The Creation and Use of a Reference Terminology for Inter-Agency Computer-based Patient Records: The GCPR RTM Demonstration Project

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The GCPR

The Government Computer-based Patient Record (GCPR) Framework Project is a joint effort of the U.S. Departments of Defense and Veterans Affairs and the Indian Health Service to assemble at the point of care a patient record constructed from available electronic sources. This is achieved through the use of a backbone layer that serves as an information mediator among the various agencies' legacy systems and a Reference Information Model to define the needed data objects and interactions.

The RTM Demonstration Project

GCPR managers commissioned the 6-month Reference Terminology Model (RTM) Demonstration Project to learn more about integrating a reference terminology into the GCPR. The project sought to show the life cycle of a reference terminology, from model development and initialization through editing and deployment. We chose medications as a sample domain because of their cost, potential dangers, and the identified shortcomings of existing medication terminologies.\textsuperscript{1}

Our medication reference model is concept-based, multi-axial and hierarchical. It explicitly separates the following medication attributes into separate axes: chemical structure, mechanism of action, intended therapeutic use and pharmacokinetics. Existing drug terminologies often represent these attributes in a single, mixed hierarchy. The aggregation of drugs into classes based on a formal semantic model can streamline maintenance and enable class-based queries.

We initialized the sample reference terminology using a MeSH chemical structure hierarchy and our own sample hierarchies for mechanism of action and therapeutic use. Then, we imported a list of orderable item names from a Veterans Administration Medical Center. Using manual and automated techniques, we linked the orderables to their active ingredients, and the active ingredients to the chemical structure hierarchy. We manually linked the ingredients to therapeutic uses and mechanisms of action.

The sample terminology includes more than 1,200 orderables, nearly 600 active ingredients, 500 chemical structure classes, 50 therapeutic uses and more than 100 mechanisms of action. Reviewers from a variety of clinical disciplines made corrections and improvements to the terminology using commercially available software tools.\textsuperscript{2}

We built a suite of Web-based terminology demonstration applications using the Metaphrase\textsuperscript{®} applications programming interface. The applications show how the terminology supports both clinical scenarios and population-based queries.

Lessons Learned

Existing controlled medication terminologies can be used both to develop and populate a formal reference model.

Comparison to a formal reference model enables system developers to understand the pros and cons of a particular controlled terminology.

The resources required to model terms depend largely on the quality and completeness of the reference taxonomies and the yield of semi-automated preprocessing.

Specialized software tools and carefully scoped tasks can improve the productivity of human terminology editors.

Further development of terminology quality metrics, the integration of information and terminology models and the deployment of a terminology within a larger environment is needed.

Conclusion

The GCPR Demonstration Project succeeded in specifying and populating a medication reference terminology model using commercial software tools and publicly available terminology sources. Although significant barriers exist to the integration of an RTM into efforts such as the GCPR Framework Project, all the tools and processes to do so exist and can be implemented.

References

\textsuperscript{1}Lau LM, Lam SH, Applying the desiderata for controlled medical vocabularies to drug information databases. Proceedings of the AMIA Annual Fall Symposium 1999;97-101.