Importing Continuity of Care Documents into i2b2 and SMART

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The Meaningful Use incentive program will require the Consolidated Clinical Document Architecture (C-CDA), an HL7 standard for electronic clinical data. Therefore, C-CDA-formatted patient data will soon become widely available. Here, we describe an Integrating Biology and the Bedside (i2b2) module to import these documents, for populating the data repository and refreshing patient data to reflect near-real-time information. This can be utilized by SMART (Substitutable Medical Apps, Reusable Technologies) apps, such as SMART-i2b2's clinical trial platform.

Background

The Consolidated Clinical Document Architecture (C-CDA) is an HL7 standard for expressing patient data electronically, and the Office of the National Coordinator for Health Information Technology (ONC) selected it as a requirement for Stage 2 of the Meaningful Use incentive program. Therefore, healthcare facilities will shortly be producing large numbers of these documents with up-to-the-minute patient information. Partners Healthcare in Boston, MA is building the capacity to generate at least 75,000 documents per day.

Informatics for Integrating Biology and the Bedside (i2b2) is one of the sponsored initiatives of the NIH National Centers for Biomedical Computing. It is a flexible, componentized clinical research and data warehousing system that now enjoys widespread adoption at over 80 sites nationwide.

Substitutable Medical Apps, Reusable Technologies (SMART) is an ONC-funded platform for reusable medical apps that can run on participating platforms connected to their various electronic health records. SMART is fully integrated in i2b2, supporting "deep dives" into the patient record directly from i2b2. [1]

Adding C-CDA import to i2b2 will create a standards-based import process from a readily available data source, and it can be used for a "live refresh" of individual patient data in SMART.

Methods

To support C-CDA import into i2b2, we developed the SETL (Service-Based Extract, Transform, and Load) cell to convert C-CDA documents into i2b2 format. We also modified the SMART cell to optionally retrieve up-to-the-minute data from the SETL cell rather than from the data repository. Finally, we created an i2b2 ontology for C-CDA documents so that the converted document can be stored directly in the data repository.

Because C-CDA is so expressive, it is possible to have very different C-CDAs that contain the same information. Therefore, we turned to the Open Health Tools (OHT) organization to help us create a solution that would require minimal modification across organizations. OHT is responsible for the official C-CDA validator used in Meaningful Use. OHT is working on C-CDA translation tools that are resilient to organizational differences in expression.

For this first release of the SETL cell, we targeted the sections of the C-CDA Continuity of Care document profile (CCD) needed for our clinical trial recruitment SMART application: demographics, problems, and notes.

The SETL cell is open source and will be available on the i2b2 wiki in April 2014.

Results

For this release we elected to implement and test our SETL cell at Partners Healthcare, which provides a robust C-CDA generation service from outpatient encounters across the enterprise. We have developed an intermediary program that, at the SETL cell's request, calls upon the service to retrieve a document for a given patient. This intermediary program also adds clinical notes into the document (Meaningful Use does not require clinical notes).

The SETL cell is running at Partners Healthcare and will be part of SMART-i2b2's clinical trial platform.

Discussion

We have achieved import/refresh of up-to-the-minute patient information in i2b2 and SMART by leveraging C-CDA. Although we have only tested the SETL cell against Partners Healthcare documents, we expect our design will make adaptation to other sites straightforward. Future work includes supporting all sections of Meaningful Use C-CDA documents. C-CDA will likely become an important data source for secondary use of clinical data.

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References

1 Wattanasin N, Porter A, Ubaha S, *et al.* Apps to display patient data, making SMART available in the i2b2 platform. In: *Proceedings of the AMIA Symposium*. 2012.