

Management of Clinical Concepts in Bulgarian Healthcare Using openEHR Specifications

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Abstract—Clinical concepts in national healthcare are usually represented employing heterogeneous information models. The existence of incompatible information models significantly complicate interoperability and management of clinical documents across a country as well as cross-border exchange of such documents. The objective of this paper is to outline a methodology for management of typical clinical concepts in the scope of Bulgarian healthcare by means of openEHR archetypes. A case study of management involving widely used clinical concepts is here considered. The clinical concepts are designed with openEHR concepts and therefore they are ready for semantic interoperability. The obtained results prove the hypothesis that existing health documents like clinical path reports can be transformed into archetype object model by preserving the semantic context. New results from computer experiments are presented and discussed in the context of providing patient- centric eHealth services.

Keywords-openEHR information model; openEHR archetype; openEHR server; clinical path report; semantic interoperability.

I. INTRODUCTION

Heterogeneous information models are widely used in national healthcare. Health information systems employing such models are incompatible. This complicates significantly management and declines the quality of eHealth patient services.

The objective of this paper is to outline a methodology for management of typical clinical concepts in the scope of Bulgarian healthcare by means of openEHR archetypes [1]. The methodology covers essential stages in the development a fully functional web application allowing semantic interoperability in management of clinical path reports by the National Health Insurance Fund (NHIF).

The following Section II shortly presents the proposed methodology for building an openEHR archetype model comprising typical clinical concepts in national healthcare. New results in the implementation of the archetype model are provided and discussed in Section III. Section IV makes an evaluation of the contributions in this research work in relation to results in the existing literature.

II. METHODOLOGY

This paper employs openEHR [2] information model concepts to build an archetype object model of a clinical path report according to the XML schema model provided by the NHIF. It has been successfully implemented in a related

research project for cross- border exchange of International patient Summary standard [3].

The applicability of the algorithm is validated by processing a real-life collection of clinical reports on a openEHR server.

III. RESULTS

An openEHR template of a clinical path report is designed. This report in national healthcare contains details of the medical services and procedure provided in the process of patient treatment. An algorithm is developed for transforming existing heterogeneous information models of clinical data in such reports into instances of a template composed of openEHR archetypes. The transformation procedure persists data structures and semantic context.

A multitier web application is developed for the purpose of testing the execution of typical management tasks with clinical concepts (Figure 1). It persists and manages archetype instances(contributions in openEHR server terms) of clinical path documents on openEHR servers[4]. These servers provide a common software platform and can be deployed locally in a healthcare organization or in a cloud infrastructure.

Clients are enabled to manage clinical path reports by invoking web service operations of the openEHR servers. In our computer experiments we demonstrate user friendly web interface that enhances the business process for openEHR management of such reports (Figure 2)[5]. This approach to modeling and management clinical data is being demonstrated for the first time in Bulgarian healthcare.

IV. CONCLUSION

The obtained results prove the hypothesis that existing health documents like clinical path reports can be transformed into archetype object model. The proposed information model enables a standards-based approach to management of clinical documents and facilitates semantic interoperability between information systems in healthcare.

Results from computer experiments demonstrate clinical path report data interactions among openEHR platforms.

This novelty approach in national healthcare allows finding cost efficient solutions. Its implementation extends our previous research work carried out in developing solutions for patient-centric eHealth services.

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REFERENCES

- [1] openEHR, Archetype Model (AM) Component - latest. 2020. [Online] Available at: <https://specifications.openehr.org/releases/AM/latest> [retrieved: October, 2020].
- [2] openEHR, Reference Model (RM) Component - latest. 2020. [Online] Available at: <https://specifications.openehr.org/releases/RM/latest> [retrieved: October, 2020].
- [3] E. Krastev, D. Tcharaktchiev, P. Kovatchev, and S. Abanos, "International Patient Summary Standard Based on Archetype Concepts" International Journal on Advances in Life Sciences, ISSN 1942-2660, vol. 12, No. 1 & 2, year 2020, pp. 34-46, http://www.iariajournals.org/life_sciences/.
- [4] P. P. Gutiérrez, "Towards the Implementation of an openEHR-based Open Source EHR Platform (a vision paper)", Studies in Health Informatics, vol. 216, pp.45-9, 2015.
- [5] P. Kovatchev, "Convert and insert hospital NHIF records into openEHR EHRServer instance," 2019. [Online]. Available: https://www.youtube.com/watch?v=a6bWEog98U4&ab_channel=PetkoKovachev[retrieved: October, 2020].

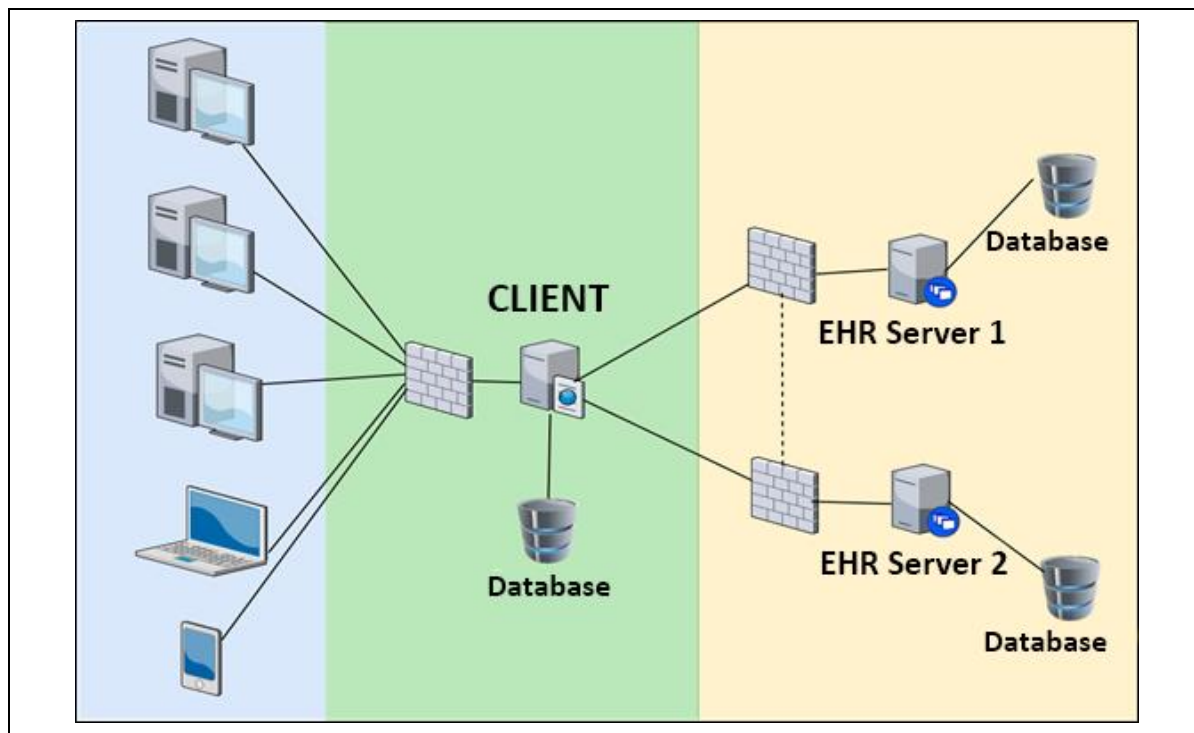


Figure 1. Architecture of the multitier web application for magement of clinical concepts.

Dashboard / EHRs / EHR Details / Contribution Details

ClinicalFileDetails PatientDetails Out_Sender Out_sendDiagnose Planned_Examination Out_mainDiagnose InPlannedPatientDetails

Practice ▼

branch <input type="text" value="22"/>	name <input type="text" value="УСБАЛЕ Акад.Ив. Пенчев ЕАД"/>	address <input type="text" value="София Здраве"/>
no <input type="text" value="2201212011"/>	healthRegion <input type="text" value="01"/>	

fileType <input type="text" value="0"/>	dateFrom <input type="text" value="2019-07-18T00:00:00"/>	dateTo <input type="text" value="2019-07-18T23:59:59"/>
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Figure 2. Web interface for management of clinical concepts..