



TUTORIAL D

ICBO: International Conference on Biomedical Ontology

Improving Structured Electronic Health Record Data through Ontological Realism

July 27, 2011 ▪ 8:30am - 12:00pm

Instructors:

Werner Ceusters (University at Buffalo) and William R. Hogan (University of Arkansas for Medical Sciences)

Workshop Venue:

Marriott Buffalo Niagara, 1340 Millersport Highway ▪ Amherst, New York 14221

Room: Salon C&D / 2nd Floor

Objective

Electronic health records (EHR) consist in part of structured data such as demographics, coded diagnoses and procedures, medications, problem list, adverse events, results from lab tests and so forth. This list will most likely expand with the move towards 'meaningful use'. To make these data useful for translational research, they are often exported to data warehouses and pooled with similar data from other systems (e.g. the i2b2 initiative). This is most typically achieved by converting data to a common format and applying data mapping procedures using reference terminologies. These techniques often lead to some form of data loss in terms of granularity or terminological detail.

In this tutorial we will explain and provide practical examples of how Ontological Realism (OR) and Referent Tracking (RT) can be used to achieve data enrichment in data warehouses rather than data loss. This will be done by demonstrating how the principles of OR and RT, thereby further exploiting how the entities represented in the Ontology of General Medical Science (OGMS) relate to each other, can be used to improve the transform component of traditional Extract-Transform-Load (ETL) procedures in data warehousing. For example, explicit representation of entities referred to by ICD-9-CM diagnosis codes can simplify queries and help track individual diseases over time. We will also demonstrate that our methods will not lead to a completely faithful representation of the reality expressed by means of the EHR data because of underspecification in prevailing EHR paradigms. It will however be a means to provide recommendations for future meaningful use criteria.

Intended Audience

This tutorial will be of interest for anyone involved in:

- EHR design and implementation, including EHR super-users and champions,
- clinical and translational data warehousing and,
- doing research on clinical and translational data collections, including the development of ontologies and terminologies for information retrieval from data warehouses.

Preparation

Attendees may submit until one month prior to the tutorial examples of what they are practically struggling with in their environment. These examples will be worked out during the tutorial. For further information, please contact Werner Ceusters (ceusters@buffalo.edu).

Preparatory Reading

- Smith B, Ceusters W. [Ontological Realism as a Methodology for Coordinated Evolution of Scientific Ontologies](#). *Applied Ontology*, 2010;5(3-4):139-188.
- Ceusters W, Smith B. [Strategies for Referent Tracking in Electronic Health Records](#). *J Biomed Inform.* 2006 Jun;39(3):362-78.
- Scheuermann R, Ceusters W, Smith B. [Toward an Ontological Treatment of Disease and Diagnosis](#). 2009 AMIA Summit on Translational Bioinformatics, San Francisco, California, March 15-17, 2009; 116-120. Omnipress ISBN:0-9647743-7-2 (paper).
- Hogan WR. [To what entities does an ICD-9-CM code refer? A realist approach](#). In: Shah N, Sansone S-A, Stephens S, Soldatova L, editors. *Bio-ontologies*; Boston, MA, 2010.

AGENDA

8:00am	Registration	10:00am	Use Case 1: Diagnoses and ICD-9-CM (B. Hogan)
8:30am	Introduction to Ontological Realism (W. Ceusters)	10:30am	Break
9:00am	Problems with Mainstream EHR Designs (W. Ceusters)	10:45am	Use Case 2: Keeping Track of Identifiers (B. Hogan)
9:15am	Ontological Realism and Referent Tracking as a Unifying Solution (W. Ceusters)	11:15am	Use Case 3: Adverse Events (W. Ceusters)
9:45am	Representing Time in Referent Tracking (B. Hogan)	11:45am	Use Case 4: Data Warehousing for EHRs (W. Ceusters & B. Hogan)
		12:00pm	End of Tutorial