



HL7 and Electronic Attachments; A Primer

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Primer on Attachments

- Standards and Implementation Guides
- What is '**Unsolicited**' Process?
- What is '**Solicited**' Process?
- X12 and HL7 Working Together
- Logical Observation Identifiers Names and Codes - LOINC
- Regenstrief LOINC Mapping Assistant - RELMA
- Value Set Authority Center - VSAC



Purpose – Bridge Administrative and Clinical

Common standards used for clinical data exchange.

Also used as Attachments for Administrative Services

- Claim payment
- Prior authorization
- Referrals
- Notifications
- Post Adjudicated Claims



HL7 Standards for Attachments

- Base Standard:
 - HL7 Clinical Document Architecture (CDA Release 2.0, 2005)
- HL7 CDA Implementation Guides:
 - Consolidated CDA 2.1 (C-CDA)
 - Exchange of C-CDA Based Documents
 - Periodontal Attachment, Release 1
 - ... many others
- HL7 Attachments Implementation Guide:
 - Additional rules for using CDA as attachments
 - Constrains set of allowable attachments
 - Must use common metadata set (US Realm Header from C-CDA)
 - Includes C-CDA, other clinical documents
 - Includes any content as C-CDA Unstructured Document
 - Set can be extended without revision to rules, if using US Realm Header



X12 Attachment Standards

- ASC X12 Documents
 - ASC X12N 277 Health Care Claim Request for Additional Information
 - ASC X12N 275 Additional Information to Support a Health Care Claim or Encounter
 - ASC X12N 278 Health Care Services Review – Request for Review and Response
 - ASC X12N 275 Additional Information to Support a Health Care Services Review
 - ASC X12N 837 Health Care Claim: Professional (837-P)
 - ASC X12N 837 Health Care Claim: Institutional (837-I)
 - ASC X12N 837 Health Care Claim: Dental (837-D)



Other Supporting Documents

- WEDI/ASC X12/HL7 Attachments Collaboration Project (ACP)
 - Guidance on Implementation of Attachments for Healthcare Transactions
- HL7 Documents
 - HL7 CDA Quick Reference Guide
 - HL7 Clinical Documents for Payers Set 1 (CDP1)
 - HL7 Digital Signatures and Delegation of Rights Release 1



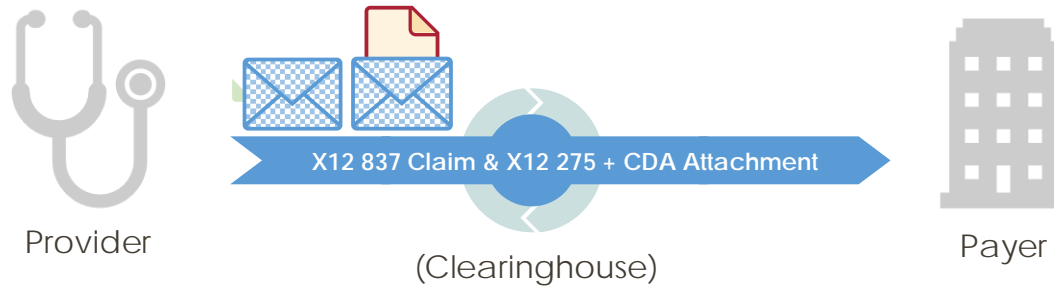
How X12 and CDA Work Together

- X12 275 is the envelope
 - Ties attachment to
 - Patient
 - Claim
 - Attachment request (solicited scenario)
- HL7 CDA Contains
 - Detailed demographics
 - Author/Attester information
 - Detailed clinical information
 - Structured (coded data) or unstructured (embedded PDF, etc.)
- Payload in 275 envelop
 - Base64 encoded
 - Binary Data Segment (BDS)



Unsolicited Process

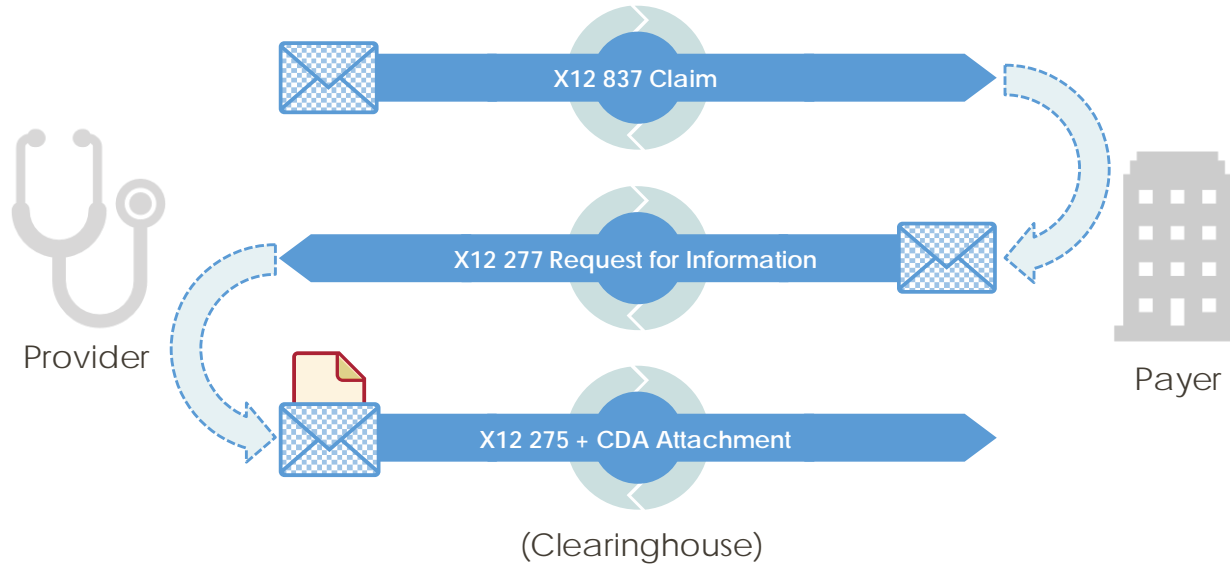
- Idealized orchestration: Unsolicited Claims Attachment





Solicited Process

- Idealized orchestration: Solicited Claims Attachment





X12 and CDA Example

X12 275

Base 64 Encoded CDA Document

```
ST*275*1001*00602~
BGN*11*0001*20120~
NM1*PR*2*ABC INSUR~
NM1*41*2*XYZ SERV~
NM1*1P*HOLY HILLS~
NX1*1P~
N3*2345 WINTER BLVD~
N4*MIAMI*FL*33132~
NM1*QC*1*JACKSON*JACK*J***MI*987654321~
REF*EJ*JACKSON123~
REF*EA*STHHL12345~
DTP*472*D8*20111229~
LX*1~
TRN*2*1822634840~
STC*R4:11490-0:20120103:LOI*20120103~
DTP*368*D8*20120110~
CAT*AE*MB~
OOI*1*47*ATTACHMENT~
BDS*ASC*6289*..... <BASE 64 ENCODED CDA~
SE*27*1001~
```

```
TWfUIGlzIGRpc3Rpbmd1aXNoZWQsIG5vdCBvbmx5IGJ5IGhpcyByZWZzb24sIGJldCBieSB0aGlzIHN
pbmd1bGFyIHhhc3Npb24gZnJvbSBvdGhlciBhbmltYWxzLCB3aGljaCBpcyBhIGxlc3Qgb2YgdGhlIG
1pbmQsIHROeXQgYnkgYSBwZXJzZXZlcmFuY2Ugb2YgZGVsaWdodCBpbiB0aGUgY29udGluZWVkaGFuZ
CBpbmRlZmF0aWdhYmxlIGd1bmVvYXRpb24gb2Yga25vd2x1ZGdlLCBlleGNlZWRzIHROZSBzaG9ydCB2
ZWhlbWVvY2Ugb2YgYW55IGNhcm5hbCBwbGVhc3VyZS4=
....
```

Unencoded CDA XML Document

```
<ClinicalDocument xmlns="urn:hl7-org:v3">
  <realmCode code="US" />
  <typeId extension="PCOD_HD000040" root="2.16.840.1.113883.1.3"/>
  <templateId root="2.16.840.1.113883.10.20.22.1.2" extension="2015-08-01"/>
  <templateId root="2.16.840.1.113883.10.20.22.1.2"/>
  <templateId root="2.16.840.1.113883.10.20.22.1.1"/>
  <id extension="TT988" root="2.16.840.1.113883.19.5.99999.1"/>
  <code code="34133-9" displayName="Summarization of Episode Note"
    codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC"/>
  <title>Patient Chart Summary</title>
  <effectiveTime value="201308151030-0800"/>
  <confidentialityCode code="N" displayName="normal"
    codeSystem="2.16.840.1.113883.5.25"
    codeSystemName="Confidentiality"/>
  <languageCode code="en-US" />
  ...
</ClinicalDocument>
```



LOINC Codes

Logical Observations Identifiers Names & Codes

- All the “big” labs
- All health-related federal agencies
- HIE’s
- Insurance companies
- EHR vendors
- Free, used world wide, updated twice a year
 - Attachments constrains the use of more than 60,000+ codes
 - List of codes for Requesting documents types
 - List of codes for Provider Responses
 - Ability to have new LOINC codes assigned
 - HL7 Attachment Work Group
 - Regenstrief



Request vs. Response Codes

- Payers request attachments using the HIPAA tab in RELMA (Regenstrief LOINC Mapping Assistant tool)
 - Generic document types like Consult Note, etc. preferred
- Providers may respond with:
 - The code from the request
 - A specific type such as Anesthesiology Consult Note
 - Any code they feel is appropriate from the LOINC document ontology (LOINC codes where SCALE=DOC)



Request Attachment Types in RELMA (HIPAA Tab)

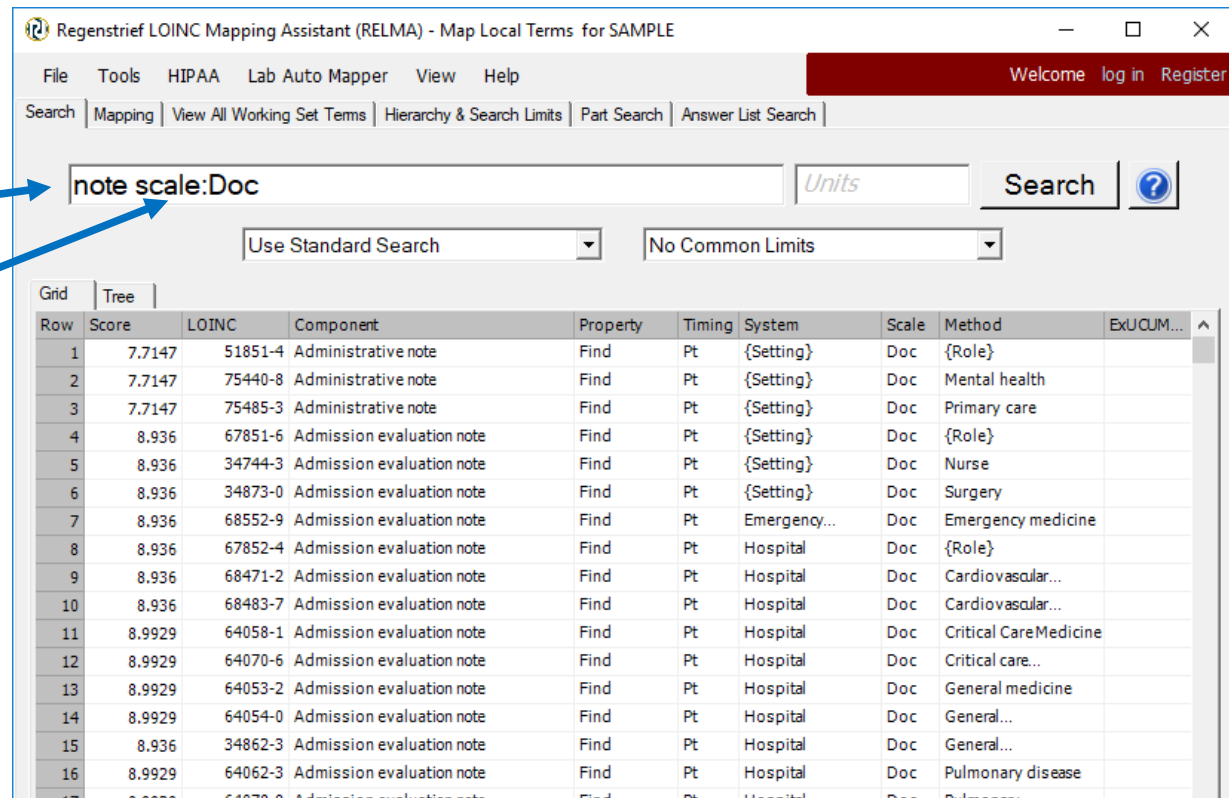
- Clinical Document types (Structured)
- Clinical & Administrative Document Types (Unstructured & Structured)

Documents with implementation guide	Documents without implementation guide	Valid attachment requests	Request Modifier Codes
Document (Attachment) Type Codes			
Consolidated CDA (C-CDA) R2.1			
Attachment Name	LOINC		
<input type="checkbox"/> Continuity of Care Document			
<input type="checkbox"/> Summary of episode note	34133-9		
<input type="checkbox"/> Care plan			
<input type="checkbox"/> Consultation note			
<input type="checkbox"/> Diagnostic imaging report			
<input type="checkbox"/> Discharge summary			
<input type="checkbox"/> History and physical note			
<input type="checkbox"/> Procedure note			
<input type="checkbox"/> Progress note			
<input type="checkbox"/> Referral note			
<input type="checkbox"/> Surgical operation note			
<input type="checkbox"/> Transfer summary			
Wrapped Text	Expand	Collapse	Print Preview

Documents with implementation guide	Documents without implementation guide	Valid attachment requests	Request Modifier Codes
Row	Attachment Name		
1	Advanced beneficiary notice		
2	Appeal denial letter		
3	Automobile liability		
4	Blood glucose monitors		
5	Charge ticket or encounter form		
6	Continuous positive airway pressure (CPAP)		
7	Dental X-rays and other images (not DICOM)		
8	Eligibility acknowledgement		
9	Employee assistance program		
10	Enteral nutrition		
11	Explanation of benefits		
12	Explanation of benefits to subscriber		
13	External infusion pump		
14	First report of injury		
15	Gait trainers		
16	General correspondence		
17	Home health claims		
18	Home health prior authorization		
19	Hospital beds		
20	Immunosuppressive drugs		
		Wrapped Text	

Finding Response Attachment Types in RELMA

- Using the search tab in RELMA
 - Add search term (Ex.: “note”)
 - Add scale: Doc after search term to limit to document type codes



Regenrief LOINC Mapping Assistant (RELMA) - Map Local Terms for SAMPLE

File Tools HIPAA Lab Auto Mapper View Help

Welcome log in Register

Search Mapping View All Working Set Terms Hierarchy & Search Limits Part Search Answer List Search

note scale:Doc Units Search ?

Use Standard Search No Common Limits

Row	Score	LOINC	Component	Property	Timing	System	Scale	Method	ExJUCUM...
1	7.7147	51851-4	Administrative note	Find	Pt	{Setting}	Doc	{Role}	
2	7.7147	75440-8	Administrative note	Find	Pt	{Setting}	Doc	Mental health	
3	7.7147	75485-3	Administrative note	Find	Pt	{Setting}	Doc	Primary care	
4	8.936	67851-6	Admission evaluation note	Find	Pt	{Setting}	Doc	{Role}	
5	8.936	34744-3	Admission evaluation note	Find	Pt	{Setting}	Doc	Nurse	
6	8.936	34873-0	Admission evaluation note	Find	Pt	{Setting}	Doc	Surgery	
7	8.936	68552-9	Admission evaluation note	Find	Pt	Emergency...	Doc	Emergency medicine	
8	8.936	67852-4	Admission evaluation note	Find	Pt	Hospital	Doc	{Role}	
9	8.936	68471-2	Admission evaluation note	Find	Pt	Hospital	Doc	Cardiovascular...	
10	8.936	68483-7	Admission evaluation note	Find	Pt	Hospital	Doc	Cardiovascular...	
11	8.9929	64058-1	Admission evaluation note	Find	Pt	Hospital	Doc	Critical CareMedicine	
12	8.9929	64070-6	Admission evaluation note	Find	Pt	Hospital	Doc	Critical care...	
13	8.9929	64053-2	Admission evaluation note	Find	Pt	Hospital	Doc	General medicine	
14	8.9929	64054-0	Admission evaluation note	Find	Pt	Hospital	Doc	General...	
15	8.936	34862-3	Admission evaluation note	Find	Pt	Hospital	Doc	General...	
16	8.9929	64062-3	Admission evaluation note	Find	Pt	Hospital	Doc	Pulmonary disease	



Relma demo



Looking Up Lists of Codes (Value Sets)

- C-CDA/MU require certain value sets
 - Gender
 - Race/Ethnicity
 - ... many others
- Use the Value Set Authority Center (VSAC)
 - Search or download C-CDA value sets
 - Requires a free UMLS License to access
 - <https://vsac.nlm.nih.gov/>



VSAC Search Example (Gender)

Search the NLM Value Set Repository

Query:

[Apply Filters](#) [Clear Filters](#)

Narrow search results by selecting from pull-down menus below:

CMS eCQM Releases

CMS eCQM ID (NQF Number)
 EP EH

Quality Data Model Category

C-CDA

[Export Search Results](#)

Select a hyperlinked OID to see its value set details.

Matched Value Sets

[Download](#) [View](#) [Toggle](#) [Clear](#) Page 1 of 1 20 View 1 - 4 of 4

<input type="checkbox"/>	Name	Code System	Type	Steward	OID	Code Count [?]
<input type="checkbox"/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
<input type="checkbox"/>	Administrative Gender (HL7 V3)	AdministrativeC	Extensional	HL7 Terminology	2.16.840.1.113883.1.11.1	3
<input type="checkbox"/>	EncounterTypeCode	CPT	Extensional	HL7 Terminology	2.16.840.1.113883.3.88.12.80.32	176
<input type="checkbox"/>	Problem	SNOMEDCT	Extensional	HL7 Terminology	2.16.840.1.113883.3.88.12.3221.7.4	115898
<input type="checkbox"/>	Procedure	SNOMEDCT	Extensional	HL7 Terminology	2.16.840.1.113883.3.88.12.80.28	57058

[Download](#) [View](#) Page 1 of 1 20 View 1 - 4 of 4



VSAC Search Results (Example)

Value Set Members

Expanded Code List				
Code	Descriptor	Code System	Version	Code System OID
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<u>E</u>	Female	AdministrativeGen	HL7V3.0_2016	2.16.840.1.113883.5.1
<u>M</u>	Male	AdministrativeGen	HL7V3.0_2016	2.16.840.1.113883.5.1
<u>UN</u>	Undifferentiated	AdministrativeGen	HL7V3.0_2016	2.16.840.1.113883.5.1

```
<administrativeGenderCode code="M" codeSystem="2.16.840.1.113883.5.1"/>
```



VSAC demo



Attachment Payloads: A Deep Dive into HL7 C-CDA for Attachments



Session Outline

- Introduction
- CDA Overview
- CDA Header
- CDA Body
- Wrap Up and Audience Q&A



Audience

- Technical implementers in Provider, Payer, and Clearinghouse settings
 - Software architects
 - Software developers
 - Information analysts
 - Information technology (IT) staff
 - Information managers
 - Vendors
- ... others needing technical details of HL7 CDA use in attachments



CDA OVERVIEW



CDA and C-CDA

- Clinical Document Architecture (CDA)
 - A specification for exchange of clinical documents, defining their structure and semantics
 - ANSI standard developed by HL7's Structured Documents Work Group (SDWG)
 - ISO standard
- Clinical documents
 - Defined: authenticated part of clinical record, less like EDI and more like a contract
 - Human readable: required
 - Machine readable (coded data): optional, defined by templates, per use case
- "Architecture": constrain for specific use cases
 - Implementation guides such as C-CDA
 - Document types for primary care and transfer of care in the US
 - C-CDA cited under Meaningful Use



Key Characteristics

- Persistence
- Stewardship
- Potential for authentication
- Context
- Wholeness
- Human readability



CDA = Header + Body

- CDA Header

- Identifies:

- Patient
- Author
- Custodian
- Type of document (e.g., Discharge summary)

- Sufficient for:

- Medical records management
- Document management
- Enable clinical document exchange across and within institutions

- CDA Body

- Contains the clinical content

- Supports StructuredBody and NonXMLBody

- StructuredBody includes:

- Sections – human-readable
- Entries – discrete clinical statements for machine processing

- NonXMLBody

- PDF
- JPEG

- Simple XML Body

- Proposed Jan 2018



C-CDA and Meaningful Use

- C-CDA: US Realm Implementation Guide for CDA
- Common Meaningful Use (MU) Data Set Covered by C-CDA Header
 - Patient name
 - Sex
 - Date of birth
 - Race
 - Ethnicity
 - Preferred language
 - Care team member(s)
- Other MU items addressed in the C-CDA Structured Body (discussed in a future webinar)

CDAR2_IG_CCDA_CLINNOTES_R1_DSTU2.1_2015AUG_Vol1_Introductory_Material



**HL7 Implementation Guide for CDA® Release 2:
Consolidated CDA Templates for Clinical Notes
(US Realm)
Draft Standard for Trial Use Release 2.1**

Draft Standard for Trial Use

August 2015

Volume 1 — Introductory Material

Sponsored by:
Structured Documents Work Group
Patient Care Work Group
Child Health work Group

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CDA HEADER



CDA Header Example

```
<effectiveTime value="201308151030-0800"/>
<confidentialityCode code="N" displayName="normal" codeSystem="2.16.840.1.113883.5.25" codeSystemName="Confidentiality"/>
<languageCode code="en-US"/>
<setId extension="sTT988" root="2.16.840.1.113883.19.5.99999.19"/>
<!-- Version of this document -->
<versionNumber value="1"/>
<recordTarget>
  <patientRole>
    <id extension="444222222" root="2.16.840.1.113883.4.1"/>
    <!-- Example Social Security Number using the actual SSN OID. -->
    <addr use="HP">
      <!-- HP is "primary home" from codeSystem 2.16.840.1.113883.5.1119 -->
      <streetAddressLine>2222 Home Street</streetAddressLine>
      <city>Beaverton</city>
      <state>OR</state>
      <postalCode>97867</postalCode>
      <country>US</country>
      <!-- US is "United States" from ISO 3166-1 Country Codes: 1.0.3166.1 -->
    </addr>
    <telecom value="tel:+1(555)555-2003" use="HP"/>
    <!-- HP is "primary home" from HL7 AddressUse 2.16.840.1.113883.5.1119 -->
    <patient>
      <name use="L">
        <given>Eve</given>
        <!-- The "SP" is "Spouse" from HL7 Code System EntityNamePartQualifier 2.16.840.1.113883.5.43 -->
        <family qualifier="SP">Betterhalf</family>
      </name>
      <administrativeGenderCode code="F" displayName="Female" codeSystem="2.16.840.1.113883.5.1" codeSystemName="Administrative Gender Codes"/>
      <!-- Date of birth need only be precise to the day -->
      <birthTime value="19750501"/>
      <maritalStatusCode code="M" displayName="Married" codeSystem="2.16.840.1.113883.5.2" codeSystemName="MaritalStatusCode"/>
      <religiousAffiliationCode code="1013" displayName="Christian (non-Catholic, non-specific)" codeSystem="2.16.840.1.113883.5.1013" codeSystemName="Religious Affiliation Codes"/>
      <!-- CDC Race and Ethnicity code set contains the five minimum race and ethnicity categories defined by OMB Standards -->
      <raceCode code="2106-3" displayName="White" codeSystem="2.16.840.1.113883.6.238" codeSystemName="Race & Ethnicity - CDC" codeSystemName="Race & Ethnicity - CDC"/>
      <!-- The raceCode extension is only used if raceCode is valued -->
      <sdtc:raceCode code="2076-8" displayName="Hawaiian or Other Pacific Islander" codeSystem="2.16.840.1.113883.6.238" codeSystemName="Race & Ethnicity - CDC" codeSystemName="Race & Ethnicity - CDC"/>
      <ethnicGroupCode code="2186-5" displayName="Not Hispanic or Latino" codeSystem="2.16.840.1.113883.6.238" codeSystemName="Race & Ethnicity - CDC" codeSystemName="Race & Ethnicity - CDC"/>
    </patient>
  </patientRole>
</recordTarget>
```

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Required vs. Optional Metadata for Attachments

- Required

- Template ID
- Document ID
- Document Type Code
- Document Title
- Document Date
- Patient Demographics
- Author
- Provider Organization
- Signing Clinician

- Optional

- Versioning Info
- Encounter Date
- Orders and Procedures
- Consents

- Details on following slides ...



CDA Header Walkthrough

- Objectives:
 - Understand the C-CDA header
 - Comply with the HL7 Attachments Implementation Guide
 - Show where to go for more information



Required Fields

- Following slides provide:
 - Minimum data to satisfy each required field
 - HL7 V3 datatype peculiarities, as they are encountered
 - Variable data shown in **blue**



Template ID (identifier)

- Asserts conformance to a set of rules
- US Realm Header template asserts MU metadata conformance

```
<templateId root="2.16.840.1.113883.10.20.22.1.1" />
```



Document ID

- Globally unique ID for the document
- Typically a UUID (universally unique identifier)
<https://tools.ietf.org/html/rfc4122>

```
<id root="038323a1-1673-401f-ab20-6393b53d1052" />
```



Document Type Code (LOINC Code)

- Type of document (Ex.: Diagnostic Imaging Report)
- Represented with LOINC codes

```
<code  
  code="18748-4"  
  codeSystem="2.16.840.1.113883.6.1"  
  codeSystemName="LOINC"  
  displayName=  
    "Diagnostic Imaging Report"  
>
```



Document Title

- Human readable title of the document
- Should not conflict with the LOINC code

```
<title>Diagnostic Imaging Report: MRI</title>
```



Document Date (Effective Time)

- Time the document was created
- For scanned documents:
 - When the original paper document was created
 - Not the time it was scanned

```
<effectiveTime value="20170929171504-0500" />
```



HL7 V3 Date/Time Fields

- Format
 - YYYYMMDDHHMMSS.UUUU[+|-ZZZZ]
 - [+|-ZZZZ] specifies time zone as the difference from Coordinated Universal Time (UTC)
- Omit digits from right to left to express less precision
- Most common formats:
 - YYYYMMDD
 - YYYYMMDDHHMMSS-ZZZZ
- Examples:
 - **20170910**
Sept 10, 2017
 - **20170910103000-0500**
Sept 10, 2017 at 10:30am EST



Patient Demographics (Record Target)

- Requires the following for C-CDA/MU compliance:
 - Patient ID(s)
 - Address
 - Contact information
 - Name
 - Gender
 - Race/Ethnicity



Record Target Example

```
<recordTarget>
  <patientRole>
    <id extension="12345" root="2.16.840.1.113883.19.5"/>
    <addr>
      <streetAddressLine>17 Daws Rd.</streetAddressLine>
      <city>Blue Bell</city><state>MA</state><postalCode>02368</postalCode>
      <country>USA</country>
    </addr>
    <telecom value="tel:(781)555-1212"/>
    <patient>
      <name>
        <given>Adam</given><family>Everyman</family>
      </name>
      <administrativeGenderCode code="M" codeSystem="2.16.840.1.113883.5.1"/>
      <birthTime value="19541125"/>
      <raceCode code="2106-3" displayName="White"
        codeSystem="2.16.840.1.113883.6.238"/>
      <ethnicGroupCode code="2186-5" displayName="Not Hispanic or Latino"
        codeSystem="2.16.840.1.113883.6.238"/>
    </patient>
  </patientRole>
</recordTarget>
```


- Represents author(s) of a document
- Typically includes the following:
 - Authoring Time
 - ID
 - Name
 - Address
 - Contact information
 - Organization



Author Example

```
<author>
  <time value="20170929171504-0500" />
  <assignedAuthor>
    <id extension="123456" root="2.16.840.1.113883.19.5" />
    <addr>
      <streetAddressLine>21 North Ave.</streetAddressLine>
      <city>Burlington</city>
      <state>MA</state>
      <postalCode>02368</postalCode>
      <country>USA</country>
    </addr>
    <telecom value="tel:(555)555-1003" />
    <assignedPerson>
      <name>
        <given>Henry</given>
        <family>Seven</family>
      </name>
    </assignedPerson>
  </assignedAuthor>
</author>
```



Provider Organization (Custodian)

- Represents the organization responsible for the document
- Typically includes the following:
 - ID
 - Name
 - Address
 - Contact Information



Custodian Example

```
<custodian>
  <assignedCustodian>
    <representedCustodianOrganization>
      <id root="2.16.840.1.113883.19.5" />
      <name>Good Health Clinic</name>
      <telecom value="tel:(555)555-1212" />
      <addr>
        <streetAddressLine>
          17 Daws Rd.
        </streetAddressLine>
        <city>Blue Bell</city>
        <state>MA</state>
        <postalCode>02368</postalCode>
        <country>USA</country>
      </addr>
    </representedCustodianOrganization>
  </assignedCustodian>
</custodian>
```



Signing Clinician (Legal Authenticator)

- Clinician with the legal authority to sign the document
- Typically the same as the author, but can be a different person



Legal Authenticator Example

```
<legalAuthenticator>
  <time value="20170929171504-0500" />
  <signatureCode code="S" />
  <assignedEntity>
    <id extension="123456" root="2.16.840.1.113883.19.5" />
    <addr>
      <streetAddressLine>21 North Ave.</streetAddressLine>
      <city>Burlington</city>
      <state>MA</state>
      <postalCode>02368</postalCode>
      <country>USA</country>
    </addr>
    <telecom value="tel:(555)555-1003" />
    <assignedPerson>
      <name>
        <given>Henry</given><family>Seven</family>
      </name>
    </assignedPerson>
  </assignedEntity>
</legalAuthenticator>
```



Representing Phone/Email in CDA

- URI (Uniform Resource Identifier) format for phone numbers and email addresses
- Coded as in a web page hyperlink
- Examples:

```
<telecom value="tel:+1-555-555-5003" />
```

```
<telecom value="mailto:user@example.com" />
```



What If I Don't Have The Required Data?

- CDA “escape hatch” = nullFlavor
- States why you don't have a piece of required information
- Examples:
 - NI: no information (default)
 - UNK: unknown
 - MSK: masked (for privacy)

```
<id nullFlavor="NI" />  
<telecom nullFlavor="UNK" />
```




Basic Header Boilerplate

- Fields in a CDA document that can typically be defaulted for attachments in the US:
 - realmCode (fixed)
 - typeId (fixed)
 - confidentialityCode
 - languageCode

```
<ClinicalDocument xmlns="urn:hl7-org:v3">
  <realmCode code="US"/>
  <typeId extension="POCD_HD000040" root="2.16.840.1.113883.1.3"/>
  ...
  <confidentialityCode code="N" displayName="normal"
    codeSystem="2.16.840.1.113883.5.25"
    codeSystemName="Confidentiality"/>
  <languageCode code="en-US"/>
  ...
</ClinicalDocument>
```



Other Optional Metadata Fields

- Versioning Info
- Encounter Date
- Orders and Procedures
- Consents



CDA BODY



Body Types

- Non XML Body
 - Used for including files like PDFs in a CDA document.
 - Useful for
 - Legacy electronic documents
 - Scanned paper data
 - Systems that can only export PDF
 - etc.
- Structured Body
 - Typically exported by MU certified EHRs
 - Includes both human readable content and coded data
 - Coded data can include:
 - Problems
 - Allergies
 - Medications
 - Procedures
 - etc.
- Simple XML Body (Proposed)
 - Native CDA documents with narrative but little or no coding
 - Incremental step beyond PDF
 - Sections can use LOINC codes or just titles
 - January 2018 ballot



Non-XML Body Examples

- Two options for including files such as PDFs:
 - Embedding them via Base64 encoding
 - Referencing them via URI

The HL7 attachments IG requires Base64 encoding except by prior arrangement between trading partners.

```
<nonXMLBody>
  <text
    mediaType="application/pdf"
    representation="B64">
    JVBERi0xLjQONJeLjz9MNCjE2IDAgb2Jq...
  </text>
</nonXMLBody>
```

or

```
<nonXMLBody>
  <text mediaType="application/pdf" >
    <reference
      value="UD_sample.pdf" />
  </text>
</nonXMLBody>
```



Structured Body Example (Narrative)

```
<section>
  <!-- conforms to Allergies section with entries optional -->
  <templateId root="2.16.840.1.113883.10.20.22.2.6" />
  <!-- Allergies section with entries required -->
  <templateId root="2.16.840.1.113883.10.20.22.2.6.1" />
  <code code="48765-2" codeSystem="2.16.840.1.113883.6.1" />
  <title>ALLERGIES, ADVERSE REACTIONS, ALERTS</title>
  <text>
    <table border="1" width="100%">
      <thead>
        <tr>
          <th>Substance</th>
          <th>Overall Severity</th>
          <th>Reaction</th>
          <th>Reaction Severity</th>
          <th>Status</th>
        </tr>
      </thead>
      <tbody>
        <tr>
          <td>ALLERGENIC EXTRACT, PENICILLIN</td>
          <td>Moderate to Severe</td>
          <td>Nausea</td>
          <td>Mild</td>
          <td>Inactive</td>
        </tr>
      </tbody>
    </table>
  </text>
```

Rendered View

ALLERGIES, ADVERSE REACTIONS, ALERTS

Substance	Overall Severity	Reaction	Reaction Severity	Status
ALLERGENIC EXTRACT, PENICILLIN	Moderate to Severe	Nausea	Mild	Inactive



Structured Body Example (Coded Data)

```

<observation classCode="OBS" moodCode="EVN">
  <id root="80a6c740-67a5-11db-bd13-0800200c9a66"/>
  <code
    code="26515-7"
    codeSystem="2.16.840.1.113883.6.1"
    displayName="PLT"/>
  <statusCode code="completed"/>
  <effectiveTime value="200003231430-0400"/>
  <value xsi:type="PQ"
    value="123"
    unit="10+3/u1"/>
  <interpretationCode
    code="L"
    codeSystem="2.16.840.1.113883.5.83"/>
  <referenceRange>
    <observationRange>
      <value xsi:type="IVL_PQ">
        <low value="150" unit="10+3/u1"/>
        <high value="350" unit="10+3/u1"/>
      </value>
    </observationRange>
  </referenceRange>
</observation>

```

- Lab Result
- LOINC code for Platelets
- Observation made on March 23, 2000 at 14:00
- The measured value: 123
- Interpretation is “low”
- The measured value is less than the low value of the reference range (why the interpretation is low)



Simple XML Body Example

```
<structuredBody>
  <component>
    <section>
      <code code="48765-2"
        codeSystem="2.16.840.1.113883.6.1"
        codeSystemName="LOINC" />
      <title>Allergies</title>
      <text>
        <list listType="unordered">
          <item>Penicillin: Hives</item>
        </list>
      </text>
    </section>
  </component>
  <component>
    <section>
      <title>Problems</title>
      <text>
        <list listType="unordered">
          <item>Hypertension</item>
        </list>
      </text>
    </section>
  </component>
</structuredBody>
```




Codes, IDs, and OIDs

- Many coding systems and identifier (ID) types in health IT
 - Code Ex: LOINC, SNOMED, ICD-9/10, etc.
 - ID Ex: SSN, Passport Number, Driver Licence Number, MRN, etc.
 - Codes and IDs are meaningless unless you know their definitions
- CDA uses OIDs to identify code systems and ID types
 - LOINC = 2.16.840.1.113883.6.1
 - SNOMED = 2.16.840.1.113883.6.96
 - SSN = 2.16.840.1.113883.4.1
- Example: what kind of ID is this?

```
<id extension="SMITHL321OG" />
```

- Mayo Clinic Medical Record Number?
- Colorado Driver License Number?
- Ireland Voter Registration ID?



Identifier Example

- Can you tell now?

```
<id  
extension=" SMITHL325OF "  
root=  
" 2.16.840.1.113883.4.3.53 "  
>
```

- Use the HL7 OID Registry to look up common OIDs (free), or to get an OID for your organization (for a fee).

OID Information	
Composite OID / GUID:	<input type="text" value="2.16.840.1.113883.4.3.53"/>
Replace By OID:	
OID Status:	<input type="text" value="OID review is complete"/>
OID Type:	<input type="text" value="4 - OID for a Registered Namespace"/>
V2.x Linkage	<input type="text"/>
Assigning/Registration Authority:	<input type="text"/>
* Full Name for Object (Title):	<input type="text"/>
Entry Timestamp:	
Description of the Object identified by the OID (Be as comprehensive as you wish):	<input type="text" value="Washington Motor Vehicle Bureau"/>
External OID SubType	<input type="text"/>
Preferred_Realm:	<input type="text" value="(UV) Universal"/>
* Desired Symbolic Name (short):	<input type="text" value="WashingtonDLN"/>



The HL7 OID Registry

- Search for OIDs
- Download all known OIDs as a spreadsheet
- Obtain your own OID:
<http://www.hl7.org/oid>

The screenshot shows the HL7 OID Registry website. On the left is a navigation sidebar with sections: Home (Home, Obtain or Register an OID), OID Excel Reports (All OIDs, External Coding System OIDs, Internal Coding System OIDs, Ad-Hoc Reporting), Search for an OID (Status: All, OID: [input], Symbolic Name: [input], Description: [input], Full Name for Object: [input], Find OID button), Edit My OID Data (Enter your OID: [input], Enter your OID Key: [input], Edit OID button), and Email OID Keys (Enter your Email Address: [input], Email OID Keys button). The main content area features the HL7 International Registry logo, an 'Admin Login' link, and a red 'Obtain or Register an OID' button. Below is the 'Introduction for the HL7 Object Identifier (OID) Registry' section, which includes an 'ISO Object Identifier (OID) Definition:' and a paragraph explaining that an OID is a globally unique ISO (International Organization for Standardization) identifier. It further details that OIDs are paths in a tree structure, created by Registration Authorities, and used in HL7 models. A 'New' notice is also present in the right sidebar under 'OID Registry Help', stating: 'New - For help with the OID process, please download and view this Introduction and Overview to the HL7 OID Registry. For general OID Registry questions, please email OIDRegistry@HL7.org. For questions related to the purchase of OID coupons, please email webmaster@HL7.org'. Other sidebar sections include 'HL7 OID Resources' (V2 Global Message Profile Library, Submit 2 x Global Message Profile, OID Registry FAQ Wiki) and 'Other OID Resources' (The General International OID).



Validating CDA Documents

- Why validate?
 - Validation ensures conformance to requirements
 - Without validation, there is no guarantee that an instance is actually correctly implemented
- Validation tools
 - HL7 provided tools
 - CDA XML Schema
 - C-CDA Schematron Schema
 - Available from HL7's gForge Subversion repository: <https://gforge.hl7.org/svn/strucdoc>
 - Online validation tools
 - C-CDA Scorecard: <https://sitenv.org/scorecard/>
 - Edge Testing Tool (ETT): <https://tppedge.sitenv.org/tpp/#/validators>
 - Lantana CDA Validator: <http://lantanagroup.com/validator/>



Rendering CDA Documents

- CDA Stylesheets
 - XSLT stylesheets that convert CDA to HTML
 - Can run directly in a browser for real-time rendering, or run separately to generate a static HTML version of the document.
 - HL7 CDA Stylesheet available in gForge:
<https://gforge.hl7.org/svn/strucdoc>
 - Lantana stylesheet:
<https://github.com/lantanagroup/stylesheets>
- CDA Rendering Challenge
 - <http://www.hl7.org/events/toolingchallenge.cfm>



Rendering Examples

Good Health History & Physical

EVE BETTERHALF

PATIENT CHART SUMMARY

PATIENT CHART SUMMARY

Input CDA Document

HL7 C-CDA Viewer

Summary of Care

Patient Adam Everyman
D.O.B October 22, 1962 **Sex** ♂ Male
[Patient Detail](#)

You can arrange the document to your preferences. Move sections by dragging them. Hide by closing. Use the TOC to review.

Reason for referral

Pulmonary function tests, Dr. Penny Puffer, Tel: 555-555-1049, 1047 Healthcare Drive, Portland, OR 97005, Scheduled date: 08/17/2012

Medications

Medication	Instructions	Dosage	Effective Dates (start - stop)	Status
Albuterol 0.09 MG/ACTUAT	2 puffs every 6 hours PRN wheezing		Aug 10, 2012 -	Active

Social history

Smoking Status:

- Never smoked Started: Stopped: Recorded August 15, 2012 08:00am

Plan of care

Date/time	Goal	Instructions
ⓘ (1) potential duplicate row. Click here to hide.		
August 15, 2012 10:00am	Weight Loss	Patient Education: Diet and exercise counseling provided during visit.
August 15, 2012 10:00am	Asthma management	Patient Education: Resources and instructions provided during visit.

Name	Date	Details
Pulmonary Function Tests, Dr. Penny Puffer, Tel: 555-555-1049, 1047 Healthcare Drive, Portland OR 97005	17-Aug-2012	Indication: Encounter Diagnosis - Costal Chondritis

Functional and cognitive status

Assessment	Date	Results	Comments
Functional Status	August 15 2012, 5:32pm	No impairment	
Cognitive Status	August 15 2012, 5:32pm	No impairment	

Procedures

No Information

Immunizations

Vaccine	Lot Number	Date	Status
Influenza Virus Vaccine	1	8/15/2010	Completed

Results

Result	Value	Units	Range	Date	Interpretation
CO2	27	mmol/L	23-29 mmol/L	8/15/2012	Normal

Encounters

Encounter	Performer	Location	Encounter date	Diagnosis	Diagnosis Status
Office outpatient visit	Dr. Samir Kahn Internal Medicine	Community Urgent Care (Urgent Care Center) 1004 Healthcare Dr. Portland, OR 97005	August 15, 2012	Costal Chondritis	Active

Problem list

Name	Dates	Status
Costal Chondritis	Onset: Aug 15, 2012	Active
Asthma	Onset: Sept 25, 2011	Active

Allergies, adverse reactions and alerts

Allergen	Reaction	Reaction Severity	Documentation Date	Start Date
Penicillin G benzathine	Hives	Severe	August 15 2012	2010
Codeine	Nausea	Mild to moderate	August 15 2012	

Vital signs

Date	Test	Result	Details
15-Aug-2012	Height	70 in	
	Weight	195 lb	
	Body Mass Index Calculated	28	
	BP Systolic	155 mm[Hg]	
	BP Diastolic	92 mm[Hg]	

Table of Contents

Collapse/Expand all

Made by Backbeach Software

RESULTS

Checkup Examination

Performer Name

Community Urgent Care Center

September 27, 2012 at 1:00pm

SOCIAL HISTORY

tel: (555)555-1212