



CDA and CCD for Patient Summaries

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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

```
<ClinicalDocument>
```

```
...
```

```
<structuredBody>
```

```
<section>
```

```
<text>...</text>
```

```
<observation>...</observation>
```

```
<substanceAdministration>
```

```
<supply>...</supply>
```

```
</substanceAdministration>
```

```
<observation>
```

```
<externalObservation>
```

```
...
```

```
</externalObservation>
```

```
</observation>
```

```
</section>
```

```
<section>
```

```
<section>...</section>
```

```
</section>
```

```
</structuredBody>
```

```
</ClinicalDocument>
```

Header

Narrative Block

ENTRIES

SECTIONS

BODY

DOCUMENT

External References

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>
```

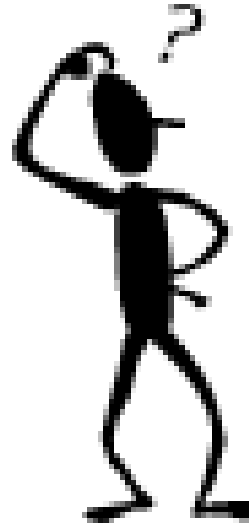
CDA, Release Two

```
<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</Text>
      <Code>
        <Value>43789009</Value>
        <CodingSystem>SNOMED CT</CodingSystem>
      </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="2.16.840.1.113883.10.20.1.14"
      <id root="2.16.840.1.113883.19" extension="1"
      <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.

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>  
  <resultInterpretation>  
  <resultReferenceRange>  
</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>
```

Thank you!

