

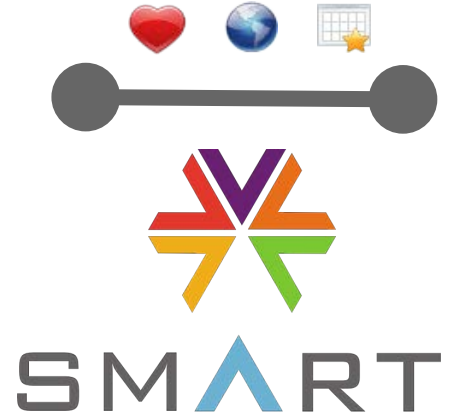
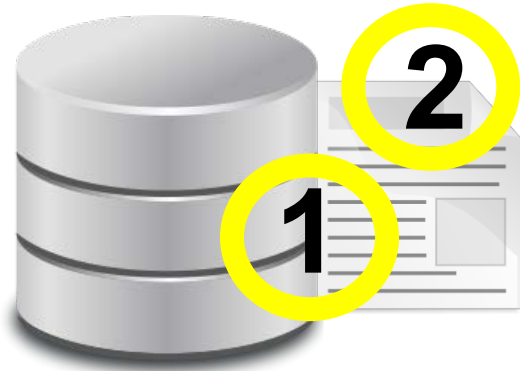
<http://bit.ly/ccda-redwood14>

# Today: C-CDA

*Redwood MedNet 2014*

Josh Mandel, MD

# Imaginary pipeline (2012)



Date: **Fri, 20 Jul 2012 12:00:02** -0700

Subject: Who's generating (prototype) CCDA documents? Let's share + discuss!

From: Josh Mandel <Joshua.Mandel@childrens.harvard.edu>

To: Structured Documents WG <strucdoc@lists.hl7.org>

#### EXECUTIVE SUMMARY:

Help build a shared, public repository of **sample CCDAs** at [https://github.com/chb/sample\\_ccdas](https://github.com/chb/sample_ccdas)

#### DETAILS:

Gaby Jewell's e-mail reminded me that *lots* of people will be implementing CCDA very soon. Many have already started.

And in addition to an excellent "bible" of an implementation guide, the community would benefit immensely from a public collection of examples that can be dissected, discussed, and corrected over time.

Of course these should involve *sample data* (not PHI), but ideally they'd represent the actual output of vendor export pipelines.

**Is anyone willing and able to participate?** If there are barriers (organizational, technical, cultural, or otherwise), can we break them down?

# Your C-CDA. Beautiful.



Paste and go.

```
<?xml version="1.0"?>
```

Score me!

Show me an example ▾

## Your C-CDA's overall score: 60%

Share your C-CDA with the SMART Community!  
P.S. We love works in progress :-)

Collapse all  Expand all

### General

64%

▼ SNOMED CT, LOINC, and RxNorm codes validate against UMLS

0/5 points

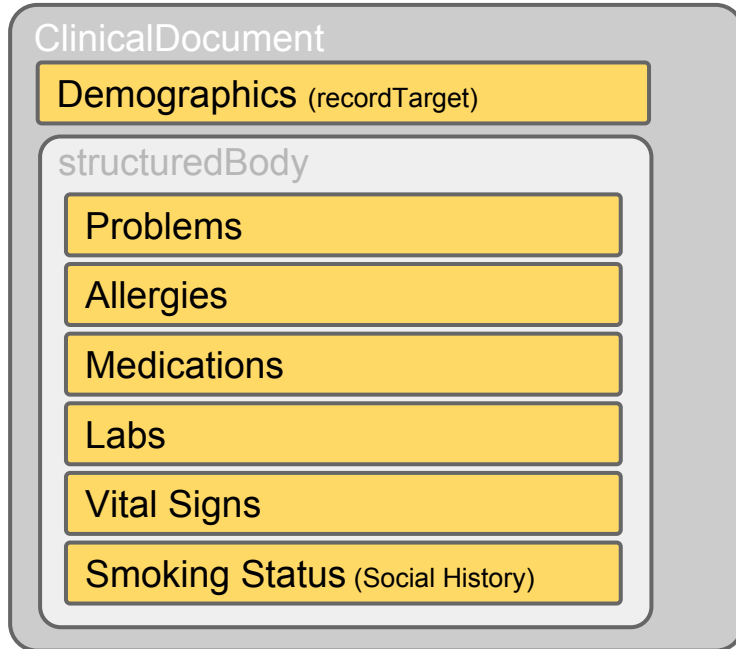
**Best Practice:** Codes that claim to be from SNOMED CT, LOINC, and RxNorm should be present in UMLS 2012AB.

Your Results:

3 of 68 codes weren't found in UMLS 2012AB

Your code		What now?
SNOMED CT:5962100	"Essential Hypertension"	Check mapping
SNOMED CT:5582204	"Hypertlipidemia"	Check mapping
SNOMED CT:49038010	"EKG"	Check mapping

# SMART C-CDA Collaborative



Focus on seven key domains to:

1. Manually examine XML to document and classify observations (>1000).
2. Use technology (e.g. C-CDA Scorecard) to examine documents.
3. Synthesize issues to interoperability.
4. Make proposals to improve, discuss, gather feedback, and work with vendors to pilot solutions.



SMART

Lantana  
CONSULTING GROUP



**Epic**



INTERSYSTEMS





## Are Meaningful Use Stage 2 certified EHRs ready for interoperability? Findings from the SMART C-CDA Collaborative

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### ABSTRACT

**Background and objective** Upgrades to electronic health record (EHR) systems scheduled to be introduced in the USA in 2014 will advance document interoperability between care providers. Specifically, the second stage of the federal incentive program for EHR adoption, known as Meaningful Use, requires use of the Consolidated Clinical Document Architecture (C-CDA) for document exchange. In an effort to examine and improve C-CDA based exchange, the SMART (Substitutable Medical Applications and Reusable Technology) C-CDA Collaborative brought together a group of certified EHR and other health information technology vendors.

**Materials and methods** We examined the machine-readable content of collected samples for semantic correctness and consistency. This included parsing with the open-source BlueButton.js tool, testing with a validator used in EHR certification, scoring with an automated open-source tool, and manual inspection. We also conducted group and individual review sessions

In our study, we apply the operational definition of semantic interoperability to assess structured data within Consolidated Clinical Document Architecture (C-CDA) documents, which certified electronic health record (EHR) systems must produce to satisfy federal regulation of EHR adoption. We study core variation in document samples to examine if reliable semantic interoperability is possible.

### EHR adoption and Meaningful Use

EHR use in the USA has risen rapidly since 2009 with certified EHRs now used by 78% of office-based physicians and 85% of hospitals.<sup>3 4</sup> Meaningful Use (MU), a staged federal incentive program enacted as part of the American Recovery and Reinvestment Act of 2009, has paid incentives of US\$21 billion to hospitals and physicians for installing and using certified EHRs pursuant to specific objectives.<sup>5 6</sup> Stage 1 of the program (MU1)

# Medications should be clear on

What drug?

How often?

How much?

---

... and then *everything else*



# What drug?

```
<code code="7982"  
  displayName="Codeine Phosphate"  
  codeSystem="2.16.840.113883.6.88"  
  codeSystemName="RxNorm">  
  <originalText>  
    <reference value="#allergy1" />  
    Codeine Phosphate  
  </originalText>  
</code>
```

```
<entry>
```

```
<act classCode="ACT" moodCode="EVN">  
  <templateId root="2.16.840.1.113883.10.20.22.4.35"/>  
  <code code="10183-2" codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC" displayName="Discharge medication"/>  
  <entryRelationship typeCode="SUBJ">  
    <substanceAdministration classCode="SBADM" moodCode="INT" negationInd="true">  
      <templateId root="2.16.840.1.113883.10.20.22.4.16"/>  
      <id extension="1898141" root="1.3.6.1.4.1.22812.11.99930.3.4.9"/>  
      <text>  
        <reference value="#ID0EAEACA"/>  
      </text>  
      <statusCode code="completed"/>  
      <effectiveTime xsi:type="IVL_TS">  
        <low nullFlavor="UNK"/>  
        <high nullFlavor="UNK"/>  
      </effectiveTime>  
      <consumable typeCode="CSM">  
        <manufacturedProduct classCode="MANU">  
          <templateId root="2.16.840.1.113883.10.20.22.4.23"/>  
          <manufacturedMaterial>  
            <code nullFlavor="OTH">  
              <originalText>  
                <reference value="#ID0EAEACA"/>  
              </originalText>  
              <translation code="410942007" codeSystem="2.16.840.1.113883.6.96" codeSystemName="SNOMED CT" displayName="drug or medication"/>  
            </code>  
            <name/>  
          </manufacturedMaterial>  
        </manufacturedProduct>  
      </consumable>  
    <entryRelationship typeCode="REFR">  
      <observation classCode="OBS" moodCode="EVN">  
        <templateId root="2.16.840.1.113883.10.20.1.57"/>  
        <templateId root="2.16.840.1.113883.10.20.1.47"/>  
        <code code="33999-4" displayName="Status" codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC"/>  
        <statusCode code="completed"/>  
        <value xsi:type="CE" codeSystem="2.16.840.1.113883.6.96" codeSystemName="SNOMED CT" code="74964007" displayName="Other"/>  
      </observation>  
    </entryRelationship>  
  </substanceAdministration>  
</entryRelationship>  
</act>  
</entry>
```

# What drug?

# How often?

```
<text>  
  Orally once a day with meals x1  
</text>  
<effectiveTime xsi:type="IVL_TS">  
  <low value="20140515" />  
  <high value="20140515" />  
</effectiveTime>  
<effectiveTime xsi:type="PIVL_TS"  
  institutionSpecified="false"  
  operator="A" />
```

# How much?

```
<doseQuantity unit="MG" value="20"/>
<consumable typeCode="CSM">
  <manufacturedProduct classCode="MANU">
    <manufacturedMaterial>
      <code code="4603" codeSystem="2.16.840.1.113883.6.88"
        codeSystemName="RxNorm"
        displayName="Furosemide 20 Mg Po Tabs">
        <originalText>
          <reference value="#med9"/>
        </originalText>
      </code>
    </manufacturedMaterial>
  </manufacturedProduct>
</consumable>
```

← Dose quantity suggests  
not pre-coordinated

} RxNorm code is  
pre-coordinated

# How much?

## White Blood Cell counts: "Thousand per microliter"

<value xsi:type="PQ" value="220" unit="THOUSAND/UL"/>

<value xsi:type="PQ" value="150" unit="X10^3/uL"/>

<value xsi:type="PQ" value="220" unit="K/uL"/>

<value xsi:type="PQ" value="6.0" unit="x10E3/uL" />

<value xsi:type="ST">7.9 X 10<sup>-3</sup>/uL</value>

<value xsi:type="ST">7.9 THOUS/MCL</value>

<value xsi:type="PQ" value="5.9" /> *[no units]*

<value xsi:type="PQ" value="6" unit="ul" /> *[??]*

# Medications should be clear on

What drug? 5/14 consistently demonstrated (meds & allergies)

How much? 4/14 consistently demonstrated

How often? 3/14 consistently demonstrated

---

... and then *everything else*

# C-CDA Medications "can" do more...

Structures for:

- Detailed timing
- Dispense history
- Precondition for administration

# Sophistication → nonsense

e.g. Improper Use of "nullFlavor"

Example from medication

```
<routeCode nullFlavor="UNK">  
  <translation code="0"  
    codeSystem=[REDACTED]  
    codeSystemName=[REDACTED]  
    displayName="Oral"/>  
</routeCode>
```



# What will it take?

Rigorous testing with realistic clinical scenarios

Publish rich [examples](#) alongside the spec

Standards focused on implementability

May have to sacrifice expressivity!

***HL7 FHIR is a very promising approach***