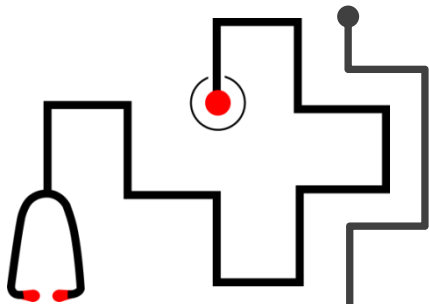**Special track: eHealth: Patient-centric eHealth Services**

Management of Clinical Concepts in Bulgarian Healthcare Using openEHR Specifications

Presenters: Simeon Abanos [1], **Evgeniy Krastev** [1], Dimitar Tcharaktchiev[2]
[1] Sofia University St. Kliment Ohridsky, Faculty of Mathematics and Informatics, Bulgaria
[2] Medical University Sofia, Bulgaria

Presenter

Simeon Abanos:

Master of Science, BioMedical Informatics
at Sofia University St. Kliment Ohridsky,
Faculty of Mathematics and Informatics

Scientific areas of interest:
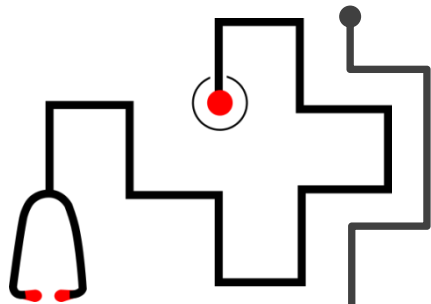
Health Informatics
Web Design
Web Application Development
Database Management
Information System development

Presenter

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
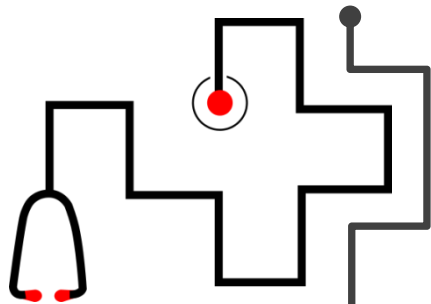
Scientific areas of interest:

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

Presenter

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)
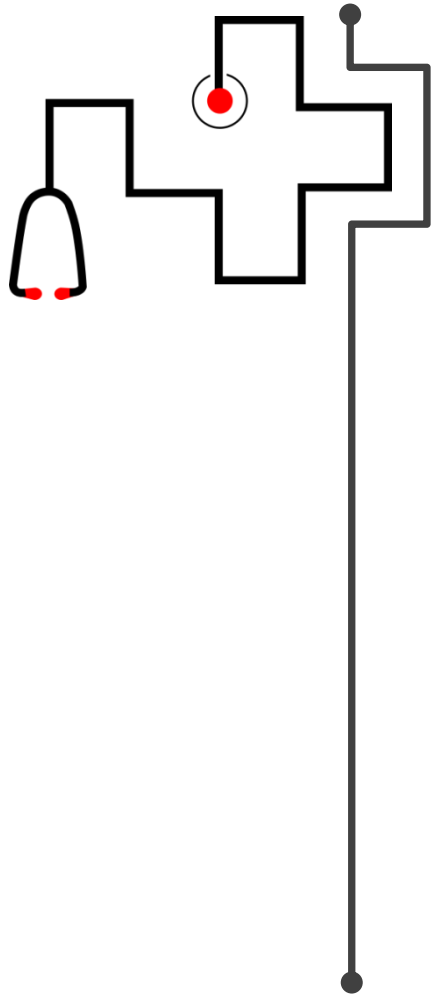
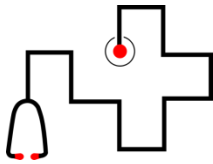# Contents

1. Introduction

Objective

The objective is to outline a methodology for management of typical clinical concepts in the scope of the Bulgarian healthcare by means of openEHR archetypes.

Tasks

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.
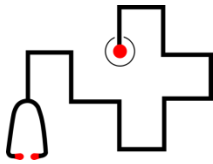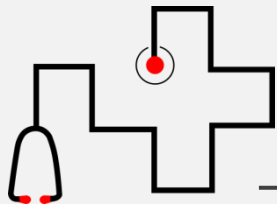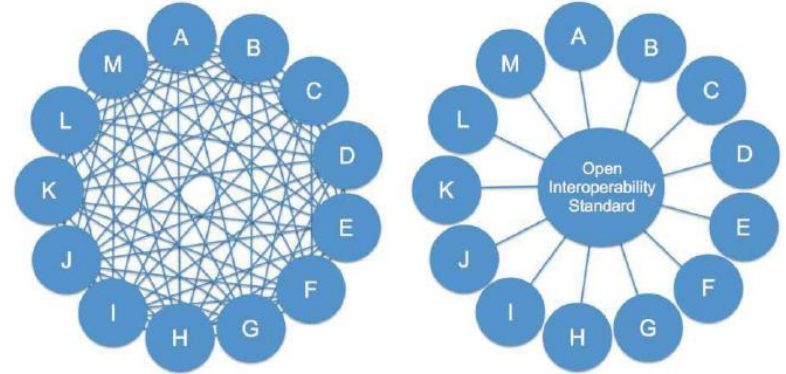
2. Materials / Methods

Interoperability

The ability of different information systems, devices and applications to access, exchange, integrate and share data in a coordinated manner, within and across organizational, regional and national borders, to ensure timely and seamless portability of information and optimization of health of people and populations worldwide.

Types of interoperability

- Functional (Level 1)

- Structural (Level 2)

- Semantic (Level 3)

2. Materials / Methods

Informational models using Archetypes

open EN

EHR 13606

Reference Model: Presentation of the general characteristics underlying any information stored in healthcare

Archetypes: Presents metadata setting structure and constraints for different categories of clinical data
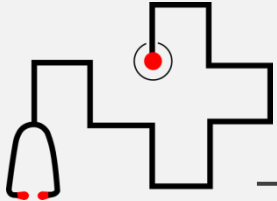
Templates: Composition of archetypes, building self-sufficient interfaces (reports, documents, etc.)
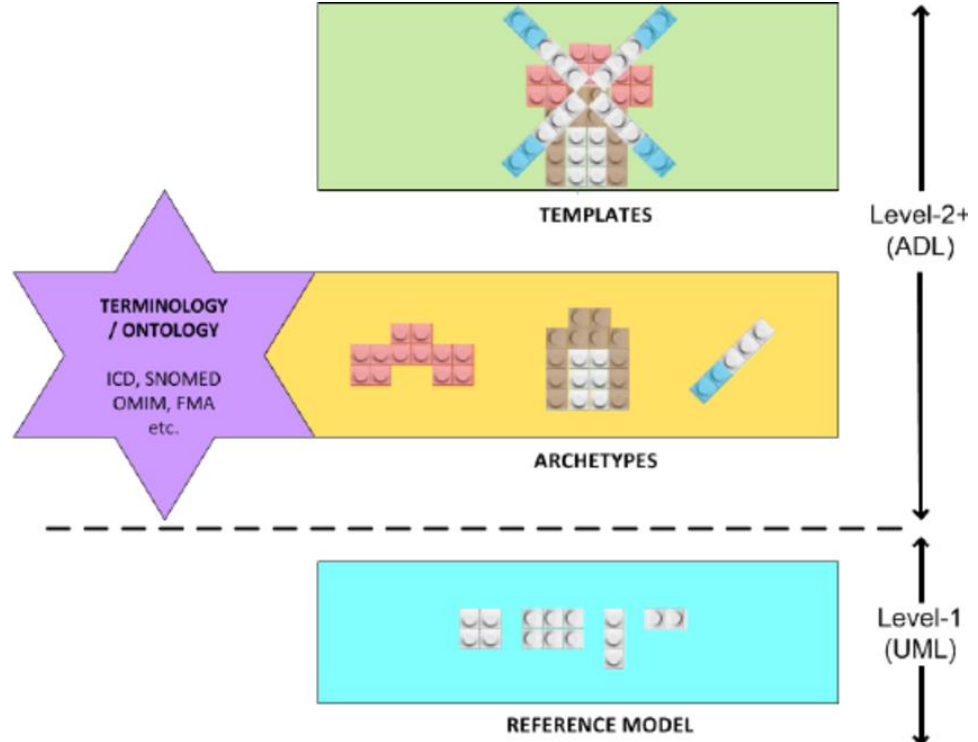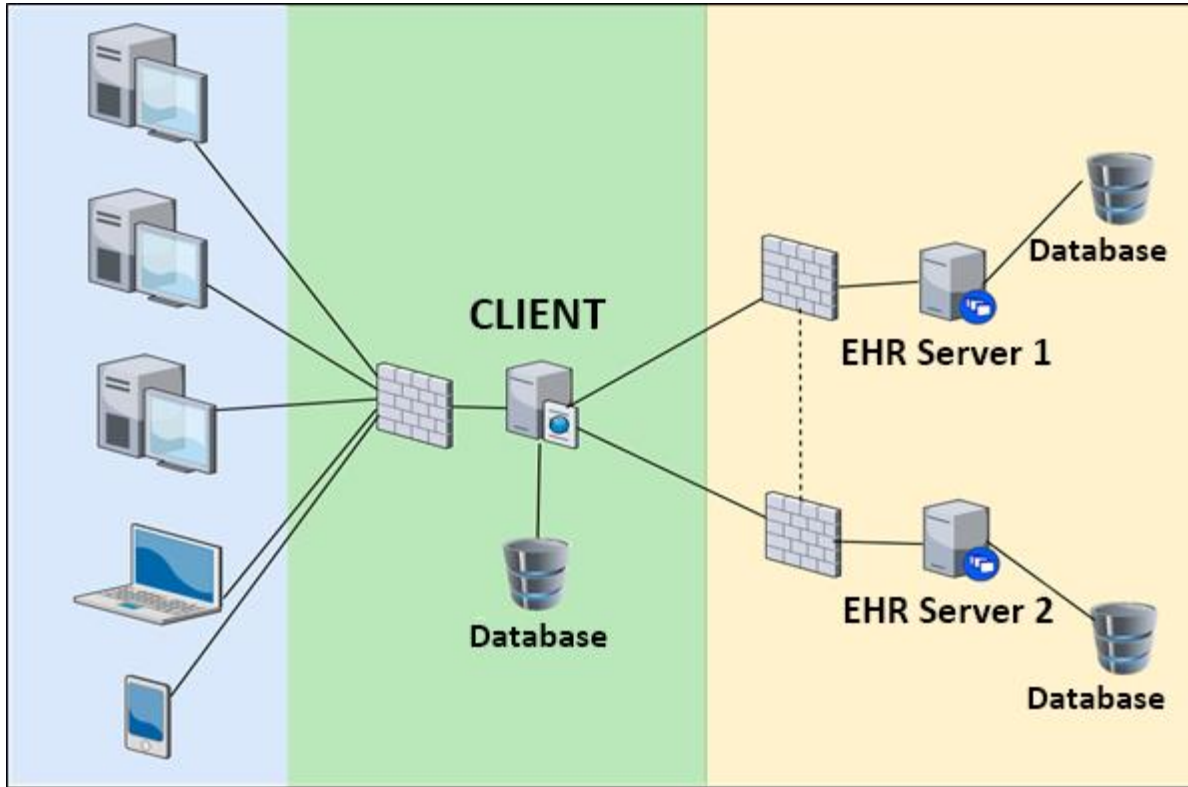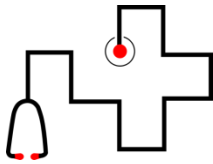
2. Materials / Methods

Methodology for building a clinical data archetype

1. Analysis

2. Design

3. Development

4. Validation

5. Publication

3. Results

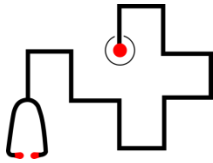Multi-layered web-based architecture

Clinical data management according to the openEHR specification

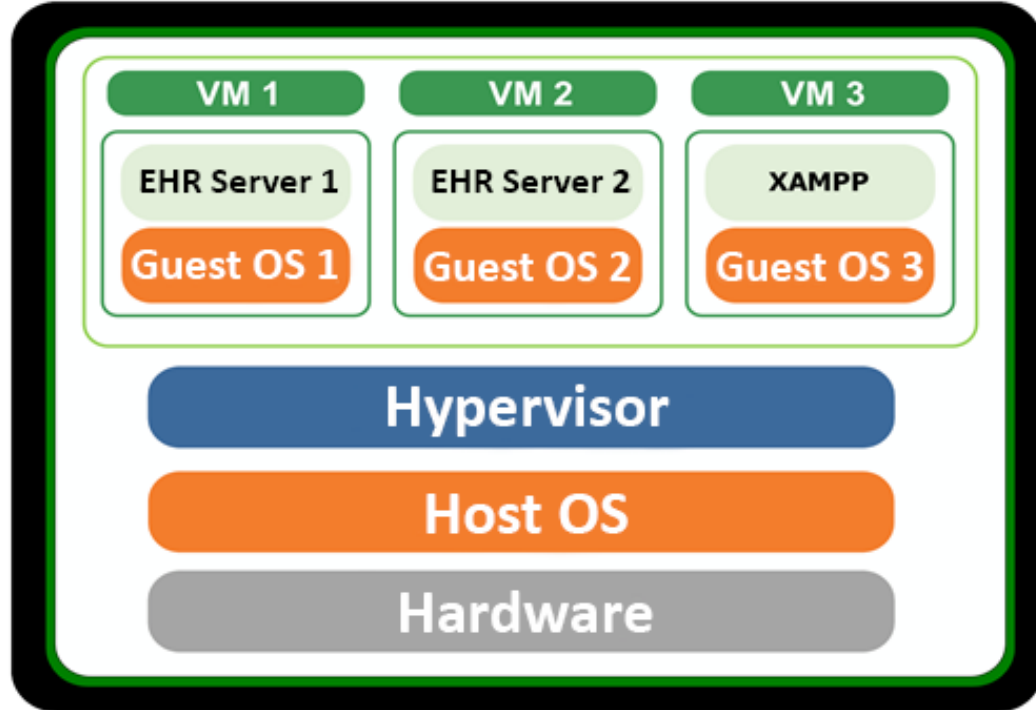Multi-layered web-based software with focus on the client.

The client application serves as an intermediary and provides the ability to auto transform data to openEHR specification.

Visualization and data management of the EHR servers, through convenient interfaces
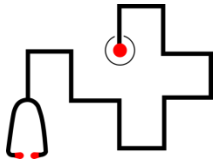
3. Results

Software architecture model of the multi-layered web-based application

- VMware
- XAMPP
- EHRServer
- Apache web server
- FileZilla server

3. Results

Use cases:

1. Data management of a group of clinical pathway instances
   – possibility to load multiple input files of clinical pathways type, according to the NHIF standard
   – data conversion and storing in EHR server

2. Management of already converted input data, according to openEHR specification
   - visualization of the EHR
   - EHR management on different EHR servers

4. Conclusion

The most important part of the multilayer web-based interface is the client part and more precisely consists in the possibility for automatic conversion of input data from the Bulgarian healthcare to openEHR specification.

The algorithm can be used with different input data, as long as the data have a clear and systematic structure.
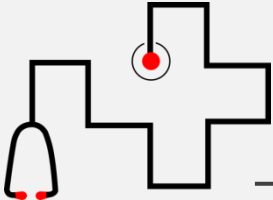
This can significantly help the transition of IT systems in Bulgarian healthcare to a clearly defined international specification, such as openEHR.
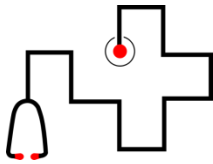
DEMO: Link   Video demonstration: Link
Email: demo@simeonabanos.com
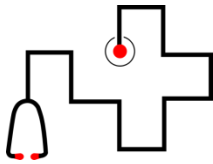Password: demo@simeonabanos.com

4. Conclusion

The following tasks have been completed:

1. An analysis of the current state of information technologies and systems in Bulgarian healthcare has been performed, with attention to the problems related to the lack of interoperability in data exchange.

2. Review of the best world practices, specifications and standards, providing for effective exchange of clinical data.

3. Multi-layered web-based software has been developed to facilitate the transformation from currently used inefficient standards to an internationally established openEHR specification.

4. Conclusion

The results are tested with real clinical data and are part of Work Package 1 of the National Research Program "Electronic Healthcare in Bulgaria" (e-health).

The results were reported and published in four international conferences, indexed in Scopus and Web of Science:
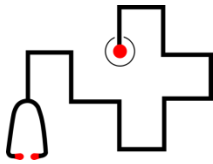
D. Tcharaktchiev, E. Krastev, P. Petrossians, S. Abanos, H. Kyurkchiev and P. Kovatchev, "Cross-border Exchange of Clinical Data using Archetype Concepts Compatible with the International Patient Summary," in 30th Medical Informatics Europe conference (MIE 2020), Geneva, Switzerland, 2020.

E. Krastev, D. Tcharaktchiev, K. Kaloyanova, L. Kirov, P. Kovatchev, S. Abanos and N. Mateva, "Standards Based Adaptation of Clinical Documents for Interoperability of e-Health Services," in 13-th conference on Information Systems and Grid Technologies (ISGT 2020), Sofia, Bulgaria, 2020.

E. Krastev, D. Tcharaktchiev, P. Kovatchev and S. Abanos, "International Patient Summary Standard Based on Archetype Concepts," International Journal On Advances in Life Sciences, vol. 12, no. 1&2, p. 34:46, 2020.
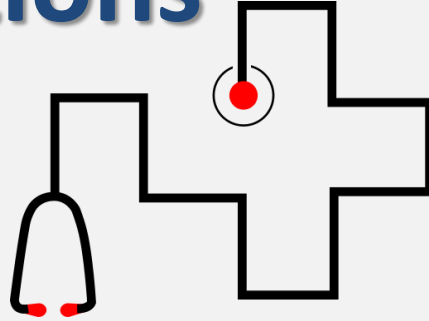
E. Krastev, D. Tcharaktchiev, L. Kirov, P. Kovatchev, S. Abanos and A. Lambova, "Software Implementation of the EU Patient Summary with Archetype Concepts," in ighth International Conference on Global Health Challenges, Porto, Portugal, 2019.

Acknowledgement

Questions

Thank you!