Health Data Management with an Archetype Driven EHR System in Low Resource Environments

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Introduction

- Based on diploma thesis “Design and prototypical implementation of an archetype based EHR system (EHRflex)”
- Held between May and October 2009 “Universidad Politécnica de Valencia”
- Has been enhanced since 2010 at the “Helmholtz Center Munich” (ByMedConnect)
- Since February 2010 OpenSource Project at “SourceForge”
- Technologies:
  - Web based Java application
  - GoogleWebToolkit adaption (GXT) for the user interface
  - XML database eXist
ISO 13606: „Electronic health record communication“

- Based on 15 years experience (GeHR and openEHR)

- Dual Model Approach

- **Information** – statements about specific entities
  - Blood pressure measurement: 120/80, patient was sitting

- **Knowledge** – statements which apply to all entities of a class
  - Pressure is taken in mmHg
  - Possible positions: Lying, Sitting, Staying and Unknown

➤ Semantically Interoperable
ISO 13606: Reference model

- Object oriented model
- Normally XML
- Represents properties of a health record

- **Generic structures to build blocks**
  - Folder, composition, section, entry, cluster and element

- **Specific data types**
  - Physical quantity, date, duration, coded text, URI, ...

  ➢ Structured information of a specific case
**Example „Anatomical Pathology Report“**

<table>
<thead>
<tr>
<th>Patient:</th>
<th>Smith, John</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td>24/07/2009</td>
</tr>
</tbody>
</table>

- **Macroscopic description:**
  - Two fragments of 0.1 cm
  - One fragment of 0.3 cm

- **Diagnostic:**
  - Chronic gastritis
  - Inflammation
  - Non atrophic chronic enteritis
ISO 13606: Archetype model

- Object oriented model
- Defined by a “Archetype Definition Language” (ADL)

- Adds knowledge
  - Translations, terminology, ...

- Constraints structure
  - Cardinality, existence, occurrences, ...

- Constraints values
  - Minimum, maximum, value list, ...

- Semantic description of clinical concepts
Archetype „Blood pressure“

Created with LinkEHR (OpenSource): www.linkehr.com
ISO13606: LEGO analogy

Data structures
**EHRflex: Goals**

- Introduce ISO 13606 into the daily practice
- Visualization of the generic model for user interaction
- Clear and self-explanatory screen forms
- Empower clinicians to design their own content
- Review and evaluate the 13606 norm
Problems faced

- Support the generic dual model approach, but not losing usability
- Reference model represents *only* “information”
- Archetype model represents *only* “knowledge”
- User interface needs more specific information
- Other reference models for health records should be supported
Solution

- Method of resolution: Operational Template Model (OTM)
Operational Template Model

- Object oriented model
- Implemented in the used UI technology

- **Structures:**
  - StructureObject, List, Alternative

- **Data types:**
  - FieldList, Boolean, Integer, Real, CodedText, SimpleText

- Allows interaction with archetype based data
Method

- Transforming the OTM out of an Archetype and bind it directly to a form
Method

- Transformation the OTM into XML (any reference model)
Example: Google Health medication
Example: Google Health medication

![Image of a medical data entry interface showing medication details and a list of entries with columns for Medication, How to take, and How many.]
Conclusion and Future Work

• Clinicians can define and use their own clinical concepts
• Widgets are useable despite the generic models of ISO 13606
• Data can be stored standard-conform in a database
• EHRflex modules are extendable for other standards

➢ Support of more archetype attributes and structures
➢ Implementation of an editing modus
➢ Enhancements of the Operational Template Model