Model-driven CDA Clinical Document Development Framework
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Abstract:
The Health Level 7 (HL7) Clinical Document Architecture, Release 2 (CDA R2) standardizes the structure and semantics of clinical documents in order to permit interchange. We have applied this standard to generate a platform independent CDA model and write a toolset that permits model specialization, generation of XML implementation artifacts, and provides an interface for clinical data managers. The resulting work was tested using US Department of Veterans Affairs Operative Note templates.

Introduction/Background
The HL7 CDA R2 standard is generic, flexible and richly expressive [1]. For CDA implementation, specialized document specifications need to be developed for targeted clinical domains. To rapidly develop specialized CDA document specifications, we have adopted Model Driven Architecture [2] and developed a CDA model driven development framework.

Methodology
1. Construct a CDA Platform Independent Model (CDA PIM): Based upon CDA hierarchical description, we have constructed an UML platform independent model. Data structures and semantics between data entities are abstractly represented in UML notation. This is the base model from which individual clinical documents will be derived.
2. Construct a CDA Platform Specific Model (CDA PSM): A UML profile with defined XML schema concepts was applied to the CDA PIM; the CDA PIM was subsequently transformed to an XML platform specific model (CDA PSM) with applied XML schema stereotypes.
3. Develop a graphic user interface for user selection of CDA header elements and input of body content definitions. Using this interface, a specialized individual clinical document model can be derived from the CDA PSM according to user input. Intended users are VA clinical application coordinators who assist users such as providers and medical records personnel.
4. Generate CDA compliant XML schemas from individual clinical document models using HyperModel [3]. Hypermodel belongs to a class of modeling tools that can transform UML models into XML schemas.

Conclusion:
The methodology described was tested on VA Surgical Operation Reports and worked as predicted to create, in codified fashion, the VA content in HL7 CDA R2 format. The applications developed provide a visual representation of the clinical document and provide a user interface that allows users who are clinically savvy, but lack knowledge of HL7 or XML, to create individual clinical document specifications. This work provides one of the first examples of a unified, standardized process to generate CDA R2 compliant XML schemas for implementation.

References:
2. OMG Model Driven Architecture http://www.omg.org/mda/
3. Carlson, Dave http://www.xmlmodeling.com/

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