CDA and CCD for Patient Summaries

Ambassador Briefing

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What is the CDA?

- The CDA is a document markup standard for the structure and semantics of an exchanged "clinical document".
- A clinical document is a documentation of observations and other services with the following characteristics:
  - Persistence
  - Stewardship
  - Potential for authentication
  - Context
  - Wholeness
  - Human readability
- A CDA document is a defined and complete information object that can exist outside of a message, and can include text, images, sounds, and other multimedia content.

CDA Business Case

- **CDA hits the "sweet spot"** – CDA encompasses all of clinical documents. A single standard for the entire EHR is too broad. Multiple standards and/or messages for each EHR function may be difficult to implement. CDA is "just right".
- **Implementation experience** - CDA has been a normative standard since 2000, and has been balloted through HL7's consensus process. CDA is widely implemented.
- **Gentle on-ramp to information exchange** - CDA is straight-forward to implement, and provides a mechanism for incremental semantic interoperability.
- **Improved patient care** - CDA provides a mechanism for inserting evidence-based medicine directly into the process of care (via templates), making it easier to do the right thing.
- **Lower costs** – CDA's top down strategy let's you implement once, and reuse many times for new scenarios.

CDA provides a gentle on-ramp to information exchange

- A minimally conformant CDA document:

```
<ClinicalDocument>
  <typeId root="2.16.840.1.113883.1.3" extension="POCD_HD000040"/>
  <id root="2.16.840.1.113883.19.4"/>
  <code code="11488-4" codeSystem="2.16.840.1.113883.6.1«/>
  <effectiveTime value="20000407"/>
  <confidentialityCode code="N" codeSystem="2.16.840.1.113883.5.25"/>
  <recordTarget>
    <patientRole><id root="2.16.840.1.113883.19.5"/></patientRole>
  </recordTarget>
  <author>
    <time value="2000040714"/>
    <assignedAuthor><id root="2.16.840.1.113883.19.5"/></assignedAuthor>
  </author>
  <custodian>
    <assignedCustodian>
      <representedCustodianOrganization>
        <id root="2.16.840.1.113883.19.5"/>
      </representedCustodianOrganization>
    </assignedCustodian>
  </custodian>
  <legalAuthenticator>
    <time value="20000408"/>
    <signatureCode code="S"/>
    <assignedEntity><id root="2.16.840.1.113883.19.5"/></assignedEntity>
  </legalAuthenticator>
  <component>
    <nonXMLBody>
      <text mediaType="text/plain"><reference value="1598765.txt"/></text>
    </nonXMLBody>
  </component>
</ClinicalDocument>
```

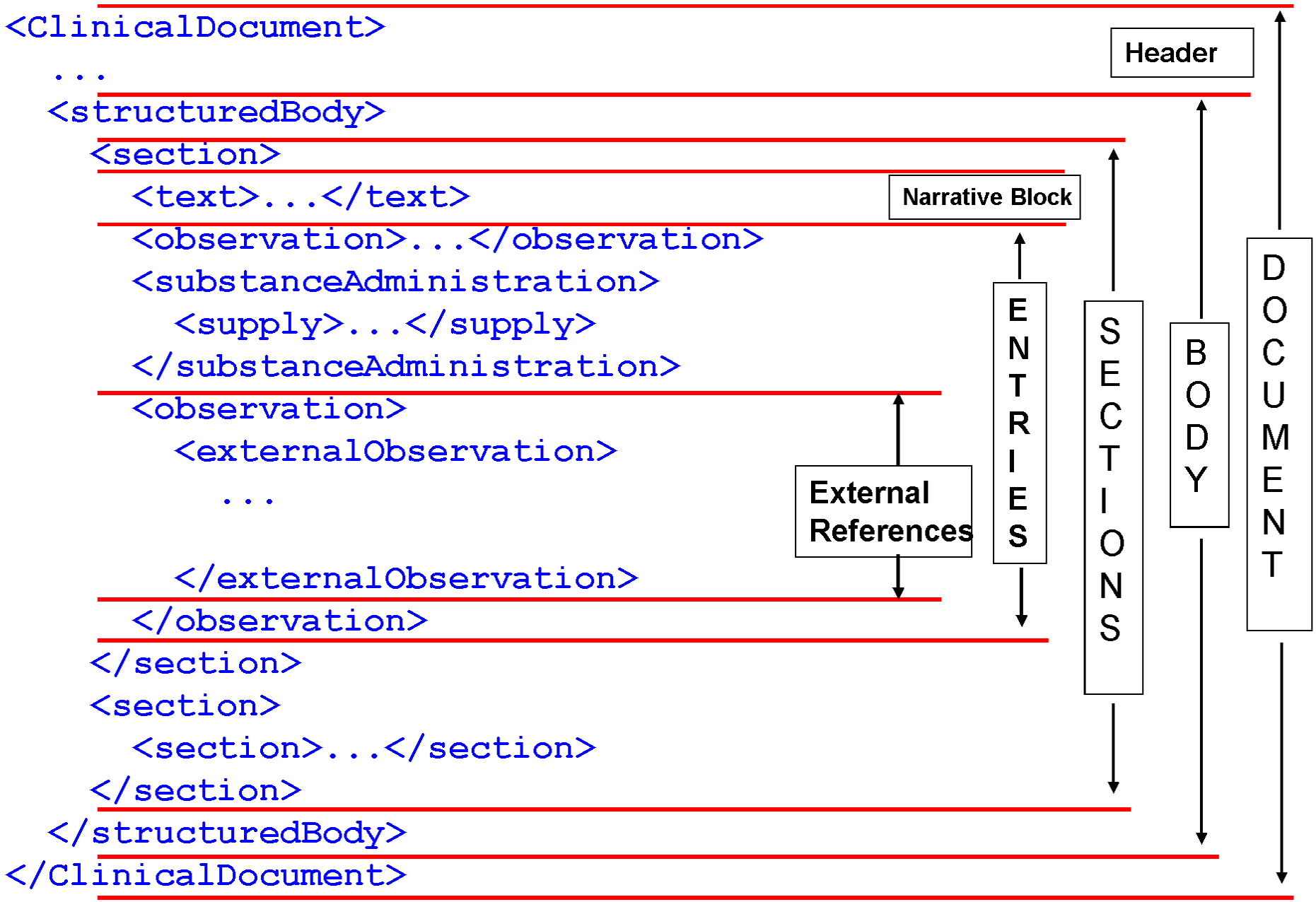
Key aspects of the CDA

- CDA documents are encoded in Extensible Markup Language (XML).
- CDA is derived from HL7's central Reference Information Model (RIM), thereby enabling data reusability - with lab or pharmacy messages, with claims attachments, clinical trials, etc.
- The CDA specification is richly expressive and flexible. Templates, conformance profiles, and implementation guides can be used to constrain the generic CDA specification.

CDA Guiding Principles

- Give priority to documents generated by clinicians involved in direct patient care.
- Minimize the technical barriers needed to implement the Standard.
- Promote longevity of all information encoded according to this architecture.
- Promote exchange that is independent of the underlying transfer or storage mechanism.
- Enable policy-makers to control their own information requirements without extension to this specification.

Major Components of a CDA Document



CDA, Release One

Allergies and Adverse Reactions

- Penicillin - Hives
- Aspirin - Wheezing
- Codeine – Itching and nausea

ANSI/HL7 CDA R1.0-2000

```
<section>
  <caption>
    <caption_cd V="48765-2" S="LOINC"/>
      Allergies and Adverse Reactions
  </caption>
  <list>
    <item><content ID="A1">Penicillin - Hives</content></item>
    <item><content>Aspirin - Wheezing</content></item>
    <item>
      <content>Codeine - Itching and nausea</content>
    </item>
  </list>
  <coded_entry>
    <coded_entry.value ORIGTXT="A1"
      V="DF-10074" S="SNOMED" DN="Allergy to Penicillin"/>
  </coded_entry>
</section>
```

CDA, Release Two

```
<section>
  <code code="48765-2" codeSystem="2.16.840.1.113883.6.1"
   codeSystemName="LOINC"/>
  <title>Allergies and Adverse Reactions</title>
  <text>
    <list>
      <item><content ID="A1">Penicillin - Hives</content></item>
      <item>Aspirin - Wheezing</item>
      <item>Codeine - Itching and nausea</item>
    </list>
  </text>
  <entry>
    <observation classCode="OBS" moodCode="EVN">
      <code code="247472004" codeSystem="2.16.840.1.113883.6.96"
       codeSystemName="SNOMED CT" displayName="Hives">
        <originalText><reference value="#A1"/></originalText>
      </code>
      <entryRelationship typeCode="MFST">
        <observation classCode="OBS" moodCode="EVN">
          <code code="91936005" codeSystem="2.16.840.1.113883.6.96"
           codeSystemName="SNOMED CT"
           displayName="Allergy to penicillin"/>
        </observation>
      </entryRelationship>
    </observation>
  </entry>
</section>
```

CDA is based on a principle of *Incremental Interoperability*

- *Incremental Interoperability* means that an implementer can begin with a simple CDA, and then add structured data elements over time.
- CDA R2 consists of a single CDA XML Schema, and the "architecture" arises from the ability to apply one or more "templates" which serve to constrain the richness and flexibility of CDA.
- Professional society recommendations, national clinical practice guidelines, standardized data sets can be expressed as CDA templates.
- There are many kinds of templates that might be created. Two are particularly relevant for documents:
  - Those that constrain the document sections based on the type of document (section-level templates);
  - Those that constrain the entries within document sections (entry-level templates).

ASTM CCR vs. HL7 CDA

- What if you could have both?!? (or, what if you could have your data elements, and send them in a common exchange framework too?)

ASTM CCR + HL7 CDA = CCD

- The primary use case for the ASTM CCR is to provide a snapshot in time containing a summary of the pertinent clinical, demographic, and administrative data for a specific patient.
- From the perspective of CDA, the ASTM CCR is a standardized data set that can be used to constrain CDA specifically for summary documents.
- The resulting specification is known as the Continuity of Care Document (CCD).

Continuity of Care Document (CCD)

- CCD maps the CCR elements into a CDA representation.

```
<Results>
  <Result>
    <CCRDataObjectID>
      2.16.840.1.113883.19.1
    </CCRDataObjectID>
    <DateTime>
      <Type>
        <Text>Assessment Time</Text
      </Type>
      <ExactDateTime>
        200004071430
      </ExactDateTime>
    </DateTime>
    <Type>
      <Text>Hematology</Text>
    </Type>
    <Description>
      <Text>CBC WO DIFFERENTIAL</Te
      <Code>
        <Value>43789009</Value>
        <CodingSystem>SNOMED CT</Co
      </Code>
    </Description>
    <Status><Text>Final Results</Text></Status>
```

```
<section>
  <templateId root="2.16.840.1.113883.10.20.1.14"
  <code code="30954-2"
    codeSystem="2.16.840.1.113883.6.1"
    codeSystemName="LOINC"/>
  <title>Laboratory results</title>
  <text>
    CBC (04/07/2000): HGB 13.2; WBC 6.7; PLT 123
  </text>
  <entry>
    <organizer classCode="BATTERY" moodCode="EVN"
      <templateId root="2.16.840.1.113883.10.20.
      <id root="2.16.840.1.113883.19" extension="
      <code code="43789009"
        codeSystem="2.16.840.1.113883.6.96"
        codeSystemName="SNOMED CT"
        displayName="CBC WO DIFFERENTIAL"/>
      <statusCode code="completed"/>
      <effectiveTime value="200004071430"/>
```

Continuity of Care Document (CCD)

- CCD sections include:
  - Payers
  - Advance Directives
  - Support
  - Functional Status
  - Problems
  - Family History
  - Social History
  - Alerts (e.g. Allergies, Adverse Events)
  - Medications
  - Medical Equipment
  - Immunizations
  - Vital Signs
  - Results
  - Procedures
  - Encounters
  - Plan of Care

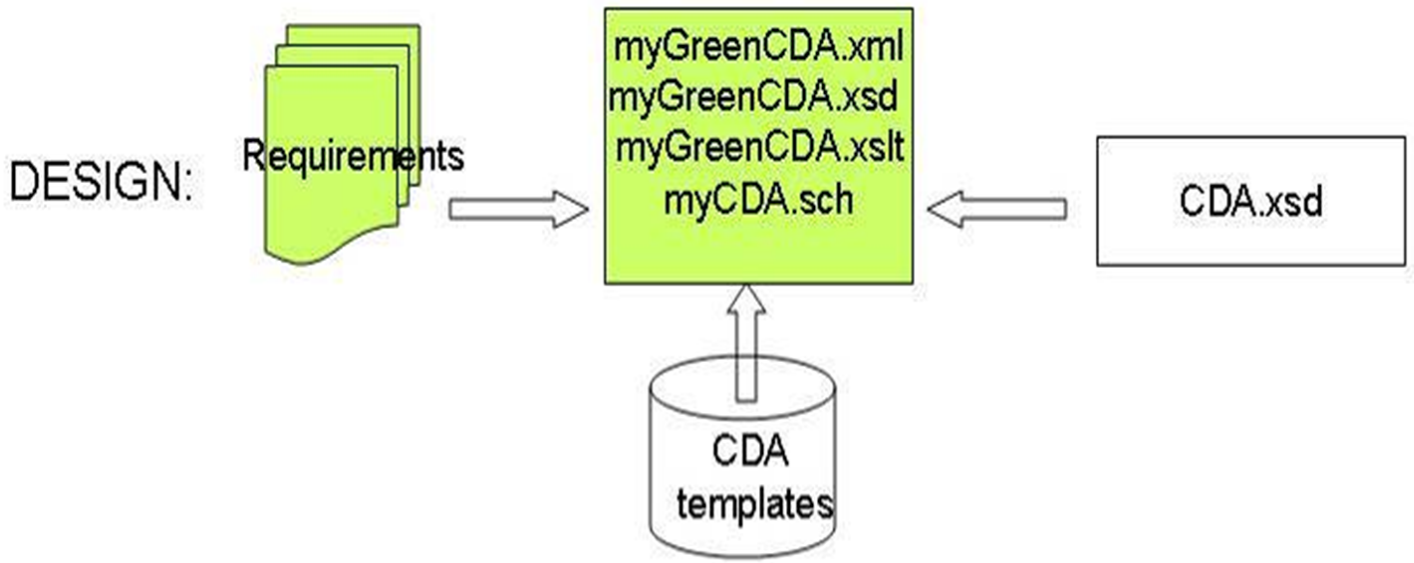
CCD Implementation challenge

- Creation of an instance conforming to a particular CDA Implementation Guide may require knowledge of:
  - CDA R2 base specification;
  - HL7 Version 3 data type specification;
  - CDA templates defined in the particular IG;
  - CDA templates referenced by the particular IG;
  - Terminology code lists defined/referenced by the particular IG;
- Validation of an instance conforming to a particular CDA IG may require:
  - W3C Schema validation;
  - Schematron validation;

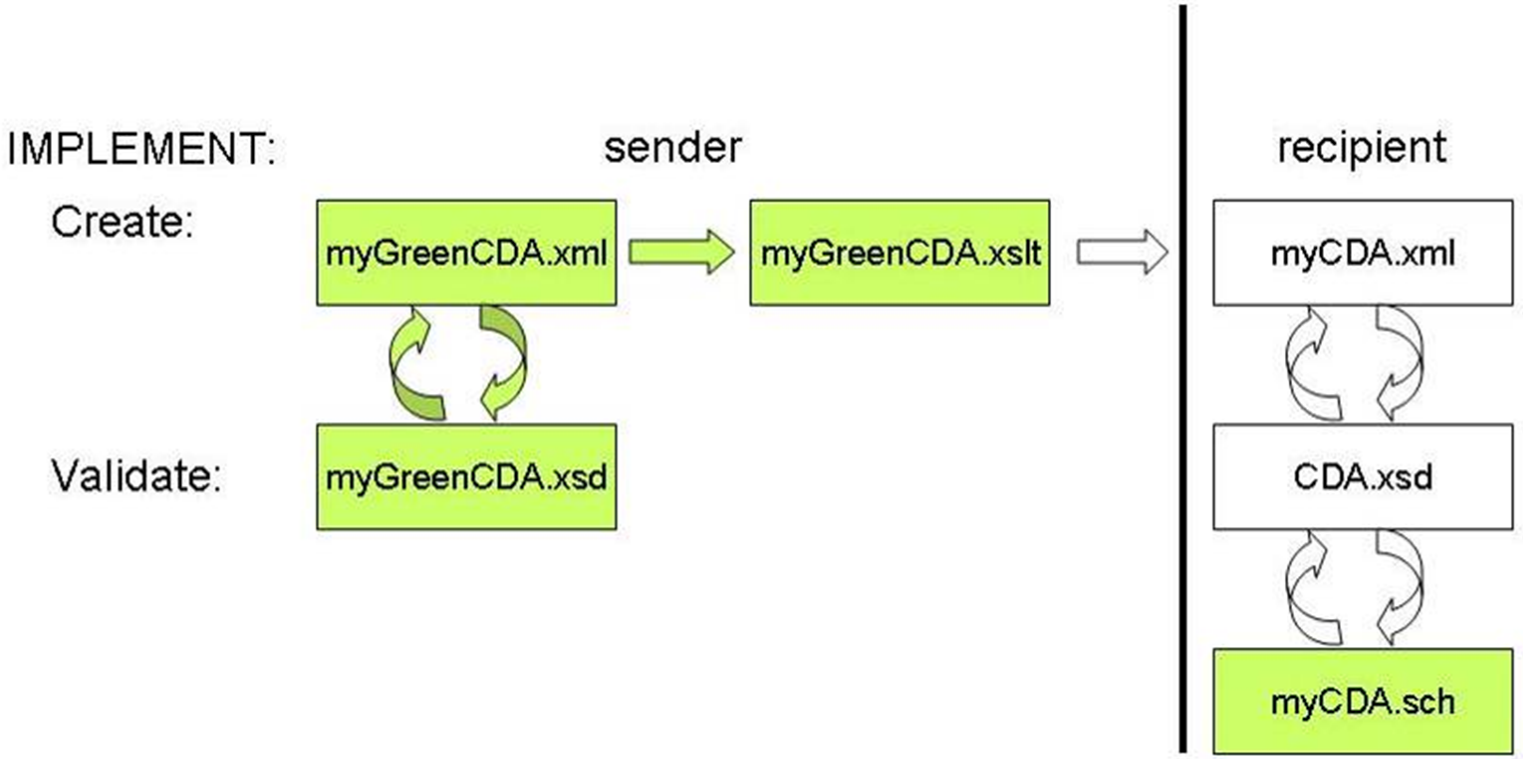
A Solution

- Create an “authoring schema” that simplifies the creation and processing of a particular CDA IG:
  - Clinically meaningful XML element and attribute names;
  - 100% transformable into conformant CDA IG;
  - Hides certain CDA complexities (such as moodCodes, fixed attributes, etc).
- We call this strategy: **greenCDA**
  - **greenCDA** schemas are modular, corresponding to CDA templates.

The Process – build the **greenCDA** module



The Process –
create a conformant instance



An example – build the **greenCDA** module

Requirements

CDA Data Location	HITSP Data Element Identifier and Name
cda:observation[cda:templateId/@root = '2.16.840.1.113883.10.20.1.31']	Result Event Entry
cda:id	15.01 - Result ID
cda:effectiveTime	15.02 - Result Date/Time
cda:code/@code	15.03 - Result Type
cda:statusCode	15.04 - Result Status
cda:value	15.05 - Result Value
cda:interpretationCode/@code	15.06 - Result Interpretation
cda:referenceRange	15.07 - Result Reference Range

greenCDA schema

```
<result>
  <resultID>
  <resultDateTime>
  <resultType>
  <resultStatus>
  <resultValue>
  <resultInterpretation>
  <resultReferenceRange>
</result>
```

An example – create a conformant instance

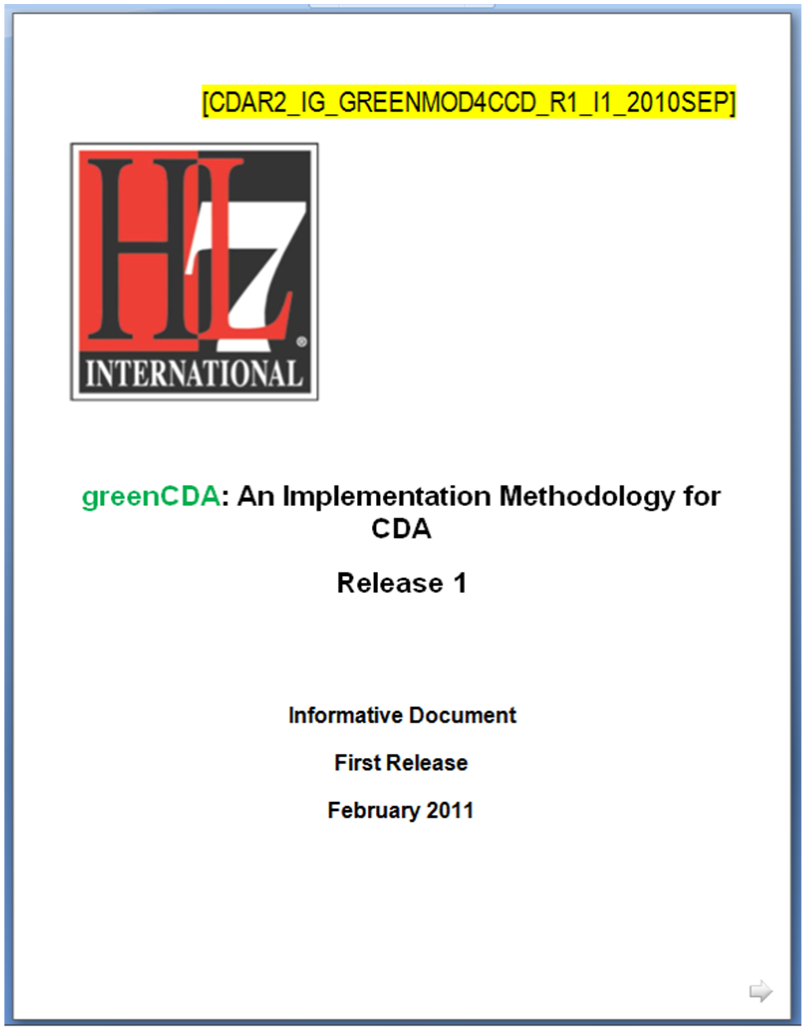
greenCDA instance

```
<result>
  <resultID>
  <resultDateTime>
  <resultType>
  <resultStatus>
  <resultValue>
  <resultInter
  <resultRefer
</result>
```

Conformant CDA instance

```
<!-- These examples assume the default namespace is 'urn:hl7-org:v3' -->
<observation classCode='OBS' moodCode='EVN'>
    <templateId root='2.16.840.1.113883.10.20.1.31'/>
    <templateId root='2.16.840.1.113883.3.88.11.83.15'/>
    <templateId root='1.3.6.1.4.1.19376.1.5.3.1.4.13'/>
    <code code='...' displayName='...'  codeSystem='2.16.840.1.113883.6.1'
codeSystemName='LOINC'/>
    <effectiveTime low value='...'/>
    <statusCode value='N'/>
    <value xsi:type="PQ" value="100" unit="g/dl"/>
  <interpretationCode code="N" codeSystem="2.16.840.1.113883.5.83"/>
    <referenceRange>
        <observationRange>
            <text>M 13-18 g/dl; F 12-16 g/dl</text>
        </observationRange>
    </referenceRange>
</observation>
```

greenCDA Implementation Guide


[CDAR2_IG_GREENMOD4CCD_R1_I1_2010SEP]

HL7 INTERNATIONAL

greenCDA: An Implementation Methodology for CDA

Release 1

Informative Document

First Release

February 2011

- Describes **greenCDA** process;
- Contains a complete **greenCCD** (HITSP/C32 conformant) example.

greenCDA Implementation Guide

- Contents

File	Description
Implementation Guide	Implementation methodology
green_ccd.xsd	Sample greenCCD (HITSP/C32) schema
green_cda_narrative.xsd	An XHTML subset for the greenCDA narrative block.
green_ccd.xml	A sample XML instance conforming to green_ccd.xsd
green_ccd.xslt	An XSLT 2.0 transform to convert green_ccd.xml to normative CDA XML (conformant HITSP/C32).
normative_cda_output.xml	The result of running green_ccd.xslt against green_ccd.xml
cda.xsl	A display stylesheet for viewing normative_cda_output.xml in a browser

Thank you!

- Bob.Dolin@LantanaGroup.com
- HL7 web site: http://www.hl7.org/
- HL7 listservers (public but must register to post): http://www.hl7.org/Special/committees/lists.cfm
  - CDA: strucdoc@lists.hl7.org
  - CCD: ccd@lists.hl7.org
- Dolin RH, Alschuler L, Boyer S, Beebe C, Behlen FM, Biron PV, Shabo A. HL7 Clinical Document Architecture, Release 2. J Am Med Inform Assoc. 2006;13:30–39. (http://www.jamia.org/cgi/reprint/13/1/30)