Ontological Approach to Clinical Recording and Form Generation: A proof of concept

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Abstract

We have designed a generic event ontology, clinical event ontology, and user interface ontology. And we propose a Clinical Record Form Generation Architecture which exploits proposed ontologies. With the proposed form generation architecture we can support EMR system developers in creating clinical record forms and interfaces. This architecture will increase usability and foster convenience for EMR users.

Keywords:

Medical records, Terminologies, Forms and records control

Introduction

Most of medical records are for documentation on clinical service events such as observing, judging, ordering, treating, billing, and so on. In this study we focus on events and propose a clinical record form generation framework through an ontological approach.

Method

We developed Event Ontology (EO) and Clinical Event Ontology (CEO). Then we modeled a Clinical Interface Ontology, which specifies contents, data types, and formats of clinical record user interfaces reflecting user preferences. Finally through these three ontologies and additional domain terminologies, we have a firm basis for dynamically generating clinical record forms and interfaces.

Result

Event Ontology: The Event Ontology (EO) defines a set of fundamental classes for events: Event, Agent, Resource, Action, State, Time, Place, and Reason.

Clinical Event Ontology: We extended the Event Ontology by adding more sub classes and properties to cover clinical record traits. The Clinical Event Ontology (CEO) was constructed through the analysis of existing clinical documentation models.

Domain Terminologies: Since CEO does not provide vocabulary to enable information interchange with EMR records we need clinical domain terminologies (DT) such as taxonomies, thesauri, vocabularies, and ontologies. DT can constrain the CEO when they are used in clinical event description; while the CEO provides description container-level interoperability. In a nutshell, DTs are reference means for sharable clinical record description.

User Interface Ontology: A user interface presents the input and output information of the system to a user. The User Interface Ontology (UIO) defines the structure and content restrictions—reserved words, units of measure requirements, or other format-related restrictions—relevant for a particular interface. Users, such as physicians and nurses, have different information needs and environments and their preferred record formats and interfaces are multifarious. These variations were considered in designing the UIO.

Clinical Record Form Generation Architecture: We propose a Clinical Record Form Generation Architecture which exploits the EO, CEO, DT, and UIO, which is comprised of three main components: *Ontologies*: The EO and CEO provide a event description frame; *Record Template Generator*: Through the CEO and DTs the system composes atomic visual presentation forms to generate a clinical record template. The template generator is responsible for consolidating all data types and clinical forms; *EMR Templates*: Users can input data entry as easily as possible. The system users are able to input data using these templates. In the user interface a user—mainly a clinician—assigns a value for each template through DTs.

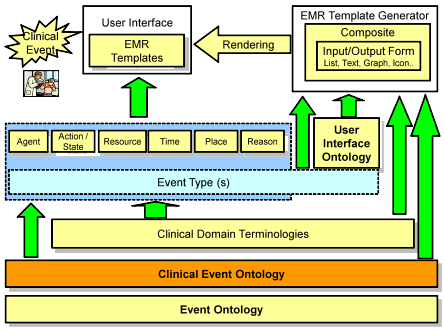

Figure 1-Form generation architecture

Discussion

With the proposed form generation architecture we can support EMR system developers in creating clinical record forms and interfaces. This architecture will increase usability and foster convenience for EMR users.

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