

Development and Implementation of an openEHR Archetype for HIV/AIDS Diagnosis

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Abstract: One of the biggest challenges in maintaining Electronic Health Record (EHR) systems is the necessity to keep clinical knowledge up-to-date with the scientific evidence. Recently the standard modeling based on archetypes, proposed by the openEHR Foundation has proved effective in creating flexibly and semantically interoperable medical records. This paper describes the process of specifying and modeling an archetype for the diagnosis of HIV/AIDS in a hospital information system designated by SaveCare.

1 INTRODUCTION

Healthcare needs a well-coordinated and collaborative approach that is not fully achieved with existing systems, as well as the traditional models of development, due to the high complexity of health data and the dynamism of clinical knowledge, thus the need to develop Electronic Health Records (EHR) Systems. (Garde et al., 2007).

The models of clinical information, including different models and EHR variants (Electronic Medical Records (EMR), Electronic Patient Record (EPR), Clinical Patient Record (CPR)), do not currently have a theoretical strong enough base to ensure interoperability and computability (Beale and Heard, 2007d). Given the difficulty of communication between systems, several groups organized themselves in order to standardize the development of interoperable EHR, so that the information could be securely transmitted and properly interpreted between different information systems. Significant contributions were made by producing specifications as the openEHR.

A openEHR

The openEHR Foundation goal of the openEHR standard is to enable semantic interoperability of

EHRs, allowing improved access to information on health (Leslie, 2007). The technical specifications openEHR define the design patterns, reference model and archetypes, these being continually evolving. This standard is becoming internationally known as the most complete architecture standard for information representation of an EHR (Kalra, 2006).

The architecture of openEHR is basically founded on the ontological separation of the technical level (information model) and the domain level (clinical content model). The information model is characterized by being stable, the content of its basic elements remains unchanged during the lifetime of the information system. On the other hand, the domain level is susceptible to changes to represent the evolving clinical knowledge, being represented by archetypes. The separation in two levels allows future modifications in information systems, without requiring changes to the software code since the construction of the information system is based on the information model, resulting in a greater interoperability (Beale and Heard, 2007a); (Leslie, 2007). In an information system based on openEHR, IT professionals develop and modify the information model, while health professionals build and modify the clinical content model / knowledge (Beale and Heard, 2007c).

The openEHR model is object-oriented and incorporates data types to represent very robust healthcare information. These are described as a formal and reusable model of a concept. Thus, if a term is represented by a prototype this concept can be reused in the various scenarios (Beale and Heard, 2007b).

Different archetypes can be grouped into a template. A template is typically used to define a clinical record, or a form to be filled out, and can determine the archetypes that will be used, occurrences that must exist for each archetype, and which elements within an archetype will be used, among other definitions. From a template, it is possible to infer an interface that allows creating a data entry application that collects information from the concepts and definitions contained in the various archetypes (Beale and Heard, 2008).

B VCIIntegrator

VCIIntegrator is the latest version of a system that is based on premises of a patient-centered EHR and allows, in an automated manner, the integration of various previously existing information systems relevant clinical information. It allows adding diversified medical records, as well as showing this information in a centralized way to the health professional. VCIIntegrator allows quick access to various clinical records without requiring the change of application, thereby allowing a horizontal view of the patient's process in the hospital.

This framework is recently being modified to work and integrate archetype based templates in its forms, so the link between the clinic side of the patient data collection may be closer to the technical side.

2 AIM AND MOTIVATION

The department of Health Information and Decision Sciences (CIDES) as been adopting the openEHR reference model, so headed to a new paradigm which will address the problem of lack of standardization of health records and little integration and interoperability between systems. This is still an early stage and SaveCare system (System for AIDS Virtual Evaluation) aims to become the first fully-implemented CIDES system in openEHR, however, at this early stage, will only set the standard variables of a model of diagnosis of HIV/AIDS.

SaveCare is a system that is based on

assumptions of an EHR patient-centered and allows, in an automated way, the integration of relevant clinical information from various previously existing information systems (clinical process, exams). The system consists of an electronic medical record of internal medicine, more specifically for patients with HIV/AIDS. The idea of building the diagnosis of HIV/AIDS archetype arose from the need to find a collection standard model fitted to the data obtained during the diagnosis of the condition and the lack of an archetype that fulfilled this purpose.

This article describes the process used in the specification and modeling of a HIV/AIDS diagnosis archetype, adjusted to the hospital/clinic reality of Portugal and Angola, to be integrated into the module VCSaveCare in VCIIntegrator framework developed by CIDES, which will be used in both countries.

3 METHODS

The first activity was to search the database of the openEHR Foundation, Clinical Knowledge Manager (CKM), for the existing archetypes.

Thus, the Diagnosis archetype (openEHR-EHR-EVALUATION.problem-diagnosis.v1) was used as a starting point to design a new archetype to fulfill our purpose. At this stage, we used open source tools to edit archetypes and build a template: Ocean Archetype Editor (Informatics, Latest Beta Release 2011a) and Ocean Template Designer (Informatics, Latest Beta Release 2011b). With the support of these tools, the archetype was translated and specialized to reflect the Portuguese and Angolan reality.

Once defined the archetype, a template was created, in turn, exported to a file in CSV format, and later was used in the openEHR VCIIntegrator compiler that transforms a openEHR template into a Web form, automatically becoming available in the clinical module VCSaveCare. The developed prototype will be further subjected to CKM for evaluation by experts. Also it was validated through tests and the archetype was changed, instantiated and validated accordingly. This cycle was repeated until the template was considered appropriated.

4 RESULTS

The Evaluation archetype was designed specifically for the collection of data related to the diagnosis of

HIV/AIDS. It is based on several data collection systems already implemented in Portugal and will serve to collect data worldwide. Table 1 briefly describes the purpose of the "Diagnosing HIV/AIDS".

Table 1: Archetype diagnosis HIV/AIDS purpose.

Archetype: HIV/AIDS Diagnosis	
Concept name	HIV/AIDS Diagnosis
Concept description	A diagnosis defined by a medical doctor, which collects data related to HIV/AIDS infection including stage of disease and diagnostic criteria.
Purpose	Registration of medical diagnostics with optional criteria of diagnosis and stage of infection. Requires entry of coded diagnosis.
Use	Used for recording any current or past diagnosis of HIV/AIDS.

The archetype was designed using Archetype Designer® application and then imported to Template Designer® application, where a template was built based on past archetypes (Diagnosis; Anatomical Location; Address) increased by other clinical information. Figure 1 shows the created mindmap.

The main differences between the existing Diagnosis archetype and the Diagnosis HIV/AIDS

reside in the fact that the etiologic agents are associated with several variables, such as TypeHIV, transmission mode, data of transmission partner and more detailed information in case of pregnancy. In turn, the variable TypeHIV is a cluster to which archetype has been defined TypeHIV.

This consists of detailed tests of detection of infection, the serotype information, contagion (vertical, sexual or blood), country of residence on the likely contagion, the country of residence of the first symptoms, age and diagnosis, the diagnosis state (confirmed, suspect, unconfirmed) and clinical description. The probable date, date of last negative test, the date of the first positive test, the date of first observation, the first date as asymptomatic carrier, the probable year of infection and viral load.

5 DISCUSSION

The incorporation of the Diagnosis HIV/AIDS archetype in SaveCare system based on openEHR model proved to be adequate even though it still was in a draft format.

The archetype and template editing tools, freely distributed, eased and sped up the work. Thus, one

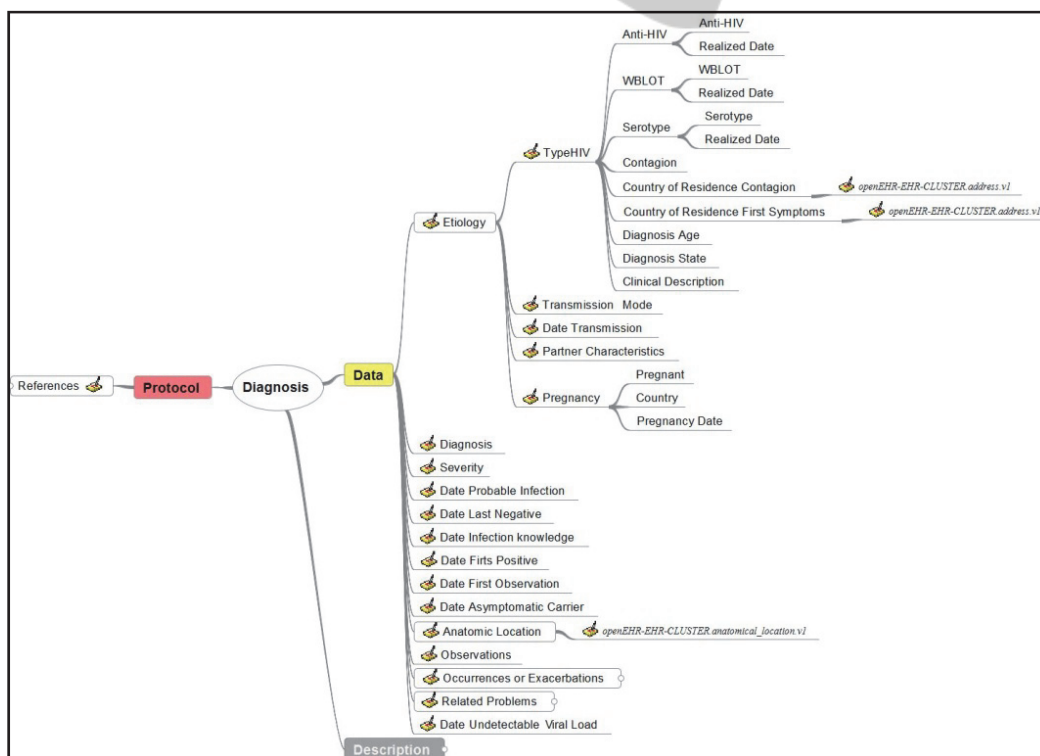


Figure 1: Mindmap diagnosis HIV/AIDS.

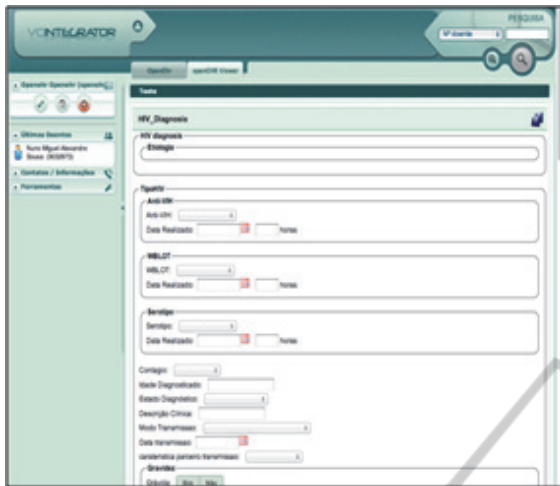


Figure 2: Archetype template result.

of the biggest challenges is in the construction of the Graphical Interface that better reflects the applications needs from the defined templates.

As the understanding of openEHR ontology increases, the faster is the process of defining archetypes and templates.

6 CONCLUSIONS

The use of the archetypes in the construction of systems is still in its early stages. We believe that modelling through archetypes allows the construction of EHR systems that meet the comprehensive needs of solution to develop, while ensuring interoperability between systems. It is also necessary to improve the freely distributed tools so that they could hide the complexity of the model from health professionals, facilitating the construction of new archetypes and templates, enabling the sharing of records. Therefore the number of available archetypes could significantly grow enabling international cooperation and influencing the clinical healthcare of patients.

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