Data
- Clinical Decision Support Systems

### Memberships and awards:

- Member of Bulgarian Institute for Standardization
- Bulgarian representative in CEN TC251
- Member of Bulgarian Medical Association
- Member of Bulgarian Union of Scientists
- Chairman of Association ProRec - Bulgaria
- Rolf Hansen Memorial Award (2011)



# Short CV



## Evgeniy Krastev:

- Professor, PhD in Mathematics and Computer Science
- at Sofia University St. Kliment Ohridsky,  
Faculty of Mathematics and Informatics
- **ORCID** 0000-0001-8740-5497
- **IEEE member** number: 93376282

### Scientific areas of interest:

- Robotics and Mechatronics,
- Object Oriented Programming,
- Health Informatics
- Database Management
- System Analysis and Design;
- Information System development

# **Special track**

## **eHealth: Patient-centric eHealth Services**

### **Main Topics**

- 1. Semantic Interoperability of Medical Information Systems and Scientific Repositories.**
- 2. Management of Clinical Concepts in Bulgarian Healthcare Using openEHR Specification.**
- 3. Modelling and Management of ePrescriptions on openEHR platform in Bulgarian eHealth.**
- 4. Picture Archiving and Communication System.**
- 5. Future Challenges.**



# 1. Semantic Interoperability of Medical Information Systems

## Short description

The implementation of European standards in Health informatics remains a true challenge nowadays. This research area is rather unexplored in the existing literature. There is rather limited information about the implementation of such standards in eHealth services. Therefore research reports like those reported in this paper represent valuable contribution in this special track.

### Main results:

1. Clinical data at the University Specialized Hospital for Active Treatment of Endocrinology (USHATE) is transferred between the Hospital Information System (HIS) and the Scientific Repositories by preserving the clinical context and the Scientific Repositories
2. Several medico-administrative, clinical and laboratory data can be transferred from the Hospital Information System to the Register of rare endocrine diseases, keeping the context of their registration, structuring the measured results, used nomenclatures and methods in archetype concepts satisfying the Archetype Object Model of ENISO13606
3. The Register of rare endocrine diseases provides mapping between ICD-10 codes, respective ORPHAcodes and Orphanet nomenclature of rare diseases.

## Blood Pressure Archetype (HIS of the University Specialized Hospital for Active Treatment of Endocrinology –Sofia, Bulgaria)

Данни от престоя на пациента ИЗ : 2008/00004

Основни данни на пациента

Имена на пациента: Христо Антонов Димитров Възраст : 18 год Дата на приемане : 21.05.2008 г.

Приет по клинична пътека : Заболяване на кифоз и надбъбр. под 18 год Приемач лекар : Д-р Нато Василевски

Приет с диагноза : Кръвно налягане и други данни за пациента

Лекуващ лекар : Алергичен към :

Ръст (в сантиметри) : 162 Тегло (в килограми) : 54 ИТМ : 20.6

Систолочно : 120 Диастолочно : 60 Покази допълнителна информация

Размер на маншета : Adult

Използван уред : RR

Место на измерване : Right arm

Метод на измерване : Korotkoff - Fourth sound

Събитие : Blood pressure reading after 10 minutes rest

Статус при измерване

Поза на измерване : Standing

Състояние при измерване : At rest

Ниво на усилие : 0

Наклон при измерването : 0

Информация

Систолочно : 120

Диастолочно : 60

Средно артериално налягане : 0

Налягане на пулса : 0.0

Коментар : Без ортостатичен

отказ от лечение от ЗЗОЛ

Пролетани леглодни : 1 Болничен лист No : Брой дни : 0 Състояние : Оздравял

Изплати пациента от лечебното заведение

# 2. Management of Clinical Concepts in Bulgarian Healthcare

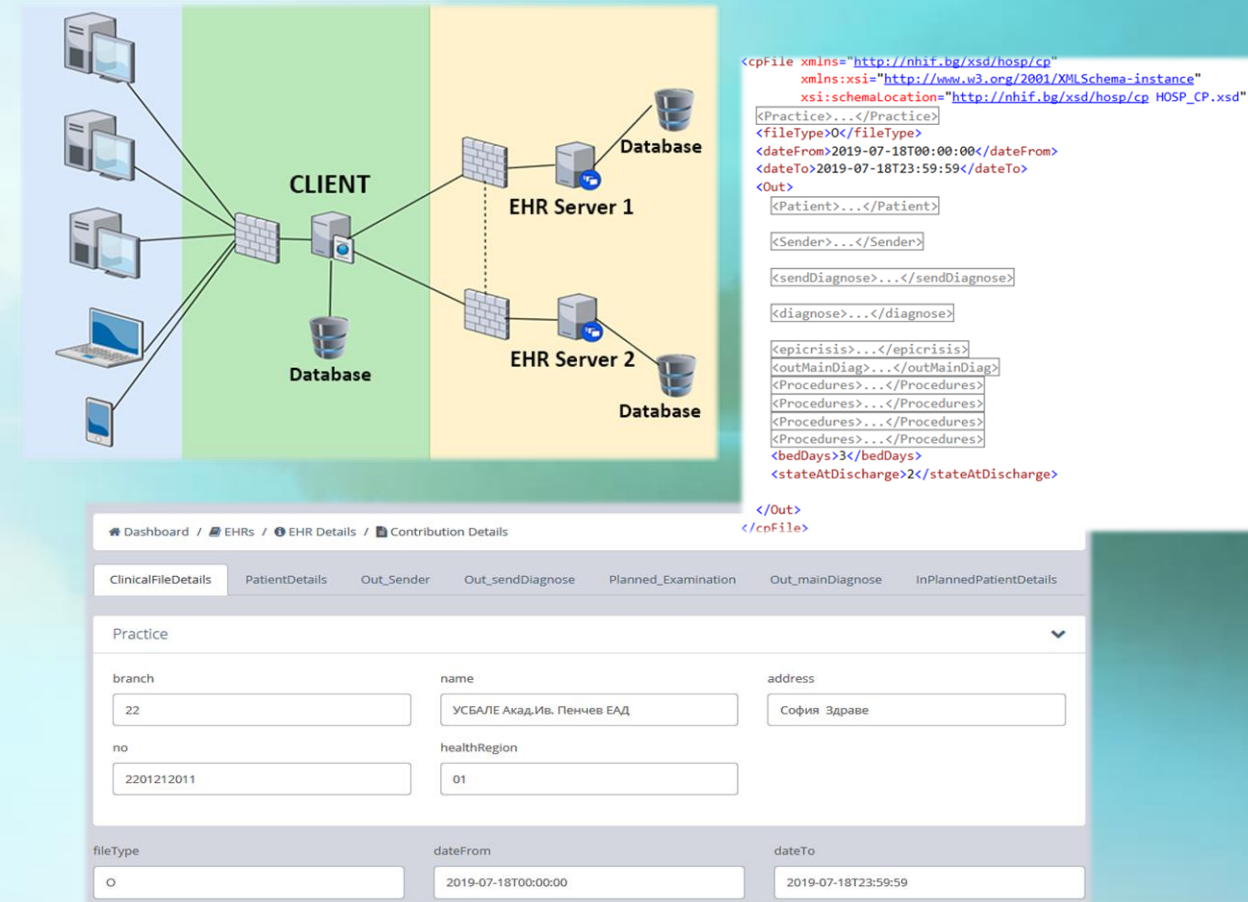
## Short description

Clinical path are used in national healthcare to report the procedures and medical services used in patient-treatment. The exchange of such clinical documents in most cases is impossible due to the usage of incompatible and heterogeneous health information reference models to represent data. The proposed methodology and its implementation for management of typical clinical concepts in the scope of the Bulgarian healthcare by means of openEHR archetypes represent an important research contribution in providing patient-centric eHealth services.

### Main results:

1. Analysis of the current state of IT systems in the Bulgarian healthcare with emphasis – problems related to inefficient data exchange.
2. Search for world best practices, specifications and standards providing interoperability.
3. Development of multi-layered web-based software, providing automatic translation of clinical data from the Bulgarian healthcare to openEHR specifications.

## Multi-layered web-based architecture using openEHR platform



# 3. Modelling and Management of ePrescriptions

## Short description

The ePrescription service is a typical patient-centric service with many benefits to all the participants involved in the business process starting with the creation the prescription and the dispensation of the prescribed medicinal product. The methodology for modelling and management of ePrescriptions using openEHR specifications is insufficiently explored. Therefore, the proposed methodology and results from computer experiments of its software implementation in a realistic use case can be considered as important research contribution in this special track.

### Tasks:

1. Analysis of W3C XML schema definitions used to report claims of pharmacies to the National Health Insurance Fund (NHIF) for reimbursed drugs.
2. Design of an openEHR archetype and corresponding operative template to meet the requirements for electronic health record for drug therapy that is compatible with NHIF requirements.
3. Installation and configuration of openEHR Server instance and deploy it in production environment.
4. Load the created operational template into the running instance of EHRServer and create basic health records for patient identifiers.
5. Development of a prototype client application / module for creating and retrieving an electronic health record for drug therapy in accordance with the developed operational template.

## openEHR INSTRUCTION archetype of ePrescription- design and management

The image displays the openEHR INSTRUCTION archetype for ePrescription design and management. It consists of two main parts: a list of elements on the left and a detailed form on the right.

**Elements List:**

- archetype\_details [0 1]
- Nhif medication [0 1]
- PrescriptionHeader [0 1]
- PrescriptionDrug [1 3]
- drugNHIFCode [0 1]
- codeICD [0 1]
- prescribedQuantity [0 1]
- prescribedMeasure [0 1]
- numberOfDays [0 1]
- signatureRepeats [0 1]
- signatureQuantity [0 1]
- signatureOccurrence [0 1]
- Allow substitution? [0 1]

**Form Details:**

The form is titled "Рецепта" (Prescription) and includes the following fields:

- Тип рецепта: 1
- Рецепта №: 5
- 20190602
- УИЧ на лекар: 2300001234
- Код Специалност: 1
- Рег. Номер ЛЗ: 3443
- Амбул. лист №: 25
- Рецепта №: 122
- ЕГН: 7807146534
- Рецептурна книжка: 5364
- Код НЗОК: CF281
- Име лекарство: Nebilet 5mg Tab.x28
- МКБ Код: I11.0
- D: 1
- Мярка: Pack
- За дни: 28
- S. | Път: 1
- По: 1
- Честота: -

The form also includes a "Назад" (Back) button and a "Печат" (Print) button.



# 4. Picture Archiving and Communication System (PACS)

## Short description

**PACS is a system software with a high degree of complexity and connectivity of the software solution.** Such systems are essential to most patient-centric eHealth services and usually it is very expensive to acquire.

A paper in this special track reports results obtained in the development and testing of a new PACS in a hospital's infrastructure.

### Business constraints:

- ✓ Product descriptions are advertising-oriented.
- ✓ Each country has specific regulatory requirements related to the storage and use of medical data.

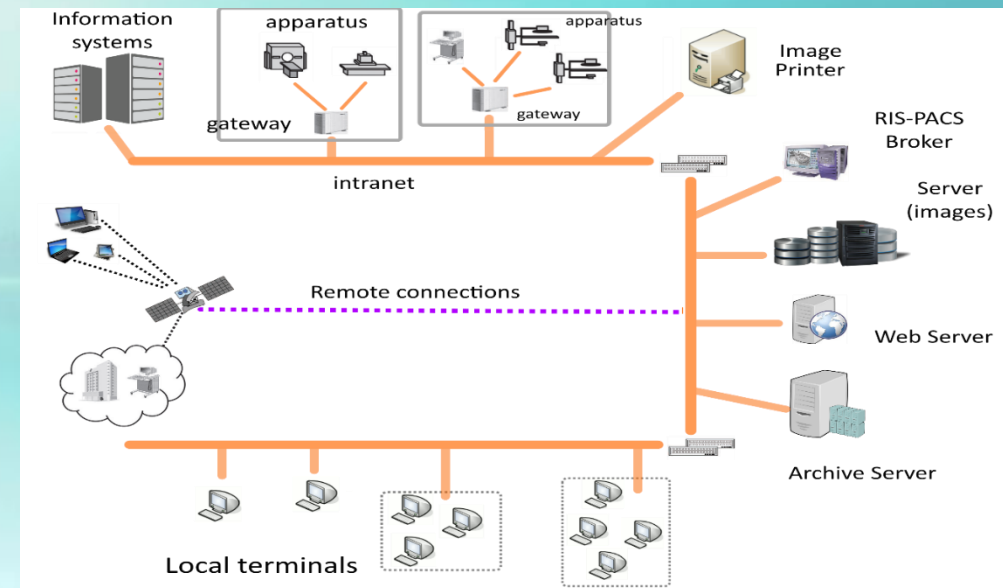
### Key characteristics of the solution:

- ✓ satisfies the principal goals and constraints.
- ✓ satisfies the business objectives and technical constraints.

### Primary and extended dynamic testing :

- ✓ use a testbed comparable to alpha testing.
- ✓ use a testbed of a semi-natural model of the hospital's infrastructure.
- ✓ usability testing, interface testing, fault tolerance testing, recovery testing, and some types of performance testing are added.

## General PACS infrastructure





# 3.3 Future Challenges

1. **Current trends in eHealth are characterized by a wide spread of applications using Artificial intelligence and machine learning, technologies and methods that provide confidentiality, security and transparency in using personal data. A major challenge in implementing such applications is achieving semantic interoperability among the systems and devices that generate and exchange clinical data in electronic format.**
2. **Continuity of care is a hallmark for the quality of health services. It is strongly related to the implementation in the development of Health Information Systems of logical models based on internationally accepted standards in health informatics like EN 13606 and openEHR .**
3. **Health organizations accumulate and operate with large amounts of clinical documents represented in proprietary legacy and incompatible logical models . The computer– aided transformation of data in such documents by preserving their semantic context into internationally accepted standards in health informatics is in very early stage of research and application development.**
4. **The exchange in electronic format of clinical documents at local and international level becomes a necessity in modern times marked with intensive and free movement of people. The implementation of international standards in health informatics in the development of services for cross-border exchange of essential medical data about Patient Summary and ePrescriptions remains a huge challenge.**
5. **Finally, there is insufficient number of specialists in eHealth qualified to implement international standards in health informatics in patient-centric services is a challenge. This appears to be a huge problem in resolving all the above challenges in addition to the difficulties in representing clinical data in terms of international nomenclatures and coding systems as well as aligning national legislation with contemporary eHealth requirements.**



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# Thank you for the attention!

## Questions?

## Comments?

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