# Health Level Seven
# Clinical Document Architecture
# CDA Release 2.0

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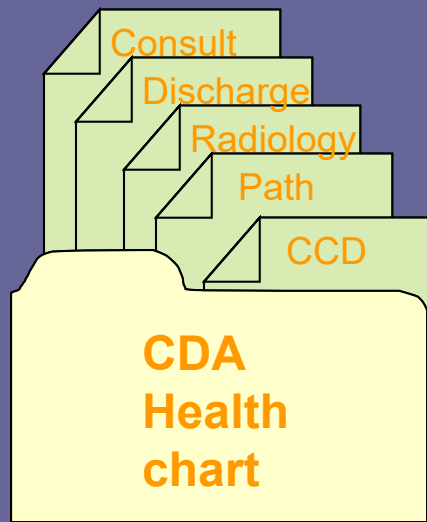
# Health Level Seven (HL7.org)


- Standards Development Organization
- Since 1985
- 2000 members: clinical, commercial, government
- 30+ international affiliates
- HL7 Version 2 messaging: workhorse of the industry
- HL7 is more than V2:
  - "A model community": building standards to a single information model
  - Reference Information Model (RIM): basis for next generation, inter-enterprise information exchange

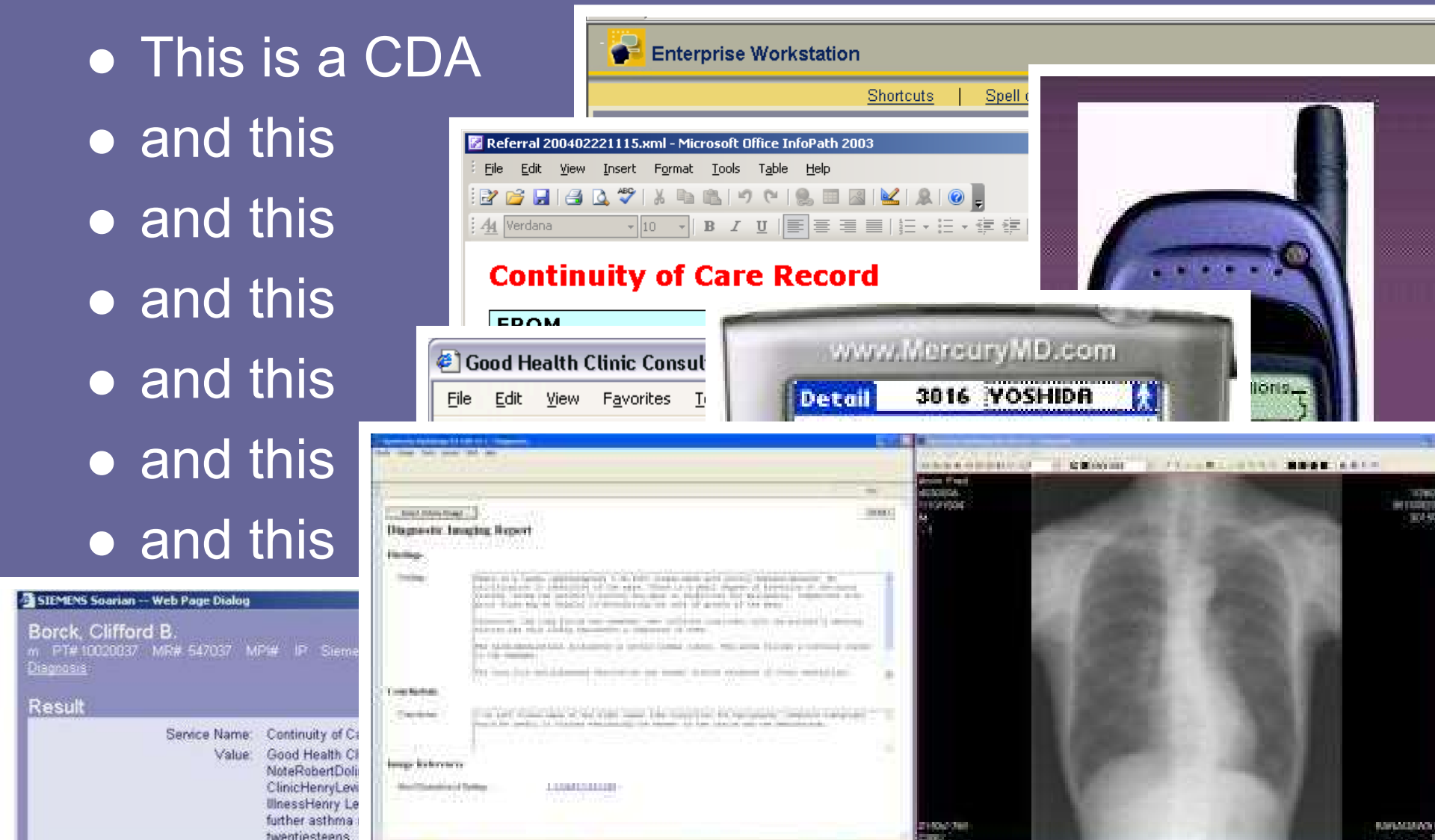
# HL7's CDA

- Clinical Document Architecture
  - ANSI/HL7 R1-2000
  - ANSI/HL7 R2-2005
- eDocuments for Interoperability
  - Key component for local, regional, national electronic health records
  - Gentle on-ramp to information exchange
    - Everyone uses documents
    - EMR compatible, no EMR required
    - All types of clinical documents



# CDA: A Document Exchange Specification

- This is a CDA
- and this
- and this
- and this
- and this
- and this
- and this



# CDA: A Document Exchange Specification

- A CDA can be a
  - Discharge Summary
  - Care Record Summary/Continuity of Care Document (CCD)
  - Progress Note
  - H&P
  - Public health report
- … any content that carries a signature
- Built for interoperability
  - XML (Extensible Markup Language, W3.com)
  - HL7 Reference Information Model (RIM)
  - and vocabulary (CPT, SNOMED, ICD, local,…)

# CDA header

- Required fields:
  - Globally-unique document ID
  - Document type code (H&P, Discharge Summary, Path report...)
  - Timestamp
  - Confidentiality code
  - Patient
  - Author
  - Custodian
- Optional:
  - Realm, template, title, language, set & version, data enterer, informant, recipient, authenticators, participants, order number, procedure, related documents, consents, encounter

# CDA header

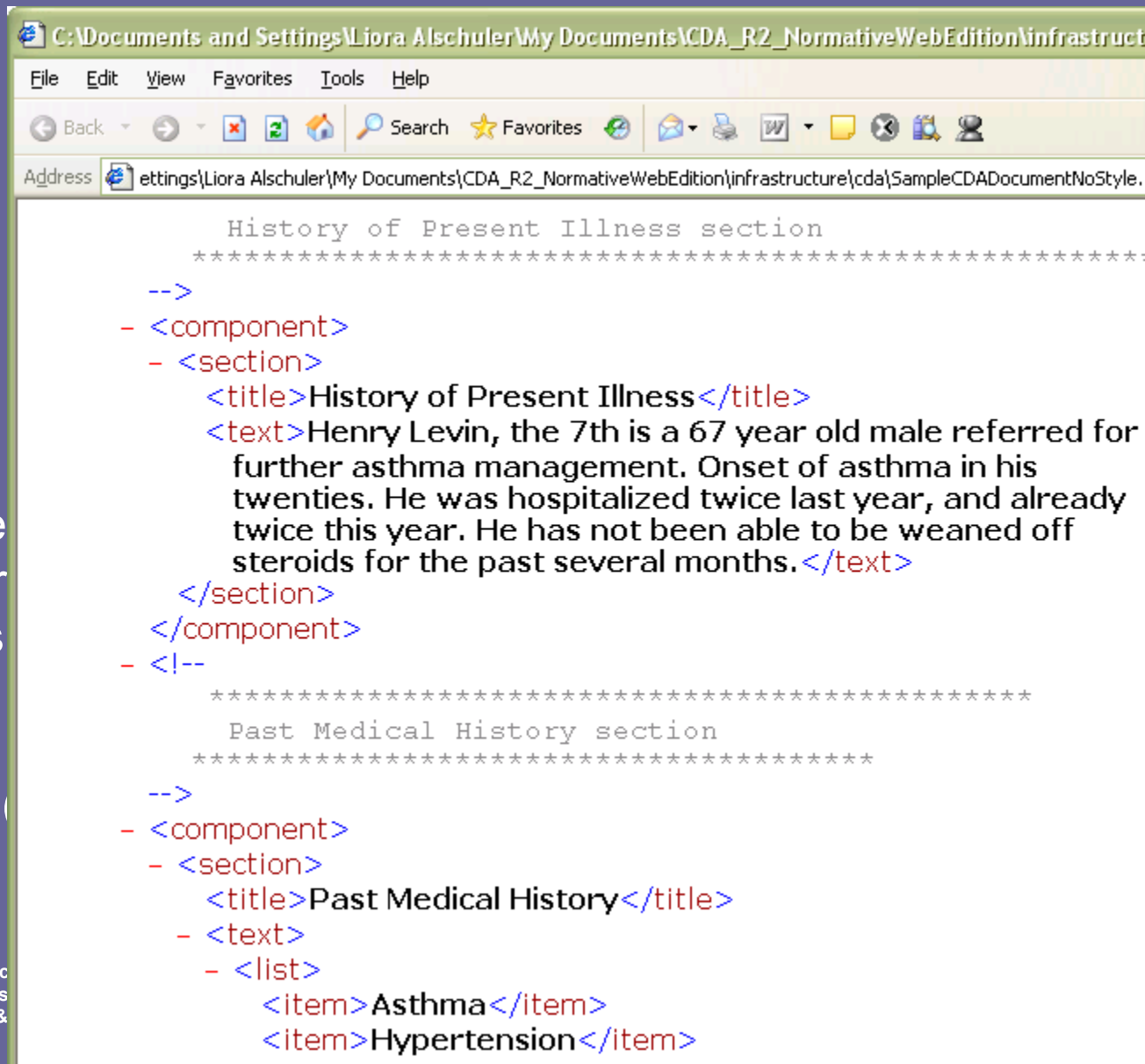
- Information sufficient to
  - Locate
  - Retrieve
  - Manage
- Extensible
- RIM-based

# CDA Body: non-XML

- Simplest CDA header + non-XML body
- Preferred non-XML document types:
  - text/rtf
  - text/html
  - text/plain
  - application/pdf
  - image/g3fax
  - image/gif
  - image/tiff
  - image/jpeg
  - image/png

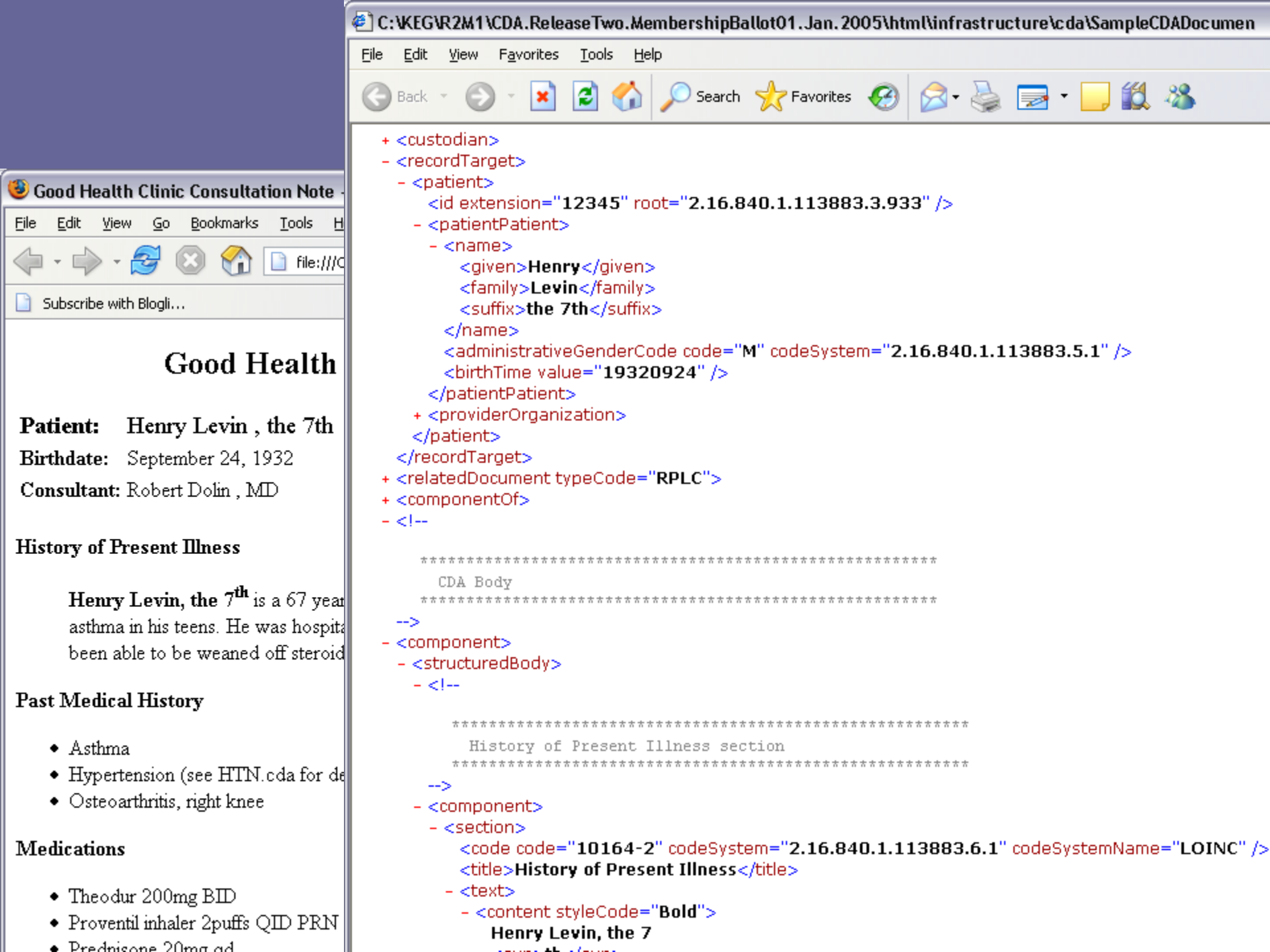
# CDA body XML

- Narrative block
  - paragraph
  - list
  - table
  - caption
  - link
  - content
  - revise (delete/inse
  - subscript/superscr
  - special characters
  - emphasis
  - line break
  - renderMultiMedia



# XML

- XML is about investing in information
  - **information design should outlive system design**
  - documents outlive the system on which they are created
- Platform and vendor independent
- Data in XML persists over time
- Data in XML can move between applications


C:\KEG\R2M1\CDA.ReleaseTwo.MembershipBallot01.Jan.2005\html\infrastructure\cda\SampleCDADocumen
File Edit View Favorites Tools Help
Back Search Favorites
+ <custodian>
- <recordTarget>
- <patient>
<id extension="12345" root="2.16.840.1.113883.3.933" />
- <patientPatient>
- <name>
<given>Henry</given>
<family>Levin</family>
<suffix>the 7th</suffix>
</name>
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<birthTime value="19320924" />
</patientPatient>
+ <providerOrganization>
</patient>
</recordTarget>
+ <relatedDocument typeCode="RPLC">
+ <componentOf>
- <!--
CDA Body
-->
- <component>
- <structuredBody>
- <!--
History of Present Illness section
-->
- <component>
- <section>
<code code="10164-2" codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC" />
<title>History of Present Illness</title>
- <text>
- <content styleCode="Bold">
Henry Levin, the 7
Good Health Clinic Consultation Note
File Edit View Go Bookmarks Tools H
Subscribe with Blogli...
Good Health
Patient: Henry Levin , the 7th
Birthdate: September 24, 1932
Consultant: Robert Dolin , MD
History of Present Illness
Henry Levin, the 7th is a 67 yea
asthma in his teens. He was hospit
been able to be weaned off steroid
Past Medical History
Asthma
Hypertension (see HTN.cda for de
Osteoarthritis, right knee
Medications
Theodur 200mg BID
Proventil inhaler 2puffs QID PRN
Prednisone 20mg qd

# and why XML alone isn't enough

- With a few simple tags, and controlled vocabulary, XML can describe anything
- but…
- the tags need to be defined:

  **<orderNum> : HL7: order placed**

  **<orderNum> : CDISC: visit sequence**
- CDA tags are defined by the HL7 Reference Information Model (RIM) and use standard controlled vocabulary

# Why isn't XML + SNOMED enough?

## Good Health Clinic Consultation note

**Consultant:** Robert Dolin, MD
**Date:** April 7, 2000
**Patient:** Henry Levin, the 7th **MRN:** 12345 **Sex:** Male
**Birthdate:** September 24, 1932

**History of Present Illness**
Henry Levin, the 7th is a 67 year old male referred for further asthma management. Onset of asthma in his ~~twenties~~ teens. He was hospitalized twice last year, and already twice this year. He has not been able to be weaned off steroids for the past several months.

**Past Medical History**
- Asthma
- Hypertension (see HTN.cda for details)
- Osteoarthritis, right knee

**Medications**
- Theodur 200mg BID
- Albuterol inhaler 2puffs QID PRN
- Prednisone 20mg qd
- HCTZ 25mg qd

**Allergies & Adv[illegible] Reactions**
- Penicillin
- Aspirin - Wheezing
- Codeine – Itching and nausea

**Family History**
- Father had fatal MI in his early 50's.

"hives": SNOMED CT **247472004**

"Dr. Dolin asserts that Henry Levin manifests hives as a previously-diagnosed allergic reaction to penicillin"

# First: human readable

**Allergies & Adverse Reactions**

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

```
<!--

**********************************************************
  Allergies & Adverse Reactions section
**********************************************************
-->
<component>
    <section>
        <code code="10155-0" codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC" />
        <title>Allergies and Adverse Reactions</title>
        <text>
            <list>
                <item>Penicillin - Hives</item>
                <item>Aspirin - Wheezing</item>
                <item>Codeine - Itching and nausea</item>
            </list>
        </text>
```

# Next: series of coded "clinical statements"

Observation: RIM-defined
History: SNOMED
Hives: SNOMED

Observation: RIM-defined
History : SNOMED
Allergy to penicillin: SNOMED

Relationship: RIM-defined
RIM-defined CDA structures + vocabulary = **Hives manifests an allergic reaction to penicillin**

```
<entry>
  <observation classCode="OBS" moodCode="EVN">
    <code code="84100007" codeSystem="2.16.840.1.113883.6.96"
          codeSystemName="SNOMED CT" displayName="history taking (procedure)" />
    <value xsi:type="CD" code="247472004" codeSystem="2.16.840.1.113883.6.96"
                         codeSystemName="SNOMED CT" displayName="Hives" />
    <entryRelationship typeCode="MFST">
      <observation classCode="OBS" moodCode="EVN">
        <code code="84100007" codeSystem="2.16.840.1.113883.6.96"
              codeSystemName="SNOMED CT" displayName="history taking (procedure)" />
        <value xsi:type="CD" code="91936005" codeSystem="2.16.840.1.113883.6.96"
                             codeSystemName="SNOMED CT" displayName="Allergy to penicillin" />
      </observation>
    </entryRelationship>
  </observation>
</entry>
```

# Then: supply context

```
<!--

************************************************************
  CDA Header
************************************************************
  -->
  <id extension="c266" root="2.16.840.1.113883.3.933" />
  <code code="11488-4" codeSystem="2.16.840.1.113883.6.1" displayName="Consultation note" />
  <title>Good Health Clinic Consultation Note</title>
  <effectiveTime value="20000407" />
  <confidentialityCode code="N" codeSystem="2.16.840.1.113883.5.25" />
  <setId extension="BB35" root="2.16.840.1.113883.3.933" />
  <versionNumber value="2" />
+<legalAuthenticator>
+<author>
+<custodian>
  <recordTarget>
     <patient>
        <id extension="12345" root="2.16.840.1.113883.3.933"
           <patientPatient>
              <name>
                 <given>Henry</given>
                 <family>Levin</family>
                 <suffix>the 7th</suffix>
              </name>
              <administrativeGenderCode code="M" codeSystem="2.16.840.1.113883.5.1" />
              <birthTime value="19320924" />
           </patientPatient>
           <providerOrganization>
              <id extension="M345" root="2.16.840.1.113883.3.933" />
           </providerOrganization>
        </patient>
     </recordTarget>
```

**Globally-unique ID**

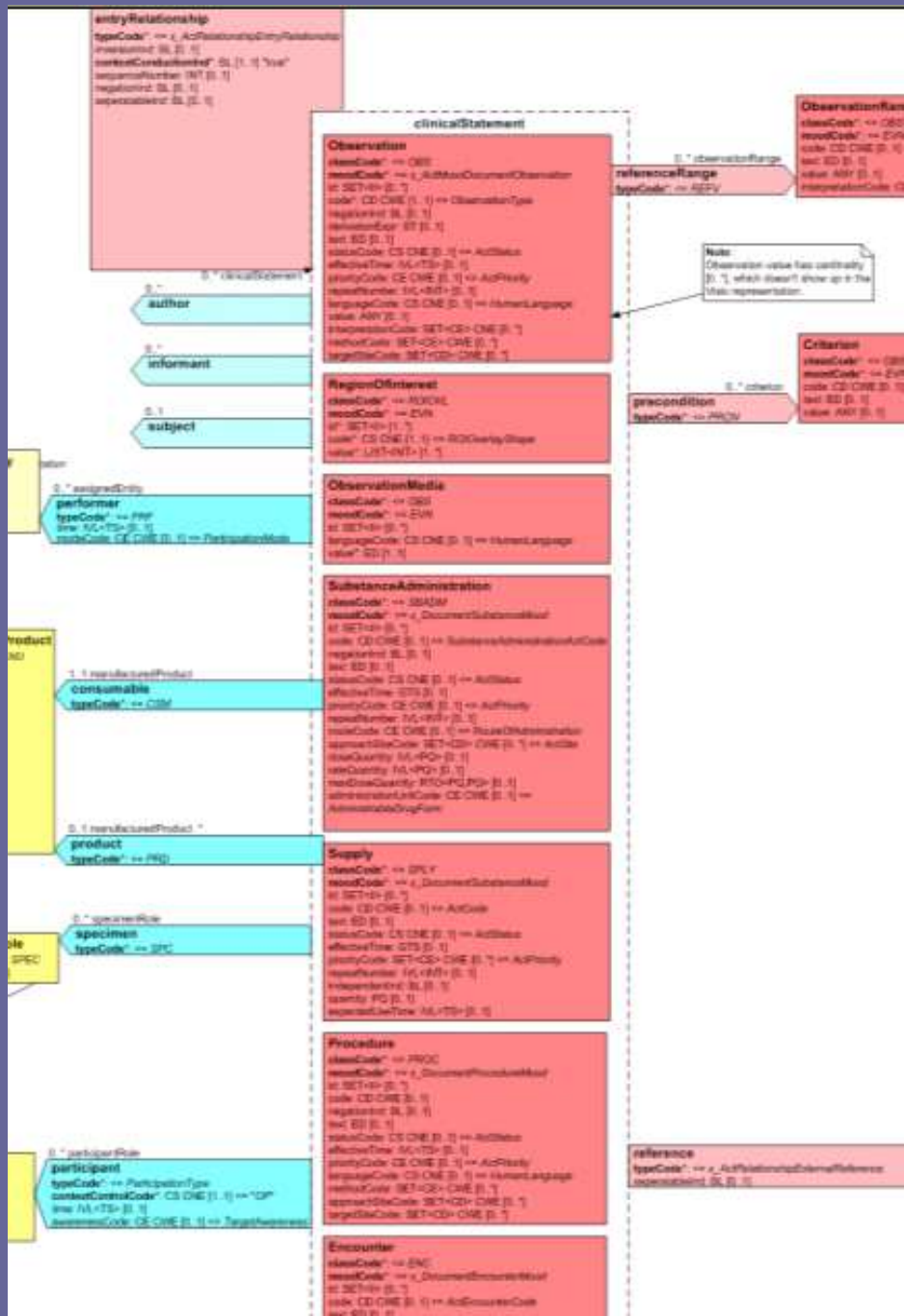
**Document type code**

**Patient, provider, location**

**Order, encounter...**

# CDA body

- Required:
  - Human readable narrative block
  - Paragraph, list, table...
- Optional: Machine processible "clinical statements"
  - Observation
  - Observation-media
    - Region of interest
  - Substance administration
  - Supply
  - Procedure
  - Encounter



# CDA Design

- Header
  - All you need for document search & retrieval
- Body
  - Non-XML: simple, low-end point of entry
  - XML narrative block: simple, reusable, XML
    - Always human readable, single stylesheet
  - XML Clinical Statements
    - RIM-based
    - Controlled vocabulary (ICD, CPT, SNOMED, MEDCIN...)
    - Interchangeable with V3 messages

# CDA for Information Exchange

- International: basis of interoperability in most advanced national networks
  - Finland, Greece, Canada, Germany, Japan, Korea, France, Italy, New Zealand, Australia, and more
- US: CMS Notice of Proposed Rule Making
  - Claims attachments using CDA + X12
  - First pilot concluded, others underway
- US: Integrating the Healthcare Enterprise
  - IHE Medical Summary – CDA for NHIN/RHIO exchange

# CDA for Information Exchange

- IHE choice for Medical Summaries

| | |
|---|---|
| MediNotes | MediNotes e |
| NextGen Healthcare Information Systems | NextGen EMR |
| AllScripts | Touchworks EHR |
| GE Healthcare | Centricity® Enterprise Solution (formerly Carecast) |
| Philips Medical Systems | Xtenity |
| McKesson | Horizon Ambulatory Care |
| CapMed/IBM | Personal HealthKey |
| Eclipsys | Sunrise |
| Medical Informatics Engineering | Webchart |
| Dictaphone | Enterprise Workstation |
| Epic Systems | EpicCare |
| GE Healthcare | Centricity® Physician Office |
| Misys Healthcare Systems | Misys Connect |
| Siemens | Soarian |

# CDA: Investing in Information

- CDA at the Mayo Clinic
  - Initiated in 1999
  - 10,000's of documents each week
  - Clinical documents: Most important capital asset
- CDA at New York Presbyterian (was Col-Pres)
  - "CDA Philosophy"
  - Clinical notes contain critical information in narrative
  - Best format for information mining and aggregation across applications
  - 1/3 of all discharges summaries

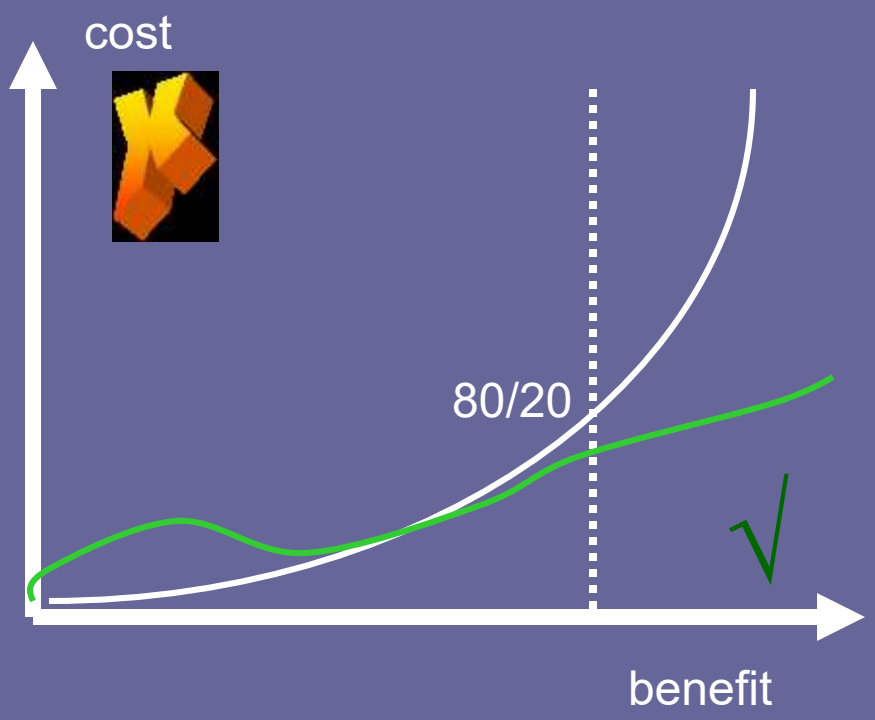
# CDA: Return on Investment

- Low end: Access to documents
  - “please send referral letter to…”
  - “please get me the discharge summary…”
  - “what imaging reports are available from the last episode?”
- High end: Reuse
  - Decision supports
  - Send synopsis to tumor board
  - Attach to claim for automated adjudication of payment
  - Extract data for clinical research

# Investing in Information: phased approach

- Lay groundwork
  - CDA header metadata
  - XML or non-XML CDA body
- Build
  - Consensus on requirements
  - Understanding of modeling process
  - Vocabulary glossary
- Understand
  - Relationship of vocabulary to model
- Introduce interoperable semantic content as requirements and business drivers dictate

# Investing in Information




- Dissecting the curve
- What is easy:
  - Header
  - Human-readable body
  - Low degree of coding
- What is hard:
  - Concensus on semantic content requirements
  - Model/vocabulary interface

# CDA for complete interoperabilty

- CDA for clinical summaries
  - Care Record Summary (CRS)
  - Continuity of Care Document (CCD)
- CDA for clinical specialties
  - CDA Imaging reports
    - In conjunction with American College of Radiology/DICOM/HL7 Imaging Integration
  - CDA Pathology reports
    - In conjunction with College of American Pathology/HL7 Path SIG
  - CDA for anesthesiology, pediatrics, dental and more, all in development
  - CDA claims attachments
    - Six document types approved, more in development

# CDA Resources

- HL7 Web site:
  - CDA Normative Web Edition
  - http://www.hl7.org/Special/committees/lists.cfm
    - CDA: strucdoc@lists.hl7.org
    - CCD: ccd@lists.hl7.org
- JAMIA
  - 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
- Liora Alschuler - Liora@alschulerassociates.com
  - CDA Quick Start Guide
  - CRS Quick Start Guide
  - EHRVA CDA/CRS Validator