

# **HL7 Additional Information Specification Implementation Guide**

(This specification replaces  
*Additional Information Specification Implementation Guide*  
May 2004)

Release 3.0  
Based on HL7 CDA Standard Release 2.0

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# 1 Introduction

In conjunction with the documents listed below, this Implementation Guide constitutes a solution to send additional supporting documentation for various business functions. This includes the requirements for electronic transmission of **claims attachments** included in the Health Insurance Portability and Accountability Act of 1996 (HIPAA). The specific relationship of this material to the HIPAA Claims Attachment regulation is further explained in section 1.1.1.

The electronic attachment solution is comprised of these basic concepts:

- Solicited Attachments - A query/response framework, allowing a provider to respond to a payer's request for additional information.
- Unsolicited Attachments – A framework allowing providers to send additional information unsolicited by the health plan. The provider may send this information in the same interchange as the claim or in a separate interchange. For HIPAA claims attachments, the Final Rule posted in the federal register is expected to define under what circumstances unsolicited attachments may be sent.
- Standardized codes that represent the specific information needed (or returned), and that can limit (or extend) the request to a particular timeframe - see the AIS and LOINC® Modifiers documents, below
- Adaptability to technological differences among trading partners, to help reduce implementation barriers - see the rest of this Implementation Guide, and the CDA Release 2.0 Standard, below

The set of specifications that define the attachments standards proposed under the HIPAA regulation is defined below:

- Health Level Seven (HL7) Additional Information Specification Implementation Guide, Release 3.0 (this document).
- Five HL7 additional information specifications (AIS) containing the LOINC code tables specific to requests for additional information. These specifications may be read in any order.
- The HL7 publication: *LOINC® Modifier Codes (For use with ASC X12 277 Implementation Guides when Requesting Additional Information to support a Health Care Claim)*.
- ASC X12 277 *Health Care Claim Request for Additional Information* Implementation Guide; a product of the insurance subcommittee (X12N) of Accredited Standards Committee X12.<sup>1,2</sup>
- ASC X12 275 *Additional Information to Support a Health Care Claim or Encounter* Implementation Guide; a product of the insurance subcommittee (X12N) of Accredited Standards Committee X12.<sup>3</sup>

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<sup>1</sup> Within the HL7 Implementation Guide, references to the transaction defined by this document will be abbreviated by calling it 277. The implied citation is to this particular X12N document.

<sup>2</sup>Information on this and other X12/HIPAA-related implementation guides is available from the Washington Publishing Company. <http://www.wpc-edi.com/>

There are other business uses of this approach for attachments not governed by HIPAA at the time of this publication. These include the following documents which replace the 277 and 275 above, as well as the other documents defined in this section.

- ASC X12 278 *Health Care Services Review and Response* Implementation Guides; a product of the insurance subcommittee (X12N) of Accredited Standards Committee X12. Used to request and provide additional information in support of a request for pre-certification or pre-authorization\*.
- ASC X12 277 (004050X164) *Request for Information in Support of a Disability Claim* Implementation Guide; a product of the insurance subcommittee (X12N) of Accredited Standards Committee X12. Used to request and provide information in support of a disability claim\*.
- ASC X12 275 *Additional Information to Support a Health Care Services Review* Implementation Guide; a product of the insurance subcommittee (X12N) of Accredited Standards Committee X12. Used to provide the additional information in support of a referral, pre-certification, or pre-authorization\*.

\* Throughout this document and the AIS documents, there are references to the 277 Request for Additional Information and the use of the 275 Additional Information to Support a Health Care Claim or Encounter. The above attachment references for those business functions not governed by HIPAA, can be used in the same manner as the 277 and 275 described throughout the documents. When using this material for these other business functions, the 278 *Health Care Services Review and Response* or 277 *Request for Information in Support of a Disability Claim* will replace the references for the 277. References to the 275 *Additional Information to Support a Health Care Claim* are replaced by the 275 *Additional Information to Support a Health Care Services Review*.

The proposed use of the attachment transactions can be better understood by reading the following additional documents, in this sequence:

- Health Level Seven (HL7) Clinical Document Architecture (CDA), Release 2.0, April 2005 (ANSI/HL7 CDA R2-2005).
- Health Level Seven (HL7) Reference Information Model, Release 1.0, December 2003 (ANSI/HL7 RIM R1-2003).
- Health Level Seven (HL7) Data Types, Release 1.0, December 2003 (ANSI/HL7 DT R1-2003).
- Health Level Seven (HL7) Implementation Technology Specification, Release 1.0, April 2004 (ANSI/HL7 XMLITS DT R1-2004).
- Health Level Seven (HL7) Vocabulary Domains, March 2006
- The Unified Code for Units of Measure (UCUM) is available from <http://aurora.regenstrief.org/ucum>

HL7 and other organizations have published or are in the process of publishing white papers to provide more insight into specific topics associated with this concept. References to these papers can be found on the HL7 website at: <http://www.hl7.org/Special/committees/claims/index.cfm>.

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<sup>3</sup> Within the HL7 Implementation Guide, references to the transaction defined by this document will be abbreviated by calling it 275. The implied citation is to this particular X12N document.



## 1.1 Conceptual Approach

This implementation guide describes how to prepare documents for various attachment transactions. It was originally written to provide electronic supporting documentation that is associated with a healthcare claim or encounter, but it may be used for other transactions as well, where there is a need to provide supplementary information electronically to support the transaction. *Electronic* supporting documentation in this context is a collection of *data components* that has been given a name, Identification Code, and a LOINC code. These defined data components are used in requests for information and are sometimes used in the transmission of the attachment information.

The items defined for electronic supporting documentation were developed by industry domain specific Work Groups and balloted through HL7. many of the items described in the attachments are based on an analysis of paper forms that have been used by payers in the past. Each possible attachment item; however, has been reviewed for appropriateness in an electronic format.

In some cases, electronic supporting documentation has been defined for situations where there was not a specific paper precursor. For example, items have been defined to send various kinds of clinical reports, laboratory results, and patient medication information.

This Implementation Guide specifies construction rules for an XML document that follows the rules of the Health Level Seven (HL7) Clinical Document Architecture (CDA) and is further constrained to contain specific content for use in electronic attachment transactions. For the purposes of electronic claims attachments for HIPAA, these CDA documents will be embedded in the Binary (BIN) segment of the ASC X12 275.

### 1.1.1 Relationship to the Health Insurance Portability and Accountability Act (HIPAA)

This document is intended to be compliant with the data standards requirements set forth by the Health Insurance Portability and Accountability Act (HIPAA) of 1996. At the time of this publication, the concepts defined in this Implementation Guide were proposed in the HIPAA Notice of Proposed Rulemaking (NPRM) for governance of electronic exchange of additional information to support a health care claim or encounter. It is expected that this implementation guide and the supporting AIS documents will be named in the final rule for claims attachments.

The ability to support attachments for purposes other than claims attachments is also included in this Implementation Guide; however, these purposes are not expected to be governed by HIPAA.

### 1.1.2 Relationship to X12 Transactions

As described in the ASC X12 Implementation Guide, the LX loop in the 275 includes a Binary (BIN) segment that will contain an HL7 CDA document. The HL7 CDA document may include an electronic attachment in its entirety or it may contain the specifics of one or more attachment data components.

Figure 2.6-1 shows an example of an HL7 CDA document embedded in an X12 275. The HL7 XML document is in boldface. The HL7 CDA document will be referred to as the CDA document throughout this and related specifications.

### 1.1.3 No Site-Specific Variations in Content or Format

The economic benefits of HIPAA and standards in general are obtained, in part, by creating a universal specification. Providers will not have to maintain large libraries of variations on transaction formats to meet the differing requirements of payers. It is intended that the formats in

this Implementation Guide meet the requirement for universality. This implementation guide and the Additional Information Specifications (AIS) introduces a concept called “cardinality” which defines if a specific data element is required or optional and the number of iterations that can be sent. Cardinality is explained in further detail in section 2.10. Where options exist in the HL7 CDA, the Implementation Guide or AIS should definitively specify which would be used. Occasionally, however, the senders need options to cover alternative use cases. When this occurs, the AIS specifies that one of the alternatives must be sent. In these cases where such options exist in the AIS, the receivers will accept all of the options that exist. For example, the electronic attachment for ambulance has a data element called patient weight. There are three different LOINC codes for patient weight according to whether the weight was measured, estimated, or stated by the patient or an agent of the patient. The attachment specifies the option to use any of the three LOINC codes.

## **1.2 Electronic Supporting Documentation Authority**

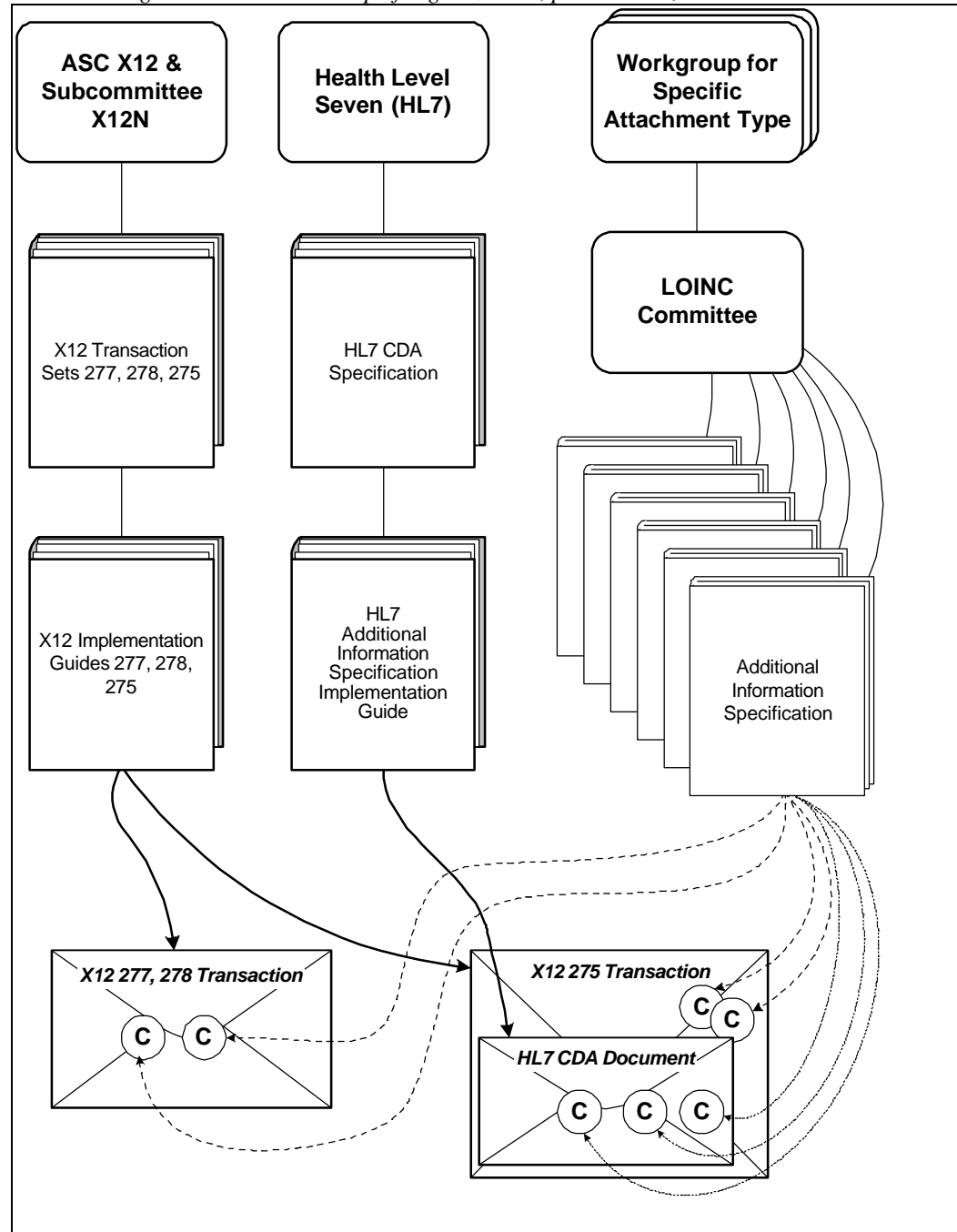
In most of the AIS's, HL7 describes the data that is both optional and required. While HL7 provides the maximum list of possible data that could be sent, the choice of what is actually sent is determined by the circumstances of requesting and/or sending additional information. Additionally, HL7 specifies how to format the HL7 CDA documents that are embedded within X12 transactions and contain the prescribed information specified in this Implementation Guide.

Initiatives to create new attachments will usually come from industry stakeholders through the affiliated group of HIPAA Designated Standards Maintenance Organizations, the DSMO. To determine content, workgroups are formed by conducting national outreach to all stakeholders, including, but not limited to, all DSMO members. Members of the HL7 Attachments Special Interest Group (ASIG) facilitate these workgroups. As the industry experts from the specific attachment type domain develop the content for the attachment, it is then shared with the ASIG in HL7. Once approved there it is sent to the HL7 membership for ballot and approval before being offered to HHS for consideration as a new attachment type under HIPAA.

Once specific attachment type work groups establish the requirements for attachment data components and that attachment passes HL7 ballot, the ASIG requests LOINC codes to be added to identify these data elements. Those codes are established and maintained by the LOINC Committee. Once the attachment type work group establishes a specific set of concepts that are the valid components and answer parts for the data components, and this is approved by the ASIG and passes HL7 ballot, the LOINC Committee provides codes to identify those concepts.

### **1.2.1 Documentation and Business Flow for Attachments (both Claims and Prior Authorization)**

Figure 1.2-1 illustrates the relationship of the organizations, documents, transaction messages, and codes. The ASC X12 implementation guides determine the contents of the ASC X12 transactions up to the BIN segment. It also specifies the use of externally defined LOINC codes in certain data fields. The HL7 Implementation Guide defines the format of the CDA document in the BIN segment. Externally defined LOINC codes are used to identify the question being asked and answered in specified data fields of the X12 277/278 and 275 transactions.

*Figure 1.2-1. Relationship of organizations, publications, and transactions.*

As of the publication of this implementation guide, five Additional Information Specification definitions are available to describe electronic supporting documentation for:

- Ambulance services
- Rehabilitation services, addressing nine disciplines: alcohol/substance abuse, cardiac, medical social services, occupational therapy, physical therapy, psychiatric, respiratory therapy, pulmonary therapy, skilled nursing and speech therapy
- Narrative clinical reports, including, but not limited to, those shown in Table 1.2-1, below
- Laboratory results

- Medications.

In addition, a specification is available that enumerates the use of LOINC codes in modifying the scope of requests in the ASC X12 277 transaction.

*Table 1.2-1. Sample Clinical report topics.*

anesthesia	diagnostic imaging	flexible sigmoidoscopy	progress note
arthroscopy	discharge note	history and physical	radiology
bronchoscope	echo heart	notes	spirometry
cardiac catheterization	EEG brain	initial assessment	surgical pathology
colonoscopy	EKG	nursing	temperature chart total
consultation note	electromyogram	OB echo	triage note
consultation request	endoscopy	operative note	visit note
cytology	exercise stress test	procedure note	

### 1.3 Authority, Organization and Scope of this Document

This Implementation Guide is based on the *HL7 Clinical Document Architecture (ANSI/HL7 CDA R2-2005)*, an ANSI-accredited American National Standard. The HL7 Membership in a letter ballot, using the procedure for publishing HL7 Recommendations, has approved this Implementation Guide.

The organization of this specification is described below:

- Section 1 is this introduction
- Section 2 provides foundational information on the CDA and the general approach to CDA-based attachments.
- Section 3 provides the rules for constructing a CDA document that conforms to this specification for attachments.
- Section 4 describes non-normative supplementary information that is included in the publication package. Non-normative data is data supplied for informational purposes to further explain or clarify some text on concept. Users may choose to use this non-normative data.
- Section 5 contains the Unified Code of Units of Measure (UCUM) table. This is a large table of units of measures used in attachment documents. To conserve space, it has been included in this document and will not be repeated in each of the relevant AIS documents.

Those sections of this document that are normative are explicitly identified by including the word "Normative" in the section title. Sections not so marked are not normative.

### 1.4 Health Level Seven Organization

The mission of HL7 is to provide standards for the exchange, management, and integration of data that support clinical patient care and the management, delivery, and evaluation of healthcare services. Founded in 1987, HL7 is a not-for-profit Standards Developing Organization (SDO) that specializes in developing standards for the exchange of clinical data among disparate health care computer applications. Like ASC X12, the American National Standards Institute (ANSI) accredits HL7.

The HL7 membership represents more than 2,200 people drawn from more than 1000 of the nation's leading organizations with an interest in this topic. These include the industry's leading

healthcare provider organizations, 90% of the top vendors selling information systems to healthcare providers, as well as consulting firms, payers, pharmaceutical vendors, other healthcare organizations and healthcare professional associations. HL7 has international chapters in Argentina, Australia, Brazil, Canada, China, Croatia, The Czech Republic, Denmark, Finland, Germany, India, Japan, Korea, Lithuania, New Zealand, Southern Africa (representing Angola, Botswana, the Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Spain, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe), Taiwan, The Netherlands, and the United Kingdom.

HL7 complements ASC X12 in that its interests have been to support the clinical processes, whereas Task Group 2, X12N (the Healthcare Task Group of the Insurance Subcommittee of X12) focuses on administrative and financial processes within healthcare.

For information on membership and obtaining HL7 standards, contact:

Health Level Seven  
3300 Washtenaw Ave., Suite 227  
Ann Arbor, MI 48104-4261  
(734) 677-7777  
hq@hl7.org  
<http://www.hl7.org>

## 1.5 Logical Observation Identifier Names and Codes (LOINC<sup>®</sup>)

The HL7 encoding of attachments makes extensive use of the code set, *Logical Observation Identifier Names and Codes (LOINC)*. LOINC codes are available for commercial use without charge, subject to the terms of a license that assures the integrity and ownership of the codes.

**Note:** All LOINC codes and descriptions are copyrighted by the Regenstrief Institute, with all rights reserved. See <http://www.LOINC.org>.

LOINC codes are used for several different purposes in the ASC X12 transactions and the HL7 CDA Document related to attachments, for example:

- ASC X12 277 *Health Care Claim Request for Additional Information* and the ASC X12 278 *Health Care Services Review and Response* identifies the "question" or data requested
- ASC X12 275 *Additional Information to Support a Health Care Claim or Encounter* – and the ASC X12 275 *Additional Information to Support a Health Care Services Review* provides a mechanism to define the type of data contained in the attachment
- HL7 CDA Document
  - a) Defines the type of attachment contained in the CDA document
  - b) Defines the individual data components used to provide electronic supporting documentation

Section 1.5.1, identifies the use of LOINC codes for electronic supporting documentation.

**Note:** the table provides a general orientation to how LOINC codes are used. The specific usage of LOINC codes in X12 277 or 278 and X12 275 transactions is described in the X12 implementation guides cited in Section 1. The STC or HI segments in these transactions have separate positions for the Scope Modifiers and Attachment Identifier, so LOINC codes can be used for both purposes in a single transaction. The specific usage of LOINC codes in the HL7 CDA documents is defined in the Additional Information Specifications.

### 1.5.1 LOINC Codes for Electronic Supporting Documentation

LOINC codes are used to identify:

- The implicit scope of a request in an ASC X12 277 transaction; e.g., to modify a request for serology lab values to specify only the abnormal results for a period 30 days prior to treatment, as a **Modifier Code**.
- An electronic attachment in its entirety (e.g., a request for the Ambulance attachment in support of a claim for ambulance services), as an **Attachment Type Identifier**.
- A category of clinical report (e.g., send any reports of CAT scans of the head that are related to the claim or a specific service), as an **Attachment Type Identifier** appearing in the CDA Header.
- One or more **Attachment Components** of an electronic attachment (e.g., a request for the number of miles that the ambulance drove in support of a claim for ambulance services).
- A part or parts of a clinical report (e.g., the impression section of a radiology report in support of a claim or a specific service), as the **Attachment Component** identifier appearing in the <code> of the <section> in the CDA document.
- A category of laboratory results (e.g., hematology results that are related to the claim or a specific service), as the **Attachment Component** identifier appearing in the <code> of the <section> in the CDA document.
- A category of medication information (e.g., send the discharge medications that are related to the claim or a specific service), as the **Attachment Component** identifier appearing in the <code> of the <section> in the CDA document.
- One of a set of observations that compose a single attachment component (e.g., in an obstetrical study, one code identifies number of prior births, and another distinct code provides the estimated date of delivery), as an **Attachment Component Answer Part**.

LOINC codes used in Additional Information Specifications are requested by the HL7 ASIG attachment workgroup that developed the content for the specific attachment.

Table 1.5-1 below describes briefly the use of LOINC in the various attachment components.

*Table 1.5-2 Relationship and Use of LOINC Codes, ASC X12 Transactions, and HL7 CDA Documents.*

<b><i>Purpose of Attachment</i></b>	<b><i>ASC X12 277/278</i></b> <b><i>Request for additional information to support a health care claim OR Services Review</i></b>	<b><i>ASC X12 275</i></b> <b><i>Additional information to support a health care claim or encounter OR Services Review</i></b>	<b><i>HL7 CDA</i></b> <b><i>Provide controlled content for ASC X12 275 BIN segment</i></b>
<b><i>LOINC Modifier Codes</i></b>	Used in the STC segment of the 277 or HI segment of the 278 to limit the scope or time frame of a request for information. e.g., ▪ <i>Send information for up to 90 days before the related encounter</i>	Reiterated in the STC segment	Not used in the CDA document
<b><i>LOINC Attachment Type Identifier</i></b>	Used in the STC segment of the 277 or HI segment of the 278 to request an attachment in its entirety, e.g., ▪ <i>Send the cardiac rehabilitation treatment plan</i>	Reiterated in the STC segment in solicited method	Used in the <code> element in the header of the CDA document, e.g. <i>This is the cardiac rehabilitation attachment</i>
<b><i>LOINC Attachment Component</i></b>	Used in the STC segment of the 277 or the HI segment of the 278 to request a specific attachment component or part of a clinical report, e.g., ▪ <i>Send the rehab treatment plan author</i>	Reiterated in the STC segment in solicited method	Used in the computer-decision CDA variant in the <code> element of a <section> to identify the attachment component being provided, e.g., <i>This is the diagnosis information</i>
<b><i>LOINC Attachment Component Answer Part</i></b>	Not used in the 277	Not used in the 275	Used in the computer-decision CDA variant in the <code> element of a clinical statement in an <entry> or <section>, to identify the answer part of an attachment component being provided, e.g., <i>This is the name, identifier and taxonomy</i>

The 275 must repeat the LOINC codes used in the STC segment of the 277 or the HI segment of the 278, but the heading of the CDA document need not. While LOINC Codes are used for questions, answers, and document classification, the queries posed by a LOINC code may be either more specific or more general than the LOINC codes organizations use to classify clinical documents.

### **1.5.2 LOINC Names and Identifiers**

Each LOINC record corresponds to a component. The LOINC record is a table entry in the LOINC database maintained by the Regenstrief Institute and the LOINC Committee. See section

1.5.3 for information on how to obtain the LOINC database. A LOINC record includes attributes to specify:

- The numeric **code** that identifies the component,
- The **component** name — e.g., potassium, hepatitis C antigen, distance the patient was transported (by an ambulance)
- The **property** reported — e.g., a mass concentration, length (distance)
- The **time** aspect — e.g., Whether the measurement is a momentary observation at a point in time, or an observation made over a span of time
- The **source** of the data used in the reported information — e.g., urine, blood, EMS transport
- The type of **scale** — e.g., whether the measurement is quantitative (a true measurement), nominal (red, blue, green), or simply narrative text providing the requested information.
- Where relevant, the **method** used to produce the result or other observation
- A **class** code that associates the observation with others in a group, such as the observations associated with an obstetric ultrasound procedure.

Many medical concepts have multiple LOINC codes. The codes distinguish different methods of making the observation. For example, there are different LOINC codes for manual and automated leukocyte counts. Indeed, there are three codes for the patient's body weight according to whether it was measured, estimated, or the datum is the weight that the patient reported.

Different LOINC codes will also be used to distinguish different ways to report the observation. For example, 10221-0 identifies the specimens taken during surgery when reported using narrative text, whereas 8721-3 would identify coded descriptions of the same specimens.

LOINC codes may also identify **sets** of observations. For example, the LOINC code 18674-2 (ALCOHOL-SUBSTANCE ABUSE REHABILITATION TREATMENT PLAN, LONGEST PERIOD OF SOBRIETY FOR ABUSED SUBSTANCE) identifies a set of other observations, identified by other LOINC codes, including 18676-7 (ALCOHOL-SUBSTANCE ABUSE REHABILITATION TREATMENT PLAN, LONGEST PERIOD OF SOBRIETY), and 18675-9 (ALCOHOL-SUBSTANCE ABUSE REHABILITATION TREATMENT PLAN, ABUSED SUBSTANCE).

The LOINC codes are not intended to transmit all possible information about a test or observation. They are only intended to *identify* the observation. The LOINC code for a name is unique and permanent. The LOINC code has no intrinsic structure except that the last character in the code is a mod-10 check digit.

**LOINC codes must always be transmitted without leading zeroes and with a hyphen before the check digit (e.g., "8709-8" and "10154-3").**

The LOINC Committee assigns LOINC codes upon request from various agencies. In the context of attachments, the LOINC codes are requested by the HL7 ASIG. The ASIG forwards appropriate requests to the LOINC committee for consideration. Requests go through a review process to ensure the concept has not been previously added and the meaning is clear.



### 1.5.3 The LOINC Committee

LOINC is a committee of laboratories, system vendors, hospitals and academic institutions organized by the Regenstrief Institute and supported by grants from The John A. Hartford Foundation, Inc., the Agency for Health Policy Research and Development and The National Library of Medicine to create formal names and codes for laboratory results and clinical variables with numeric, coded, or narrative text values. The LOINC codes were designed specifically to provide a universal identifier for clinical observations. It has since been adopted by DICOM as well. For identifying observations in these "messages," the LOINC Committee distributes the over 30,000-record database and the Regenstrief LOINC Mapping Assistant (RELMA™) software for perpetual use free via the Internet. Widespread use of LOINC will enable better and more efficient use of computer-stored clinical data.

### 1.5.4 Obtaining the LOINC Database

LOINC codes are registered by Regenstrief Institute and the Logical Observation Identifier Names and Codes (LOINC<sup>®</sup>) Committee.

The LOINC database provides sets of universal names and ID codes for identifying laboratory and clinical test results and other units of information meaningful in attachments such as clinical report documents.

The LOINC database can be obtained from the Regenstrief Institute, on-line at <http://www.LOINC.org>.

## 1.6 Revision History

The following provides a historical view of the iterations for this document and why each major revision was made.

<i>Date</i>	<i>Purpose</i>
Feb 1999	Version 1.0
Feb 2000	Version 1.0a – released for technical correction.
Dec 2001	Document identifier, title change and technical corrections
August 2003	Version 2.0 Ballot
December 2003	Version 2.0 Publication
December 2003	Release 2.1 Ballot
May 2004	May 2004 - Release 2.1 Publication (referenced by 9-23-2005 HIPAA NPRM)
November 2006	Release 3.0 Ballot
March 2007	Second Informative Ballot for Release 3.0 Changes

## 2 Attachment Transactions

This section describes how the HL7 CDA document is constructed to convey an attachment. It further describes the format of Additional Information Specifications that document specific electronic attachments.

### 2.1 Use Cases

Health plans and healthcare providers vary with regards to their technological capabilities. Many health plans will use electronic attachments as a way to support human decisions. These health plans will want to see the attachment information in human-readable form and will not necessarily be concerned with structure and coding.

The most advanced health plans may want to obtain the efficiencies that arise from direct computer decision-making based on the data in certain kinds of attachments. These health plans will want attachment information to be structured and coded. In this context "structured" means that the information is subdivided into discrete data components suitable to support computer-based decisions. In this context "coded" means that the questions that compose an attachment are identified with LOINC codes and the answers, where appropriate, are coded using a specified coding system appropriate to a specific question.

It is unlikely that health plans will find it productive to use computer-decision processing on all attachments in the same time frame. The authors of this Implementationn Guide believe, they will use computer decision processing for some attachments and will use human decision making for other attachment types.

The most advanced provider organizations will have electronically accessible structured data to support some attachment types. Additionally, it is likely that over time Health Plans will implement more attachments for use with computer decision processing. For other attachment types, particularly dictated reports, the information may be accessible electronically but not in a structured format or only on paper. For many provider organizations, the information will only be available on paper. For these provider organizations substantial efficiencies could be achieved by allowing the unstructured text to be transmitted or scanning paper documents and transmitting them as electronic image attachments.

In the future it is likely that provider organizations will build up a body of clinical notes that are formatted according to the HL7 Clinical Document Architecture (as described in 2.5). Being able to submit these electronic notes as attachments will be desirable.

### 2.2 Variant Attachment Formats

There are two variants of a CDA document when used as an attachment. These are as follows:

- The **human-decision variant** (HDV) is used solely for information that will be rendered for a person to look at, in order to make a decision. The HDV is not required to have structured or coded answers. The only LOINC value used in a HDV CDA document is the LOINC for the *Attachment Type Identifier*. HL7 provides a non-normative style sheet for this purpose. There are two further alternatives within the human-decision variant.
  - It can be a single <nonXMLBody> element that contains a reference to an

external file that provides the content for the body of the document, or

- It can contain a <structuredBody> element containing free text in XML elements that organize the material into sections, paragraphs, tables and lists as described in the future sections of this document.
- The **computer-decision variant** (CDV) has the same content as the human-decision variant, but additional structured information and LOINC coded data is included so that a computer could provide decision support based on the document. Attachments in the CDV can be rendered for human decisions using the same style sheet that HL7 provides for rendering documents formatted according to the human-decision variant.

These variants do not differ in functional content. All variants of the same attachment have required and optional content as specified in the Additional Information Specification document for that attachment. The variants only differ with regard to whether structured and coded data is mandated.

Both variants place constraints upon what information must be present in the CDA to support the Attachment use case, described in Section 1.1 of the AIS documents. Additional CDA structures (document sections, entries, at cetera), may be present to support use cases other than those defined by this AIS. Anything not explicitly prohibited by the AIS may be present in the CDA document to support use cases other than those defined herein.

HL7 has provided XML stylesheets as part of this implementation package, however these are not balloted standards, nor are they required for use under HIPAA. Use of HL7 provided stylesheets is entirely up to the implementer.

## 2.3 Certain XML Terms

This section informally introduces certain XML terms that are used extensively in this implementation guide. The reader can find them fully defined in *Extensible Markup Language (XML) 1.0 (Fourth Edition)* which is available at <http://www.w3.org/TR/REC-xml>. Later section of this implementation guide will provide more detail on the relevant terms and concepts used in attachments and this example.

XML documents are composed of elements that can contain attributes, and text (which is called parsable computer data (PCDATA)). A well-formed XML document has a single element, the root, which contains all other elements in the document. The following example is, by itself, a well-formed XML document, although it is only a portion of what constitutes a complete CDA document. The example contains several distinct kinds of elements, including: <section>, <code>, <title>, <text>, <paragraph>, <content>, <entry>, <observation>, <effectiveTime>, <reference> and <value>. The <code> element contains a LOINC code in its "code" attribute. Data is also conveyed as PCDATA within the content element (2003-03-26) and the <title> elements.

```
<section>
  <code code="27515-6" codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC"
        displayName="PRIMARY DIAGNOSIS" />
  <title>PRIMARY DIAGNOSIS</title>
  <text>
    <paragraph ID="content-1" >
      <content ID="content-2" >bipolar affective disorder</content>
      as of 26 March 2003
    </paragraph>
  </text>
```

```
<entry>
  <observation classCode="OBS" moodCode="EVN" >
    <code code="27515-6" codeSystem="2.16.840.1.113883.6.1"
      codeSystemName="LOINC" displayName="PRIMARY DIAGNOSIS" />
    <text>
      <reference value="#content-1" />
    </text>
    <effectiveTime value="20030326" />
    <value code="296.7" codeSystem="2.16.840.1.113883.6.103" codeSystemName="ICD-
      9-CM" displayName="BIPOLAR AFFECTIVE DISORDER" xsi:type="CD" >
      <originalText>
        <reference value="#content-2" />
      </originalText>
    </value>
  </observation>
</entry>
</section>
```

### 2.3.1 Use of XPath

Compliance statements that refer to elements of a CDA document here are identified using the notation defined in *XML Path Language (XPath)*, which is available at <http://www.w3.org/TR/xpath>. XPath expressions are also used in the AIS Value Tables to show how each *Attachment Component* or *Attachment Component Answer Part* can be located within the clinical document.

For example, a reference to

```
/ClinicalDocument /code/@code
```

would be a reference to the code attribute of the <code> element within the <ClinicalDocument > element.

XPaths generally refer to a set of nodes. For example, the XPath

```
section/code
```

refers to all the <code> elements that are direct descendants of any <section> element.

The notation **a//b** (two slashes) within XPath refers to the set of all `<b>` that are descendants of an `<a>` element including those that are descendants of intervening elements, so it would include the `<b>` element in

```
<a>  
  <b></b>  
</a>
```

and also the `<b>` element in

```
<a>  
  <c>  
    <b></b>  
  </c>  
</a>
```

An example of how we use XPath in conformance statements would be to say `/ClinicalDocument//section/code/@code` must have a LOINC code.

In the circumstances where that conformance statement applies, the code attribute of any `<code>` element within a `<section>` element of the document must contain a LOINC code.

## 2.4 MIME Multipart/Related Messages

An attachment is comprised of the CDA document, including any supporting files necessary to render the attested content of the document. Two Internet request for comments (RFCs) are needed to properly construct the mime multipart message. When supporting files are needed, the collection of information shall be organized using a MIME multipart/related package constructed according to RFC-2557. Within the MIME package, supporting files must be encoded using Base-64. RFC-4648 should be used when encoding the contents of the MIME package using Base-64. Finally, RFC-2392 may be used to reference other content that appears in the same X12 transaction to use the same content to answer multiple questions for a single claim. Internet RFCs can be downloaded from the RFC editor page at <http://www.rfc-editor.org>.

### 2.4.1 RFC-2557 MIME Encapsulation of Aggregate Documents, such as HTML (MHTML)

This RFC describes how to construct a MIME multipart/related package, and how URLs are resolved within content items of that package. RFC-2557 can be obtained at: [www.rfc-editor.org/rfc/rfc2557.txt](http://www.rfc-editor.org/rfc/rfc2557.txt)

A MIME multipart/related package is made up of individual content items. Each content item has a MIME header identifying the item. Each content item is delimited from other content items using a string of application specified text. In addition, there must be an ending boundary. The actual content is recorded between these delimiter strings using a BASE-64 encoding of the content item. There is also a MIME header for the entire package.

The first content item of a multipart/related message supporting attachments is the CDA document, containing the header and structured or non-structured body. Subsequent content items included in this package will contain additional content that appears within the body of the document. The CDA document will reference these additional content items by their URLs.

### 2.4.2 Referencing supporting files in Multipart/Related messages

Because the CDA document and its supporting files may have already existed in a clinical information system, references may already exist within the CDA document to URLs that are not accessible outside of the clinical information system that created the document. When the CDA

document is sent via attachments, these URLs may no longer be accessible by the receiving information system. Therefore, each content item that is referenced by a URL within the CDA document must be included as a content item in the MIME package. Each content item may specify the URL by which it is known using the Content-Location header. The receiver of this MIME package shall translated URL references according the RFC-2557. This will ensure resolution of the original URL to the correct content item within the MIME package. Thus, URL references contained within an original document need not be rewritten when the CDA package is transmitted. Instead, these URLs are simply supplied as the value of the Content-Location header in the MIME package. RFC 2557 can be accessed at: <http://www.faqs.org/rfcs/rfc2557.html>.

This capability allows for the same content item to be referred to more than once in a MIME multipart/related package without requiring the content item to be supplied twice. However, it does not allow a separate MIME multipart/related package to contain references to information sent in a previously recorded package.

### **2.4.3 Referencing documents from other multipart within the same X12 transactions**

RFC-2392 is used when referencing content across MIME package boundaries, but still contained within the same X12 transaction (ST to SE). This can occur when the same document is used to answer multiple questions for a single claim. Each component of a MIME package may be assigned a content identifier using the Content-ID header for the content item. For example, this header would appear as:

Content-ID: <07EE4DAC-76C4-4a98-967E-F6EF9667DED1>

This content identifier is a unique identifier for the content item, which means it must never be used to refer to any other content item<sup>4</sup>. RFC-2392 defines the cid: URL scheme (http: and ftp: are two other URL schemes). This URL scheme allows for references by the Content-ID header to be resolved. The URL for the content item identified above would be:

cid:07EE4DAC-76C4-4a98-967E-F6EF9667DED1

Receivers of the MIME multipart message must be able to resolve a cid: URL to the content item that it identifies. Senders must ensure that they only refer to items that have already been transmitted to the receiver by their cid: URL. Thus, this implementation guide prohibits forward URL references using the cid: URL scheme. RFC 2392 can be accessed at: <http://www.faqs.org/rfcs/rfc2392.html>.

Content items shall not be referenced across X12 transactions using the cid: URL scheme. For example, if the payer previously requested information using a 277, and the provider returned that information in a MIME multipart/related package in a 275, and then the payer requested additional information in another 277, the provider may not refer to the content item previously returned in the prior 275 transaction.

---

<sup>4</sup> The example above uses a GUID (globally unique identifier), which is a random stream of bytes that is almost guaranteed to be unique.

## 2.5 The Structure of a CDA Document

This section introduces some basic concepts of the HL7 CDA. More detail is available in *Health Level Seven (HL7) Clinical Document Architecture, Release 2.0*. This summary does not mention features of the CDA that are not germane to the use of CDA documents as attachments.

The root element CDA Release 2.0 document is always <ClinicalDocument>. This element is logically broken up into a *Header* and a *Body*.

### 2.5.1 The CDA Header

The header contains information about the patient, the event being documented, the healthcare providers who have documented the event, and other administrative data. This header information is always provided in discrete XML elements. The following sub-sections provides a brief description of the most relevant CDA Header elements, with examples for each. **Table 2.5-1** below shows the required and optional header elements. Please see HL7 Clinical Document Architecture Release 2.0 for a more complete list of header elements and technical details on their representation in a CDA document.

*Table 2.5-1 CDA Header Elements*

Header Element	Opt	Header Element	Opt
typeId	R	informant	O
id	R	custodian	R
code	R	informationRecipient	O
title	R <sup>5</sup>	legalAuthenticator	O
effectiveTime	R	authenticator	O
confidentialityCode	R	participant	O
languageCode	O	inFulfillmentOf	R <sup>6</sup>
setId	O	documentationOf	O
versionNumber	O	relatedDocument	O
recordTarget	R	authorization	O
author	R	componentOf	O
dataEnterer	O		

#### 2.5.1.1 typeId

This is an identifier that indicates the ClinicalDocument conforms to the CDA Release 2.0 specification. Future releases of CDA will use a different value for this element. This element must appear exactly as follows:

```
<typeId extension="POCD_HD000040" root="2.16.840.1.113883.1.3"/>
```

#### 2.5.1.2 id

This is a user assigned identifier unique to the Clinical Document being re-used or created. This identifier should not be confused with the providers Patient Account Number or Medical Record

<sup>5</sup> The IG requires that all clinical documents have a human readable title.

<sup>6</sup> The IG requires that all clinical documents record the attachment control number in this header element.

Number. The extension typically contains the institution assigned identifier. The root is an OID that identifies the assigner of the identifier. Each revision of a clinical document is assigned a distinct identifier. See section 2.5.6 for a description of OIDs and their use in attachments and for more information on how to obtain a list of OIDs that have been registered with HL7.

```
<id extension="a123" root="2.16.840.1.113883.19.2744.1.1" />
```

### 2.5.1.3 code (Attachment Type Identifier)

This is a LOINC code that classifies the kind of clinical document.

```
<code code="18594-2" codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC"
  displayName="Psychiatric Rehabilitation Attachment" />
```

### 2.5.1.4 title (Attachment Type Name)

This is the human readable name of the clinical document.

```
<title>Psychiatric Rehabilitation Attachment</title>
```

### 2.5.1.5 effectiveTime

This is the date (and time) when this revision of the clinical document was created.

```
<effectiveTime value="20030812" />
```

### 2.5.1.6 confidentialityCode

This code defines the level of confidentiality assigned to the clinical document. *Note that the receiver is not obligated to give the document any special handling beyond its normal policies for dealing with personally identifiable health information, regardless of the value placed in confidentialityCode.*

```
<confidentialityCode code="N" codeSystem="2.16.840.1.113883.5.25"
  codeSystemName="Confidentiality"
  displayName="Normal" />
```

### 2.5.1.7 recordTarget

This element identifies the patient, and can include the name, identifier, date of birth and gender. This is typically the patient identifier assigned by the provider. If the patient identifier assigned by the Health Plan is needed, a second instance of the recordTarget element may be included with the appropriate OID reference to identify the assigning entity.

```
<recordTarget contextControlCode="OP" typeCode="RCT" >
  <patientRole classCode="PAT" >
    <id extension="184569" root="2.16.840.1.113883.19.2744.1.2" />
    <patient>
      <name>
        <given>John</given> <given>J</given> <family>Jay</family>
      </name>
      <administrativeGenderCode code="M" codeSystem="2.16.840.1.113883.5.1"
        codeSystemName="AdministrativeGender" displayName="Male" />
      <birthTime value="19320924" />
    </patient>
  </patientRole>
</recordTarget>
```

### 2.5.1.8 author

This element identifies the creator of the document.

```
<author contextControlCode="OP" typeCode="AUT" >
  <time value="20061025" />
```



```
<assignedAuthor classCode="ASSIGNED" >
  <id extension="298379" root="2.16.840.1.113883.19.2744.1.3" />
  <assignedPerson>
    <name>
      <given>John</given> <given>E</given> <family>Smith</family> <suffix>MD</suffix>
    </name>
  </assignedPerson>
</assignedAuthor>
</author>
```

#### 2.5.1.9 custodian

This element identifies the organization that maintains the original.

```
<custodian typeCode="CST" >
  <assignedCustodian classCode="ASSIGNED" >
    <representedCustodianOrganization classCode="ORG" >
      <id extension="ghc" root="2.16.840.1.113883.19.2744.1.3.1" />
      <name>Organization Name</name>
    </representedCustodianOrganization>
  </assignedCustodian>
</custodian>
```

#### 2.5.1.10 legalAuthenticator

This element identifies the person who has legally "signed" the document.

```
<legalAuthenticator typeCode="LA" >
  <time value="20061025" />
  <signatureCode code="S" />
  <assignedEntity classCode="ASSIGNED" >
    <id extension="298379" root="2.16.840.1.113883.19.2744.1.3" />
    <assignedPerson>
      <name>
        <given>John</given> <given>E</given> <family>Smith</family> <suffix>MD</suffix>
      </name>
    </assignedPerson>
  </assignedEntity>
</legalAuthenticator>
```

#### 2.5.1.11 authenticator

This element identifies the person who has verified the content of the clinical document. *Note that the authenticator may not be the legal party, see legalAuthenticator.*

```
<authenticator typeCode="LA" >
  <!-- See content of legalAuthenticator above -->
</authenticator>
```

#### 2.5.1.12 parentDocument

This element identifies the predecessor of the clinical document (a previous revision).

```
<relatedDocument typeCode="RPLC" >
  <parentDocument>
    <id extension="a122" root="2.16.840.1.113883.19.2744.1.1" />
  </parentDocument>
</relatedDocument>
```

#### 2.5.1.13 inFulfillmentOf (Attachment Control Number(CAN))

This element identifies the orders associated with this document. At least one of these elements must be present and contain the attachment control number associated with the clinical document.

```
<inFulfillmentOf>
```

```
<order>
  <id extension="XA728302" root="2.16.840.1.113883.19.2744.1.5" />
</order>
</inFulfillmentOf>
```

#### 2.5.1.14 documentationOf

This element identifies the services documented, and the performers of those services. This is the provider who rendered the service. The billing provider must be obtained from the 275 transaction. A service event records the services performed for a patient and described within the clinical document, e.g., an immunization, or evaluation and management. Service events are distinct from encounters. Although there is often a one to one relationship between the two, a service event may occur outside the context of an encounter (e.g., review of laboratory results), or several service events might occur within the context of a single encounter.

```
<documentationOf>
  <serviceEvent>
    <code code="99201" codeSystem="2.16.840.1.113883.6.12" codeSystemName="CPT"/>
    <performer typeCode="PRF" >
      <assignedEntity>
        <id extension="298379" root="2.16.840.1.113883.19.2744.1.3" />
        <assignedPerson>
          <name>
            <given>George</given> <given>F</given> <family>Carson</family>
          </name>
          <suffix>MD</suffix>
        </assignedPerson>
      </assignedEntity>
    </performer>
  </serviceEvent>
</documentationOf>
```

#### 2.5.1.15 componentOf

This element identifies the encounter or visit that is described by this clinical document. Not all documents are created as a result of an encounter with a patient (e.g., review of test results).

```
<componentOf>
  <encompassingEncounter>
    <id extension="773789090" root="2.16.840.1.113883.19.2744.1.4" />
    <effectiveTime value="20061002" />
  </encompassingEncounter>
</componentOf>
```

### 2.5.2 The CDA Body

The CDA body can be either unstructured or can be comprised of structured markup, including narrative text and structured and coded entries containing machine-readable information. Every CDA document has exactly one body, which appears in the <component> element following the CDA Header information.

The <component> element containing the body of a CDA document takes one of two forms.

- It can be a single <nonXMLBody> element that contains a reference to an external file that provides the content for the body of the document. This is used when the entire attachment content is an image or other type of externally referenced file format. See section 3.5.3 for all allowable format types and section 2.4 for MIME packaging requirements of a <nonXMLBody> type.
- Or it can contain a <structuredBody> element containing one or more <component> elements each with its own <section> element. The following sub-sections details the requirements and structure of the CDA body with sections.

### 2.5.3 CDA Body with Sections

The CDA body is just a set of containers for information. There are several levels. The outer-level container within the body is a "component" of the document. Each <component> element contains a "section" that is represented by the <section> element. Within a section the content is placed in a <text> element. Within the <text> element may be containers that support alternative ways of arranging the information:

- a <paragraph> element is a container for a block of text
- a <list> element is a container for a list of blocks of text
- a <table> element is a container for blocks of text arranged in rows and columns.

For example, here is a fragment of a CDA document in the human-decision variant.

```
<section>
  <title>PRINCIPAL DIAGNOSIS</title>
  <text>
    <paragraph>
      <content>BIPOLAR AFFECTIVE D/O</content>
    </paragraph>
  </text>
</section>
```

In this example the Principal Diagnosis section consists of one paragraph. It contains the diagnosis. Both the title and the text are intended to be read by a person.

The CDA allows for human-readable text to be supplemented by discrete data elements that would assist a computer in processing the information in the document. Here is the same fragment with the supplementary information that is used for the computer-decision variant.

```

<section>
  <code code="19007-4" codeSystem="2.16.840.1.113883.6.1"
    codeSystemName="LOINC" displayName="Principal Diagnosis" />
  <title>PRINCIPAL DIAGNOSIS</title>
  <text>
    <paragraph>
      <content ID="content-1">BIPOLAR AFFECTIVE D/O</content>
    </paragraph>
  </text>
  <entry>
    <observation classCode='OBS' moodCode='EVN'>
      <code code="19007-4" codeSystem="2.16.840.1.113883.6.1"
        codeSystemName="LOINC" displayName="Principal Diagnosis" />
      <text><reference value="#content-1"/></text>
      <value xsi:type="CD" code="296.4"
        codeSystem="2.16.840.1.113883.6.103" codeSystemName="ICD-9-CM"/>
    </observation>
  </observation>
</entry>
</section>

```

In this example the <entry> and <observation> elements provide the supplementary information, which in this case includes the ICD-9-CM Diagnosis code associated with the principal diagnosis.

### 2.5.3.1 Subsections

Any CDA Section can have further subsections. These are represented in additional <component> elements of the CDA Section. Subsections follow entries within the CDA structure (see section 2.5.4 below on Entries). The following is an example of a component with multiple answer parts in the human decision variant (HDV).

```

<section>
  <title>PRINCIPAL DIAGNOSIS</title>
  <text>
    <paragraph>
      <content>BIPOLAR AFFECTIVE D/O</content>
    </paragraph>
  </text>
  <component>
    <section>
      <title>DATE OF FIRST ONSET OR EXACERBATION</title>
      <text>
        <paragraph>
          <content>2006-03-06</content>
        </paragraph>
      </text>
    </section>
  </component>
</section>

```

## **2.5.4 CDA Entries**

CDA Entries are used to store the computer processable information in the computer decision variant of attachments. There are several different kinds of entries that may be used within a CDA Document. Each entry represents some sort of clinical statement about the care that is being provided to the patient. This implementation guide discusses the most common types of entries used in the Additional Information Specifications. Additional Information Specifications will describe other kinds of entries as they become necessary.

To support reuse of existing CDA documents being returned in response to a claims attachment request, additional CDA data elements may be present within an entry used in a claims attachment. These data elements must conform to the CDA Release 2.0 specification. Receivers are encouraged to not reject transactions with these additional data elements to promote the re-use of existing CDA documents, but need not process them, unless otherwise specifically indicated in an Additional Information Specification. At this point, no Additional Information Specification requires data elements other than those listed below.

### **2.5.4.1 Entry Classes**

This section explains how the Claims Attachment AIS makes use of HL7 Version 3 classes in the CDA document to represent information. For more detail on how these classes are represented in an attachment see the *HL7 Clinical Document Architecture Release 2.0* standard, or related standards.

HL7 Version 3 standards partition information into four basic class types: information about intentional acts, the participations in those acts, the role that a participant plays, and the entities (persons, organizations, locations or substances) taking on those roles. The type of class used to represent the information appears in the AIS value tables for each attachment component and attachment component answer part. An example and explanation of the value tables and their structure can be found in section 2.9 of this implementation guide.

Compliance statements and other details about the entry classes are found in section 3.6 and its sub-sections.

#### **2.5.4.1.1 Acts**

Most of the information requested by an AIS will appear in some form of act class, represented using the <act>, <procedure>, <encounter>, <observation>, <substanceAdministration> or <supply> elements, corresponding to ACT, PROC, ENC, OBS, SBADM, SPLY values in the AIS data tables.

#### **2.5.4.1.2 Persons and Organizations**

Information about persons and organizations will be through the participation class, and will be indicated by the value PART in the AIS data table. CDA uses the following participation elements to represent the participation of various people or organizations: <author>, <informant>, <subject>, <performer>, <authenticator>, <legalAuthenticator>, <custodian>, <dataEnterer>, <encounterParticipant>, <informationRecipient>, <participant>, <performer>, <recordTarget>, and <responsibleParty>. Answer parts will appear in the appropriate participation element, or one of its contained classes based on the kind of information being requested.

Each participant has an associated role. For example, the <recordTarget> participant has a <patient> role. The participation element will often carry the time that participation started in the

<time> element, and may including other information, relevant to the participation (e.g., a signature code).

The role carries the identifiers of the person or organization in one or more contained <id> elements. Addresses and contact information for persons are stored on the role, because this contact information may vary with the role.

Each role has an at least one associated entity, which may be a person or organization, or both, depending upon the type of role. For example, the <assignedAuthor> role can have an <assignedPerson> entity, as well as a <representedOrganization> entity.

Entities carry the names of people or organizations. Entities representing organizations also carry the address and contact information for the organization.

#### 2.5.4.1.3 Substances

Acts related to substances (<substanceAdministration> and <supply>) have other participants, which are the substances being administered (through the <consumable> element), or supplied (via the <product> element). The product is acting in the <manufacturedProduct> role, and the substance detail appears mainly in the entities represented by the <manufacturedLabeledDrug> or <manufacturedMaterial> elements.

#### 2.5.4.1.4 Locations

The location is sometimes important (as in the Ambulance Service AIS). These are attached to acts via the nearly universal <participant> element, with its typeCode attribute set to the appropriate value to identify the location (LOC, DST, SRC).

### 2.5.5 The <nonXMLBody> CDA Body

As an alternative to the use of sections and paragraphs a CDA document can consist of a header and a body that has solely the <nonXMLBody> element. This element contains a single <text> element, which contains a single <reference> element. The value attribute of that reference element contains a URL that references content contained within the same MIME multipart document that contains the CDA document. An example of a nonXMLbody is shown below.

```
<body>
  <nonXMLBody >
    <text mediaType="image/jpeg"><reference value="labReport.jpg"/></text>
  </nonXMLBody>
</body>
```

See the **Note on the <reference> element** below in 3.6.8 for more information on these references.

### 2.5.6 ISO Object Identifiers

The CDA uses ISO object identifiers (OIDs) to uniquely specify where to find more information regarding a coded data value or an identifier for a person, organization, or other entity.

Although OIDs look very obscure at first, they present a systematic way to identify the organization responsible for issuing a code or entity identifier. In the example below, the underlined information is the OID that represents the ICD-9-CM code set for diagnoses.

```

<section>
  <code code="19007-4" codeSystem="2.16.840.1.113883.6.1"/>
  <title>PRINCIPAL DIAGNOSIS</title>
  <text>
    <paragraph>
      <content ID="content-1">BIPOLAR AFFECTIVE D/O</content>
    </paragraph>
  </text>
  <entry>
    <observation classCode='OBS' moodCode='EVN'>
      <code code="19007-4" codeSystem="2.16.840.1.113883.6.1"/>
      <text><reference value="#content-1"/></text>
      <value xsi:type="CD" code="296.4"
        codeSystem="2.16.840.1.113883.6.103" codeSystemName="ICD-9-CM"/>
    </observation>
  </entry>
</section>

```

An OID is a globally unique string consisting of numbers and dots (e.g., 2.16.840.1.113883.6.103). This string expresses a tree data structure, with the left-most number representing the root and the right-most number representing a leaf.

Each branch under the root corresponds to an assigning authority. Each of these assigning authorities may, in turn, designate its own set of assigning authorities that work under its auspices, and so on down the line. Eventually, one of these authorities assigns a unique (to it as an assigning authority) number that corresponds to a leaf node on the tree. The leaf may represent an assigning authority (in which case the @S attribute identifies the authority), or an instance of an object. An assigning authority owns a namespace, consisting of its sub-tree.

HL7 is an assigning authority, and has the OID prefix "2.16.840.1.113883." Any OID that begins with this is further described by a registry maintained by the HL7 organization. For example, the OID 2.16.840.1.113883.6.103 (above) was established by HL7 as a globally unique identifier for the ICD-9-CM code set for diagnoses<sup>7</sup>.

The numbers in the HL7 OID indicate that:

- The OID was assigned by a joint ISO-ITU (2.) assigning authority,
- it is specific to the country (16.)
- of the USA (840.)
- and is specific to the organization (1.)
- known as Health Level Seven (113883.).

Beyond that, the HL7 organization assigns any numbers - and these are maintained in a registry available on the HL7.org website. HL7 uses its registry to assign OIDs within its branch for HL7 users and vendors upon their request. HL7 is also assigning OIDs to public identifier-assigning authorities both U.S. nationally (e.g., the U.S. State driver license bureaus, U.S. Social Security Administration, US National Provider Identifier (NPI) registry, etc.) and internationally (e.g., other countries' social security administrations, citizen ID registries, etc.)

<sup>7</sup> The HL7 Vocabulary TC retired 2.16.840.1.113883.6.2 in 2004 in favor of two separate code sets, one for ICD-9-CM diagnoses, and another for ICD-9-CM Procedures.

Additional reference information about OIDs, including the current directory of OIDs assigned by HL7, is available at <http://www.hl7.org/oid/index.cfm>. Organizations that wish to request an OID for their own use (e.g., to be able to create identifiers within a CDA document), may also obtain one from HL7 at this site.

## 2.6 Rules for Constructing Attachment Documents

All attachment documents are HL7 CDA documents. Attachment-specific Additional Information Specifications specify the content for all attachments, additionally; they specify the code(s) to be used for the computer-decision variants.

Figure 2.6-1 provides an example of an additional information transaction for the scenario, “the payer requests the date of onset or aggravation of the primary diagnosis and the primary diagnosis for the psychiatric rehabilitation treatment plan. The provider replies using the human-decision variant.”

The boldface portion is the CDA document. There are three sections to correspond to the three requested elements. The captions in human readable form for these sections are in the <caption> elements.

The white space characters (tabs and newlines) that are included in the XML in the example are included for readability. They are permitted, but not required, in an XML document. Their presence does not alter the way the document will be rendered when it is presented to a person through their browser or other XML rendering software.

The following are two examples of the same attachment. Figure 2.6-1 shows the X12 transaction and the embedded CDA document fully strung as it would be in its native EDI transaction. In this example the XML portion is bolded. Figure 2.6-2 shows the same example unstrung for ease of understanding. Note that X12 segments do not end with a newline, although for clarity they are shown in the figure as if they did.

*Figure 2.6-1. Sample fully strung attachment transaction with psychiatric rehabilitation document.*

```
ST*275*1001~BGN*11*0001*20030429~NM1*PR*2*HEALTH CARE SERVICE
CORPORATION*****PI*00121~PER*IC*MEDICAL REVIEW DEPARTMENT~NM1*85*2*DUKE UNIVERSITY
MEDICAL CENTER*****FI*364015560~NM1*41*2* DUKE UNIVERSITY MEDICAL
CENTER*****SV*00000000500~NM1*QC*1*STONE*ERIKA*M***HN*111223333A~REF*EJ*1722634842~DTP*47
2*RD8*20060801~20060811~LX*01~STC*R3:18594-
2~DTP*368*D8*20060816~CAT*AE*TX~EFI*05~BIN*99999*<?xml version="1.0" encoding="utf-
8"?><?xml-stylesheet href='cda.xsl' type='text/xsl'?><ClinicalDocument xmlns="urn:hl7-
org:v3" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" classCode="DOCCLIN"
moodCode="EVN" ><typeId extension="POCD_HD000040" root="2.16.840.1.113883.1.3" /><id
extension="rehabhdv" root="2.16.840.1.113883.19.2744.1.1" /><code code="18594-2"
codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC" displayName="Psychiatric
Rehabilitation Attachment" /><title>Psychiatric Treatment Plan</title><effectiveTime
value="20030812" /><confidentialityCode code="N" codeSystem="2.16.840.1.113883.5.25"
codeSystemName="Confidentiality" displayName="Normal" /><recordTarget
contextControlCode="OP" typeCode="RCT" ><patientRole classCode="PAT" ><id
extension="111223333A " root="2.16.840.1.113883.19.2744.1.2"
/><patient><name><given>Erika</given><given>M</given><family>Stone</family></name><admini
strativeGenderCode code="F" codeSystem="2.16.840.1.113883.5.1"
codeSystemName="AdministrativeGender" displayName="Female"
/></patient></patientRole></recordTarget><author contextControlCode="OP" typeCode="AUT"
><time value="20060812" /><assignedAuthor classCode="ASSIGNED" ><id extension="1298379"
root="2.16.840.1.113883.19.2744.1.3" /><code code="203BP0800Y"
codeSystem="2.16.840.1.113883.5.53" codeSystemName="HIPAAPProviderTaxonomy"
```



```

displayName="Psychiatrist"
/><assignedPerson><name><given>John</given><given>E</given><family>Smith</family><suffix>
MD</suffix></name></assignedPerson></assignedAuthor></author><custodian typeCode="CST"
><assignedCustodian classCode="ASSIGNED" ><representedCustodianOrganization
classCode="ORG" determinerCode="INSTANCE" ><id extension="ghc"
root="2.16.840.1.113883.19.2744.1.3.1"
/></representedCustodianOrganization></assignedCustodian></custodian><legalAuthenticator
contextControlCode="OP" typeCode="LA" ><time value="20060622" /><signatureCode code="S"
/><assignedEntity classCode="ASSIGNED" ><id extension="1298379"
root="2.16.840.1.113883.19.2744.1.3"
/><assignedPerson><name><given>John</given><given>E</given><family>Smith</family><suffix>
MD</suffix></name></assignedPerson></assignedEntity></legalAuthenticator><inFulfillmentOf
><order><id extension="123456789A" root="2.16.840.1.113883.19.2744.1.5"
/></order></inFulfillmentOf><component contextConductionInd="true" typeCode="COMP"
><structuredBody><component><section><code code="19007-4"
codeSystem="2.16.840.1.113883.6.1" /><title>PRINCIPAL
DIAGNOSIS</title><text><paragraph>bipolar affective disorder as of 26 March
2006</paragraph></text></section></component></structuredBody></component></ClinicalDocum
ent>~SE*16*1001~

```

Figure 2.6-2. Sample unstrung attachment transaction with psychiatric rehabilitation document.

X12 275 transaction start = identifies transaction as a solicited 275 with a create date of 8/16/2006.	ST*275*1001~ BGN*11*0001*20060816~
Receiver/Payer Name and ID	NM1*PR*2*HEALTH CARE SERVICE CORPORATION*****PI*00121~ PER*IC*MEDICAL REVIEW DEPARTMENT~
Billing/Servicing Provider Name and IDs (both legacy and NPI)	NM1*85*2*DUKE UNIVERSITY MEDICAL CENTER*****FI*364015560~ NM1*41*2*DUKE UNIVERSITY MEDICAL CENTER*****SV*00000000500~
Subscriber Name and ID	NM1*QC*1*STONE*ERIKA*M***HN*111223333A~
Medical Record Number	REF*EJ*1722634842~
Claim Dates of Service	DTP*472*RD8*20060801-20060811~
Attachment for Psychiatric Rehabilitation using LOINC value	LX*01~ STC*R3:18594-2~
Additional Information Submission Date	DTP*368*D8*20060816~
Attachment is in the HL7 CDA HDV text format	CAT*AE*TX~ EFI*05~
CDA Clinical Document start, root, and document identifier	BIN*1573* <b>&lt;ClinicalDocument xmlns:xm1="http://www.w3.org/XML/1998/namespace" xmlns="urn:hl7-org:v3" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" classCode="DOCCLIN" moodCode="EVN" &gt;</b> <b>&lt;typeId extension="POCD_HD000040" root="2.16.840.1.113883.1.3" /&gt;</b> <b>&lt;id extension="rehabhdv" root="2.16.840.1.113883.19.2744.1.1" /&gt;</b>
CDA Header continued: Defines that the Attachment Type is the Psychiatric Rehabilitation Attachment as defined by the LOINC and the effective time of the document is 8/12/2006	<b>&lt;code code="18594-2" codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC" displayName="Psychiatric Rehabilitation Attachment" /&gt;</b> <b>&lt;title&gt;Psychiatric Treatment Plan&lt;/title&gt;</b> <b>&lt;effectiveTime value="20060812" /&gt;</b>
CDA Header continued: Defines that the confidentiality code for this document is "normal"	<b>&lt;confidentialityCode code="N" codeSystem="2.16.840.1.113883.5.25" codeSystemName="Confidentiality" displayName="Normal" /&gt;</b>

CDA Header continued: Subscriber Name and ID	<pre> &lt;recordTarget contextControlCode="OP" typeCode="RCT" &gt;   &lt;patientRole classCode="PAT" &gt;     &lt;id extension="111223333A" root="2.16.840.1.113883.19.2744.1.2" /&gt;     &lt;patient&gt;       &lt;name&gt;&lt;given&gt;Erika&lt;/given&gt; &lt;given&gt;M&lt;/given&gt; &lt;family&gt;Stone&lt;/family&gt;&lt;/name&gt;       &lt;administrativeGenderCode code="F" codeSystem="2.16.840.1.113883.5.1" codeSystemName="AdministrativeGender" displayName="Female" /&gt;     &lt;/patient&gt;   &lt;/patientRole&gt; &lt;/recordTarget&gt; </pre>
CDA Header continued: Treatment Plan Author Name, ID and Taxonomy Code	<pre> &lt;author contextControlCode="OP" typeCode="AUT" &gt;   &lt;time value="20060812" /&gt;   &lt;assignedAuthor classCode="ASSIGNED" &gt;     &lt;id extension="1298379" root="2.16.840.1.113883.19.2744.1.3" /&gt;     &lt;code code="203BP0800Y" codeSystem="2.16.840.1.113883.5.53" codeSystemName="HIPAAPProviderTaxonomy" displayName="Psychiatrist" /&gt;     &lt;assignedPerson&gt;       &lt;name&gt;&lt;given&gt;John&lt;/given&gt; &lt;given&gt;E&lt;/given&gt; &lt;family&gt;Smith&lt;/family&gt; &lt;suffix&gt;MD&lt;/suffix&gt;&lt;/name&gt;     &lt;/assignedPerson&gt;   &lt;/assignedAuthor&gt; &lt;/author&gt; </pre>
CDA Header continued: Custodian for the document is an Organization	<pre> &lt;custodian typeCode="CST" &gt;   &lt;assignedCustodian classCode="ASSIGNED" &gt;     &lt;representedCustodianOrganization classCode="ORG" determinerCode="INSTANCE" &gt;       &lt;id extension="ghc" root="2.16.840.1.113883.19.2744.1.3.1" /&gt;     &lt;/representedCustodianOrganization&gt;   &lt;/assignedCustodian&gt; &lt;/custodian&gt; </pre>
CDA Header continued: The Legal Authenticator for the document is Dr. John E Smith	<pre> &lt;legalAuthenticator contextControlCode="OP" typeCode="LA" &gt;   &lt;time value="20060622" /&gt;   &lt;signatureCode code="S" /&gt;   &lt;assignedEntity classCode="ASSIGNED" &gt;     &lt;id extension="1298379" root="2.16.840.1.113883.19.2744.1.3" /&gt;     &lt;assignedPerson&gt;       &lt;name&gt;&lt;given&gt;John&lt;/given&gt; &lt;given&gt;E&lt;/given&gt; &lt;family&gt;Smith&lt;/family&gt; &lt;suffix&gt;MD&lt;/suffix&gt;&lt;/name&gt;     &lt;/assignedPerson&gt;   &lt;/assignedEntity&gt; &lt;/legalAuthenticator&gt; </pre>
CDA Header continued: Attachment Control Number	<pre> &lt;inFulfillmentOf&gt;   &lt;order&gt;&lt;id extension="123456789A" root="2.16.840.1.113883.19.2744.1.5" /&gt;&lt;/order&gt; &lt;/inFulfillmentOf&gt; </pre>
CDA Structured Body with the Principal Diagnosis	<pre> &lt;component contextConductionInd="true" typeCode="COMP" &gt;   &lt;structuredBody&gt;     &lt;component&gt;       &lt;section&gt;         &lt;code code="19007-4" codeSystem="2.16.840.1.113883.6.1" /&gt;         &lt;title&gt;PRINCIPAL DIAGNOSIS&lt;/title&gt;         &lt;text&gt;&lt;paragraph&gt;bipolar affective disorder as of 26 March 2006&lt;/paragraph&gt;&lt;/text&gt;       &lt;/section&gt;     &lt;/component&gt;   &lt;/structuredBody&gt; &lt;/component&gt; </pre>
Close of Clinical Document	<b>&lt;/ClinicalDocument&gt;</b> ~
X12 275 transaction end	<b>SE*16*1001~</b>

Figure 2.6-3 shows a screen shot of the CDA document above as rendered in a popular browser

using the HL7-supplied stylesheet for attachments.

*Figure 2.6-3. Screen-shot of rendered CDA document.*

<b>Psychiatric Treatment Plan</b>	
<b>Patient:</b> Peter Jones	MRN: 184569
	Sex: Male
<b>Consultant:</b> John Smith , MD	<b>Created On:</b> August 12, 2003
<b>PRINCIPAL DIAGNOSIS</b>	
bipolar affective disorder as of 26 March 2006	
<b>Signed by:</b> John Smith , MD on June 22, 2006	

The same 275 response structure is used with the computer-decision variant, with different content in the BIN segment.

The following is an example of a scanned image document for the laboratory attachment type. The first part is the XML defining that an image is included. The second part of the rendering is the header information of the attachment, and the third part is the actual scanned image. We have included two image types (GIF and TIFF).

```
<?xml version="1.0" encoding="utf-8"?>
<ClinicalDocument classCode="DOCCLIN" moodCode="EVN" xmlns="urn:hl7-org:v3"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="urn:hl7-org:v3 file:/D:/cd/hl7/cda/CDA_R2_NormativeWebEdition2005/infrastructure/cda/CDA.xsd">
  <typeId extension="POCD_HD000040" root="2.16.840.1.113883.1.3"/>
  <id extension="a123" root="2.16.840.1.113883.19.2744.1.1"/>
  <code code="26436-6" codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC" displayName="All Laboratory
Studies"/>
  <effectiveTime value="20061025"/>
  <confidentialityCode code="N" codeSystem="2.16.840.1.113883.5.25" codeSystemName="Confidentiality"
displayName="Normal"/>
  <recordTarget contextControlCode="OP" typeCode="RCT">
    <patientRole classCode="PAT">
      <id extension="6910828" root="2.16.840.1.113883.19.2744.1.2"/>
      <patient>
        <name><given>Sample</given> <given>H</given> <family>Patient</family></name>
        <administrativeGenderCode code="M" codeSystem="2.16.840.1.113883.5.1" codeSystemName="AdministrativeGender"
displayName="Male"/>
        <birthTime value="19320924"/>
      </patient>
    </patientRole>
  </recordTarget>
  <author contextControlCode="OP" typeCode="AUT">
    <time value="20061025"/>
    <assignedAuthor classCode="ASSIGNED">
      <id extension="298379" root="2.16.840.1.113883.19.2744.1.3"/>
    </assignedAuthor>
  </author>
  <custodian typeCode="CST">
    <assignedCustodian classCode="ASSIGNED">
      <representedCustodianOrganization classCode="ORG" determinerCode="INSTANCE">
        <id extension="ghc" root="2.16.840.1.113883.19.2744.1.3.1"/>
      </representedCustodianOrganization>
    </assignedCustodian>
  </custodian>
  <inFulfillmentOf><order><id extension="XA728302" root="2.16.840.1.113883.19.2744.1.5"/></order></inFulfillmentOf>
  <componentOf>
    <encompassingEncounter>
      <id extension="773789090" root="2.16.840.1.113883.19.2744.1.4"/>
      <effectiveTime value="20061002"/>
      <responsibleParty>
        <assignedEntity>
          <id extension="298379" root="2.16.840.1.113883.19.2744.1.3"/>
          <assignedPerson>
            <name><given>Ge orge</given> <given>F</given> <family>Carson</family> <suffix>MD</suffix></name>
          </assignedPerson>
        </assignedEntity>
      </responsibleParty>
    </encompassingEncounter>
  </componentOf>

  <component contextConductionInd="true" typeCode="COMP">
    <nonXMLBody>
      <text mediaType="image/gif"><reference value="labnonxml.gif"/></text>
    </nonXMLBody>
  </component>
</ClinicalDocument>
```

This is the header information from the scanned laboratory attachment.

## All Laboratory Studies

**Provider:** George F Carson, MD  
**Patient:** Sample H Patient **Provider's Pt ID:** 6910828 **Sex:** Male  
**Birthdate:** 24 Sep 1932  
**Attachment Control Number:** XA728302

The following is a scanned image in GIF format.

REPORT STATUS	TEST	RESULT		UNITS	REFERENCE RANGE	SITE CODE
		IN RANGE	OUT OF RANGE			
CHEMISTRY PANEL #1						TP
	GLUCOSE		209 H	MG/DL	70 - 125	
	UREA NITROGEN (BUN)	14		MG/DL	7 - 25	
	CREATININE	1.1		MG/DL	0.7 - 1.4	
	BUN/CREATININE RATIO	13		RATIO (CALC)	6 - 25	
	SODIUM	141		MEQ/L	135 - 145	
	POTASSIUM	4.2		MEQ/L	3.5 - 5.3	
	CHLORIDE	104		MEQ/L	95 - 108	
	MAGNESIUM	1.5		MEQ/L	1.2 - 2.0	
	CALCIUM	9.5		MG/DL	8.5 - 10.3	
	PHOSPHORUS		5.4 H	MG/DL	2.5 - 4.5	
	PROTEIN, TOTAL	7.5		G/DL	6.0 - 8.5	
	ALBUMIN	4.3		G/DL	3.2 - 5.0	
	GLOBULIN, TOTAL	3.2		G/DL (CALC)	2.8 - 4.2	
	A/G RATIO	1.3		RATIO (CALC)	0.8 - 2.0	
	BILIRUBIN, TOTAL	0.4		MG/DL	0.0 - 1.3	
	ALKALINE PHOSPHATASE	95		U/L	20 - 125	
	LACTATE DEHYDROGENASE	133		U/L	0 - 250	
	GGT	12		U/L	0 - 45	
	AST (SGOT)	10		U/L	0 - 42	
	ALT (SGPT)	8		U/L	0 - 48	
	URIC ACID	4.4		MG/DL	2.5 - 7.5	
	IRON, TOTAL	91		MCB/DL	25 - 170	
	TRIGLYCERIDES		390 H	MG/DL	< 200	
	CHOLESTEROL, TOTAL		243 H	MG/DL	< 200	
HEMOGLOBIN A1C BY IEC		5.5		%	3.4 - 6.1	TP
<p>The following ranges may be useful in interpreting results. However, factors such as duration of diabetes, adherence to therapy and the age of the patient should also be considered in assessing the degree of blood glucose control.</p>						
DEGREE OF GLUCOSE CONTROL:		HGB A1C VALUE				
POOR		>10%				
FAIR		9-10%				
GOOD		7-9%				
>> END OF REPORT <<						

1 INDICATES TESTING SITE SEE REVERSE SIDE



The following is a scanned image in TIFF format.

REPORT STATUS	TEST	RESULT		UNITS	REFERENCE RANGE	SITE CODE
		IN RANGE	OUT OF RANGE			
CHEMISTRY PANEL #1 TP						
	GLUCOSE		209 H	MG/DL	70 - 125	
	UREA NITROGEN (BUN)	14		MG/DL	7 - 25	
	CREATININE	1.1		MG/DL	0.7 - 1.4	
	BUN/CREATININE RATIO	13		RATIO (CALC)	6 - 25	
	SODIUM	141		MEQ/L	135 - 145	
	POTASSIUM	4.2		MEQ/L	3.5 - 5.3	
	CHLORIDE	104		MEQ/L	95 - 108	
	MAGNESIUM	1.5		MEQ/L	1.2 - 2.0	
	CALCIUM	9.5		MG/DL	8.5 - 10.5	
	PHOSPHORUS		5.4 H	MG/DL	2.5 - 4.5	
	PROTEIN, TOTAL	7.5		G/DL	6.0 - 8.5	
	ALBUMIN	4.3		G/DL	3.2 - 5.0	
	GLOBULIN, TOTAL	3.2		G/DL (CALC)	2.8 - 4.2	
	A/G RATIO	1.3		RATIO (CALC)	0.8 - 2.0	
	BILIRUBIN, TOTAL	0.4		MG/DL	0.0 - 1.3	
	ALKALINE PHOSPHATASE	95		U/L	20 - 125	
	LACTATE DEHYDROGENASE	133		U/L	0 - 250	
	GGT	12		U/L	0 - 45	
	AST (SGOT)	18		U/L	0 - 40	
	ALT (SGPT)	8		U/L	0 - 40	
	URIC ACID	4.4		MG/DL	2.5 - 7.5	
	IRON, TOTAL	91		MCB/DL	85 - 170	
	TRIGLYCERIDES		350 H	MG/DL	< 200	
	CHOLESTEROL, TOTAL		243 H	MG/DL	< 200	
HEMOGLOBIN A1C BY IEC 5.5 % 3.4 - 6.1 TP						
<p>The following ranges may be useful in interpreting results. However, factors such as duration of diabetes, adherence to therapy and the age of the patient should also be considered in assessing the degree of blood glucose control.</p>						
DEGREE OF GLUCOSE CONTROL:		HGB A1C VALUE				
POOR		>10%				
FAIR		9-10%				
GOOD		7-9%				
>> END OF REPORT <<						

1

INDICATES TESTING SITE SEE REVERSE SIDE \*

## 2.7 Additional Information Specifications

Additional Information Specifications provide information specific to a given attachment or attachment category and supplement this implementation guide. The following is a list of Additional Information Specifications available at the time of this publication. Other Attachment types are in various stages of development at HL7 and will be available for use when published. Currently this is the list of AIS documents expected to be named in the final rule for HIPAA claims attachments. Others may be named in future regulations.

- Additional Information Specification 0001: Ambulance Service Attachment (CDAR2AIS0001R030)
- Additional Information Specification 0003: Rehabilitation Services Attachment (CDAR2AIS0003R030)
- Additional Information Specification 0004: Clinical Reports Attachment (CDAR2AIS0004R030)
- Additional Information Specification 0005: Laboratory Results Attachment (CDAR2AIS0005R030)
- Additional Information Specification 0006: Medications Attachment (CDAR2AIS0006R030)

## 2.8 Contents of an Additional Information Specification

The codes and message variants for each type of electronic supporting documentation are defined in an Additional Information Specification. Each specification contains:

- The LOINC code or codes that are used to identify the attachment in its entirety or the attachment type category in the 277 transaction and the CDA /ClinicalDocument/code element.
- XML elements of the CDA header that must be present in a compliant CDA document
- The LOINC codes that are used to identify individual attachment components or parts of clinical reports in the 275 and 277 transactions, and the computer-decision variant of the CDA document.

Note that in some specifications, the implementer is referred to the more comprehensive lists available in the RELMA tool, available at no cost from the Regenstrief Institute. (See <http://www.LOINC.org>.)

- A **value table**, which includes the LOINC codes for each attachment data component or report category with the associated answer part LOINC codes, data type, and answer code information
- A coding example
- **Code sets**, which are lists of the codes used for specific attachment data component parts.
- **Code set Object IDs (OIDs)**, which are required for coded answers (see Section 2.5.6).

These are described below.

## 2.9 Additional Information Specification Value Table

Figure 2.9-1 is an example of the value tables that are included in the Additional Information Specification documents.

Editor's note: this example is for illustration purposes only; some of the referenced information may be changed through the HL7 balloting process. Refer to *Additional Information Specification 0003: Rehabilitation Services Attachment*.

LOINC code Component	Answer	Description and Value	Entry Type	Data Type	Card	Response Code / Numeric Units
<b>18671-8</b>	18671-8	ALCOHOL-SUBSTANCE ABUSE REHABILITATION TREATMENT PLAN, NEXT PLAN OF TREATMENT TEXT (NARRATIVE)		ED	0,1	
<b>18674-2</b>		ALCOHOL-SUBSTANCE ABUSE REHABILITATION TREATMENT PLAN, LONGEST PERIOD OF SOBRIETY FOR ABUSED SUBSTANCE (COMPOSITE) This information is stored in an <observation> pertaining to the diagnosis addressed by the plan. The XPath Expression to access this information is:  /Clinical Document//section[code/@code="18674- 2" and code/@codeSystem=\$LOINC]//observation[code/@code ="18674- 2" and code/@codeSystem=\$LOINC]	OBS		0,n	
	18676-7	ALCOHOL-SUBSTANCE ABUSE REHABILITATION TREATMENT PLAN, LONGEST PERIOD OF SOBRIETY The <value> element of the <observation> indicates the longest period of sobriety. The @value attribute indicates the length of the period.  /Clinical Document//section[code/@code="18674- 2" and code/@codeSystem=\$LOINC]//observati on[code/@code ="18676- 7" and code/@codeSystem=\$LOINC]/value/@value  Include units for the period of sobriety in the @unit attribute: d      days mo     months wk     weeks	PQ	1,1 UCUM		
	18675-9	ALCOHOL-SUBSTANCE ABUSE REHABILITATION TREATMENT PLAN, ABUSED SUBSTANCE	EN		1,1	

Figure 2.9-1. Sample Value Table.

The columns of the value table are:

- **LOINC Code Component** — this column contains the LOINC code that identifies an attachment component or clinical report category. The LOINC code in bold identifies the question or the information being requested
- **LOINC Code Answer** — this column contains the LOINC code that identifies an answer part of a component or clinical report. If there is a single answer part for a LOINC, the LOINC code is the same as the LOINC component and is on the same line as the Component. If there are multiple answer parts, the LOINC codes are in the next row in the table and typically each answer part has a distinct LOINC code.
- **Description and Value** — this column names the component identified by the LOINC codes. It can also contain instructions on what data to include
- **Entry Type** — this column contains the HL7 entry type used to record the information for the component. This dictates the format of the data in the computer-decision variant of the attachments document as described in section 3.6.
- **Data Type** — this column contains the HL7 data type of the answer. This dictates the format of the data in the computer-decision variant of the attachments document as



described in section 3.6.

- **Card**— this column gives the minimum and maximum number of repetitions. It describes whether the attachment component, clinical report category, answer part, or clinical report component is optional or can repeat. (See 2.10.)
- **Response Code/Numeric Units** – this column defines supporting information relevant to those attachment components defined as coded elements (CD) or numeric Physical Quantity (PQ) data type. For CD data types it specifies the coding system for the answer codes. For PQ data types it limits the units of measure that may be included with the number. Note that all physical quantities must use UCUM for the units of measure.

## 2.10 Cardinality

HL7 uses the term Cardinality to refer to the specification of the number of times that a component may or must repeat. When the minimum number of repetitions is zero, the cardinality specification indicates optionality.

Cardinality is described as a pair of numbers, the first is the least number of repetitions that are required, and the second the greatest. The second number can also be “n” which means an unspecified number, more than one. The common patterns are

- |     |  |
|-----|--|
| 1,1 | The attachment component or attachment component answer part is required; only a single occurrence is permitted    |
| 0,1 | The attachment component or attachment component answer part is optional; at most a single occurrence is permitted |
| 1,n | The attachment component or attachment component answer part is required; multiple occurrences are permitted       |
| 0,n | The attachment component or attachment component answer part is optional; multiple occurrences are permitted       |

The Card column describes repetition in the pattern of attachment components and attachment component answer parts. If such a value appears in a row containing a LOINC code for an attachment component, it describes whether the entire component (including one or more answer parts) can repeat. If a repetition value appears in a row containing LOINC code for an attachment component answer part, it indicates that the answer part can repeat within a single occurrence of the complete attachment component.

In some cases, a data component may be shown as required even though it is not always collected as part of the episode that is the subject of the claim. In this case, the detailed specifications offer the ability to document affirmatively that the data was not collected. See sections 3.5.1(2) and 3.7.13 for a description on how this is represented in a CDA document.

## 2.11 Display Capability of Attachment Receiver

The HL7-supplied style sheets create HTML from the XML of the attachment.

When this HTML is viewed, a browser will re-flow paragraphs, lists and table entries to adjust to the size of the screen. CDA attachments rendered in this way will be viewable in windows that are less than 500 pixels wide but for easiest viewing receivers should view the attachments in a

browser with a window at least 750 pixels wide and 300 pixels deep. This is practical on screens with a resolution of 800x600 or larger. If necessary, a receiver could accommodate smaller screens by adjusting the browser's font size.

### 3 CDA Attachment Compliance Statement (Normative)

This chapter provides the normative information that describes how compliance with the attachments implementation guide and the AIS documents is determined. It provides a series of compliance statements (rules) that can be used to determine that a specific attachment complies with this implementation guide and the relevant Additional Information Specification.

The compliance statements are normative components of this guide. This means that they make up the authoritative content (that which must be followed to be in compliance). Non-normative examples may be provided to illustrate compliance, but judgments about the compliance of an implementation cannot be made from the examples. The examples do not show every legal variation that could be present.

Examples in this section are not normative. They represent specific instances that meet the compliance statement that they accompany. An example in this section is typically not a complete attachment document. It is a fragment that illustrates the compliance statement it accompanies.

#### 3.1 Definitions

The following definitions apply to terms as used in the compliance statements for this document. Some of these terms and definitions, such as 'may', 'shall', 'need not' and 'should' are consistent to the HL7 standards as defined the HL7 publishing guide.

**Attachment Document.** The CDA document that is part of an Attachment Package.

**Attachment Component.** A portion of an attachment that represents one or more attachment component answer parts as defined in section 2.9. This concept is not related to the XML notion of an element.

**Attachment Component Answer Part.** A portion of an attachment that represents a single unit of information identified by a LOINC code as defined in section 2.9.

**Attachment Package.** The combination of a CDA document and any adjunct files (e.g., images) that are transmitted together in fulfillment of an administrative transaction (e.g., included in the BIN segment of an ASC X12 275 transaction as transmitted from a provider to a payer). For HIPAA, the Attachment Package defines the full requirements of the required administrative transaction.

**CDA Content.** CDA content appears as PCDATA within structural elements.

**CDA Structure Element.** One of the XML elements used to structure text within a CDA document. These elements appear beneath the <text> element of the <section> within a CDA document, and include such elements as <paragraph>, <list> or <table>.

**Computer-decision variant.** An instance of a CDA attachment with enough structure and coding so that it can be rendered with detailed data suitable for a computer decision algorithm. Attachments in the computer-decision variant can also be rendered so that a person can make a decision based on its contents. Contrast with *human-decision variant*.

**Deprecate.** Used to describe a feature that is permitted but not recommended. It is the equivalent of "should not." Features that are deprecated may be forbidden in future releases of the standard.

**Human-decision variant.** An instance of a CDA attachment intended solely for rendering so that a person can make a decision based on its contents. Contrast with *computer-decision variant*.

**May.** The auxiliary verb "may" indicates a condition or action that is permitted, but not mandatory. An attachment document that is otherwise compliant but does not meet a "may" condition is nonetheless compliant. An entity that is otherwise compliant that fails to take the recommended action is still compliant. In contrast to "should," "may" does not denote a recommended construct or action.

**Natural language.** Text constructed to be understood by a human being who has the professional competencies required to review or make decisions based on attachment information.

**Need not.** The construct "need not" indicates a condition or action that is not recommended, but is nonetheless permitted. This construct is equivalent to "should" (below), without the sense of endorsing the feature described. An attachment document that is otherwise compliant but contains a "need not" condition is nonetheless compliant. An entity that is otherwise compliant but takes the "need not" action is still compliant.

**Object Identifier (OID).** An ISO Object Identifier (OID) is a globally unique string consisting of numbers and dots (e.g., 2.16.840.1.113883.3.1). This string expresses a tree data structure, with the left-most number representing the root and the right-most number representing a leaf.

**Shall.** Consistent with general standards usage, the auxiliary verb "shall" indicates a condition or action that is mandatory. An attachment document which does not meet any "shall" condition is noncompliant. An entity that fails to take the "shall" action would not be compliant. "Shall" in HL7 standards documents is equivalent to "must" in ASC X12 implementation guides.

**Should.** Consistent with general standards usage, the auxiliary verb "should" indicates a condition or action that is recommended, but not mandatory. A document that is otherwise compliant but does not meet a "should" condition is nonetheless compliant. An entity that is otherwise compliant that fails to take the recommended action is still compliant.

**Should Not.** The verb "should not" indicates a condition or action that is not recommended. A document that contains information that does not meet the condition of "should not" is still compliant.

## 3.2 Compliance Statements

Compliance with the attachment standards is determined by examining an attachment package in the light of the compliance statements in this document. Each compliance statement is a predicate; i.e., a statement that can be determined to be true or false by examining an attachment package. An attachment will be compliant if it is possible to answer yes to all the statements in this section that use the verb "shall".

The CDA includes some elements that are not germane to the functions of attachments. This specification might have created compliance statements saying that those elements shall not be present in compliant packages. However, it is desirable to be able to submit CDA documents that were created for other purposes when they meet all the provider compliance statements. Therefore, this specification adopts a different approach for these extraneous elements. It includes statements that these elements "should" not be present, so that their presence does not make the document noncompliant.

Receivers of attachment packages must ignore elements that "should" **not** be present.

### 3.3 General Compliance Statements

The following compliance statements apply to all CDA documents proffered as attachments.

- 1) **CDA Compliant.** *The document shall be compliant with Health Level Seven (HL7) Clinical Document Architecture, Release 2.0, April 2005 (ANSI/HL7 CDA R2-2005).*
- 2) **CDA Namespace.** *The document shall use a namespace with the Uniform Resource Identifier (URI) "urn:hl7-org:v3" for elements in the CDA schema.*
- 3) **Self-Contained Package.** *Unless a specific Additional Information Specification specifically overrides this provision, the interpretation of the attachment shall not depend on any information that is not included in the attachment package.*

This statement means that a compliant health plan need not perform document management with respect to revisions of the submitted document. Decisions will be made on the basis of the transmitted document without regard to whether it is an updated or amended version of a prior document. This does not preclude a payer from requesting another attachment once an attachment has already been requested and received. The final rule for claims attachments will define the rules around when it is appropriate to request more supporting documentation.

It also means that if a submitted document contains a URL that references information otherwise not included in the attachment package (e.g., available only through the internet), a compliant health plan does not need to retrieve and render the referenced information in order to make a decision based on the document. This is consistent with the CDA rule that the information referred to by such URLs are not part of the attestable content of the CDA document.

At publication date no Additional Information Specifications will override this compliance statement. We are holding out the option that the use case of a specific Additional Information Specification in the future might justify something like Internet access to related data.

- 4) **Deprecate and Limit Recipient Obligations for Confidentiality Elements.** *Providers should not include any of the following elements anywhere in a compliant CDA document: section/confidentialityCode, structuredBody/confidentialityCode, and nonXMLBody/confidentialityCode. If, however, a provider transmits an attachment document that includes these documents, the health plan is not obligated to give the document any special handling beyond its normal policies for dealing with personally identifiable health information.*

### 3.4 Header Compliance Statements

The following compliance statements apply to elements in the header of all CDA documents proffered as attachments.

Relative XPaths in this section are derived from the base location of `/ClinicalDocument`. For example, a reference to `"code/@code"` would be a reference to the code attribute of the `<code>` element within the `<ClinicalDocument>` element of the document.

#### 3.4.1 General Header Compliance Statements

- 1) **Document Type.** *The `.title` element will contain the name of the document type in natural language that has been identified as the subject of an attachment in natural language. This name will be understood by a human reader to be equivalent to the name of a document that has been identified as the subject of an attachment in an Additional Information Specification. There is no requirement that the name be repeated letter by letter from the Additional Information Specification, only that it be understood by a knowledgeable person to have the same meaning.*
- 2) **Coded Document Type.** *The element `code/@code` (value) attribute will contain a LOINC code for the document.*
- 3) **Required Header Elements.** *Certain header elements that are required in the header may be redundant with questions specified in individual Additional Information Specifications. In such cases the provider shall provide the information in the header, and should provide it in the body.*
- 4) **Optional Header Elements.** *Certain header elements that are optional in the header may be redundant with questions specified in individual Additional Information Specifications. In such cases the provider shall provide the information in the body of the document **and** should redundantly include that information in the header.*

Comment: the reason that such information should appear in the header is to allow copies of the document to be processed by software that is built to the CDA standard but not specific to attachments.

- 5) **Format of LOINC Codes.** *LOINC codes must always be transmitted without leading zeroes with a hyphen before the check digit (e.g., "8709-8" or "10154-3").*
- 6) **Signing.** *Documents that are signed by a person but not legally authenticated shall use the `<authenticator>` element. Documents that are legally authenticated shall use the `<legalAuthenticator>` element.*

#### 3.4.2 Recording the Attachment Control Number (ACN)

In order to ensure appropriate linkage to the associated healthcare transactions such as the ASC X12 837 claim or the ASC X12 278 services review, the header shall contain an `inFulfillmentOf/order/id` element to convey an attachment control number. The `inFulfillmentOf/order/id/@extension` attribute shall contain the value that is specified in the corresponding loop position of the related administrative transaction. The `inFulfillmentOf/order/id/@root` attribute shall contain the OID of the assigning authority of that identifier.

Example: a claim identified in ASC X12 275 *Additional Information to Support a Health Care*

*Claim or Encounter*, contains the value XA728302 in data element TRN02-Attachment Control Number of Loop 2000A-Payer/Provider Control Number from the ASC X12 275. The OID of the assigning authority for this identifier is 2.16.840.1.113883.19.2744.1.5. The header of the CDA document would include:

```
<inFullfilmentOf>
  <order>
    <id root="2.16.840.1.113883.19.2744.1.5" extension="XA728302"/>
  </order>
</inFullfilmentOf>
```

A CDA document that already exists will not usually contain the appropriate attachment control number. A simple transformation of that document can be created to incorporate the appropriate attachment control number. When this is done, a new identifier is assigned to the newly created transformation of the existing CDA document. Furthermore, a */relatedDocument* element is created identifying the original document in *relatedDocument/parentDocument/id*, and *relatedDocument/@typeCode* contains the value XFRM.

Example: A request for additional information in an ASC X12 277 *Healthcare Claim Request for Additional Information* can be answered using information in an existing clinical document whose id is 99275 from the namespace identified by the OID 2.16.840.1.113883.19.2744.1.1. The existing clinical document is copied and a new identifier is assigned to it, replacing the previous identifier.

```
<ClinicalDocument>
  <id root="2.16.840.1.113883.19.2744.1.1" root="99276"/>
```

The following information replaces any existing *<relatedDocument>* element in the CDA document.

```
<relatedDocument typeCode="XFRM">
  <parentDocument>
    <id root="2.16.840.1.113883.19.2744.1.1" root="99275"/>
  </parentDocument>
</inFullfilmentOf>
```

### 3.4.3 Attachments Attributable to An Organization

For many administrative transactions identifying the organization to which the attachment is attributed is at least as important as identifying the person. For example this occurs in an attachment to a claim when the entity requesting the payment for service is an organization.

*When the administrative transaction associated with an attachment is performed on behalf of an organization the attachment shall contain an author/assignedAuthor/representedOrganization element in the header that identifies the organization.*

*Where (1) there is an author/assignedAuthor/representedOrganization element that identifies an organization, and (2) the person responsible for the information in the attachment is of no substantive consequence, the attachment need not contain an author/assignedAuthor/assignedPerson element. This is applicable when an organization is the sending entity.*

Example:

```
<author>
  <time value="298379"/>
  <assignedAuthor>
```

```
<id root="2.16.840.1.113883.19.2744.1.3" extension="298379"/>
</assignedAuthor>
<representedOrganization>
  <name>Name of Organization</name>
</representedOrganization>
</author>
```

Every attachment must have either an author/assignedAuthor/representedOrganization element or an author/assignedAuthor/assignedPerson element. Attachments may have both.

### 3.4.4 Additional Header Compliance Statements for the "Computer-Decision" variant

The header elements of attachment documents in the "Computer-Decision" variant must meet all the compliance statements of section 3.4.1. In addition, they must meet the following compliance statements.

- 1) **Required and Optional Header Elements.** Certain header elements that are required in the header may be redundant with questions specified in individual Additional Information Specifications. In such cases the provider shall provide the information in the header, and should provide it in the body.
- 2) **Authors.** Authors of clinical documents shall be recorded in the /ClinicalDocument/author element of the header.
- 3) **Document Signer.** When a document has been legally signed, the legal signer of the clinical document shall be represented in /ClinicalDocument/legalAuthenticator.
- 4) **Other Signers.** Other parties may sign a document to attest to the accuracy of it. These shall be represented in /ClinicalDocument/authenticator elements.
- 5) **Responsible Physician.** The physician responsible for the encounter shall be recorded in the /ClinicalDocument/componentOf/encompassingEncounter/responsibleParty element.
- 6) **Referring or Ordering Physician.** The physician responsible for referring the patient or ordering the study shall be represented in /ClinicalDocument/participant element, and the @typeCode of that participant shall be "REF".

## 3.5 Body Compliance Statements

### 3.5.1 General Body Compliance Statements

This section applies to attachments where the contents are expressed in XML. This section does not apply to attachments that have a <nonXMLBody> body and the content is transmitted as image or text. The compliance statements for those attachments are included in section 1.1.1.

- 1) **Natural Language Title for Attachment Components.** Where an attachment document contains an attachment component as described in an Additional Information Specification, a natural language representation of the name of that attachment component shall be present in a section/title element.

Within these compliance statements the <section> that contains this title is said to be the "section that contains the attachment component."

- 2) **Cardinality of Attachment Components.** Sections that contain attachment components shall appear in an attachments document consistent with the cardinality specification of the relevant Additional Information Specification.



The above notwithstanding, a sender cannot send information that it does not have. *If a sender does not have the information required in a component of an Additional Information Specification, and if the cardinality specified for the component is greater than zero, the sender shall send a <section> or <paragraph> element with the caption and an explanation of why the information is not available. Common explanations are "not observed or not asked", "patient declined or was unable to provide the information" or "no result could be obtained for this request or specimen (for example, if a blood specimen is hydrolyzed).*

- 3) ***Positioning of Attachment Component Answer Parts.*** *Attachment component answer parts shall appear as natural language text in CDA structure elements descended from the section element that contains the attachment component.*

There is no compliance statement requiring that the answer part be directly descended from the section element that contains the attachment component. The preparer has latitude to group the answer parts into subsections should it choose any of the CDA structure elements, except if more specific instructions are given in an Additional Information Specification.

There is no compliance statement saying whether the content element is descended from a <paragraph> or <list> element. The preparer has latitude to choose among the alternatives available through the CDA.

- 4) ***Cardinality of Attachment Component Answer Parts.*** *Attachment component answer parts shall appear in an attachment document consistent with the cardinality specification of the relevant Additional Information Specification.*
- 5) ***Natural Language Caption for Attachment Component Answer Parts.*** *Where an attachment component contains more than one answer part, the text for each answer should be in a separate CDA structure element. Each such structure element should contain a <caption> element that identifies the answer part in natural language.*

*If, however, the contents of a section of an attachment are organized using the <table> element, the captions should appear in <th> elements that head columns of the table.*

"Should" is used here to allow for the possibility that a pre-existing CDA document that contains all the required information exists, but was not structured specifically to be an attachment. As long as a person can discern the answers that should suffice.

- 6) ***<observationMedia> Referent.*** *If an answer part includes the <observationMedia> element, the element shall reference a file contained in the attachment package.*
- 7) ***<observationMedia> Referent Type.*** *The <observationMedia> is used when an image is embedded within a CDA Body. Unless this compliance statement is overridden by an Additional Information Specification, if an answer part includes the <observationMedia> element, referenced file shall be one of the file types listed in Table 3.5-1 and the file name shall include the suffix identified in the table. The table also shows the value of observationMedia/@mediaType that corresponds to the image type.*
- 8) *Images should have a pixel density suitable for rendering on a screen (i.e., they should be suitably sized when displayed at 96pixels per inch).*

*Table 3.5-1. Acceptable File Types for Observation Media.*

File Type	File Name Suffix	MT Value
Joint Photographic Experts Group image	.JPG, .JPEG	image/jpeg
Portable Network Graphics image	.PNG	image/png
Graphics Interchange Format	.GIF	image/gif
Tag Image File Format	.TIF	image/tiff

### 3.5.2 Non-XML Body Compliance Statementets

The non-XML body is used when an external file contains all of the information to be transmitted as the attachment.

- 1) **Permissible File Types.** *The nonXMLBody/text/@mediaType attribute should contain one of the file types listed in .*

*Table 3.5-3. Acceptable File Types for <nonXMLBody>*

File Type	File Name Suffix	MT Value
Plain text	.TXT	text/plain
HTML	.HTM, .HTML	text/html
Joint Photographic Experts Group image	.JPG, .JPEG	image/jpeg
Portable Document Format	.PDF	application/pdf
Portable Network Graphics image	.PNG	image/png
Graphics Interchange Format	.GIF	image/gif
Rich Text Format	.RTF	text/rtf
Tag Image File Format <sup>8</sup>	.TIF	image/tiff

All receivers shall be able to render all of the file types listed in Table 5. This may require conversion software on the receivers end to convert file types to the native file type accepted in their system or that can be viewed on their system.

TIFF is included because it is far more compressed for "fax quality" copies of pages than the other formats. . The TIFF images must be a monochrome image scanned at a minimum of 200x100 bits per inch (fax quality) in the format of a TIFF file with the CCITT Group 4 subtype <sup>TM</sup> Revision 6.0 Final, June 3, 1992. This is equivalent to a facsimile transmission with "fine" resolution. Resolutions substantially greater than 200x100 bits per inch may result in excessively large file sizes. Trading partners should consider file size in comparison to resolution when exchanging images.

Other file types, such as DICOM and other variations of TIFF, may be used when mutually agreed upon by trading partners. File sizes may also be limited when trading partners agree to such limitation.

When viewing files in a revisable format (such as RTF) receivers are encouraged to use software that is designed for viewing but does not permit revisions to be created.

<sup>8</sup> TIFF is a trademark of the Adobe Developers Association; 345 Park Avenue; San Jose, CA 95110-2704 See: <http://partners.adobe.com/asn/developer/pdfs/tn/TIFF6.pdf>

- 2) *The nonXMLBody/text/reference/@value attribute shall contain the name of a file that is packaged with the CDA document in a MIME package as described in Section 2.5.4*  
For example:

```
<body>
  <nonXMLBody >
    <text mediaType="image/jpeg"><reference value="labReport.jpg"/></text>
  </nonXMLBody>
</body>
```

*Specific Additional Information Specifications may authorize the use of URLs within the nonXMLBody/text/reference/@value attribute.*

### **3.5.2.1 No Information For Non-XML Body Type)**

When a nonXMLBody is sent, the sender may not have all the required data elements of the attachment. For XMLBody types, there is a way to tell the receiver that “no information” is available for the required component. For a nonXMLBody type, the receiver must assume that all data was not available if not sent.

### **3.5.3 Additional Body Compliance Statements for the "Computer-Decision" Variant**

The body elements of attachment documents in the "Computer-Decision" variant must meet all the compliance statements of section 3.5.1. Specifically, the need to include human-readable representations of the information is maintained in the computer-decision variant, since many receivers will process attachments in the computer-decision variant for human decision making.

In addition, they must meet the following compliance statements.

- 1) ***Coded Sections for Attachment Components.*** *Where an Additional Information Specification specifies elements of an electronic attachment, a LOINC code for the element shall be present in the section/code element of the section that contains the element.*
- 2) ***Coded Entries for Attachment Component Answer Parts.*** *The <entry> element associated with an attachment component answer part must contain a <code> element that contains the LOINC code associated with the attachment component answer part, unless otherwise specified in an AIS.*
- 3) ***Entries Linked to Narrative for Attachment Component Answer Parts.*** *Acts in the <entry> element shall be linked to the narrative text. Therefore, section/entry/\*/text/reference/@value must be present, and that value must reference an element in section/text.*
- 4) ***Format of Answer Parts.*** *The structure element that is the direct ancestor of the <code> element associated with an attachment component answer part must contain (directly or in subelements) the information for that answer element in a format that is specific to the data type specified for the attachment component answer part in the Additional Information Specification.*

The formats for specific data types are described in section 3.6.

- 5) **No Answer Provided.** Section 3.5.1 discusses a scenario where requested information is not available. In addition to the requirements stated in that section the sender of a document in the computer-decision variant shall add a special entry as described in Section 3.7.16.
- 6) **Uncertain values.** The *uncertaintyCode* element shall not be included in any CDA clinical statement unless specifically required by an Additional Information Specification.

## 3.6 Entries in the CDA

The human-decision variant includes minimal machine-readable information in the CDA header to identify the document, patient, and other information critical to the processing of the attachment. The computer-decision variant includes machine-readable information in both the CDA header and in entries in the body of the document.

Please reference the individual ASI documents to determine which elements of an entry are relevant to a specific attachment type.

### 3.6.1 General Statements about Entries

Entries in the CDA all derive from the HL7 Act class and have certain common features. This section describes these features in more detail, and provides for certain constraints on them.

The basic pattern followed by an entry is shown below.

```
<entry>
  <someAct>
    <id root="20030306" extension="20030306"/>
    <code code="18011-7" displayName='AORTA ARCH, DIAMETER (ECHO)'
      codeSystem="2.16.840.1.113883.6.1"/>
    <effectiveTime value="20030306"/>
    <text><reference value="#aad-1"/></text>
  </someAct>
</entry>
```

#### 3.6.1.1 id

One or more identifiers may be present, and identify the act being recorded. The identifier of the act has a required root attribute, which may be a GUID or OID. The extension attribute may be present, and is a string that may further identify the act within the namespace identified by the root attribute.

#### 3.6.1.2 code

The `<code>` element is required, and further refines the kind of act being recorded. This will often be the LOINC answer part code. Each AIS shall indicate what code to place on an entry.

The `codeSystem` attribute shall be present, and is the OID for the coding system used. Values for coding systems can be obtained from the HL7 OID registry accessible from the HL7 home web page at [www.hl7.org](http://www.hl7.org). The `codeSystemName` may be present, and is a human readable name for the coding system. The `code` attribute is required and contains the code value. The `displayName` attribute may be present, and is a human readable description of the code value. Codes for procedures, medications, diagnoses, and observations can be obtained from a variety of sources,

including CMS (NDC, HCPCS, ICD-9-CM), the National Library of Medicine (RxNORM), the Regenstrief Institute (LOINC), SNOMED (SNOMED CT) and the American Medical Association (CPT-4). Additional vocabularies are also available from the HL7 Version 3 Vocabulary tables, available to HL7 members through the HL7 web site.

Additional AIS may restrict the coding systems that are permitted for a particular entry.

### 3.6.1.3 effectiveTime

The <effectiveTime> element may be present, and records the "biologically" effective time of the act, which is not necessarily the same as when it was recorded or determined. For example, a diagnosis of an illness occurs after the onset, but its effective time is from the onset to the resolution of the illness. Each Additional Information Specification shall indicate whether this element need be recorded.

The <effectiveTime> element may be a time stamp, date range, or more complex timing structure depending upon the use. For almost all acts, <effectiveTime> is represented either as a time stamp, or as a range. Only a <substanceAdministration> act uses a more complex timing structure.

Data Type	Description	Representation
TS	The value attribute of the <effectiveTime> element gives the effective time of the act.	<code>&lt;effectiveTime xsi:type='TS' value='...'/&gt;</code>
IVL_TS	The value attribute of the <low> and <high> elements give the bounds of the date range. Either <low> or <high> may be omitted to specify a time range that has no upper or lower bound. While CDA permits several alternative representations of IVL_TS, only the representation shown to the right is permitted.	<code>&lt;effectiveTime xsi:type='IVL_TS' &gt;     &lt;low value='...'/&gt;     &lt;high value='...'/&gt; &lt;/effectiveTime&gt;</code>
GTS	Recurring activities can be recorded using the GTS data type. This is recorded in CDA as a series of <effectiveTime> elements with set operations that indicate how to combine these. Under this specification, the first <effectiveTime> element must be the bounding range, and the second <effectiveTime> element may further constrain the set to indicate the frequency (e.g., of visits, or administrations).	See section 3.7.14

Table 3.6-1 effectiveTime Data Types

The value attribute shown above records the time and date in the HL7 date time format, which is described in section 3.7.13 below.

### 3.6.1.4 text

The <text> element shall be present and points to the narrative text by use of the <reference> element. The value attribute shall be a local URI in the form *#identifier* referencing an element in the <text> narrative that most closely contains the text to which the entry pertains. A structured text element shall be present that has a matching value for *identifier* in its ID attribute.

Use of this mechanism to link the coded entries to the narrative text allows payer systems receiving the Computer Decision Variant form to take advantage of the rich information provided in the machine readable entries even when no automated processing of this information is performed. By linking the entries with the text, codes, times, values, and other information, the entry can be displayed to the human making decisions about the claim.

Figure 3.6-1 below shows how this works with an observation.

*Figure 3.6-1 Observation Example With Pointer to Narrative Text*

```

<section>
  <code code="18011-7" displayName='AORTA ARCH, DIAMETER (ECHO)'
    codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC"/>
  <title>Aortic Arch Diameter </title>
  <text>
    <paragraph ID='aad-1'>
      <content>1 inch</content>
    </paragraph>
  </text>
  <entry>
    <observation classCode='OBS' moodCode='EVN'>
      <code code="18011-7" displayName='AORTA ARCH, DIAMETER (ECHO)'
        codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC"/>
      <effectiveTime value="20030306"/>
      <text><reference value="#aad-1"/></text>
      <value xsi:type="PQ" value="1" units="[in_us]"/>
    </observation>
  </entry>
</section>

```

### 3.6.2 Observation (OBS)

Most coded information returned in an attachment will be returned using the observation entry structure as shown above in Figure 3.6-1. Each observation represents information about a subject (usually the patient). Structurally, the attachment observations represent name-value pairs, where the <code> element identifies what was observed, and the <value> element identifies the value of the observation. Diagnoses, measurements of any type, lab results, and study observations are all recorded using the observation entry structure.

In the example given above, the observation of the aortic arch diameter obtained during a cardiac echo study is recorded. This observation uses the same LOINC code to identify it as is used to identify the section where the information appears in narrative form, however, in some cases, the LOINC code will be for a different answer part.

The <code>, <effectiveTime> and <text> elements are used as described in section 3.6 above.

#### 3.6.2.1 value

The <value> element shall give the value of the observation. Each specific observation has a related data type, and is indicated in the AIS data tables. Most observations will use the PQ data type, which represents physical quantities, as shown in the example above. A physical quantity has a real numeric value, as reflected in the value attribute of the <value> element, and units of measure, shown in the units attribute on that element. The units of measure are specified using the Unified Code for Units of Measure (UCUM). This code system supports reporting all units of measures being contemporarily used in international science, engineering, and business.

Because different observations may demand different data types to record them, the data type must be specified. This is done using the xsi:type attribute on the <value> element. A detailed list of data types is given below in Table 3.6-3.

**Note:** Type names found in the `xsi:type` attribute are sensitive to the namespace prefixes in use in the document. If the CDA document sets the default namespace to 'urn:hl7-org:v3', then the type name that appears as the value of the `xsi:type` attribute must appear as shown in Table 3.6-3. However, if a namespace prefix is used, then the type name must also include that namespace prefix.

Without a namespace prefix	<code>&lt;value xsi:type="PQ" value="1" units="[in_us]"&gt;</code>
With a namespace prefix	<code>&lt;hl7:value xsi:type="hl7:PQ" value="1" units="[in_us]"&gt;</code>

Table 3.6-3 Value Data Types

Data Type	Description	Data Type	Description
Boolean		Contact Information	
BL	Boolean (true/false)	EN	Entity Name
Codes		ON	Organization Name
CD	Concept Descriptor (coded)	PN	Person Name
CS	Coded Simple	AD	Address
Dates		TEL	Phone numbers or e-mail addresses.
GTS	General Timing	Quantities	
IVL_TS	Interval of Time	PQ	Physical Quantity
TS	Time Stamp	Content	
Identifiers		ED	Structured Text or Multimedia Content
II	Identifier	ST	String

The `<value>` element provides the measurement being requested, and may be of any type listed above in the table above.

### 3.6.3 procedure (PROC)

Some coded information in an attachment will be for a medical procedure, such as a surgical procedure, anesthesia, or other therapeutic procedure. This information will be recorded using the procedure entry structure. For example, the Hospital Discharge Procedures Section of a discharge summary will list the relevant procedures performed during a hospital stay, and is shown in the example below.



```

<section>
  <code code="8651-2" displayName=' HOSPITAL DISCHARGE PROCEDURES'
    codeSystem="2.16.840.1.113883.6.1"/>
  <title>Discharge Procedures</title>
  <text>
    <paragraph>
      <content ID='p-1'>Suture Removal, Left forearm</content>
    </paragraph>
  </text>
  <entry>
    <procedure>
      <code code="S0630" displayName="REMOVAL OF SUTURES"
        codeSystem="2.16.840.1.113883.6.14" codeSystemName="HCPCS"/>
      <effectiveTime value="200004071430"/>
      <text><reference value="#p-1"/></text>
    </procedure>
  </entry>
</section>

```

### 3.6.3.1 code

The <code> element of the <procedure> entry indicates what kind of procedure was performed.

### 3.6.3.2 effectiveTime

The <effectiveTime> element indicates when the procedure was performed.

## 3.6.4 substanceAdministration (SBADM)

Information regarding the administration or prescription of medications or immunizations is recorded using the <substanceAdministration> entry structure, which is shown below in excruciatingly painful detail.

```

<substanceAdministration classCode="SBADM" moodCode="RQO" >
  <code code="18617-1" codeSystem="2.16.840.1.113883.6.1"
    codeSystemName="LOINC"
    displayName="MEDICATION DISCHARGE" />
  <text><reference value="#paragraph-1" /></text>
  <effectiveTime xsi:type="IVL_TS" >
    <low value="20061025" />
  </effectiveTime>
  <effectiveTime operator="A" xsi:type="PIVL_TS" >
    <period unit="h" value="6" />
  </effectiveTime>
  <routeCode code="PO" codeSystem="2.16.840.1.113883.5.112"
    codeSystemName="RouteCode" displayName="Oral" />
  <doseQuantity unit="mg" value="5" />
  <consumable>
    <manufacturedProduct>
      <manufacturedLabeledDrug>
        <code code="321197008" codeSystem="2.16.840.1.113883.6.96"
          codeSystemName="SNOMED CT"
          displayName="diazepam 5mg tablet" />
        <name>diazepam 5mg tablet</name>
      </manufacturedLabeledDrug>
    </manufacturedProduct>
  </consumable>

```



```

    </manufacturedProduct>
  </consumable>
  <entryRelationship typeCode="COMP" >
    <supply classCode="SPLY" moodCode="RQO" >
      <code code="29304-3" codeSystem="2.16.840.1.113883.6.1"
        codeSystemName="LOINC"
        displayName="MEDICATION DISPENSED" />
      <repeatNumber value="1" />
      <quantity value="15" />
    </supply>
  </entryRelationship>
  <entryRelationship typeCode="RSON" >
    <act classCode="ACT" moodCode="EVN" >
      <code code="410665000" codeSystem="2.16.840.1.113883.6.96"
        codeSystemName="SNOMED CT" displayName="indication for" />
      <text><reference value="#content-2" /></text>
    </act>
  </entryRelationship>
  <precondition>
    <criterion>
      <code code="225761000" codeSystem="2.16.840.1.113883.6.96"
        codeSystemName="SNOMED CT" displayName="as required" />
      <text><reference value="#content-1" /></text>
    </criterion>
  </precondition>
</substanceAdministration>

```

#### 3.6.4.1 code

The <code> element indicates the kind of medication event or order that was recorded, and must be present.

#### 3.6.4.2 text

The <text> element shall be present, and shall include a <reference> element with a @value attribute that points to the text in the narrative that describes the medication event or order.

#### 3.6.4.3 effectiveTime

The <effectiveTime> elements record when the medication was or is to be administered. These elements should be present.

#### 3.6.4.4 routeCode

The <routeCode> element should be present, and shall be a code from the HL7 RouteOfAdministration vocabulary table that indicates the route of administration.

#### 3.6.4.5 approachSiteCode

The <approachSiteCode> element may be present. If present, it shall provide a code that indicates the site where the medication was administered (as in the case of an injection, IV, or topical medication).

#### 3.6.4.6 doseQuantity

The <doseQuantity> element shall be present, and shall be of type PQ or IVL\_PQ. It represents the quantity of medication that was or is to be administered at each dosing.

#### 3.6.4.7 rateQuantity

The <rateQuantity> element should be present for continuous dosing regimens (e.g., IV pump). It is of type PQ and represents the rate at which the medication is administered.

#### 3.6.4.8 administrationUnitCode

The <administrationUnitCode> element may be present. If present it shall include a code from the HL7 MaterialForm vocabulary. This element describes the form of the medication (e.g. tablet, sustained release capsule, gelcap, et cetera).

#### 3.6.4.9 consumable

The <consumable> element records the type of medication that was or is to be administered. At the very leaf it has a <code> element that may be used to code the medication against a controlled vocabulary such as RxNorm or NDC. The <name> element at the leaf must be present and provide the name and strength of the medication.

#### 3.6.4.10 supply (SPLY)

When information about the supply of the medication to be administered is required, this shall be included in a <supply> component of the <substanceAdministration> element. The <code> of the <supply> element shall be present.

The <supply> element may be used to record the <quantity> of medication to be given to the patient. The <repeatNumber> element records the total number of fills that are allowed for the prescription. *Note, that the number of fills is one more than the number of refills.*

#### 3.6.4.11 reason

An <act> element may be present as a reason for the administration of the medication. The act shall have a <text> element that refers to the narrative description of the reason or indication for the medication (for example, in "PRN for pain", the reason is "pain"). The act may have a <code> element that provides further details.

#### 3.6.4.12 precondition

The <precondition> element may be present to describe the conditions under which the medication is to be given (for example, PRN, or if blood sugar over X). The <code> element of the precondition may be present, and shall be coded value describing the precondition. The <text> element of the precondition shall be present, and shall point to the narrative text that describes the precondition.

### 3.6.5 Encounter (ENC)

Information regarding prior or planned (future) encounters is recorded using the <encounter> entry structure. The current AIS's do not use any elements of the <encounter> that have not already been described above in section 3.6.1.

### **3.6.6 Act (ACT)**

Some information does not fit neatly into any of the above categories. For example, transport of a patient from one location to another is not a clinical procedure, administration of medication, or measurable observation. This information will be recorded using the <act> entry structure. The current AIS's do not use any elements of the <act> that have not already been described above in section 3.6.1.

### **3.6.7 Other Components of an Entry**

A CDA entry not only describes the act being documented, but also describes the participants in those acts. Each participant has a particular role, and that role is played by a person, organization, place or thing. Participation in an act is contextual. In any given act, the participation occurs at a point or range of time. The role played by the participant is based not just on context, but also the scoping organization. Most commonly, these participants are assigned to the role by the scoping organization (thus, tag names like <assignedAuthor> or <assignedEntity> are often used to record roles). The entities playing the role are typically persons or organizations, but may also be locations or materials used in the act.

#### **3.6.7.1 Participations (PART)**

When the datum being conveyed is principally about a person, organization, place or thing, the entry type will be listed as PART. There are many kinds of participations which can be used in CDA, the most general being the generic <participant>. More common participants also include <performer> (PRF), <author>, <legalAuthenticator> and <subject>, describing the performer of the act, the author of the information, the person taking legal responsibility, and the person upon whom the act is performed respectively. The participants used in the AIS are described in more detail in sections 4.2.2 and 4.3.7 of the CDA.

#### **3.6.7.2 Manufactured Material (MMAT)**

While common entities such as persons and organizations are easy to understand, the manufactured material participation is distinctive. It is only used in relation to substance administration or supply acts. This entity allows the material (the medication) to be named, and given a code that describes it.

### **3.6.8 observationMedia**

The CDA supports references to multimedia elements such as images and video or audio files. Such references are created in <renderMultiMedia> or <linkHtml> elements appearing in the text of the document. The distinction between these two elements is based on the degree of relevance of the multimedia element to the content of the CDA document. If the multimedia element is an integral part of the document (in the terminology of the CDA is part of the "attestable content" of the document) then the <renderMultiMedia> element is used. The <renderMultiMedia> element references an <observationMedia> element found in the <entry> element of the section. If, on the other hand, the multimedia is illustrative but not essential to the interpretation of the CDA document the connection to the multimedia reference is made through a <linkHtml> element.

Images or other multimedia content that is an integral part of the clinical document are recorded using the <observationMedia> entry structure.

**Example:**

```
<section>
  <code code="8709-8" codeSystem="2.16.840.1.113883.6.1"/>
  <title>Skin</title>
  <text>
    <paragraph>
      <content>Erythematous rash, palmar surface, left index finger.
        <renderMultiMedia referencedObject="media-1"/>
      </content>
    </paragraph>
  </text>
  <entry>
    <observationMedia ID="media-1" mediaType="image/jpeg">
      <value xsi:type="ED" ><reference
        value="left_hand_image.jpg" ></value>
    </observationMedia>
  </entry>
</section>
```

The <reference> element in the above example illustrates how the reference will be created when the image file will physically accompany the CDA document in the transmission. The files are combined using a MIME package as described in section 3.7.16. The file name in the reference/@value attribute corresponds to the file name assigned to the JPG file in the MIME package.

The example below illustrates an alternate form of reference. A uniform resource locator (URL) is placed in the reference/@value attribute. The sender uses this form when the multimedia file does not accompany the CDA document and is instead available over the Internet.

```
<section>
  <code code="8709-8" codeSystem="2.16.840.1.113883.6.1"/>
  <title>Skin</caption>
  <text>
    <paragraph>
      <content>Erythematous rash, palmar surface, left index finger.
        <renderMultiMedia referencedObject="media-1"/>
      </content>
    </paragraph>
  </text>
  <entry>
    <observationMedia ID="media-1" mediaType="image/jpeg">
      <value xsi:type="ED" ><reference
value="https://www.someprovider.org/somepath/rash.jpg"></value>
    </observationMedia>
  </entry>
</section>
```

**Note on the <reference> element.** The <reference> element has a @value attribute that contains a URL that points to the content being referenced. This element is used in several places within the CDA Release 2.0 specification to provide a mechanism to refer to external content. Absent specific specifications in an Additional Information Specification, two different types of URL references are permitted:

1. Reference to content contained within the same MIME multipart document that contains the CDA document shall use a relative URL that begins with the Content-ID of the component of the MIME multipart document that is being referenced.
2. References to content contained elsewhere (e.g., via a web server or other connection) shall use an absolute URL that contains the complete path to the document being referenced.

These restrictions are designed to reduce the complexity of a receiver's implementations of attachments.

**Issues Around the Use of External References.** When external references are used the mechanism for ensuring the confidentiality of the information in the external file and establishing the authority of the receiver to view the information must be established between trading partners rather than by this specification.

When external references are used, the receiver of the CDA document should consider whether simply keeping the URL of the multimedia image file constitutes an adequate audit trail. That decision is outside the scope of this specification and may be dependent on the particular source of the multimedia file (e.g., some specific organizations that serve as a repository for images may be trusted in this regard).

Because of the additional responsibilities of the receiver when multimedia files are referenced with a URL the default in Additional Information Specifications is to require that the multimedia files be included with the CDA document. However, this Implementation Guide includes language to allow specific Additional Information Specifications to permit references to multimedia files that are not sent with the CDA document.

**Types of Multimedia Files.** There are many forms of multimedia files identified in various Internet standards. Absent specific specifications in an Additional Information Specification the sender is limited to static visual image formats commonly rendered by browsers (see Table 3.5-1). This restriction is designed to reduce the complexity of a receiver's implementations of attachments. In future Additional Information Specifications the industry may agree to other multimedia types (such as DICOM) for specific use cases.

## **3.7 Representation of Data Types**

In the "computer-decision" format of attachment document answers must be encoded in a format that can be reliably interpreted by a computer. At the same time all answers must be capable of being interpreted by a human being. The stylesheet file ais.xsl included with the supplemental files available with these documents is able to render the structured information in either the header or the body for human viewing. See Table 3.6-2 for a list of data types.

### **3.7.1 What Are Data Types?**

Data types are the basic building blocks used to construct any higher order meaning: messages, computerized patient record documents, or business objects and their transactions. Every element has a data type. Data types define the meaning (semantics) of values that can be assigned to an element. Meaningful exchange of data requires that we know the definition of values so

exchanged. This is true for complex "values" such as business messages as well as for simpler values such as character strings or integer numbers.

The value tables in the Additional Information Specifications specify a data type for the value represented by each LOINC code. Figure 2.9-1 above provides an example of these tables.

The following subsections of this specification describe how each data type is formatted in a CDA attachment. The approach varies according to the data type. For string (ST) and text (ED) the format used for interpretation by the computer is the same as the format used for a human.

For all other data types the sender includes the information twice: once in natural language for human decision making and once in markup structured using <entry> elements in the <section>.

### 3.7.2 **General Rules for All Data Types**

When an AIS asks for information of a specific data type, the information contained within that data type needs to be available in human-readable form. When using the computer-decision variant, the information must also be available in machine-readable form in an <entry> in a <section> or in an element in the header of the <ClinicalDocument>.

### 3.7.3 **Encapsulated Data (ED) Data Type**

The ED data type is used to capture narrative text. Where a component or answer part in an attachment is of the ED data type, it is expected to appear as <text> in a <section>, in both the computer- and human-decision variants, and shall be clearly identified with a human-readable <title>. In the computer-decision variant, the <section> element shall have a <code> element that identifies it using the LOINC code of the answer component.

CDV Example:

```
<section>
  <code code="18663-5" codeSystem="2.16.840.1.113883.6.1"
    codeSystemName="LOINC"/>
  <title>HISTORY OF PRESENT ALCOHOL/SUBSTANCE ABUSE</title>
  <text><paragraph>Patient is a 15-year old white male who reports consuming
alcohol daily since age thirteen. He claims that his current alcohol consumption has
been from various beverages averaging in excess of 500 ml of ethanol per day. There
is evidence of substantial acquired physiological tolerance for alcohol. He dropped
out of school in October and reports blackouts and episodes of combative behavior.
  </paragraph></text>
</section>
```

XML parsers will normalize white space in PCData, so that the example above and the example below would be processed the same. Browsers and other rendering programs will usually word-wrap the text according to the dynamic size of the window or page that is the target.

```
<section>
  <code code="18663-5" codeSystem="2.16.840.1.113883.6.1"
    codeSystemName="LOINC"/>
  <title>
    HISTORY OF PRESENT ALCOHOL/SUBSTANCE ABUSE
  </title>
  <text><paragraph>
    Patient is a 15-year old white male who reports consuming alcohol daily
    since age thirteen. He claims that his current alcohol consumption has
    been from various beverages averaging in excess of 500 ml of ethanol per
```

day.

**There is evidence of substantial acquired physiological tolerance for alcohol. He dropped out of school in October and reports blackouts and episodes of combative behavior.**

```
</paragraph></text>
</section>
```

The apparent paragraph break in the example above will disappear during normalization. If a preparer of a CDA attachment wishes to include distinct paragraphs within a block of data in the ED data type it must include multiple paragraph tags, as shown below.

```
<section>
  <code code="18663-5" codeSystem="2.16.840.1.113883.6.1"
    codeSystemName="LOINC"/>
  <title>
    HISTORY OF PRESENT ALCOHOL/SUBSTANCE ABUSE
  </title>
  <text><paragraph>
    Patient is a 15-year old white male who reports consuming alcohol daily
    since age thirteen. He claims that his current alcohol consumption has
    been from various beverages averaging in excess of 500 ml of ethanol per
    day.
  </paragraph>
  <paragraph>
    There is evidence of substantial acquired physiological tolerance for
    alcohol. He dropped out of school in October and reports blackouts and
    episodes of combative behavior.
  </paragraph></text>
</section>
```

All content elements that correspond to an attachment component answer part with a data type of text (ED) may include the CDA `<renderMultimedia>` element.

### 3.7.4 Instance Identifier Data Type (II)

In HL7 Version 3 terminology, a person or organization is represented as an entity in a role, participating in an act. Where a component or answer part in an attachment represents the II data type, the identifiers associated with the person or organization can be found in the role. The identifiers associated with the act can be found in that act.

#### 3.7.4.1 II in the Header or in Entries

All identifiers in the CDA header or in entries are represented using the II data type. This data type has two attributes, @root, identifies the issuer of the ID while @extension is the actual ID. The root and the extension together comprise a globally unique ID for the object with which the id element is associated. The @root attribute shall be present. The @extension attribute need not be present when the @root attribute sufficiently identifies the object. The example below is for an identifier value of 3582901, assigned by the organization with the OID of 2.16.840.1.113883.4.6.

```
<id extension='3582901' root='2.16.840.1.113883.4.6'>
```

### 3.7.4.2 II in Body, Human Decision Variant

Where a component or answer part in an attachment represents the II data type, the sender should include the ID and an indication of the issuing authority in human-readable form. For example:

```
<paragraph>  
  <caption>Psychiatric Rehabilitation Treatment Plan, Author Identifier</caption>  
  <content>3582901 (NPI)</content>  
</paragraph>
```

### 3.7.5 Entity Name (EN) Data Type

#### 3.7.5.1 Entity Name in Header or in Entries

Entity names are used to name organizations, places or things. The entity name is recorded as PCDATA within the <name> tag.

#### 3.7.5.2 Entity Name in Body, Human Decision Variant

Where entity name appears in the body of a CDA attachment of the computer-decision variant it shall appear in the PCDATA of <content> in a human-readable form.

### 3.7.6 Person Name (PN) Data Type.

#### 3.7.6.1 Person Name in Header or in Entries

In HL7 Version 3 terminology, a person is represented as an entity in a role, participating in an act. The names of the person can be found in the "person" entity. Where a person name appears in the header of a CDA attachment it shall follow the CDA Release 2.0 convention for a person name as shown below.

Specific elements within the <name> element are:

<given> - a person's given name. Note: The middle name is simply the second given name.

<family> - Family name, this is the name that links to the genealogy.

<prefix> - a prefix associated with the name that follows it. Prefixes can be professional in nature or, in non-US cultures, auxiliary words associated with names.

<suffix> - a suffix associated with the name that it follows. Suffixes can be professional in nature or, in non-US cultures, auxiliary words associated with names.

A <name> element may contain a @use attribute that indicates whether the name is the person's full legal name or other options such as a tribal name or stage name. Multiple <name> elements can be provided giving multiple names for the same person. The @use attribute may assist in distinguishing among those names. The order in which components of the name appear should be the order in which they are displayed for natural reading.

*CDA attachments shall include the full legal name first among the names when it is available. If the legal name is not available CDA attachments shall include first the primary name that was used for maintaining the patient or provider record in the sending system.*

*CDA attachments may include more than one <name>, but there is no requirement that the system processing the attachment process any name other than the first.*



```

<name>
  <given>Margaret</given>
  <given>Ross</given>
  <family>Ellen</family>
</name>

```

### 3.7.6.2 Person Name in Body, Human-Decision Variant

Where person name appears in the body of a CDA attachment of the computer-decision variant it shall appear in the PCDATA of content in a human-readable form.

```
<content>Margaret Ross Ellen</ content >
```

### 3.7.7 Address Data Type (AD).

In HL7 Version 3 terminology, a person or organization is represented as an entity in a role, participating in an act. The address of a person can be found in the role, and the address of the organization can be found in the entity.

#### 3.7.7.1 AD in the Header or Entries

Where an address appears in the header or within entries of a CDA attachment it shall follow the CDA Release 2.0 convention for a postal address as shown below. Specific elements within the <addr> element are

streetAddressLine – denotes the street address

city - denotes the city part of the address

state - denotes the state, province or other political division

postalCode - denotes a postal zone designation (such as a U.S. zip code)

delimiter - denotes literal delimiters to be included in the address

country - shall contain the complete, spelled-out country name. The country element should be omitted for addresses in the United States.

Examples:

```

<addr>
  <streetAddressLine>124 Elm St</streetAddressLine>
  <streetAddressLine>Apt 12</streetAddressLine>
  <city>Elmo</city> <state>UT</state><postalCode>85912</postalCode>
</addr>
<addr>
  <streetAddressLine>377 Dalhousie Street</streetAddressLine>
  <streetAddressLine>Suite 200</streetAddressLine>
  <city>Ottawa</city> <state>ON</state> <postalCode>K1N 9N8</postalCode>
  <country>Canada</country>
</addr>

```

#### 3.7.7.2 AD in the Body, Human-Decision Variant

XML parsers normalize white space in PCDATA. In particular they convert embedded new line characters to spaces. The sender should use the CDA line break element to send the multi-line address as shown below.

```
<paragraph>
  <content>
    124 Elm St<br/>
    Apt 12<br/>
    Elmo, UT 85912<br/>
  </content>
</paragraph>
```

### 3.7.8 **Concept Descriptor Data Type (CD)**

#### 3.7.8.1 **CD in the Header or in Entries**

Certain elements in the header provide a coded value. These are defined in the CDA schemas to follow a consistent pattern of attributes. These elements shall be populated as described in the CDA schemas.

Example:

```
<code code="18594-2" displayName="Psychiatric Rehabilitation Plan"
      codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC" />
```

#### 3.7.8.2 **CD For the Human-Decision Variant**

*When a CDA attachment of the human-decision variant contains a body element for which the Additional Information Specification calls for a item with a CD data type the code should be sent in the PCDATA of the content. Additional explanatory information should be included.*

If the code value is available, the sender should include the code value as well as a textual explanation of its meaning. This applies particularly to medical codes such as ICD-9-CM, HCPCS4 and SNOMED.

Example:

```
<content>BIPOLAR AFFECTIVE D/O</content>
```

### 3.7.9 **Boolean Data Type (BL)**

When an Additional Information Specification specifies an Boolean datum, it shall be present in a human readable form.

#### 3.7.9.1 **BL in Entries**

The Boolean value is recorded in the value attribute using the string "true" or "false" to represent the datum.

```
<value xsi:type="BL" value="true" />
<value xsi:type="BL" value="false" />
```

#### 3.7.10 **Integer Data Type (INT)**

When an Additional Information Specification specifies an integer datum, it shall be present in a human readable form.

**3.7.10.1 INT in Entries**

The number shall be recorded in the value attribute.

```
<value xsi:type="INT" value="1" />
```

**3.7.11 Physical Quantity Data Type (PQ)**

When an Additional Information Specification specifies a physical quantity datum, it shall be present in a human readable form, and should contain the units of measure used.

```
<content>285 pounds</content>
```

**3.7.11.1 PQ in the Header or Entries**

Where the number is a measure of a physical quantity it must contain a units specification drawn from UCUM. See section 5.1 for details of UCUM. Any use of UCUM is fixed by HL7 data types; therefore, an OID does not need to be specified.

```
<code code="3142-7" displayName="BODY WEIGHT (STATED)" codeSystem="2.16.840.1.113883.6.1"
  codeSystemName="LOINC"/>
<title>Body Weight</title>
<text>
  <paragraph>
    <content ID='content-1'>285 pounds</content>
  </paragraph>
</text>
<entry>
  <observation classCode='OBS' moodCode='EVN'>
    <code code="3142-7" displayName="BODY WEIGHT (STATED)"
      codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC"/>
    <effectiveTime value="" />
    <text><reference value="#content-1" /></text>
    <value xsi:type="PQ" value="285" unit="[lb_av]" />
  </observation>
</entry>
```

**3.7.12 String (ST) Data Type.**

A string datum shall be represented as PCDATA within the content in the human-decision variant. In the computer-decision variant, this data will be duplicated in the entry.

CDV Example:

```
<td id='tr-1'>STRAW</td>
```

HDV Example:

```
<observation classCode="OBS" moodCode="EVN">
  <code code="5778-6" codeSystem="2.16.840.1.113883.6.1"
    codeSystemName="LOINC" displayName="urine color"/>
  <text><reference value="#tr-1"/></text>
  <effectiveTime value="200610021838"/>
  <value xsi:type="ST">STRAW</value>
</observation>
```

XML parsers will normalize white space in PCDATA, so that the CDV example above and the example below would yield the same data.

```
<td>  
  STRAW  
</td>
```

### 3.7.13 Time Stamp (TS) Data Type

The TS data type refers to a point in time, i.e., a date and time. The point in time may be expressed with varying degrees of precision. It can be only a date, it can be a date with an accompanying clock time specified to the minute. Or the clock time can be precise to a second or even a fraction of a second.

Time stamps are formatted according to the HL7 date time specification. The format of a date time is "CCYYMMDDHHMMSS.sss+hhmm", where each part is further described in Table 3.7-1 below.

Table 3.7-1 Parts of an HL7 Date Time

Part	Time Unit	Part	Time Unit	Part	Time Unit
CC	century	HH	hour, using a 24 hour clock.	+	+ or – to represent difference from GMT
YY	year	MM	minute	hh	hours difference from GMT
MM	month	SS	second	mm	Minutes difference from GMT
DD	date	sss	Decimal fraction of second		

The HL7 Date time format allows for varying degrees of precision by omitting more precise components. The offset from GMT (+hhmm) must be present or absent in entirety. If the offset from GMT is absent, then local time is assumed. Thus, 200303061425 represents March 6, 2003, at 2:25PM, in the local time zone of the document producer.

*If the time zone is not included the receiver shall assume that the time is based on the local time zone at the time and place where the event being described occurred.*

For example, transmitting 1:20 pm on May the 31st, 2003 for Eastern Daylight Time, which is 4 hours behind Coordinated Universal Time (UTC):

```
<time value='20030531132000-0400'/>
```

For most administrative uses the receiver is concerned to know the date that the event occurred in the time zone that was operative at the time and place where the event being described happened. *The sender should send times in their local time zone.*

The time part is optional unless required for a specific answer part in an Additional Information Specification. Example, transmitting May the 31st, 2003 for an unspecified time zone:

```
<time value='20030531'/>
```

### 3.7.13.1 TS in the Header or Entries

*Dates in the header and entries that use the TS data type shall be formatted as described above.*

### 3.7.13.2 TS in the Body, Human-Decision Variant

*In the body, element answer parts that are time stamps shall be included in the PCDATA of the content in a format understandable to a person.*

Examples:

```
<content>24 Oct 2003</content>  
<content>24 Oct 2003 11:47 PM</content>  
<content>24 Nov 2003 11:47 PM EST</content>
```

### 3.7.14 Interval of Time (IVL\_TS) Data Types

The IVL\_TS is like the TS data type, but has <low> and <high> elements whose @value attributes indicate two points in time. The range of time between these two points is the interval that is represented. Either the <high> or <low> element can be omitted to indicate an unbounded upper or lower range.

While the CDA and the Data types specification permit other representations for intervals in time, this guide permits only representation that include the <low> and <high> element.

An example is shown below:

```
<effectiveTime >  
  <low value="20070429" />  
  <high value="20070504" />  
</effectiveTime>
```

#### 3.7.14.1 IVL\_TS in the Header or Entries

*Dates in the header and entries that use the IVL\_TS data type shall be formatted as described above.*

#### 3.7.14.2 IVL\_TS in the Body, Human-Decision Variant

*In the body, element answer parts that are intervals of time shall be included in the PCDATA of the content in a format understandable to a person.*

```
<content>April 29, 2007 – May 4, 2007</content>
```

### 3.7.15 General Timing Specification (GTS) Data Type.

The GTS data type is used for elements that describe the time of administration of a therapy or other service. Where an attachment describes a complex regimen or a planned use of a medication, the required information pattern can be very involved. Many sending systems and receiving systems do not have the functional depth to generate or interpret such messages. This is particularly burdensome on receiving systems when processing an attachment that is regulated by HIPAA because, under HIPAA regulations, there should not be companion guides or trading partner agreements that would exclude the use of specific options. Therefore each receiver must be able to handle the most complex GTS expression that a sender can create.

Accordingly, HL7 has adopted a constrained specification for elements using the GTS data type when creating attachments in the computer-decision variant. As always, elements that describe

GTS values in the computer-decision variant shall include human-readable text that describes the information. For very complex regimens the human-readable text is the only way that the information can be sent.

### 3.7.15.1 GTS in the Human-Decision Variant

*In the human-decision variant where the answer that is called for is assigned the GTS data type the sender shall send a natural language phrase that gives the timing of the service. It is permissible to use abbreviations that are commonly used in writing prescriptions such as QD and BID. For example:*

`<content>2 puffs BID for 30 days</content>`

### 3.7.15.2 GTS in the Computer-Decision Variant

*As usual, in the computer-decision variant the sender shall also include a natural language phrase that describes the content. For very complex regimens that cannot be expressed using the restricted GTS data type, the natural language description of the regimen shall be the only way in which the information is described.*

The GTS data type is most often used with the `<effectiveTime>` data element, but can be applied to other data elements as well. A GTS in HL7 Version 3 is a sequence of timing specifications, which can be intersected to produce the final timing. This guide restricts the use of the GTS data type as follows:

The first `<effectiveTime>` element shall be of type `IVL_TS`, and shall either indicate the starting and ending points in time over which administration occurs, or indicate the duration when starting and ending points are not known. For example:

```
<effectiveTime xsi:type='IVL_TS'>
  <low value="20060812" />
  <high value="20060821" />
</effectiveTime>
```

Indicates that the duration is over 10 days, starting on August 12, 2006.

When the start date is not known the representation shall only include a `<width>` element, with the time unit represented using UCUM. For example:

```
<effectiveTime xsi:type='IVL_TS'>
  <width value="10" value="d" />
</effectiveTime>
```

Shows a duration of 10 days.

#### 3.7.15.2.1 Periodic administration

The second `<effectiveTime>` element may be of type `PIVL_TS` or `EIVL_TS` to indicate the periodic timings for specific administrations. It shall have the `@operator` attribute set to "A". If no second `<effectiveTime>` element is present, then the administration is assumed to be continuous over the time span indicated by the first element.

The example below shows how periodic time interval is recorded.

```
<effectiveTime xsi:type='PIVL_TS' operator='A' institutionSpecified='false'>
  <effectiveTime xsi:type='PIVL_TS' >
    <period value='8' unit='h' />
    <phase>
      <low value='198701010800' />
      <width value='10' unit='min' >
    </phase>
  </effectiveTime>
```

The above example shows a periodic interval of every eight hours for 10 minutes, in phase with a start time of 08:00am.

The period element describes the time between administrations. Units may be specified in seconds, minutes, hours, days, weeks, months, lunar months, using the values shown in Table 3.7-3.

*Table 3.7-3 Units for Time Periods*

<b>Unit code</b>	<b>Meaning</b>
s	seconds
min	minutes
h	hours
d	days
wk	weeks
mo	months
mo_s	Lunar months

If the administration is to be started at a specific time, then the starting time shall be specified in <low> element of the <phase> element. The <low> element is a time stamp (TS data type) that indicates when the first dose should start. If that time is unknown, the <low> element shall be omitted.

If the administration is to occur for a specific duration, this shall be recorded in the <width> element of the <phase> element. The <width> is a PQ data type. The @value attribute must be present, and indicates the duration, and the @unit attribute is the unit of time. The @unit attribute must also be present, and contain one of the unit codes shown in Table 3.7-3.

It is also common to indicate the number of dosages per day. These are represented by converting the number of dosages per day into the number of hours between dosages, and setting the value of the @institutionSpecified attribute to true. Thus, BID (twice a day), is represented as every 12 hours at institution specified times. When the @institutionSpecified attribute is true, the <low> element of the <phase> element should not be sent.

## 3.7.15.2.2 Event related administration

Some administrations are temporally related to daily events, such as meals, waking or sleeping. These are recorded using the EIVL data type, as shown below.

```
<effectiveTime xsi:type='EIVL' operator='A'>
  <event code='HS'>
    <offset>
      <low value='-1' unit='h'>
        <width value='10' unit='min' >
      </offset>
    </effectiveTime>
```

The event code indicates which event the timing is based on, using one of the codes from Table 3.7-5.

*Table 3.7-5 Event Codes for EIVL*

<i>code</i>	<i>definition</i>
AC	before meal (from lat. ante cibus)
ACD	before lunch (from lat. ante cibus diurnus)
ACM	before breakfast (from lat. ante cibus matutinus)
ACV	before dinner (from lat. ante cibus vespertinus)
HS	the hour of sleep
IC	between meals (from lat. inter cibus)
ICD	between lunch and dinner
ICM	between breakfast and lunch
ICV	between dinner and the hour of sleep
PC	after meal (from lat. post cibus)
PCD	after lunch (from lat. post cibus diurnus)
PCM	after breakfast (from lat. post cibus matutinus)
PCV	after dinner (from lat. post cibus vespertinus)

The <low> element of the <offset> element indicates the time before or after the event at which administration starts. The <low> element uses the PQ data type. The @value attribute must be present, and indicates the duration before (if negative) or after (if positive), and the @unit attribute is the unit of time. The @unit attribute must also be present, and contain one of the unit codes shown in Table 3.7-3.

If the administration is to occur for a specific duration, this shall be recorded in the <width> element of the <offset> element. The <width> element uses the PQ data type. The @value attribute must be present, and indicates the duration, and the @unit attribute is the unit of time. The @unit attribute must also be present, and contain one of the unit codes shown in Table 3.7-3.

In most cases the additional information specification will allow the timing and quantity answer part to repeat, e.g., to express "two pills four times a day for 4 days then 1 pill four times a day for 4 days."



**3.7.15.3 Examples**

Figure 3.7-1 shows some examples.

<p><b>twice a day, 30 days</b></p> <p>High and low values (dates) represent the duration of 30 days</p> <p>Period value indicates every 12 hours which equates to twice a day</p>	<pre>&lt;effectiveTime xsi:type='IVL_TS'&gt;   &lt;low value='20061101' /&gt;&lt;high value='20061130' /&gt; &lt;/effectiveTime&gt; &lt;effectiveTime xsi:type='PVL_TS' operator='A' institutionSpecified='true'&gt;   &lt;period value='12' value='h' /&gt; &lt;/effectiveTime&gt;</pre>
<p><b>1 unit of service each morning, unspecified duration</b></p> <p>UNK – represents the unspecified duration</p> <p>Value of ACM in the EIVL data type = before breakfast to indicate each morning</p>	<pre>&lt;effectiveTime xsi:type='IVL_TS'&gt;   &lt;low nullFlavor='UNK' /&gt;&lt;high nullFlavor='UNK' /&gt; &lt;/effectiveTime&gt; &lt;effectiveTime xsi:type='EIVL_TS'&gt;   &lt;event code='ACM' /&gt; &lt;/effectiveTime&gt;</pre>
<p><b>1 unit of service given one time</b></p> <p>High and low values represent single day and the absence of the EIVL data type would indicate that this is a single occurrence.</p>	<pre>&lt;effectiveTime xsi:type='IVL_TS'&gt;   &lt;low value='20061102' /&gt;&lt;high value='20061102' /&gt; &lt;/effectiveTime&gt;</pre>
<p>twice a day, on Monday, Wednesday and Friday</p>	<p>Must be represented textually, cannot be represented in the form specified for GTS in this implementation guide.</p>

*Figure 3.7-1. Examples of the GTS data type, computer-decision variant.*

### 3.7.16 "No Information" Indicator.

In any attachment component answer part it may sometimes be impossible to send a required answer and necessary to send, instead, a reason why the information is not available. In the computer decision variant the sender shall supplement the natural language explanation of why the information is not available with appropriate use of the @nullFlavor attribute, as shown in this example.

```
<code code='3142-7' displayName='BODY WEIGHT (STATED)'
  codeSystem='2.16.840.1.113883.6.1' codeSystemName='LOINC'/>
<title>Body Weight</title>
<text>
  <paragraph>
    <content ID='content-1'>Information asked but unknown</content>
  </paragraph>
</text>
<entry>
  <observation classCode='OBS' moodCode='EVN'>
    <code code='3142-7' displayName='BODY WEIGHT (STATED)'
      codeSystem='2.16.840.1.113883.6.1' codeSystemName='LOINC'/>
    <text><reference value='#content-1'></text>
    <value nullFlavor='ASKU'/>
  </observation>
</entry>
```

The possible values within the @nullFlavor attribute are shown in Table 3.7-7.

Table 3.7-7. Types of "no information" indicators.

Value	Interpretation
NI	No information whatsoever can be inferred from this exceptional value.
OTH	The actual value is not an element in the value domain of a variable. (e.g., concept not provided by required code system).
UNK	A proper value is applicable, but not known.
ASKU	Information was sought but not found (e.g., patient was asked but didn't know)
NAV	Information is not available at this time but it is expected that it will be available later.
NASK	This information has not been sought (e.g., patient was not asked)
TRC	The content is greater than zero, but too small to be quantified.
NA	Known to have no proper value (e.g., last menstrual period for a male).

The "No information" indicator is not a data type that will be specified in a value table. Instead, it is a value that can be substituted for a value of any data type.

## 3.8 Package

*When CDA attachments are transmitted with adjunct files in an ASC X12 transaction (such as the 275) the CDA document and the adjunct files shall be combined in a single MIME package. The CDA document shall be the first of the parts of the package.*

MIME is a standard promulgated by the Internet Engineering Task Force (IETF -- see <http://www.ietf.org/>). The IETF calls all its standards "requests for comments (RFCs)," even when they have been finalized. MIME is officially known as RFC number 2045 (see <http://www.ietf.org/rfc/rfc2045.txt?number=2045>).

### **3.9 Attachment-Specific CDA Extensions**

As described in *Clinical Document Architecture Framework, Release 2.0*, CDA provides a mechanism for extensions to the CDA. At this time, no extensions to the AIS specific attachments are defined. Extensions may be defined in the future if needed for new Attachment Implementation specifications.

Senders of a CDA document in a claims attachment transaction should not use extensions not described by this guide. Receivers of a CDA document in a claims attachment transaction must be prepared to receive documents that contain extensions to the CDA. A very simple transformation is available that removes all extension elements from the CDA document, and is supplied in the `cleancda.xsl` file in the supplemental files available with this document.

## 4 Supporting Information

This section provides non-normative information that may be useful to those creating attachments under this specification.

### 4.1 Additional Information in the Specification Package

The following information will be provided with this specification as non-normative appendices.

- XSL Stylesheet for human interpretation of "human-decision" and "computer-decision" variants of CDA Attachments Documents.
- README.TXT identifying the files in the package
- Various XML files containing examples

**The schema and stylesheet files that are provided are not part of the balloted content of the standard.** Their use by implementers of the standard is entirely optional. HL7 intends to issue improvements to these documents from time to time without changing the official balloted recommendation.

## 5 Response Code Sets

An Additional Information Specification document usually contains all the code tables required to create an attachment in the computer decision variant. Due to its length, however, the following table is included here and cited in the Additional Information Specification documents.

### 5.1 Unified Code of Units of Measure (UCUM)

The Unified Code for Units of Measure (UCUM) is used throughout to codify the units of a measurement of a physical quantity. A mapping of this table to ISO+ is provided below. HL7 V3 data types fix any use of UCUM; therefore, an OID does not need to be specified. The following list contains those units of measures likely to be used in attachments. A complete list of the UCUM values can be obtained from: <http://aurora.regenstrief.org/ucum>

**Note to ballot reviewers:** Table is sorted by descriptive name, the shaded entries near the end are added for this ballot because these, as were the rest of the items, found somewhere in the AIS booklets. Many of these entries were kept merely because the word "dose" appears. Comments welcome.

*Table 5.1-1 UCUM code set for units for physical quantities.*

UCUM Code	ISO+ Code	Name
g/(kg.d)	g/(kg.d)	(Gram / Kilogram) / Day = gram / (kilogram × day) (e.g., mass dose of medication per body weight per day)
g/(kg.h)	g/(kg.hr)	(Gram / Kilogram) / Hour = gram / (kilogram × hour) (e.g., mass dose of medication per body weight per hour)
g/(kg.min)	g/(kg.min)	(Gram / Kilogram) / Minute = gram / (kilogram × minute) (e.g., mass dose of medication per body weight per minute)
g/(8.kg.h)	g/(8.kg.hr)	(Gram / Kilogram) / 8 Hour Shift = gram / (kilogram × 8 hour shift) (e.g., mass dose of medication per body weight per 8 hour shift)
ug/(8.h.kg)	ug/(8.hr.kg)	(Microgram / Kilogram) / 8 hour shift = microgram / (kilogram × 8 hour shift) (e.g., mass dose of medication per patient body weight per 8 hour shift)
ug/(kg.h)	ug/(kg.hr)	(Microgram / Kilogram) / Hour = microgram / (kilogram × hours) (e.g., mass dose of medication per patient body weight per hour)
ug/(kg.min)	ug/(kg.min)	(Microgram / Kilogram) / Minute = microgram / (kilogram × minute) (e.g., mass dose of medication per patient body weight per minute)
ug/(kg.d)	ug/(kg.d)	(Microgram / Kilogram) / Day = microgram / (kilogram × day) (e.g., mass dose of medication per patient body weight per day)
meq/(8.h.kg)	meq/(8.hr.kg)	(Milliequivalents / Kilogram) / 8 Hour Shift = milliequivalents / (kilogram × 8 hour shift) (e.g., dose of medication in milliequivalents per patient body weight per 8 hour shift)
meq/(kg.d)	meq/(kg.d)	(Milliequivalents / Kilogram) / Day = milliequivalents / (kilogram × day) (e.g., dose of medication in milliequivalents per patient body weight per day)

UCUM Code	ISO+ Code	Name
meq/(kg.h)	meq/(kg.hr)	(Milliequivalents / Kilogram) / Hour = milliequivalents / (kilogram × hour) (e.g., dose of medication in milliequivalents per patient body weight per hour)
meq/(kg.min)	meq/(kg.min)	(Milliequivalents / Kilogram) / Minute = milliequivalents / (kilogram × minute) (e.g., dose of medication in milliequivalents per patient body weight per minute)
mg/(kg.d)	mg/(kg.d)	(Milligram / Kilogram) / Day = milligram / (kilogram × day) (e.g., mass dose of medication per patient body weight per day)
mg/(kg.h)	mg/(kg.hr)	(Milligram / Kilogram) / Hour = milligram / (kilogram × hour) (e.g., mass dose of medication per patient body weight per hour)
mg/(kg.min)	mg/(kg.min)	(Milligram / Kilogram) / Minute = milligram / (kilogram × minute) (e.g., mass dose of medication per patient body weight per hour)
mg/(8.h.kg)	mg/(8.hr.kg)	(Milligram / Kilogram) / 8 Hour Shift = milligram / (kilogram × 8 hour shift) (e.g., mass dose of medication per patient body weight per 8 hour shift)
mL/(8.h.kg)	mL/(8.hr.kg)	(Milliliter / Kilogram) / 8 Hour Shift = milliliter / (kilogram × 8 hour shift) (e.g., volume dose of medication or treatment per body weight per 8 hour shift)
mL/(kg.d)	mL/(kg.d)	(Milliliter / Kilogram) / Day = milliliter / (kilogram × day) (e.g., volume dose of medication or treatment per patient body weight per day)
mL/(kg.h)	mL/(kg.hr)	(Milliliter / Kilogram) / Hour = milliliter / (kilogram × hour) (e.g., volume dose of medication or treatment per patient body weight per hour)
mL/(kg.min)	mL/(kg.min)	(Milliliter / Kilogram) / Minute = milliliter / (kilogram × minute) (e.g., volume dose of medication or treatment per patient body weight per minute)
mmol/(8.h.kg)	mmol/(8.hr.kg)	(Millimole / Kilogram) / 8 Hour Shift = millimole / (kilogram × 8 hour shift) (e.g., molar dose of medication per patient body weight per 8 hour shift)
mmol/(kg.d)	mmol/(kg.d)	(Millimole / Kilogram) / Day = millimole / (kilogram × day) (e.g., molar dose of medication per patient body weight per day)
mmol/(kg.h)	mmol/(kg.hr)	(Millimole / Kilogram) / Hour = millimole / (kilogram × hour) (e.g., molar dose of medication per patient body weight per hour)
mmol/(kg.min)	mmol/(kg.min)	(Millimole / Kilogram) / Minute = millimole / (kilogram × minute) (e.g., molar dose of medication per patient body weight per minute)
ng/(8.h.kg)	ng/(8.hr.kg)	(Nanogram / Kilogram) / 8 Hour Shift = nanogram / (kilogram × 8 hour shift) (e.g., mass dose of medication per patient body weight per 8 hour shift)
ng/(kg.d)	ng/(kg.d)	(Nanogram / Kilogram) / Day = nanogram / (kilogram × day) (e.g., mass dose of medication per patient body weight per day)
ng/(kg.h)	ng/(kg.hr)	(Nanogram / Kilogram) / Hour = nanogram / (kilogram × hour) (e.g., mass dose of medication per patient body weight per hour)
ng/(kg.min)	ng/(kg.min)	(Nanogram / Kilogram) / Minute = nanogram / (kilogram × minute) (e.g., mass dose of medication per patient body weight per minute)
kg{body_wt}	kg(body_wt)	* kilogram body weight

UCUM Code	ISO+ Code	Name
10*3/mm3	10*3/mm3	*103 / cubic millimeter (e.g., white blood cell count)
10*6/mm3	10*6/mm3	*106 / millimeter3
g/(8.h)	g/(8.hr)	*Gram / 8 Hour Shift
g/d	g/d	*Gram / Day
[iU]	iu	*International Unit
[iU]/d	iu/d	*International Unit / Day
[iU]/h	iu/hr	*International Unit / Hour
[iU]/L	iu/L	*International Unit / Liter
[iU]/mL	iu/mL	*International Unit / Milliliter
[iU]/min	iu/min	*International Unit / Minute
L/(8.h)	L/(8.hr)	*Liter / 8 hour shift
L/d	L/d	*Liter / Day
ueq	ueq	*Microequivalents
meq	meq	*Milliequivalent
mL/h	mL/hr	*Milliliter / Hour
[HPF]	/(hpf)	*Per High Power Field
pH	(ph)	*pH
d	d	Day
eq	eq	Equivalent
fL	fL	Femtoliter
g	g	Gram
g/dL	g/dL	Gram / Deciliter
g/h	g/hr	Gram / Hour
g/kg	g/kg	Gram / Kilogram (e.g., mass dose of medication per body weight)
g/L	g/L	Gram / Liter
g/m2	g/m2	Gram / Meter2 (e.g., mass dose of medication per body surface area)
Gy	gy	Grey (absorbed radiation dose)
<b>h</b>		<b>hour</b>
[in_us]	in	Inches
[iU]/kg	iu/kg	International Unit / Kilogram
kg	kg	Kilogram
L	L	Liter
L/h	L/hr	Liter / hour
ug/dL	ug/dL	Microgram / Deciliter
ug/m2	ug/m2	Microgram / Meter2 (e.g., mass dose of medication per patient body surface area)
<b>[mi_us]</b>		<b>Mile</b>
meq/kg	meq/kg	Milliequivalent / Kilogram (e.g., dose of medication in milliequivalents per patient body weight)
meq/L	meq/L	Milliequivalent / Liter
meq/m2		Milliequivalent / Meter2 (e.g., dose of medication in milliequivalents per patient body surface area)
mg	mg	Milligram
mg/dL	mg/dL	Milligram / Deciliter

UCUM Code	ISO+ Code	Name
mg/m2	mg/m2	Milligram / Meter2 (e.g., mass dose of medication per patient body surface area)
mL	mL	Milliliter
mL/kg	mL/kg	Milliliter / Kilogram (e.g., volume dose of medication or treatment per patient body weight)
mL/m2	mL/m2	Milliliter / Meter2 (e.g., volume of medication or other treatment per patient body surface area)
mm	mm	Millimeter
mmol/kg	mmol/kg	Millimole / Kilogram (e.g., molar dose of medication per patient body weight)
mmol/m2	mmol/m2	Millimole / Meter2 (e.g., molar dose of medication per patient body surface area)
min		Minute
mo		Month
ng/kg	ng/kg	Nanogram / Kilogram (e.g., mass dose of medication per patient body weight)
ng/m2	ng/m2	Nanogram / Meter2 (e.g., mass dose of medication per patient body surface area)
[nmi_i]		Nautical mile
%	%	Percent
[lb_av]		Pounds (weight)
REM	dm2/s2	Rem (roentgen equivalent man) = 10 <sup>-2</sup> meter2 / second2 = decimeter2 / second2 Dose of ionizing radiation equivalent to 1 rad of x-ray or gamma ray) [From Dorland's Medical Dictionary]
wk		Week
a		Year

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