HL7 CDA Document Validation and Content Quality Assessment

HL7 Payer Summit User Group Panel Discussion Moderated by Lisa Nelson

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Life Over Time Solutions
Introductions

Rick Geimer
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Kai Heitmann, MD
Art-Decor

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JKM Software

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Agenda

- The Problem: What is CDA document validation and content assessment and why is it important?
- The Solution: A Panel Discussion
- Wrap Up
- Q&A
What is CDA Validation and Assessment?

- Validation is the process of ensuring conformance of a set of data to well-defined requirements.
- Assessment goes deeper into other issues related to the quality of the information.
Why is CDA Validation & Assessment Important?

- To ensure documents are valid according to specifications.
  - Each document conforms to the CDA standard
  - Each document conforms to canonical Implementation Guide

- To ensure documents being received from external sources match expectations.
  - Expectations could be more than syntactic and structural conformance
Multi-Stage Process

1. CDA Schema validation

2. Schematron validation of IG requirements

3. Other types of content evaluation
CDA Template Tooling:

Rick Geimer
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Trifolia Workbench
Trifolia Workbench

Create Implementation Guides

View Templates

Edit Templates

Generate Schematron

• Developed and maintained by Lantana Consulting Group
• Free to use for all HL7 members
• Accessible from the HL7.org or the Lantana websites
Support for Schema Validation

- Based on CDA schema
- Ensures XML well-formedness
- Any XML parser should have no problem parsing the document
- Ensures that XML conforms to overall CDA structure, not just XML well-formedness
- Does not validate any data (values) such as existence of nodes with specific values, etc.
- Can only check existence of nodes and hard document structure
Supports Schematron Validation

- Based on IG requirements
- Uses declarative expression, allowing developers to be expressive in document requirements and structure
- Any XML parser should have no problem parsing the document
- Can validate data (values) such as existence of nodes with specific values, node counts, etc.
- Uses standard XPath (1.1) to “select” nodes based on index, name, name + value, and many others

Schematron is the bee’s knees – the de facto way to validate CDA documents!
Validation: Sample Implementation

Online CDA Validator

- Implements a basic multi-stage validation pipeline
- Freely available for anyone to use
- Provides validation for most SDWG-developed IGs

- http://www.lantanagroup.com/validator
CDA Template Tooling:

Kai Heitmann, MD
Art-Decor

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ART-DECOR® Tool Suite...

- ...is an open-source tool and a methodology for various multidisciplinary stakeholders of healthcare information exchange.
- ...supports comprehensive collaboration of team members within/between governance groups.
- ...supports creation and maintenance of HL7 templates (HL7 STU), value sets, and more.
- ...has a built-in schematron engine to allow easy comprehensive validation and testing.
- ...is used in over 40 projects.
Template Viewer / Editor

Demo 5: Vital Signs CDA Document Templates

CDA recordTarget

- Version: 2014-07-08
- Status: Active
- Id: demo5-template-2001
- Display Name: CDA recordTarget

Description, model, context and examples

- Description: The patient / client
- Classification: cdahheader/eve
- Open/Closed: open

Used by / Uses

- Used by Template Id: 2.16.840.1.113883.3.1507.99.50.5.10:1

Relations

- Type: Specialization
- Model / Template: 2.16.840.1.113883.10.12.101
- as of: 2005-09-07

Example

A simple patient, named John Doe

delete

<recordTarget>
  <patient>
    <id root="2.16.840.1.113883.2.1.5.1" extension="100202020"/>
    <given>John/given>
    <family>Doe/</family>
  </name>
  <administrativeGenderCode code="M" codeSystem="2.16.840.1.113883.5.1"/>
  <birthTime value="19620202"/>
Validation of CDA

- directly derived from ART-DECOR Template + Value Set Definitions
- automatically + manual additions

...directly derived from templates
Validation of CDA

- Documentation
  - HTML
  - PDF
  - Wiki
- Implementation
  - RESTful/Export
- Validation
  - Schematron
- Testing/Qualification
CDA Template Tooling:

Sean Muir
JKM Software

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MDHT Overview

MDHT is an eclipse based, *open source* suite of model driven features supporting full life cycle of development of CDA Implementation guides and FHIR profiles (beta).
Validation Features and Analysis Features

• Validation Granularity
  • Support for Document, Section, and Individual Template Rules Validation
• eclipse based Validation Applications
  • XML Editor Validation – Visually marks issues within document
  • CDA Analyzer - Section based UI providing separate views per section for Narrative, Entries, and issues. Issues are rolled up
  • CDA Metrics – Configurable metrics tool to provide analytics for 1 to many CDA documents. For instance, how many medications activities are using RXNorm
• Validation and Query API
  • Simple, extensible, domain based Java based API supports customizable document and validation handling
  • Document Query support to allow developers to quickly select entries from the document. (Select all MedicationActivities from Document)
• OCL Base Validation
  • Beta versions of Schematron and Java 8
XML Editor Validation for CDA
MDHT CDA Analyzer

![Screenshot of MDHT CDA Analyzer tool showing a detailed analysis of a CDA document with sections such as Advance Directives, Allergies, Adverse Reactions, Alerts, Encounters, Family History, Immunizations, Insurance Providers, Medical Equipment, Medications, Plan of Care, Problems, Procedures, Results, Social History, and Vital Signs. The table displays structured entries, total issues, errors, warnings, and information for each section. Errors and warnings are listed with descriptions, while informational notes and no warnings are also indicated.]
Other types of tools:

John D’Amore, MS
Diameter Health

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FINDINGS:

Majority of EHR Vendors had zero or very few schema/schematron errors during validation.

So did we achieve semantic interoperability?

No, there are many ways to create clinical documents that are technically conformant but still hard to use in the real-world.
Challenges

The above sample will pass all HL7 schema/schematron tests, but it’s a dangerous example of poor semantic interoperability...

7982 is the RxNorm norm code for penicillin, not codeine!

Need for Real-World Tools

Rigorous data normalization including free-text analysis of clinical documents

Data Surveillance & Improvement

Data Extraction
De-Duplicate Data

Improve Clinical Documentation
Identify Patients at Risk

Population health applications for care providers and payers

Document assessment and Surveillance (CCD Analyzer)
Wrap Up:
# Tooling References:

<table>
<thead>
<tr>
<th>Tool</th>
<th>Reference Link</th>
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<tr>
<td><strong>Certification Validation:</strong></td>
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<td>SITE (ONC)</td>
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<tr>
<td><strong>CDA Template Tooling, Schema and Schematron Validation:</strong></td>
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| MDHT                          | Eclipse Project Home Page  
GitHub Model Repository  
[https://github.com/mdht/mdht-models](https://github.com/mdht/mdht-models)  
Project Release Page  
[https://sourceforge.net/projects/oht-modeling/files/](https://sourceforge.net/projects/oht-modeling/files/)  
CDA Tools Page  
[http://www.cdatools.org](http://www.cdatools.org) |
| **Other CDA Content Analyzers:** | |
| SMART CDA Scorecard           | http://ccda-scorecard.smartplatforms.org/static/ccdaScorecard/#/             |
Q&A

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