

Semantic Description of Health Record Data for Procedural Interoperability

(The MediGrid Project)

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Why

- medical data, health-related data, EHR, continuous monitoring, body area networks ... *peta? bytes*
- communication, mobile lines, fixed lines ... *giga? bits per second*
- personal data assistants, cloud computing, ubiquitous computing ... *tera? flops?*
- communication standards, ontologies, semantic interoperability, reference models (?)

Standing on the heads of the Titans

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and have the potential to (sometimes ?) close the scissors between health care and healthcare

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- medical guidelines, medical algorithms, medical algorithm repositories *... thousands*

Procedural value of data

Pragmatic nature of medicine

Each bit of information was collected with some purpose (!)
(unlike poetry)

Purpose .. some algorithm to be used on that data

Question(s)

How can this duality of medical data / medical procedures be reflected in their IT representations ?

How do I decide about the possible use of particular data in a particular algorithm ?

By semantic matching :-)

Semantic matching of medical data and algorithms

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Basic Assumption 2:

Data processed by biomedical algorithms are (following the philosophical tradition of phenomenology) indicators that can be transformed into other indicators and grouped into indicator classes by their roles in these transformations.¹³

Semantic matching

- need for extensive review and verification of semantic links
 - stress on correct procedures in medicine (lege artis)
- => practical requirements on design and implementation of a knowledge-processing system:
- **Semantic information (meaning for the human user) of both indicator classes and transformations must be explicitly described and readily available for user assessment and validation.**
 - **Semantic information must be bound to the current scientific paradigm and to evidence based medicine through extensive links to published and reviewed works.**

Components of decision making

- indicators, transformations, indicator classes (data, algorithms, data types)
- users (owners, institutional users, represented entities, conceptual domains)
- supporting information (scientific requirements on medicine)
- trust and authority representation
- (flexibility to contain contradictions [contradictory algorithms / recommendations])
- (flexibility to support development of scientific knowledge)

Components of decision making

- **Mechanisms of procedural authority and trust must be implemented to support users' decisions about procedural values of individual components.**

Decision making

Semantic matching of data and algorithms, tracking the information down to the source (scientific information) level
... with respect to existing trust / authority relations

MediGrid: aiming for reasonable support for this model of decision making, representing entities as resources.

MediGrid layers (sandwich-style)

- source: description of supporting information: author and cited work
- concepts: semantic description of transformations (algorithms) and indicator classes (data types)
- implementation: algorithm representation and execution, data instances and validation
- review / trust / authority: r/t/a statements
- users (resource ownership, responsibility, conceptual domains)

Closest by approach: OpenEHR

Basic similarity: phenomenology (dealing with information as independent representation of reality), archetype data can be seen as indicators

Matching the entities between MediGrid – OpenEHR

Indicator class – Observation archetype

User, Reference – Encoded in archetype description

Transformation, Implementation – Not defined

Trust / review / authority statements – Out of scope (?)

MediGrid implemetation

- Documentation Service (empty infrastructure)
- Auxology algorithms
- (Exercise physiology)
- MediGrid on Sourceforge

Ongoing work

- User representation / identity mechanisms
- Shibboleth
- Domain applications

Thank you for your attention

