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# Standard Specification for Continuity of Care Record (CCR)[1]

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## 1. Scope

1.1 The Continuity of Care Record (CCR) is a core data set of the most relevant administrative, demographic, and clinical information facts about a patient's healthcare, covering one or more healthcare encounters.[2] It provides a means for one healthcare practitioner, system, or setting to aggregate all of the pertinent data about a patient and forward it to another practitioner, system, or setting to support the continuity of care.

1.1.1 The CCR data set includes a summary of the patient's health status (for example, problems, medications, allergies) and basic information about insurance, advance directives, care documentation, and the patient's care plan. It also includes identifying information and the purpose of the CCR. (See 5.1 for a description of the CCR's components and sections, and Annex A1 for the detailed data fields of the CCR.)

1.1.2 The CCR may be prepared, displayed, and transmitted on paper or electronically, provided the information required by this specification is included. When prepared in a structured electronic format, strict adherence to an XML schema and an accompanying implementation guide is required to support standards-compliant interoperability. The Adjunct[3] to this specification contains a W3C XML schema and Annex A2 contains an Implementation Guide for such representation.

1.2 The primary use case for the CCR is to provide a snapshot in time containing the pertinent clinical, demographic, and administrative data for a specific patient.

1.2.1 This specification does not speak to other use cases or to workflows, but is intended to facilitate the implementation of use cases and workflows. Any examples offered in this specification are not to be considered normative.[4]

1.3 To ensure interchangeability of electronic CCRs, this specification specifies XML coding that is required when the CCR is created in a structured electronic format.[5] This specified XML coding provides flexibility that will allow users to prepare, transmit, and view the CCR in multiple ways, for example, in a browser, as an element in a Health Level 7 (HL7) message or CDA compliant document, in a secure email, as a PDF file, as an HTML file, or as a word processing document. It will further permit users to display the fields of the CCR in multiple formats.

1.3.1 The CCR XML schema or .xsd (see the Adjunct to this specification) is defined as a data object that represents a snapshot of a patient's relevant administrative, demographic, and clinical information at a specific moment in time. The CCR XML is not a persistent document, and it is not a messaging standard.

NOTE 1—The CCR XML schema can also be used to define an XML representation for the CCR data elements, subject to the constraints specified in the accompanying Implementation Guide (see Annex A2).

1.3.2 Using the required XML schema in the Adjunct to this specification or other XML schemas that may be authorized through joints efforts of ASTM and other standards development organizations, properly designed electronic healthcare record (EHR) systems will be able to import and export all CCR data to enable automated healthcare information transmission with minimal workflow disruption for practitioners. Equally important, it will allow the interchange of the CCR data between otherwise incompatible EHR systems.

1.4 *Security*—The data contained within the CCR are patient data and, if those data are identifiable, then end-to-end CCR document integrity and confidentiality must be provided

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[2] A CCR is not intended to be a medical-legal clinical or administrative document entered into a patient's record, but may in specific use cases be used in such a manner, provided that accepted policies and procedures in adding such data to a patient's record are followed. A personal health record, with the information under the control of the patient or their designated representative, would be an example of such a use case, as would be importation into an electronic health record system, a data repository, or a registry.

[3] Available from ASTM International Headquarters. Order Adjunct No. ADJE2369. Original adjunct produced in 2006.

[4] Since the CCR is a core data set of selected, relevant information, it is not a discharge summary, that is, it does not include all of a patient's health information that would be routinely recorded at the time of discharge, nor is it the transfer of an entire patient record.

[5] The required XML may be as represented in the Adjunct to this specification or Annex A2 or other XML representation made possible through joint efforts of ASTM and other standards development organizations.

while conforming to regulations or other security, confidentiality, or privacy protections as applicable within the scope of this specification.

1.4.1 Conditions of security and privacy for a CCR instance must be established in a way that allows only properly authenticated and authorized access to the CCR document instance or its elements. The CCR document instance must be self-protecting when possible, and carry sufficient data embedded in the document instance to permit access decisions to be made based upon confidentiality constraints or limitations specific to that instance.

1.4.2 Additional Subcommittee E31.20 on Security and Privacy guides, practices, and specifications will be published in support of the security and privacy needs of specific CCR use cases. When a specification is necessary to assure interoperability or other required functionality, the CCR core schema will be extended to meet the profile requirements of the underlying use case, building upon existing standards and specifications whenever possible.

1.4.2.1 For profiles that require digital signatures, W3C's XML digital signature standard (http://www.w3.org/TR/xmldsig-core) will be used with digital certificates. Encryption will be provided using W3C's XML encryption standard (http://www.w3.org/TR/xmlenc-core).

1.5 The CCR is an outgrowth of the Patient Care Referral Form (PCRF) designed and mandated by the Massachusetts Department of Public Health for use primarily in inpatient settings.

1.5.1 Unlike the PCRF, the CCR is designed for use in all clinical care settings.

1.6 It is assumed that information contained in a CCR will be confirmed as appropriate in clinical practice. For example, the CCR insurance fields should not be construed to address all reimbursement, authorization, or eligibility issues, and current medications and other critical data should be validated.

1.7 Committee E31 gratefully acknowledges the Massachusetts Medical Society, HIMSS (Health Information Management and Systems Society), the American Academy of Family Physicians, the American Academy of Pediatrics, the American Medical Association, the Patient Safety Institute, the American Health Care Association, the National Association for the Support of Long Term Care, the Mobile Healthcare Alliance (MoHCA), the Medical Group Management Association (MGMA) and the American College of Osteopathic Family Physicians (ACOFP) as co-leaders with ASTM in the standard's development and adoption, and joins them in inviting the collaboration of all stakeholders, including other clinical specialty societies, other professional organizations, insurers, vendors, other healthcare institutions, departments of public health, and other government agencies.

1.8 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

2.1 *ASTM Standards:*[6]

E1382 Test Methods for Determining Average Grain Size Using Semiautomatic and Automatic Image Analysis

E1384 Practice for Content and Structure of the Electronic Health Record (EHR)

E1762 Guide for Electronic Authentication of Health Care Information

E1869 Guide for Confidentiality, Privacy, Access, and Data Security Principles for Health Information Including Electronic Health Records

E1985 Guide for User Authentication and Authorization

E1986 Guide for Information Access Privileges to Health Information

E2084 Specification for Authentication of Healthcare Information Using Digital Signatures (Withdrawn 2009)[7]

E2085 Guide on Security Framework for Healthcare Information (Withdrawn 2009)[7]

E2086 Guide for Internet and Intranet Healthcare Security (Withdrawn 2009)[7]

E2147 Specification for Audit and Disclosure Logs for Use in Health Information Systems

E2182 Specification for Clinical XML DTDs in Healthcare (Withdrawn 2011)[7]

E2183 Guide for XML DTD Design, Architecture and Implementation (Withdrawn 2011)[7]

E2184 Specification for Healthcare Document Formats (Withdrawn 2011)[7]

E2211 Specification for Relationship Between a Person (Consumer) and a Supplier of an Electronic Personal (Consumer) Health Record (Withdrawn 2014)[7]

E2212 Practice for Healthcare Certificate Policy

2.2 *Other References:*

Health Information Portability and Accountability Act, U.S. Congress, 1996

ICD-9-CM (http://www.cdc.gov/nchs/about/otheract/icd9/abticd9.htm)

ICD-10-CM (http://www.cdc.gov/nchs/icd/icd10cm.htm)

LOINC (http://www.loinc.org/)

Massachusetts Department of Health Patient Care Referral Form

NDC (http://www.fda.gov/cder/ndc/)

RxNorm (http://www.nlm.nih.gov/research/umls/rxnorm_main.html)

SNOMED (http://www.snomed.org/)

W3C XML Digital Signature Standard (http://www.w3.org/TR/xmldsig-core/)

W3C XML Encryption Standard (http://www.w3.org/TR/xmlenc-core)

2.3 *ASTM Adjuncts:*

W3C XML Schema[3]

[6] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[7] The last approved version of this historical standard is referenced on www.astm.org.

## 3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 These terms also include the common terms seen in many documents related to the CCR. See also Annex A1 for definitions of additional terms specific to this specification.

3.1.2 *actors*—all the individuals, organizations, locations, and systems associated with the data in the CCR.

3.1.3 *attribute*—for the purposes of this specification, an attribute is a characteristic of data, representing one or more aspects, descriptors, or elements of the data. In object-oriented systems, attributes are characteristics of objects. In XML, attributes are characteristics of tags.

3.1.4 *CCR body*—contains the core patient-specific data in a CCR, for example, Insurance, Medications, Problems, Procedures, and the like.

3.1.5 *CCR components*—CCR Header, CCR Body, CCR Footer; each component is made of sections, which in turn are made up of data fields.

3.1.6 *CCR footer*—contains data defining all of the actors, as well as information about external references, all text comments, and signatures associated with any data within the CCR.

3.1.7 *CCR header*—defines the document parameters, including its unique identifier, language, version, date/time, the patient whose data it contains, who or what has generated the CCR, to whom or what the CCR is directed, and the CCR's purpose.

3.1.8 *comments*—all text comments associated with any data within the CCR not containing core relevant, clinical, or administrative data, and not containing pointers to references external to the CCR.

3.1.9 *CDA*—the HL7 CDA (Clinical Document Architecture) is a document markup standard for the structure and semantics of exchanged clinical documents. **E2182**

3.1.10 *complex data type or a group*—concepts used more than once; defined by adding the post-fix 'Type.'

3.1.11 *continuity of care record (CCR)*—a core data set of the most relevant administrative, demographic, and clinical information facts about a patient's healthcare, covering one or more healthcare encounters. It provides a means for one healthcare practitioner, system, or setting to aggregate all of the pertinent data about a patient and forward it to another practitioner, system, or setting to support the continuity of care. See Section 5 for a summary of CCR contents, and Annex A1 for a detailed list of data fields.

3.1.12 *current procedural terminology (CPT)*—an annual reference published by the American Medical Association that lists descriptive terms and identifying codes for reporting medical services and procedures performed by physicians.

3.1.13 *data fields*—required or optional data within a section. Data fields may be repeated as often as necessary (see Annex A1).

3.1.14 *data objects*—discrete patient-specific data (Medications, Problems, Procedures, and the like).

3.1.15 *DERF*—NCPDP's Data Element Request Form used to request an addition or modification to NCPDP's current or new standards. **www.ncpdp.org**

3.1.16 *digital signature*—data associated with, or a cryptographic transformation of, a data unit that allows a recipient of the data unit to prove the source and integrity of the data unit and protect against forgery, for example, by the recipient. **E2084**

3.1.17 *DMR*—durable medical equipment

3.1.18 *document object*—the CCR as an XML document, consisting of a header, a body, and a footer, each built from a set of discrete XML building blocks.

3.1.19 *domain-specific applications*—additional, optional sets of CCR data elements specific to such areas as clinical specialties, institutions or enterprises, payers, disease management, and personal health records. Data sets for optional CCR domain-specific applications will be developed and balloted separately from this specification.

3.1.20 *element and attribute names*—the literal names of the XML tags (elements) and attributes of the XML tags (attributes).

3.1.21 *encounter—(1)* an interaction, regardless of the setting, between a patient and a practitioner who is vested with primary responsibility for diagnosing, evaluating, or treating the patient's condition. It may include visits, appointments, as well as non face-to-face interactions; and *(2)* a contact between a patient and a practitioner who has primary responsibility for assessing and treating the patient at a given contact, exercising independent judgment. **E1384**

3.1.22 *enumeration*—the process of limiting the allowed data values within a defined set of XML tags to a defined and constrained list, an enumerated list.

3.1.23 *electronic health record (EHR)*—any information related to the physical or mental health/condition of an individual that resides in electronic system(s) used to capture, transmit, receive, store, retrieve, link, and manipulate data for the primary purpose of providing health care and health-related services. The EHR is meant to be a much more comprehensive collection of information than the CCR. **E1384**

3.1.24 *extensible markup language (XML)*—a standard from the World Wide Web Consortium (W3C) that provides for tagging of information content within documents, offering a means for representation of content in a format which is both human and machine readable. Through the use of customizable style sheets and schemas, information can be represented in a uniform way, allowing for interchange of both content (data) and format (metadata). **E1382**

3.1.25 *fields*—see *data fields*.

3.1.26 *Health Level 7*—also known as HL7, a standards organization traditionally focused on message-oriented standards for healthcare. HL7 messages are the dominant standard for peer-to-peer exchange of clinical, text-based information. **E2182**

3.1.27 *HIPAA*—Health Information Portability and Accountability Act adopted by U.S. Congress in 1996.

3.1.28 *HL7*—see *Health Level 7*.

3.1.29 *ICD9-CM*—The International Classification of Diseases, Ninth Revision, Clinical Modification, is based on the World Health Organization's Ninth Revision, International Classification of Diseases (ICD-9). ICD-9-CM is the official system of assigning codes to diagnoses and procedures associated with hospital utilization in the United States. Source: National Center for Health Statistics.

3.1.30 *ICD-10*—the International Classification of Diseases, Tenth Revision, the World Health Organization.

3.1.31 *integrity*—property that data has not been altered or destroyed in an unauthorized manner. **E2084**

3.1.32 *language*—Refers to the language in which the CCR is expressed.

3.1.33 *LOINC*—Logical Observation Identifiers Names and Codes (LOINC) is a database to facilitate exchange and pooling of results, such as hemoglobin, serum potassium, or vital signs, for clinical care, outcomes, management, and research. **http://www.loinc.org/**

3.1.34 *messaging standard*—a method of electronic data exchange offered by HL7.

3.1.35 *NCPDP*—National Council for Prescription Drug Programs. Creates and promotes standards for transfer of data to and from the pharmacy services sector of the healthcare industry. **www.ncpdp.org**

3.1.36 *NCPDP SCRIPT*—A standard created by NCPDP to facilitate the electronic transfer of prescription data between pharmacies and prescribers. **www.ncpdp.org**

3.1.37 *NDC*—National Drug Code; originally established as an essential part of an out-of-hospital drug reimbursement program under Medicare. The NDC serves as a universal drug identifier for human drugs. The current edition of the National Drug Code Directory is limited to prescription drugs and a few selected OTC products. **http://www.fda.gov/cder/ndc/**

3.1.38 *normalization*—the process of listing data only once within a data object (XML document) or database and then referring to that data through a link, reference, or pointer.

3.1.39 *optional field*—a CCR data field that is not required but should be completed when there is relevant information about the patient available (see Annex A1).

3.1.40 *optionality*—defining whether or not something is optional or not.

3.1.41 *patient health record*—the primary legal record documenting the healthcare services provided to a person in any aspect of healthcare delivery. This term is synonymous with: medical record, health record, patient care record (primary patient record), client record, and resident record. The term includes routine clinical or office records, records of care in any health-related setting, preventive care, life style evaluation, research protocols, special study records, and various clinical databases. **E1384**

3.1.42 *persistent document*—a document that remains as a document within a data structure or file system once it has been used for its original intended use.

3.1.43 *personal health record (PHR)*—an electronic application where individuals can maintain and manage their health information or that of others for whom they are authorized in a private, secure, and confidential environment that allows the individual or other authorized persons to access and share such information. **E2211**

3.1.44 *practitioner*—an individual who is qualified to practice a healthcare profession, for example, physician, nurse, or physical therapist. Practitioners are often required to be licensed as defined by law. **E2184**

3.1.45 *purpose*—the specific reason for which a specific CCR is generated, such as patient admission, transfer, consult/referral, or inpatient discharge.

3.1.46 *referral*—the process of transferring all or a portion of a patient's care from one setting or practitioner to another.

3.1.47 *references*—data sources/locations that are outside the CCR, for example, URLs, diagnostic images, clinical documents.

3.1.48 *required field*—a field that must be completed within the CCR (see Annex A1). *None* or *unknown* is an acceptable entry.

3.1.49 *role*—defines the healthcare or support role of the <Actor> relative to the patient. <Role> does not define, in itself, an explicit role relative to data security, confidentiality, privacy, or access control.

3.1.50 *RxNorm*—a clinical drug nomenclature produced by the National Library of Medicine, in consultation with the Food and Drug Administration, the Department of Veterans Affairs, and HL7. RxNorm provides standard names for clinical drugs and for dose forms as administered. **http://www.nlm.nih.gov/research/umls/rxnorm_main.html**

3.1.51 *section*—a group of data fields within each component of the CCR (see Annex A1).

3.1.52 *SIG*—the use or administration instructions for a medication.

3.1.53 *SNOMED CT*—SNOMED Clinical Terms is the universal healthcare terminology that makes healthcare knowledge usable and accessible wherever and whenever it is needed. **http://www.snomed.org/**

3.1.54 *transfer*—referral of a patient that results in the physical movement of the patient from one location to another.

3.1.55 *vendor configurable fields*—fields where a vendor can define their use or content, or both.

3.1.56 *version*—refers to the version of the CCR as defined by the release of the standard used.

3.1.57 *W3C XML schema*—defines the elements that may appear within the XML document and the attributes that may be associated with an element. An element that has no content must not be present in the CCR XML. It also defines the structure of the XML document: which elements are children of others, the sequence in which the child elements may appear, and the number of child elements. It defines whether an element is empty or can include text. The schema can also define default values for attributes. **E2183**

3.1.58 *XSLT*—extensible style language transformation; a standard from the W3C that is a language for transforming XML documents into other XML documents and with extensions into other formats. **http://www.w3.org/TR/xslt**

3.1.59 *Xpath*—a standard from the W3C that is a language for addressing parts of an XML document, designed to be used by XSLT and other XML technologies. **http://www.w3.org/TR/xpath**

3.1.60 *XML*—extensible markup language; a standard from the World Wide Web Consortium (W3C) that provides for tagging of information content within documents, offering a means for representation of content in a format which is both human and machine readable. Through the use of customizable style sheets and schemas, information can be represented in a uniform way, allowing for interchange of both content (data) and format (metadata). **E2182**

3.1.61 *XML codes*—descriptors used to define the fields of the CCR when it is prepared in a structured electronic format.

3.1.62 *XML document*—a document constructed of XML tags and data.

3.1.63 *XML encryption*—a W3C standard for encrypting XML.

3.1.64 *XML signature*—a signature to an XML document that is similar in intent to a signature for paper-based document. In actual use within XML, these tend to be digital signatures.

3.1.65 *XML tag attributes*—attributes that apply to a specific XML tag and its data.

3.1.66 *xsd*—the XML schema.

3.1.67 *xsl*—extensible style language; used to format and transform XML documents into other XML formats or to non-XML data or print formats.

3.1.68 *W3C*—the World Wide Web Consortium develops interoperable technologies (specifications, guidelines, software, and tools) to lead the Web to its full potential as a forum for information, commerce, communication, and collective understanding. **E2182**

## 4. Significance and Use

4.1 Standardizing patient care information transfer through the CCR will greatly benefit the healthcare process. It addresses the lack of appropriate, succinct, and up-to-date patient health information for practitioners at a new point of care, and it can improve continuity of patient care by providing a method for easily communicating the most relevant clinical information about a patient among practitioners, institutions, and other entities. It enables a practitioner to readily access information about a patient's healthcare at any point in an encounter and to easily update the information at any time, particularly at the end of an encounter or when the patient goes from one provider to another.

4.2 The intent of the CCR is to enhance patient safety, reduce medical errors, reduce costs, enhance efficiency of health information exchange, and assure at least a minimum standard of health information transportability when a patient is referred, transferred, or is otherwise seen by, another practitioner.

4.2.1 The information included in the CCR is essential to good patient care and thus serves as a necessary bridge to a different environment, often with new practitioners who know little about the patient. By using the CCR, the next healthcare practitioner may:

4.2.1.1 Be informed about a patient's allergies, medications, current and recent past diagnoses, most recent healthcare assessments and services, advance directives, and the recommendations of practitioners who last treated the patient.

4.2.1.2 More quickly and easily verify patient demographics and insurance status, saving time and effort by not having to repeatedly ask a patient for this information in detail.

4.2.1.3 Minimize the effort required to update the patient's most essential and relevant information in an EHR.

4.2.1.4 Reduce costs associated with the patient's care, for example, through avoiding repetitive tests and basic information gathering.

4.3 The CCR will be completed by practitioners, such as physicians, nurses, and ancillary practitioners (for example, social work, physical therapy, occupational therapy), for example, in the following instances, which are non-normative.

4.3.1 *Referral (inpatient or outpatient) or Transfer (from an inpatient or institutional setting)*—The referring practitioner should transmit the CCR to the receiving practitioner and new care setting where the patient is being sent so that it arrives before or with the patient.

4.3.2 *Discharge without a Referral or Transfer*—The CCR should be provided to the patient for future use, including visits to an urgent care or emergency department, and to whomever the patient designates as the primary care practitioner who will be responsible for follow-up care, if needed.

4.3.3 *Personal Health Record*—A person may keep copies of his/her CCRs and supplement them, for example, with alternative medicine information and other personal health information. It should be noted, as well, that a person may also generate their own CCR.

4.4 Subsequently, the CCR may provide additional content and support for the EHR through domain-specific applications,[8] including the following non-normative examples:

4.4.1 *Enterprise- and Institution-specific Information*—particularly regarding discharge or transfer, for example, hospital to nursing and rehabilitation facilities or to home care agencies, and vice versa.

4.4.2 *Clinical Specialty Information,* for example, Pediatrics, Surgery, OB-GYN, Cardiology, Orthopedics, and so forth

4.4.3 *Disease Management Information,* to accommodate the recording of disease-specific management information, performance measures, or guidelines, for example, for diabetes, congestive heart failure, asthma, and so forth. This

[8] Where representation of data for such additional content cannot be achieved through the current CCR structure, it shall be addressed through the ballot process. Variability of data expression will be limited in order to support interoperability.

extension may be utilized by health plans, pharmaceutical companies, patient advocacy groups, and others interested in promoting "best practices".

4.4.4 *Payer-related Information,* including additional financial and care documentation.[9]

4.4.5 *Patient-entered Personal Health Record Information,* for example, complementary and alternative medicine care documentation or other patient considerations, such as private or sensitive health information a patient may be reluctant to share with certain practitioners or spouses. Expanded family history information is another potential use.

4.4.6 With appropriate modifications for confidentiality, the CCR may also be useful to researchers and others not directly involved in a patient's treatment.

## 5. Specifications

5.1 The CCR consists of three core components: the CCR Header, the CCR Body, and the CCR Footer.

5.1.1 *CCR Header* consists of the following CCR Sections:

5.1.1.1 *Unique Identifier* of the CCR, generated by the originating entity/system uniquely identifies each explicit instance of a CCR.

*(1)* The uniqueness of the ID is defined within the generating system and must be unique to and within each CCR and ideally is unique across the universe of CCRs.[10]

5.1.1.2 *Language* refers to the language in which the CCR is expressed.

5.1.1.3 *Version* refers to the version of the CCR Implementation Guide that is used to create a given instance of a CCR.

5.1.1.4 *Date/Time* refers to the exact time the data on a specific patient were aggregated to create a CCR, which is not necessarily the time the CCR was transmitted, printed, or sent.

5.1.1.5 *Patient* identifies the person to which the CCR refers.

*(1)* Patient identification is not based on a centralized system or a national patient identifier. Rather, it is based on a distributed identification system that links various practitioners and contains the core data set of identifying information that could be used by any record system to assign the individual their own identifier.

*(2)* A CCR can be about only one patient with the rare exception of Conjoined Twins, where it contains data on two patients. Other than within that rare exception, the CCR is a snapshot in time of the clinical, demographic, and administrative data of a unique patient.

5.1.1.6 *From* identifies who or what has generated the CCR and also defines the healthcare role that entity is playing when generating the CCR.[11]

5.1.1.7 *To* identifies to whom or to what the CCR is targeted and that recipient's role in relationship to the patient.

5.1.1.8 *Purpose* defines the specific reason that a CCR is generated, such as patient admission, transfer, consult/referral, or inpatient discharge.

5.1.2 *CCR Body* includes the following patient administrative and clinical sections. For the items in the sections of the body where the data are coded in a controlled vocabulary, the string used to represent the vocabulary coding system should use the National Library of Medicine Unified Medical Language System (UMLS) Metathesaurus root source abbreviation (RSAB) for those controlled vocabularies that are part of the UMLS Metathesaurus.

5.1.2.1 *Payers* contains data on the patient's payers, whether a 'third party' insurance, self-pay, other payer or guarantor, or some combination of payers and is used to define which entity is the responsible fiduciary for the financial aspects of a patient's care.

*(1)* This CCR section defines each unique instance of a payer and all the pertinent data needed to contact, bill to, and collect from that payer.

*(2)* Also contained within the Payers section is authorization information that can be used to define pertinent referral, authorization tracking number, procedure, therapy, intervention, device, or similar authorizations for the patient or provider, or both.

5.1.2.2 *Advance Directives* contains data defining the patient's advance directives and any reference to any existing supporting documentation and the physical location of that documentation, such as a durable power of attorney for healthcare.

5.1.2.3 *Support* lists the patient's support providers and contacts (family, next of kin, legal guardian, durable power for healthcare, clergy, caregivers, support organizations, etc.) at the time the CCR is generated.

*(1)* The patient's healthcare providers are not listed in this section. They are listed under the Practitioners Section in the CCR.

5.1.2.4 *Functional Status* lists and describes the patient's functional status, for example, competency, ambulatory status, ability to care for self, activities of daily living, at the time the CCR is generated.

5.1.2.5 *Problems* contains data defining the patient's relevant current and historical clinical problems, conditions, diagnoses, symptoms, findings, and complaints at the time the CCR is generated. If the CCR is being created for a referral, they should be ranked in order of importance for the referral purpose. Otherwise, reverse chronological order of onset should prevail.

5.1.2.6 *Family History* contains data defining the patient's blood or genetic relatives in terms of possible or relevant health risk factors.

5.1.2.7 *Social History* contains data defining the patient's occupational, personal (for example, lifestyle), social, and environmental history and health risk factors, as well as administrative data (ADT) such as marital status, race, ethnicity, and religious affiliation.

5.1.2.8 *Alerts* lists and describes any allergies, adverse reactions, and alerts that are pertinent to the patient's current or past medical history.

[9] The CCR is not intended for use as a claims attachment. Claims attachments are standardized (U.S. Realm) under the ASC X12N standard ASC X12N 275 (004050X15) 275 – Additional Information to Support a Health Care Claim or Attachment.

[10] The use of a universally unique ID representation is recommended, such as a UUID or OID.

[11] The intent of <From> is for validity of origin of the CCR not validity of data.

*(1)* Alerts data represent critically important variations from the norm that have temporal relevance in the near term or long term to the patient's condition and therapeutic options.

*(2)* Alerts are prompts or warnings related to patient safety.

5.1.2.9 *Medications* defines a patient's current medications and pertinent medication history.

*(1)* At a minimum, the currently active medications should be listed, with an entire medication history as an option, particularly when the CCR is used for comprehensive data export.

5.1.2.10 *Medical Equipment* defines a patient's implanted and external medical devices and equipment that their health status depends on, as well as any pertinent equipment or device history. This section is also used to itemize any pertinent current or historical durable medical equipment (DME) used to help maintain the patient's health status.

5.1.2.11 *Immunizations* defines a patient's current immunization status and pertinent immunization history.

5.1.2.12 *Vital Signs* defines the patient's current and historically relevant vital signs, for example, blood pressure, pulse. respiratory rate, height, weight, body mass index, head circumference, crown-to-rump length, pulse oximetry, and pulmonary function tests.

*(1)* At a minimum, pertinent vital signs, such as the most recent, maximum or minimum, or both, baseline, or relevant trends should be listed.

5.1.2.13 *Results* captures detailed pertinent and most recent laboratory, diagnostic, and therapeutic results data.

5.1.2.14 *Procedures* defines all interventional, surgical, diagnostic, or therapeutic procedures or treatments pertinent to the patient historically and at the time the CCR is generated.

*(1)* The preferred controlled vocabulary here is SNOMED CT, as well as the current CPT Codeset for the procedure and LOINC for any result,

5.1.2.15 *Encounters* contains data defining all healthcare encounters pertinent to the patient's current health status or health history.

*(1)* Encounters can be hospitalizations, office visits, home health visits, long-term care stays, or any other pertinent encounters.

5.1.2.16 *Plan of Care* contains data defining all pending orders, interventions, encounters, services, and procedures for the patient. It is limited to prospective, unfulfilled, or incomplete orders and requests only.

*(1)* All active, incomplete, or pending orders, appointments, referrals, procedures, services, or any other pending event of clinical significance to the current and ongoing care of the patient should be listed, unless constrained due to issues of privacy.

*(2)* Clinical reminders should also be placed here for purposes of providing prompts that may be used for disease prevention, disease management, patient safety, and healthcare quality improvements, including widely accepted performance measures.

5.1.2.17 *Healthcare Providers* contains data defining all healthcare providers involved in the current or pertinent historical care of the patient. At a minimum, the patient's key healthcare providers should be listed, particularly the patient's primary physician and any active consulting physicians, therapists, and counselors.

5.1.3 *CCR Footer* contains the following sections:

5.1.3.1 *Actors* contains data defining all of the individuals, organizations, locations, and systems associated with the data in the CCR.

5.1.3.2 *References* contains details concerning all references within the CCR to external data sources.

*(1)* External reference data can be URLs, references articles, clinical documents, paper or electronic patient records, diagnostic or document images, or any other data that would be of value to the providers using the CCR data for patient care.

5.1.3.3 *Comments* contains all text or structured comments associated with any data within the CCR.

*(1)* Comments are text or structured comments that are not intended to contain core relevant clinical or administrative data.

*(2)* Comments are not to be used to contain any data that correctly belong under <Description>, <Type>, <Status>, <Source>, or <ReferenceID>.

*(3)* Comments should also not contain pointers to references or other data external to the CCR that apply to a CCR section.

5.1.3.4 *Signatures* contains all signatures associated with any data within the CCR.

5.2 Annex A1 provides a detailed list of the CCR sections contained within the CCR Header, Body, and Footer, as well as all data fields within each section. Each field within a section includes: an XML code; a definition; explanations, descriptions, requirements, and restrictions; comments and examples; and specification of whether the field is required or optional.

5.3 The Adjunct to this standard provides the W3C XML schema derived from the XML codes in Annex A1. When the CCR is prepared in a structured electronic format, this XML schema in conjunction with Annex A2, the Implementation Guide, or other XML xsd and its related implementation guide that may be authorized through joint efforts of ASTM and other standards development organizations, must be used to assure interoperability.

5.4 Annex A2 provides the Implementation Guide, which contains instructions for using the XML schema (provided in the Adjunct to this specification) for generation of a standards-compliant, interoperable CCR.

5.5 Detailed coding is recommended whenever practical within the CCR. In all instances, the coding system and version must be specified.[12] Specific coding recommendations (for the U.S.) include the following. (note that these are coding suggestions and are non-normative).

5.5.1 Problems should be coded at the highest level using SNOMED CT and the most recent ICD-9CM or ICD-10 codes at the time the CCR is generated to accommodate the need for the various healthcare entities that will be interacting with the

[12] While it is recognized that there is no clear method to interpret the relationship between coded elements, it is outside the scope of this specification to resolve this difficulty.

CCR data to have accurate coding for reimbursement purposes. These and other controlled vocabularies are integral to the enhancement of data contained within the CCR to support intelligent clinical decision support. It is recommended that problems be categorized with SNOMED CT codes to as granular a level as possible.

5.5.2 Procedures should be coded at the highest level using SNOMED CT, LOINC, and the most recent CPT codes at the time the CCR is generated to accommodate the need for the various healthcare entities that will be interacting with the CCR data to have accurate coding for reimbursement purposes as well as potential utilization for clinical decision support functions. It is recommended that procedures be coded with SNOMED CT and LOINC codes to as granular a level as possible.

5.5.3 Products and agents should be coded with RxNorm to as granular a level as possible. In addition, they may be coded with another standard as applicable (NDC, for example) or proprietary code, with the type of code and the source and version clearly defined. If any coding system is used, however, an RxNorm code must be included, if legally required.

5.5.4 Procedures generating results should be coded with the most recent CPT codes at the time the CCR is generated for procedures and with LOINC for <Result> and <Test>.

## 6. Keywords

6.1 actor; advance directives; adverse reactions; alerts; allergies; attribute; care documentation; CCR; CCR Body; CCR components; CCR Footer; CCR Header; coding; comment; complex data type or group; condition; Continuity of Care Record; core data set; data field; data object; date/time; diagnosis; digital signature; discharge; disease management; document object; electronic health record; EHR; encounter; encryption; enumeration; external CCR link; family history; field; from; functional status; health risk factors; health status; healthcare provider; HIPAA-compliant; immunization; insurance; integrity; internal CCR link; laboratory results; language; medical equipment; medication; normalization; optionality; patient; patient health record; patient health status; patient identifying information; payer; personal health record; PHR; physiological measurements; plan of care; practitioner; problem; procedure; purpose; referral; reference; required data; result; sections; security; SIG; signature; social history; source; status; support; to; transfer; unique identifier; vendor configurable fields; version; vital signs; W3C; XML; XML code; XML document; XML schema; XML signature; .xsd; .xsl

# ANNEXES

**(Mandatory Information)**

## A1. CCR DATA FIELDS SPREADSHEET

A1.1 Table A1. lists and describes the data set attributes of the three core components of the CCR: the Header, the Body, and the Footer. The following information is included for each document object attribute:

A1.1.1 An XML code (see the Adjunct for the corresponding W3C XML schema derived from these XML codes);

A1.1.2 A definition;

A1.1.3 Explanations, descriptions, requirements, and restrictions;

A1.1.4 Comments and examples; and

A1.1.5 Required or optional status.

**CCR Data Fields Spreadsheet**

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| CCR Document Object Attributes | | | | | |
| CCR HEADER | | | | | |
| CCR Unique Identifier | <CCRDocumentObjectID> | The CCR and all Data Objects contained within the CCR must have ObjectIDs. The CCR Document Object ID is generated by the originating entity/system to uniquely identify each explicit instance of a CCR. The uniqueness of this ObjectID is defined within the generating system and must be unique to and within each CCR and ideally should be unique across the universe of all CCRs. | The <CCRDocumentObjectID> is of type xs:string. Ideally it is a UUID or OID. | Any numeric or alphanumeric string. | Required |
| Language | <Language> | The Language in which the CCR is expressed. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. It is recommended to encode language in ISO 639 version 1 or version 2 | English | Required |
| Version | <Version> | The Version of the CCR Implementation Guide that is used to create a given instance of a CCR. | <Version> is expressed as type xs:string. For this <Version> of the CCR it must state "V1.1" | V1.1 | Required |
| CCR Creation Date/Time | <DateTime> | This is the exact clock time that this CCR was created/generated. This DateTime refers to the exact time the data on a specific patient were aggregated to create a CCR, which is not necessarily the time the CCR was transmitted, printed, or sent. | CCR Creation DateTime must be expressed in ISO-8601 date-time format, with precision to include seconds. All date times expressed in Hours, Minutes, and/or Seconds in the CCR must express a time zone offset, either using Z [universal coordinated time, or Zulu time], or an offset in hours and minutes. The CCR further requires that the time zone offset be a legal time zone. This latter constraint cannot be expressed in the schema, as time zones are determined by political entities [for example, Nations or States]. There presently exist time zones in the form ##:15 and ##:30. CCR Creation DateTime time should ideally come from a net-based atomic time service and not from an individual computing device's internal clock. | The ISO-8601 standard defines the time string as CCYY-MM-DDThh:mm:ss-hh:mm. 2005-01-25-T12:15:37-09:00 represents January 25, 2005 12:15:37 PST (Pacific Standard Time), which is minus (-) 9 hours from universal coordinated time (Zulu). This exact time can also be expressed as Zulu time as 2005-01-25-T21:15:37Z, which represents January 25, 2005 21:15:37 Zulu. | Required |
| Patient | <Patient> | Identifies the patient to which the CCR refers. This is a link to <Actor> through an <ActorID> of type xs:string. This should equal one of the <ActorObjectID> in <Actors>. Detailed data on each <Actor> is maintained in the <Actors> Section in the CCR Footer. | The CCR can only be about one patient with the extreme exception of Conjoined Twins, where it can contain data on two patients. Therefore, patient cardinality must be at least 1, and at most 2, in the rare case of Conjoined Twins. Other than within that extreme exception, the CCR is a snapshot in time of the clinical and administrative data of a unique patient. | | Required |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| From | <From> | Identifies who or what has generated the CCR. This is a link to an Actor <ActorID> and also defines the healthcare role <ActorRole> that the actor is playing when generating the CCR. | An Actor and their Role must be specified under <From>. An <ActorLink> and <ActorID> are REQUIRED. | Originating practitioner(s), other healthcare provider, healthcare organization, or healthcare information system (in the use case where the CCR is generated by a computer system for data exchange or export, for example). | Required |
| To | <To> | Identifies to whom or what the CCR is targeted. This is a link to an Actor <ActorID> and also defines the healthcare role <ActorRole> that the Actor plays in receiving the CCR. | An Actor and their Role must be specified under <To> if the <To> object is used in the CCR. An <ActorLink> and <ActorID> are REQUIRED. | Receiving/target practitioner(s), other healthcare provider, healthcare organization, or healthcare information system (in the use case where the CCR is generated by one computer system for data exchange or export to another computer system, for example). | Optional |
| Purpose | <Purpose> | Defines the specific reason for which the CCR was generated. | The general use case does not require a <Purpose>. <Purpose> should be utilized when the CCR has a specific purpose such as patient admission, transfer, consult/ referral, or inpatient discharge. | | Optional |
| | <DateTime> | An optional data attribute used to define DateTimes relevant to the <Purpose> of the CCR. | Exact DateTime, age, approximate DateTime, or DateTime range are permitted. | For a CCR with a <Purpose> defined as a request for consult, a range of time (e.g., within two weeks) may be specified, or ASAP, or Today, or a specific date or specific date and time. The same would hold true for a request for procedure, request for follow-up, request for authorization, etc. | Optional |
| | <Description> | Used to express the <Purpose> of the CCR. One or more purposes are allowed. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Request For Consult, Request For Procedure, Request for Service, Request for Encounter, Request for Authorization, Request for Medical Device Or Product, Request for Medication, Request for Immunization, For Patient Use. | Required if Purpose Section/ Object is included |
| | <OrderRequest> | Used to define a specific Procedure, Device/ Product, Medication, Immunization, Service, Encounter, and/or Authorization that is the <Purpose> of this CCR. | See <OrderRequest> under <PlanOfCare>. | See <OrderRequest> under <PlanOfCare>. | Optional |
| | <Indications> | Defines a specific <Indication> that supports the <Purpose> of this CCR. | See <Indication>. | See <Indication>. | Optional |
| | <ReferenceID> | Used to link the <Purpose> to an external data source or location. | This is a link to <Reference>. | See References. | Optional |
| | <CommentID> | Used to link to and support a free text or structured <Comment> for the <Purpose>. | This is restricted to legitimate comments only. It is NOT to be used to contain any data that correctly belong under <Description>, <OrderRequest>, or <Indication>. This is a link to <Comment>. | See Comments. | Optional |
| CCR BODY | | | | | |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| Payers | <Payers> | This CCR DataObject contains data on the patient's payers, whether insurance, self-pay, other payer, or some combination of payers. | At a minimum, the patient's pertinent current payment sources should be listed. | | Optional |
| | <Payer> | Defines each unique instance of a payer - insurance or self-pay or other, and all the pertinent data needed to contact, bill to and collect from that payer. | | | Required if Insurance Section/Object is included |
| | <CCRDataObjectID> | All CCR data objects must have a unique data object ID. | The <CCRDataObjectID> is of type xs:string. | Any numeric or alphanumeric string. | Required if Insurance Section/Object is included |
| | <PaymentProvider> | Identifies the <PaymentProvider>. This is a link to an Actor <ActorID> and also defines the healthcare role <ActorRole> that the actor plays. | | | <ActorID> is Required, <ActorRole> is Optional. |
| | <DateTime> | Used to define dates and times relevant to the payer and patient relationship. | This is restricted to an ExactTime and requires <Type> and <ExactDateTime>, which should be specified to at least the Year/Month/Day. <ExactDateTime> must be expressed as an ISO8601 DateTime. | For healthcare insurance: Effective Date, End Date, Termination Date | Optional |
| | <Type> | Used to define the <Payer> <Type>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Self-Pay, Primary Health Insurance, Supplemental Health Insurance, Prescription Drug Benefit, Mental Health Benefit, Long Term Care Benefit, Worker's Compensation, Auto Insurance, Dental Insurance, Other. | Optional |
| | <Subscriber> | Identifies the <Subscriber>. This is a link to an Actor through <ActorID> and also defines the role through <ActorRole> that the <Subscriber> plays. | | | <ActorID> is required, <ActorRole> is optional. |
| | <IDNumber> | Used to list all of the relevant IDs for this patient relative to the defined payer. | If an <ID> is listed, then <Type> is also required in this instance. | Subscriber Number, Group Number, Employer Number, Plan Code, Worker's Comp Claim Number, Etc. | Optional but required if <ID> is listed |
| | <Authorizations> | Used to define any authorizations/pre-authorizations that are currently active for this patient and payer. | | Authorization for service, encounter, product/device, medication, immunization, procedure. | Optional |
| | <Source> | Used to define the person, system, or institution that is the <Source> of the <Insurance> data. | Source can be a link to an <Actor> with an <ActorRole> or a <Reference>. <Source> also has children <DateTime> and <Comment>. <Source> is required of all CCRDataObjects. This is so that any data within the CCR can be validated as to its origin/source. | Link to the patient or patient's parent, child, relative, guardian, durable power, primary physician, practice management system, etc. | Required if Insurance Section/Object is included |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <InternalCCRLink> | Used to link one CCRDataObject to another CCRDataObject. | This defines internal CCR links and uses a <LinkID> to refer/link to a CCRDataObjectID, which is of type xs:string. <LinkRelationship> defines the relationship to the CCRDataObjectID | Pharmacy benefit plan to cover medications. <Authorization> to a specific procedure, etc. | Optional |
| | <ReferenceID> | Used to link the <Payer> to a <Reference>. | This is a link to <Reference>. <Reference> under <AdvanceDirective> must be a child of <Source>. | A <Reference> to an insurance card on file, etc. | Optional |
| | <CommentID> | Used to link to and support a free text or structured <Comment> for the <AdvanceDirective>. | This is restricted to legitimate comments only. It is NOT to be used to contain any data that correctly belong under <Description>, <Type>, <Status>, <Source>, or <Reference>. This is a link to <Comment>. | See Comments. | Optional |
| Advance Directives | <AdvanceDirective> | This CCRDataObject contains data defining the patient's advance directives and any reference to any existing supporting documentation and the physical location of that documentation —such as a durable power of attorney for healthcare. | The most recent and up-to-date Advance Directives are required in the general use case, if known,, in as much detail as possible. Otherwise, optionality is use-case specific. | | Required if known in general use case, otherwise use-case specific. |
| | <CCRDataObjectID> | Defined above. | Required of all CCRDataObjects. | | Required if known in general use case, otherwise use-case specific |
| | <DateTime> | Used to define dates and times relevant to the patient's advance directives. | This is restricted to an ExactTime and requires <Type> and <ExactDateTime>. <ExactDateTime> should be specified to at least the Year/Month/Day. <ExactDateTime> must be expressed as an ISO8601 DateTime. | This should list the DateTime that the Advance Directive was last recorded and/or verified and any relevant applicable dates or ranges (applicable from Date A____ to Date B____). DateTime <Type> should express Last Recorded, Verified With Patient, Verified With Parent, Verified With Guardian, Verified With Family, Verified With Durable Power Of Attorney for Healthcare, Verified With Treating Physician, Start Date, End Date. | Optional |
| | <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. | | Optional |
| | <Type> | Defines the <AdvanceDirective> <Type>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Resuscitation Status, Intubation Status, IV Fluid and Support Status, CPR Status, Antibiotic Status, Life Support Status, Tube Feedings, Other. | Required if Advance Directives Section/Object is included |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <Description> | Used to express the <AdvanceDirective>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Full Code, No Code, No CPR, Cardioversion Only, CPR Drugs Only, No Intubation, IV Fluids Only, No IV Fluids, Antibiotics Only, No Antibiotics, Tube Feedings, No Feeding Tube, No Prolonged Life Support. | Required if Advance Directives Section/Object is included |
| | <Status> | Used to define the <Status> of the <AdvanceDirective>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Current and Verified, Supported By Healthcare Will, Supported By Durable Power of Attorney for Healthcare, Verified With Family Only, Verified By Medical Record Only. | Required if Advance Directives Section/Object is included |
| | <Source> | Used to define the person, system, or institution that is the <Source> of the <AdvanceDirective> data. | Source can be a link to an <Actor> with an <ActorRole> or a <Reference>. <Source> also has children <DateTime> and <Comment>. <Source> is required of all CCRDataObjects so that any data within the CCR can be validated as to its origin/source. | Link to the patient, or the patient's parent, child, relative, guardian, durable power, primary physician, etc. | Required if Advance Directives Section/Object is included |
| | <InternalCCRLink> | Used to link one CCRDataObject to another CCRDataObject. | This defines internal CCR links and uses a <LinkID> to refer/link to a CCRDataObjectID, which is of type xs:string. <LinkRelationship> defines the relationship to the CCRDataObjectID. | Advance Directive may be linked to a specific problem/diagnosis such as COPD or metastatic CA, etc. | Optional |
| | <ReferenceID> | Used to link the <AdvanceDirective> to a <Reference>. | This is a link to <Reference>. <Reference> under <AdvanceDirective> must be a child of <Source>. | A <Reference> to a durable power of attorney for healthcare or other documents or healthcare records that support the <AdvanceDirective>. | Optional |
| | <CommentID> | Used to link to and support a free text or structured <Comment> for the <AdvanceDirective>. | This is restricted to legitimate free text comments only. It is NOT to be used to contain any data that correctly belong under <Description>, <Type>, <Status>, <Source>, or <ReferenceID>. This is a link to <Comment>. | See Comments. | Optional |
| Support | <SupportProvider> | Used to list the patient's sources of support such as immediate family, relatives, guardian, durable power, spiritual advisory/clergy, and the like. | This is a link to an <Actor> with an <ActorRole>. This data object is *not* used for listing a patient's healthcare providers, which are listed under the <HealthCareProviders> Section of the CCR, with the exception that 'Care Giver' should be listed under <Support>. At a minimum, the patient's key support contacts relative to healthcare decisions, including next of kin, should be listed here. | Parent, immediate family, next of kin, relative, guardian, durable power, care giver, priest, minister, rabbi, iman, etc. | Optional |
| Functional Status | <Function> | This CCRDataObject is used to list and describe the patient's current functional status including ambulatory status, activities of daily living, mental status, home/living situation, ability to care for self, etc. | At a minimum, any functional limitations that affect the patient's ability to care for self, ambulate, follow diagnostic, therapeutic, or treatment advice, follow-up for care, or which in any way limit or compromise the patient's ability to function normally should be listed. | | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <CCRDataObjectID> | Defined above. | Required of all CCRDataObjects. | | Required if Functional Status Section/Object is included |
| | <DateTime> | Used to define dates and times relevant to the patient's <FunctionalStatus>. | This can be an exact DateTime, an age, an approximate DateTime, or a DateTime range. | Date of Onset, From Date A___ To Date B___, Since Age___, etc. | Optional |
| | <Type> | Defines the <FunctionalStatus> <Type>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Ambulatory Status, Mental Status, Activities of Daily Living, Home/Living Situation, Ability to Care for Self. | Required if Functional Status Section/Object is included |
| | <Problem> | Used when the <FunctionalStatus> is a problem, such as a clinical condition. | See Problems. | | Optional |
| | <Result> | Used when the <FunctionalStatus> is a result such as a mini-mental status exam or functional assessment. | See Results. | | Optional |
| | <Description> | Used to express the <FunctionalStatus> *if and only if* the <FunctionalStatus> described is not a <Problem> or a <Result>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | To be used only in the rare case where <FunctionalStatus> is not more appropriately described as a <Problem> or <Result>. | Optional |
| | <Status> | Defines the <Status> of the <FunctionalStatus>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Active, Chronic, Temporary, Resolved. | Required if Functional Status Section/Object is included |
| | <Source> | Used to define the person, system, or institution that is the <Source> of the <FunctionalStatus> data. | Source can be a link to an <Actor> with an <ActorRole> or a <Reference>. <Source> also has children <DateTime> and <Comment>. <Source> is required of *all* CCRDataObjects so that any data within the CCR can be validated as to its origin/source. | Link to a healthcare provider, the patient, their parent, child, relative, guardian, durable power, a healthcare record, etc. | Required if Functional Status Section/Object is included |
| | <InternalCCRLink> | Used to link one CCRDataObject to another CCRDataObject. | This defines internal CCR links and uses a <LinkID> to refer/link to a CCRDataObjectID, which is of type xs:string. <LinkRelationship> defines the relationship to the CCRDataObjectID. | <Function> to a specific <Problem>. | Optional |
| | <ReferenceID> | Used to link the <FunctionalStatus> to a <Reference>. | This is a link to <Reference>. <Reference> under <FunctionalStatus> *must* be a child of <Source>. | A link to a reference such as a healthcare document, assessment tool, or healthcare record that is a <Reference> for the <FunctionalStatus>. | Optional |
| | <CommentID> | Used to link to and support a free text or structured <Comment> for the <FunctionalStatus>. | This is restricted to legitimate comments only. It is NOT to be used to contain any data that correctly belong under <Description>, <Type>, <Status>, <Problem>, <Result>, <Source>, or <ReferenceID>. This is a link to <Comment>. | See Comments. | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| Problems | <Problem> | This CCRDataObject lists and describes all relevant clinical problems, conditions, diagnoses, symptoms, findings, and complaints at the time the CCR is generated. | At a minimum, all pertinent current and historical problems should be listed. In the special case that the CCR is being created for a referral, each <Problem> should be ranked in order of importance for the referral purpose. Otherwise, reverse chronological order of onset should prevail. | | Optional |
| | <CCRDataObjectID> | Defined above. | Required of all CCRDataObjects. | | Required if Problem Section/ Object is included |
| | <DateTime> | Used to define dates and times relevant to the patient's <Problem>. | This can be an exact DateTime, an age, an approximate DateTime, or a DateTime range. | Date of Onset, From Date A___ To Date B_ ___, Since Age___, etc. | Optional |
| | <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. | | Optional |
| | <Type> | Defines the <Problem> <Type>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Problem, Condition, Diagnosis, Symptom, Finding, Complaint, Functional Limitation | Optional |
| | <Description> | Used to express the <Problem>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. It is recommended that, when possible, all problems be coded (ICD-9CM, ICD-10, and/or SNOMED). | Myocardial Infarction, Nausea, Headache, Parkinson's Disease, etc. | Optional |
| | <Status> | Defines the <Status> of the <Problem>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Active, Inactive, Chronic, Intermittent, Recurrent, Rule Out, Ruled Out, Resolved. | Optional |
| | <Episodes> | Used to define one or more occurrences of a problem. | Episodes should be listed for recurrent or repetitive problems, conditions, diagnoses, or symptoms, rather than listing a problem multiple times in the problem list. <Episodes> has children <Number>, <Frequency>, <Episode>, and <Duration>. | | Optional |
| | <HealthStatus> | Used to define the <HealthStatus> of the Actor to whom the problem applies (used more commonly in <Family History>). | <HealthStatus> has children <DateTime>, <Description>, <CauseOfDeath>. <DateTime> can be an Exact DateTime, an age, an approximate DateTime, or a DateTime range. <Description> and <CauseOfDeath> are instances of Coded DescriptionType with restricted content that must be one of the defined structured text values. | <Description> Alive And Well, In Remission, Symptom Free, Chronically Ill, Severely Ill, Disabled, Severely Disabled, Deceased; <CauseOfDeath> Yes, No, Unknown. Note that under <HealthStatus> the CCR can record the current health status relative to this problem as well as if the problem was or was not the <CauseOfDeath> and a Time Of Death as a <Type> under <DateTime>. | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <PatientKnowledge> | Used to define whether or not the patient is aware of a <Problem> and the <Reason> why they are or are not aware. | <PatientAware> restricted to Yes, No, Unknown. <Reason> is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | <PatientAware> Yes, No, Unknown. <Reason> Patient Request Not To Know, Family Request For Patient Not To Know, Durable Power Request For Patient Not To Know. | Optional |
| | <Source> | Used to define the person, system, or institution that is the <Source> of the <Problem> data. | Source can be a link to an <Actor> with an <ActorRole> or a <Reference>. <Source> also has children <DateTime> and <Comment>. <Source> is required of all CCRDataObjects. This is so that any data within the CCR can be validated as to its origin/source. | Link to a healthcare provider, the patient, their parent, child, relative, guardian, durable power, a healthcare record, etc. | Required if Problem Section/ Object is included |
| | <InternalCCRLink> | Used to link one CCRDataObject to another CCRDataObject. | This defines internal CCR links and uses a <LinkID> to refer/link to a CCRDataObjectID, which is of type xs:string. <LinkRelationship> defines the relationship to the CCRDataObjectID. | Problem to a specific <History>, <Procedure>, <Product>, or <Encounter>, etc. | Optional |
| | <ReferenceID> | Used to link the <Problem> to a <Reference>. | This is a link to <Reference>. <Reference> under <Problem> *must* be a child of <Source>. | A <Reference> to a clinical note, discharge summary, or other documents or healthcare records that support the <Problem>. | Optional |
| | <CommentID> | Used to link to and support a free text or structured <Comment> for the <Problem>. | This is restricted to legitimate comments only. It is NOT to be used to contain any data that correctly belong under <Description>, <Type>, <Status>, <Episodes>, <CurrentHealthStatus>, <PatientKnowledge>, <Source>, or <ReferenceID>. This is a link to <Comment>. | See Comments. | Optional |
| Family History | <FamilyProblemHistory> | This CCRDataObject contains data defining the patient's blood or genetic relatives in terms of possible or relevant risk factors. | At a minimum, all family history that has a potential impact on the patient's healthcare risk profile should be listed. Family history is a key risk factor of high predictive value in diagnosis and treatment for many healthcare conditions, and is often difficult to collect at each encounter and maintain between encounters. Inclusion of family <History> data in the CCR is important. | | Optional |
| | <CCRDataObjectID> | Defined above. | Required of all CCRDataObjects. | | Required if Family History Section/ Object is included |
| | <DateTime> | Used to define dates and times relevant to the patient's family <History>. | This can be an exact DateTime, an age, an approximate DateTime, or a DateTime range. | Date of Onset, From Date A___ to Date B_ ___, Since Age___, etc. | Optional |
| | <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. | | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <Type> | Defines the family <History> <Type>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Condition, Diagnosis, Problem, Symptom | Optional |
| | <Description> | Used to express the <History> if and only if the <History> described is not a <Problem>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | To be used only in the rare case where <History> is not more appropriately described as a <Problem>. | Optional |
| | <Status> | Defines the <Status> of the family <History>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Active, Inactive, Chronic, Intermittent, Recurrent, Rule Out, Ruled Out, Resolved. | Optional |
| | <Problem> | Defines the <Problem>. | If only the <Problem> is known but not which <FamilyMember> or members have or have had that <Problem>, then only the <Problem> need be listed. If the affected <FamilyMember> is known, then <FamilyMember> must be listed and all problems must be constrained and listed discretely by Family Member. | See <Problem>, above. | Optional |
| | <FamilyMember> | Defines the <FamilyMember> to whom the <Problem> or in the exceptional case <Description> applies. | This is an <ActorRole> and comes from the <ActorRole> restricted values set. If the family member is listed under the <Actors> section, then this also includes a link to an <ActorID>. | See <ActorRole>. | Optional |
| | <Source> | Used to define the person, system, or institution that is the <Source> of the <History> data.. | Source can be a link to an <Actor> with an <ActorRole> or a <Reference>. <Source> also has children <DateTime> and <Comment>. <Source> is required of *all* CCRDataObjects. This is so that any data within the CCR can be validated as to its origin/source. | Link to a healthcare provider, the patient, their parent, child, relative, guardian, durable power, a healthcare record, etc. | Required if Family History Section/ Object is included |
| | <InternalCCRLink> | Used to link one CCRDataObject to another CCRDataObject. | This defines internal CCR links and uses a <LinkID> to refer/link to a CCRDataObjectID, which is of type xs:string. <LinkRelationship> defines the relationship to the CCRDataObjectID. | <History> to a specific <Problem>. | Optional |
| | <ReferenceID> | Used to link the <History> to a <Reference>. | This is a link to <Reference>. <Reference> under <History> *must* be a child of <Source>. | A <Reference> to a clinical note, discharge summary, personal health record, or other documents, system, or healthcare records that support the <History>. | Optional |
| | <CommentID> | Used to link to and support a free text or structured <Comment> for the <History>. | This is restricted to legitimate comments only. It is NOT to be used to contain any data that correctly belong under <Description>, <Type>, <Status>, <Problem>, <FamilyMember>, <Source>, or <ReferenceID>. This is a link to <Comment>. | See Comments. | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| Social History | <SocialHistoryElement> | This CCRDataObject is used to define the patient's occupational, personal (for example, lifestyle), social, and environmental history and health risk factors. Included are administrative data (ADT) such as marital status, ethnicity, nationality, and religious preference. | At a minimum, all pertinent social history and risk factors should be included, with respect to the high sensitivity and privacy concerns surrounding some of these data for patients. | | Optional |
| | <CCRDataObjectID> | Defined above. | Required of all CCRDataObjects. | | Required if Social History Section/ Object is included |
| | <DateTime> | Used to define dates and times relevant to the patient's social <History>. | This can be an exact DateTime, an age, an approximate DateTime, or a DateTime range. | Start Date, Stop Date, From Date A___To Date B____, Since Age___, Stop Age/Age of Last Use, Exposure, etc. | Optional |
| | <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. | | Optional |
| | <Type> | Defines the social <History> <Type>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. <Type> defines each discrete data object within <SocialHistory> and each time a new data object is generated a new instance of <RiskFactorHistory> must be initiated. | Marital Status, Religion, Ethnicity, Race, Language, Smoking, Exercise, Diet, Employment, Toxic Exposure, ETOH Use, Drug Use, Etc. | Optional |
| | <Description> | Defines the specific attributes of the Social History defined under <Type>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | | Optional |
| | <Status> | Defines the <Status> of the social <History>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Active, Prior History No Longer Active, Unknown | Optional |
| | <Episodes> | Used to define one more occurrences of a social history item. | Episodes should be listed for social history items that have an episodic component or character, such as changing Marital Status, Tobacco Use, ETOH Use, Employment, etc. | | Optional |
| | <Source> | Used to define the person, system, or institution that is the <Source> of the <History> data. | Source can be a link to an <Actor> with an <ActorRole> or a <Reference>. <Source> also has children <DateTime> and <Comment>. <Source> is required of *all* CCRDataObjects. This is so that any data within the CCR can be validated as to its origin/source. | Link to a healthcare provider, the patient, their parent, child, relative, guardian, durable power, a healthcare record, etc. | Required if Social History Section/ Object is included |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <InternalCCRLink> | Used to link one CCRDataObject to another CCRDataObject. | This defines internal CCR links and uses a <LinkID> to refer/link to a CCRDataObjectID, which is of type xs:string. <LinkRelationship> defines the relationship to the CCRDataObjectID. | <History> to a specific <Problem>. | Optional |
| | <ReferenceID> | Used to link the <History> to a <Reference>. | This is a link to <Reference>. <Reference> under <History> *must* be a child of <Source>. | A <Reference> to a clinical note, discharge summary, personal health record, or other documents, system, or healthcare records that support the <History>. | Optional |
| | <CommentID> | Used to link to and support a free text or structured <Comment> for the <History>. | This is restricted to legitimate comments only. It is NOT to be used to contain any data that correctly belong under <Description>, <Type>, <Status>, <Source>, or <ReferenceID>. This is a link to <Comment>. | See Comments. | Optional |
| Alerts | <Alert> | This CCRDataObject is used to list and describe any allergies, adverse reactions, and alerts that are pertinent to the patient's current or past medical history. | At a minimum, currently active and any relevant historical allergies, adverse reactions, and alerts should be listed. | | Optional |
| | <CCRDataObjectID> | Defined above. | Required of all CCRDataObjects. | | Required if Alerts Section/Object is included |
| | <DateTime> | Used to define dates and times relevant to the patient's <Alert>. | This can be an exact DateTime, an age, an approximate DateTime, or a DateTime range. | Start Date, Stop Date, From Date A___ To Date B____, Since Age___, Stop Age/Age of Occurrence, Exposure, etc. | Optional |
| | <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. | | Optional |
| | <Type> | Defines the <Alert> <Type>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Allergy, Adverse Reaction, Alert | Optional |
| | <Description> | Defines the specific attributes of the Alert defined under <Type>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | | Optional |
| | <Status> | Defines the <Status> of the <Alert>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Active, Prior History No Longer Active | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <Agent> | Defines the <Agent> that is the cause of the allergy, adverse reaction, or alert. | Can be <EnvironmentalAgent>, <Product>, <Problem>, or <Procedure>. <EnvironmentAgent> is a CodedDescriptionType. <Product>, <Problem>, and <Procedure> follow the explicit rules defined for each of these data types in this spreadsheet. | Product (including medications and immunizations), environmental agent, Problem/Diagnosis (G6PD deficiency, for example), or Procedure (claustrophobia with MRI, for example). | Optional. <Unknown> is required content. |
| | <Reaction> | Describes the <Reaction> that the <Alert> addresses. | Contains <Description> and <Severity> as CodedDescriptionTypes, and <Intervention>, which can be used to define any <Intervention> that has been successful in treating the <Reaction>. For multiple reactions <ReactionSequencePosition> and <MultiplereactionModifier> are used and <Status> is used to define pertinent positive or pertinent negative reactions. | Pertinent Positive: <Description><Text>Anaphylaxis<Severity>Life Threatening<Intervention>Intubation; Pertinent Negative: <Description> <Text>Anaphylaxis<Status>Not Present | Optional |
| | <Source> | Used to define the person, system, or institution that is the <Source> of the <Alert> data. | Source can be a link to an <Actor> with an <ActorRole> or a <Reference>. <Source> also has children <DateTime> and <Comment>. <Source> is required of all CCRDataObjects. This is so that any data within the CCR can be validated as to its origin/source. | Link to a healthcare provider, the patient, their parent, child, relative, guardian, durable power, a healthcare record, etc. | Required if Alerts Section/Object is included |
| | <InternalCCRLink> | Used to link one CCRDataObject to another CCRDataObject. | This defines internal CCR links and uses a <LinkID> to refer/link to a CCRDataObjectID, which is of type xs:string. <LinkRelationship> defines the relationship to the CCRDataObjectID. | <Alert> to a specific <Product>, <Problem>, or <Procedure>. | Optional |
| | <ReferenceID> | Used to link the <Alert> to a <Reference>. | This is a link to <Reference>. <Reference> under <Alert> must be a child of <Source>. | A <Reference> to a clinical note, discharge summary, personal health record, or other documents, system, or healthcare records that support the <Alert>. | Optional |
| | <CommentID> | Used to link to and support a free text or structured <Comment> for the <Alert>. | This is restricted to legitimate comments only. It is NOT to be used to contain any data that correctly belong under <Description>, <Type>, <Status>, <Agent>, <Reaction>, <Source>, or <ReferenceID>. This is a link to <Comment>. | See Comments. | Optional |
| Medications | <Medication> | This CCRDataObject is used to list and describe the patient's current medications and pertinent medication history. | At a minimum, the currently active medications should be listed, with an entire Medication History as an option, particularly when the CCR is used for comprehensive data export. | | Optional |
| | <CCRDataObjectID> | Defined above. | Required of all CCRDataObjects. | | Required if Medications Section/Object is included |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <DateTime> | Used to define dates and times relevant to the patient and the <Product>. | This can be an exact DateTime, an age, an approximate DateTime, or a DateTime range. | Start Date, Stop Date, From Date A___ To Date B____, Since Age___, Stop Age, Etc. | Optional |
| | <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. | | Optional |
| | <Type> | Defines the <Product> <Type>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Medication, IV Fluid, Parental Nutrition, Supplemental Nutrition, Immunization, Disposable, Supplies, Device, Implantable Device, Durable Medical Equipment | Optional |
| | <Description> | An instance of a CodedDescriptionType. <Text> under <Description> is used as a text string container for those systems that cannot generate a structured description of a product. The structured and coded portions of <Description> are used to define the name and overall characteristics of any complex product made up of one or more structured products as defined below. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Amoxicillin | Optional |
| | <Status> | Defines the <Status> of the <Product>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Active, On Hold, Prior History No Longer Active | Optional |
| | <Product> | Used as a container for the core descriptive attributes of a <Product>. | <Product> is used within the CCR for <Medication>, <Immunization> and for medical devices and durable medical equipment (DME). A product can be a simple <Product> or can repeat to define a combination product made up of two or more individual products. | | Required if Medications Section/Object is included |
| | <ProductName> | Defines the generic name for prescriptions and over-the-counter medications and nonproprietary name for non-medication products. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. An NCD Code or RxNorm Code (preferred) should be used when <Product> is used to describe a medication. | Amoxicillin | Required if <Product> is used |
| | <BrandName> | For the medications that are branded, It defines the <BrandName> of the <Product>. One should also provide the generic name of the medication as <ProductName> above. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Amoxil | Optional |
| | <Manufacturer> | Defines the <Manufacturer> of the <Product>. | This is a link to <Actor>. | Eli Lilly, Pfizer, etc. | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. | | Optional |
| | <Strength> | Defines the predefined strength of the <Product>. | MeasureType with <Value>, <Units>, and <Code>. <Units> has children <Unit> and <Code>. | 250mg | Optional |
| | <Form> | Defines the <Form> of the <Product>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Capsule, tablet, etc. | Optional |
| | <Concentration> | Defines the <Concentration> of the <Product>. | MeasureType with <Value>, <Units>, and <Code>. <Units> has children <Unit> and <Code>. | 250mg/5mL | Optional |
| | <Size> | Defines the <Size> of the <Product>. | Can be a text string, structured text, or defined by <Dimensions>. | Small, Medium, Large, 6, 6.5, 7, 7.5, 2 cm by 15 cm, 24 mm diameter. | Optional |
| | <Quantity> | Defines the <Quantity> of the <Product>. | MeasureType with <Value>, <Units>, and <Code>. <Units> has children <Unit> and <Code>. | 30 | Optional |
| | <Directions> | <Directions> is the instructions (SIG) component describing the intended patient use of the <Product>. <Directions> contains an XML string defined as follows below: | Can be used to map a single SIG or a complex recurring SIG like a tapered dose or sliding scale. Recurring SIG segments are represented by repeating the <Directions> tag and its children. | 1 po tid x 10 days, Prednisone taper, Insulin sliding scale | Optional |
| | <DoseIndicator> | Indicates the action to be taken on the <Description>/SIG. This is a direct map to the NCPDP Script SIG standard. | CodedDescriptionType - codes and content to follow NCPCP Script SIG standard. | 1 = Specified - remaining fields populated. 2 = As needed - skip rest of Dose Segment. 3 = As directed - skip rest of Dose Segment. 4 = Unspecified - see free text <Description>. | Optional |
| | <DeliveryMethod> | The textual representation of the Dose Delivery Method. This is the method in which the dose is delivered (describes how the dose is administered/consumed). | CodedDescriptionType - codes and content to follow NCPCP Script SIG standard. | Defines the method: take, apply, swish, swallow, inject, insert, chew, use, give, sprinkle, mix, dissolve… | Optional |
| | <Dose> | This is the dose portion of the SIG which can define a fixed dose or can repeat to define a variable dose, dose range, or dose options. This is the dose to be administered, not the dispensed dose. Dispensed dose is found under <Strength>, above. | MeasureType with <Value>, <Units>, and <Code>. <Units> has children <Unit> and <Code>. Also contains <Rate> and for multiple or variable doses <DoseSequencePosition> and <MultipleDoseModifier>. | This is the numeric or text expression of the dose. A simple does example would be '250mg' where the value in this field would be '250'. | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <DoseCalculation> | This segment is used to express a dose as a calculation, such as '40mg/kg/day divided into 3 doses'. This segment is used in conjunction with <Dose> to allow the expression of a dose as a calculation. Also used to express doses to be calculated by nurses based on physiological parameters, such as Dopamine, Nipride, etc. | Includes <Dose><Value> and <Units> as well as a <Variable> and a <DoseCalculation>. Also contains <Rate> and for multiple calculations <CalculationSequencePosition> and <MultipleCalculationModifier>. | Amoxicillin for a child is dosed at approximately 40mg/kg/day/2 to 3 doses. For a 9kg child, an appropriate dose would be 125mg tid. To express this, the prescribing physician would put '125mg' in the <Dose> (and 'tid' in <Frequency>) and '40mg/kg/day/3 doses' in <DoseCalculation>. This allows the pharmacist to look at the dose (125mg tid) and do a secondary patient safety check against the desired dosing of '40mg/kg/day/3 doses'. | Optional |
| | <Vehicle> | Used to define a <Vehicle> used to deliver the <Product> such as an IV solution. | Vehicle can be expressed as a CodedDescriptionType (<Description>) or as an <InternalCCRLink> to another <Product>. For mulitple vehicles, includes <VehicleSequencePosition> and <MultipleVehicleModifier>. | D5W, normal saline, etc. | Optional |
| | <Route> | Used to define the <Route> of administration. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. For multiple routes it contains <RouteSequencePosition> and <MultipleRouteModifier>. | po, pr, sl, etc. | Optional |
| | <Site> | Used to define the physical location on the patient for use, implantation, or administration, where specified. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. For multiple sites it contains <SiteSequencePosition> and <MultipleSiteModifier>. | Right gluteus, left deltoid, Hickman catheter, etc. | Optional |
| | <AdministrationTiming> | This is used to define a specific administration or use time. Can repeat for more than one administration time. | An instance of DateTimeType. For multiple or variable timings it includes <TimingSequencePosition> and <MultipleTimingModifier>. | Can be a text string (Morning, Evening, Before Meals, 1 Hour After Meals, 3 Hours After Meals, Before Bed) or an exact time. | Optional |
| | <Frequency> | Used to define a <Product> frequency of use/ administration. | This can be expressed as a <Description> (CodedDescriptionType) or a <Value> and <Units>. For multiple or variable frequencies it includes <FrequencySequencePosition> and <MultipleFrequencyModifier>. | qd, bid, tid, qid, qod, etc. | Optional |
| | <Interval> | Used to define a <Product> interval of use/ administration. | This can be expressed as a <Description> (CodedDescriptionType) or a <Value> and <Units>. For multiple or intervals timings it includes <IntervalSequencePosition> and <MultipleintervalModifier>. | q15m, q2h, q4h, q12h | Optional |
| | <Duration> | Used to define the <Duration> of use or administration of a product. | This can be expressed as a <Description> (CodedDescriptionType) or a <FixedDuration> or a <DurationRange>. For multiple or variable durations it includes <Duration SequencePosition> and <MultipleTimingModifier>. | x 10 days | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <DoseRestriction> | This is the dose restriction segment of the SIG which defines a maximum or dose limit. This segment can repeat for more than one dose restriction. | An instance of DoseCalculationType - identical to <DoseCalculation> above. | 'Not to exceed 10 Tablets in 24 Hours' or '1000 mg/kg/hr'. | Optional |
| | <Indication> | Defines the <Indications> for the use of the <Product>. | This can be a <Description> or a <Problem> or a link to a <Problem> within the CCR, or one or more <PhysiologicalParameter>. It also includes a PRN designator. | Strep pharyngitis | Optional |
| | <StopIndicator> | Used to express a hard stop, such as the last SIG sequence in a tapering dose, where the last sequence is 'then D/C' or where the therapy/drug is used to treat a condition and that treatment is for a fixed duration with a hard stop, such as antibiotic treatment, etc. | An instance of CodedDescriptionType. Can have the value Yes or the tags will not exist and there will be no content (the null instance of a <StopIndicator>). | | Optional |
| | <DirectionSequencePosition> | Used when the <Direction> repeats (multiple SIGs) such as with an insulin sliding scale or tapering dose, etc. | Expressed as an Integer from 1-n. Signifies the order of the directions. Tag is not used if there is no repeat. | 1, 2, 3,... | Optional |
| | <MultipleDirectionModifier> | Defines the relationship between multiple directions (SIGs). | Used with the values AND, OR, or THEN to express when there is more than one SIG as to whether all the SIGs must apply (AND) or if any of the SIGs can apply (OR) or if the SIGs are sequential (THEN), in the sequence defined by <DirectionSequencePosition>. | AND, OR, THEN | Optional |
| | <PatientInstructions> | Defines the <PatientInstructions> for the <Product> that are not covered under <Directions> - in other words <PatientInstructions> that are not traditionally part of the SIG. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Take with water. | Optional |
| | <FulfillmentInstructions> | Defines the <FulfillmentInstructions> for the <Product>, which in the case of medications are the instructions to the dispensing pharmacist or nurse. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Label In Spanish, Dispense As Written | Optional |
| | <Refill> | Defines the number of <Refills> and any constraints on <Refills>. | Includes <Number>, <Quantity>, <DateTime>, to define 'Last Refill", for example, and <Comment> for any specific <Refill> alerts or comments. | None, 2 refills of 25 capsules, etc. | Optional |
| | <SeriesNumber> | Defines the <SeriesNumber> of the <Product>, for use when there is a series of medication administrations. | This is a simple integer 1-x. | Enoxaparin, chemotherapy, etc. | Optional |
| | <Consent> | Used to catalog any <Consents> obtained relative to the administration of this <Product>. Also used to catalog patient, family, guardian, or other mechanism of refusal. | Must contain a <DateTime>, a <Description>, and <Source>. <ReferenceID> and <CommentID> are optional. May link to <Actor> or <Reference>. | <Description><Text>Consent Obtained ,Source>Mother | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <Reaction> | Defines any follow-up <Reaction> to the <Product>. | This is used only to track routine follow-up reactions to the administration of a medication, but is not to be used for allergic or adverse reactions, which belong under <Alerts> in the CCR. | No adverse reaction 30 minutes post administration | Optional |
| | <FulfillmentHistory> | Defines the fulfillment history of the <Product>. | Under <Fulfillment> contains <DateTime>, <Description>, <Provider>, <Location>,and <FulfillmentMethod>. | DateTime, Provider, Location and Method as to how and where dispensed/fulfilled. | Optional |
| | <Source> | Used to define the person, system, or institution that is the <Source> of the <Product> order or prescription or administration or fulfillment. | Source can be a link to an <Actor> with an <ActorRole> or a <Reference>. <Source> also has children <DateTime> and <Comment>. <Source> is required of all CCRDataObjects. This is so that any data within the CCR can be validated as to its origin/source. | Link to a healthcare provider, the patient, their parent, child, relative, guardian, durable power, a healthcare record, etc. | Required if Medications, Medical Equipment, or Immunization Section/Object is included |
| | <InternalCCRLink> | Used to link one CCRDataObject to another CCRDataObject. | This defines internal CCR links and uses a <LinkID> to refer/link to a CCRDataObjectID, which is of type xs:string. <LinkRelationship> defines the relationship to the CCRDataObjectID. | <Product> to a specific <Encounter>, and/or as a link under <Indication> to a specific <Problem>. | Optional |
| | <ReferenceID> | Used to link the <Product> to a <Reference>. | This is a link to <Reference>. | A <Reference> to a prescription, order, clinical note, discharge summary, personal health record, or other documents, system, or healthcare records that support the <Alert>. | Optional |
| | <CommentID> | Used to link to and support a free text or structured <Comment> for the <Product>. | This is restricted to legitimate comments only. It is NOT to be used to contain any data that correctly belong under the appropriate explicit tags. | See Comments. | Optional |
| Medical Equipment | <Equipment> | This CCRDataObject is used to define the patient's implanted and external medical devices and equipment that their health status depends on, as well as any pertinent equipment or device history. It also itemizes any pertinent current or historical Durable Medical Equipment (DME) used to help maintain the patient's health status. | This is a specific use for <Product> and uses the same tagging as defined under <Medication>, above, with the tag content to be specific for implanted or external medical devices or durable medical equipment (DME). All pertinent equipment relevant to the diagnosis, care, and treatment of a patient should be included. | Pacemaker/defibrillator, artificial joint, implanted or external prosthetic, home nebulizer, ventilator, hospital bed, oxygen, wheelchair, walker, etc. | Optional |
| Immunizations | <Immunization> | This CCRDataObject is used to define the patient's current immunization status and pertinent immunization history. | This is a specific use for <Product> and uses the same tagging as defined under <Medication>, above, with the tag content to be specific for immunizations. At a minimum, the latest immunization in an immunization series should be listed, with an entire Immunization History as an option, particularly when the CCR is used for comprehensive data export. | Hepatitis A, B, MMR, DPT, etc. | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| Vital Signs | <Result> | This CCRDataObject is used to list pertinent vital signs. | This is a specific use for <Result> as defined below (Results). Vital Signs is defined within the CCR as a Section in order to follow clinical convention, even though Vital Signs are technically Results ("Observations"). At a minimum, pertinent vital signs, such as the most recent, maximum and/or minimum, baseline, or relevant trends should be listed. | Blood pressure (systolic/diastolic, mean), pulse, respiratory rate, height, weight, body mass index (BMI), head circumference, crown-to-rump length, pulse oximetry. pulmonary function tests, etc. | Optional |
| Results | <Result> | This CCRDataObject is used to provide detailed laboratory, diagnostic, and therapeutic results data. | Pertinent results, such as the most recent, maximum, average, mean, and/or minimum, baseline, or relevant trends should be listed at a minimum. Due to the importance of establishing normal or stable trends as well as abnormal, comprehensive results should be considered, particularly when the CCR is used for comprehensive data export. | Hematology, chemistry, serology, virology, microbiology, imaging - X-ray, ultrasound, CT, MRI, angio, nuclear medicine, pathology, etc. | Optional |
| | <CCRDataObjectID> | Defined above. | Required of all CCRDataObjects. | | Required If Vital Signs or Results Section/Object is included |
| | <DateTime> | Used to define dates and times relevant to the patient and the <VitalSign> or <Result>. | For a <Result> this should be restricted to an exact DateTime, or a DateTime range if a collection was done over a specific time period. At a minimum, the DateTime of collection or physiological measurement should be included. Additional times such as when the <Result> was run, sent, or recorded can be included if and when pertinent. | Collection date time, collection start date, collection stop date, measurement time, measurement start date, measurement stop date | Optional |
| | <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. | | Optional |
| | <Type> | Used to define the <VitalSign> or <Result> <Type>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Hematology, Chemistry, Serology, Virology, Toxicology, Microbiology, Imaging - X-ray, Ultrasound, CT, MRI, Angiography, Cardiac Echo, Nuclear Medicine, Pathology, Procedure. | Required If Vital Signs or Results Section/Object is included |
| | <Description> | Used to describe a <VitalSign> or <Result> set when there are more than one <Test> in a <VitalSign> or <Result>, such as a panel or battery. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. <Description> should be coded with CPT and LOINC codes, when applicable. | CBC, Lytes, Hepatitis Panel, Thyroid Panel, Diabetes Panel, Etc. | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <Procedure> | Used to define the procedure used to obtain the <Result>. | This is a specific use of <Procedure> as defined, below (Procedures). The use of <Procedure> under <Result> should be reserved for instances where listing the <Procedure> has direct clinical relevance to the <Result> or when the <Procedure> used to obtain the <Result> is not obvious or is atypical or specialized. When the <Procedure> is listed in the <Procedures> section of the CCR, <Procedure> under <Result> should be an <InternalCCRLink>. | Punch Biopsy Left Shoulder Skin Lesion, Cath Urinalysis | Optional |
| | <Substance> | Used to define the substance that the <Result> is obtained from. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Arterial blood, venous blood, urine, spinal fluid, joint fluid, aspirate, etc. | Optional |
| | <Test> | <Test> contains the actual result data XML string defined as follows below: | Each <Test> is a potential CCRDataObject in its own right, if a specific test result will be referred to as an InternalCCRLink. | | Optional |
| | <DateTime> | Used to define dates and times relevant to the patient and the <Test>. | | | Optional |
| | <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes “external” IDs such as a driver’s license number, Social Security number, product ID number, serial number, or “internal” IDs such as EHR or system-specific IDs for discrete data objects. | | Optional |
| | <Type> | Defines the <Test> <Type> as an Observation or a Result. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Observation, Result. | Required |
| | <Description> | The actual name of the <Test>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. <Description> should be coded with CPT and LOINC codes, when applicable. | Hematocrit, hemoglobin, cell count, specific gravity, micro or path description, etc. | Optional |
| | <Status> | Defines the <Status> of the <Test>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Pending, In Process Preliminary Results, Final Results, Corrected Results | Optional |
| | <Method> | Used when a <Description> modifier is needed. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Manual Differential, Buffy Coat, KOH, etc. | Optional |
| | <Agent> | Used to define a specific agent in relation to a <Test>, such as a drug name for microbiology/culture sensitivities. | An instance of Complex Data Type AgentType. Has children <Products>, <EnvironmentalAgents>, <Problems>, <Procedures>, <Results>. | Ciprofloxacin, Penicillin, etc. | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <TestResult> | The actual <TestResult>, recorded at the individual, discrete <Test> level. | <TestResult> can be a <Value>, <Value> and <Units>, and/or a <Description>, which is a CodedDescriptionType supporting a free text string, a structured text string or strings, or a structured and coded text string or strings. | HCT as a value with the units %, Urine culture as a text string with coded organisms and detailed susceptibilities, etc. | Required if Results Section/ Object is included |
| | <NormalResult> | The benchmark <NormalResult> or range for the <TestResult>. | This is not to be used to express a normal <TestResult>, rather it is to be used to express the benchmark 'normal'. <NormalResult> can be expressed as a <Description> (CodedDescriptionType), or as a <Value> or <Value><Units> pair. Ranges are expressed within <Value> with a "-" (dash) as a separator. This also applies to <Units> as ranges. <Units> as concentrations are expressed with a "/" (backslash) as a separator. | Any normal test result value. | Optional |
| | <Flag> | Used to express a warning or "flagged" <TestResult>. There can be zero-to-many flags per <TestResult>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Abnormal Value, Critical Value, Hemolyzed Sample, Mis-Labeled Sample, Etc. | Optional |
| | <ConfidenceValue> | Used to express a <TestResult> <ConfidenceValue>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Varies by lab/test result. | Optional |
| | <Source> | Used to define the person, system, or institution that is the <Source> of the <Result> data. | Source can be a link to an <Actor> with an <ActorRole> or a <Reference>. <Source> also has children <DateTime> and <Comment>. <Source> is required of all CCRDataObjects. This is so that any data within the CCR can be validated as to its origin/source. | Link to a laboratory, healthcare provider, the patient, their parent, child, relative, guardian, durable power, a healthcare record, etc. | Required if Results Section/ Object is included |
| | <InternalCCRLink> | Used to link one CCRDataObject to another CCRDataObject. | This defines internal CCR links and uses a <LinkID> to refer/link to a CCRDataObjectID, which is of type xs:string. <LinkRelationship> defines the relationship to the CCRDataObjectID. | <Result> or <TestResult> to a specific <Problem> or <Encounter>. | Optional |
| | <ReferenceID> | Used to link the <Result> to a <Reference>. | This is a link to <Reference>. | A <Reference> to a prescription, order, clinical note, discharge summary, personal health record, or other documents, system, or healthcare records that support the <Result>. | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <CommentID> | Used to link to and support a free text or structured <Comment> for the <Result>. | This is restricted to legitimate comments only. It is NOT to be used to contain any data that correctly belong under the appropriate explicit tags, such as <Flag>. This is critical to avoid clinical errors when data are not in their assigned and explicitly allocated positions in the CCR. <Flag> not <Comment> is specifically used in <Result> to point out warnings. | See Comments. | Optional |
| Procedures | <Procedure> | This CCRDataObject is used to define all interventional, surgical, diagnostic, or therapeutic procedures or treatments pertinent to the patient's health status at the time the CCR is generated. | At a minimum, any recent or historically relevant <Procedure> should be listed. The intent is to list major diagnostic and/or therapeutic procedures that have a current or historical impact on the patient's current or future health. The preferred controlled vocabulary is SNOMED CT, as well as the current CPT Codeset for the <Procedure> and LOINC for any <Result>. | | Optional |
| | <CCRDataObjectID> | Defined above. | Required of all CCRDataObjects. | | Required if Procedures Section/ Object is included |
| | <DateTime> | Used to define dates and times relevant to the patient and the <Procedure> | For a <Procedure>, <DateTime> should express the <DateTime> the <Procedure> occurred, as accurately as possible, but due to the fact that historical <Procedure> data may be collected retrospectively, exact DateTime, an age, an approximate DateTime, or a DateTime range are all valid. | Procedure DateTime | Optional |
| | <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. | | Optional |
| | <Type> | Defines the <Procedure> <Type>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Cardiac, Surgical, Imaging, etc. | Optional |
| | <Description> | Used to describe the actual <Procedure>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. <Procedure> should be coded with SNOMED, CPT, and LOINC codes, when applicable. | Cardiac catheterization, transfusion, echocardiogram, exercise stress test, appendectomy, cholecystectomy, endoscopy, etc. | Optional |
| | <Status> | Defines the <Status> of the <Procedure>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Cancelled, On Hold, In Progress, Not Completed, Completed | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <Location> | Defines the geographic location where the procedure was done. Physical location on the patient is defined as <Site>. | This can be expressed as a <Description> (CodedDescriptionType) or as a link to an <Actor>. | Charity Hospital | Optional |
| | <Practitioner> | Used to describe the <Practitioner>(s) who did the <Procedure>. | This is a link to <Actor> and includes an <ActorRole>. | John Q. Doe, MD, Consulting Cardiologist | Optional |
| | <Frequency> | Used when more than one occurrence of the same <Procedure> are related (a series of treatments, for example). | This can be expressed as a <Description> (CodedDescriptionType) or as a <FixedFrequency> or a <FrequencyRange>. | Chemotherapy or radiation treatments, physical therapy | Optional |
| | <Duration> | Used when a <Procedure> involves a <Duration>. | This can be expressed as a <Description> (CodedDescriptionType) or as a <FixedDuration> or a <DurationRange>. | Chemotherapy or radiation treatments, physical therapy, bariatric chamber times, etc. | Optional |
| | <Indication> | Used to describe the <Indication>(s) for the <Procedure>. | This can be a <Description> or a <Problem> or a link to a <Problem> within the CCR. | Chest pain, myocardial infarction, malignant melanoma, etc. | Optional |
| | <Product> | Used to describe any <Product>(s) associated with the <Procedure>. | This is a specific use of <Product>, described above. It can either list the <Product> or link to a <Product> in the CCR through an <InternalCCRLink>. | Pacemaker/defibrillator, artificial joint, implanted prosthetic, etc. | Optional |
| | <Substance> | Used to describe any <Substance>(s) associated with the <Procedure>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Packed red blood cells (PRBC), fresh frozen plasma (FFP), etc. | Optional |
| | <Method> | Used to describe a specific procedural technique. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Anterior approach, punch biopsy, etc. | Optional |
| | <Position> | Used to describe a specific anatomical position relative to the <Procedure>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Supine, left lateral decubitus, etc. | Optional |
| | <Site> | Used to describe a specific anatomical location relative to the <Procedure>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Left shoulder, anterior chest, etc. | Optional |
| | <Source> | Used to define the person, system, or institution that is the <Source> of the <Procedure> history. | Source can be a link to an <Actor> with an <ActorRole> or a <Reference>. <Source> also has children <DateTime> and <Comment>. <Source> is required of all CCRDataObjects. This is so that any data within the CCR can be validated as to its origin/source. | Link to a healthcare provider, the patient, their parent, child, relative, guardian, durable power, a healthcare record, etc. | Required if Procedure Section/Object is included |
| | <InternalCCRLink> | Used to link one CCRDataObject to another CCRDataObject. | This defines internal CCR links and uses a <LinkID> to refer/link to a CCRDataObjectID, which is of type xs:string. <LinkRelationship> defines the relationship to the CCRDataObjectID. | <Procedure> to a specific <Problem>. | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <ReferenceID> | Used to link the <Procedure> to a <Reference>. | This is a link to <Reference>. | A <Reference> to a prescription, order, clinical note, discharge summary, personal health record, or other documents, system, or healthcare records that support the <Alert>. | Optional |
| | <CommentID> | Used to link to and support a free text or structured <Comment> for the <Procedure>. | This is restricted to legitimate comments only. It is NOT to be used to contain any data that correctly belong under the appropriate explicit tags. | See Comments. | Optional |
| Encounters | <Encounter> | This CCRDataObject is used to list and describe any healthcare encounters pertinent to the patient's current health status or historical health history. An Encounter is an interaction, regardless of the setting, between a patient and a practitioner who is vested with primary responsibility for diagnosing, evaluating, or treating the patient's condition. It may include visits, appointments, as well as non face-to-face interactions. It is also a contact between a patient and a practitioner who has primary responsibility for assessing and treating the patient at a given contact, exercising independent judgment. | At a minimum, the most recent and all pertinent recent and historical healthcare encounters should be included, particularly any that apply to Problems and significant clinical events. | An <Encounter> can be a hospitalization (acute, rehab, nursing facility, or longterm care), office or clinic visit, emergency room visit, home health visit, or any treatment or therapy (physical, occupational, respiratory, or other), or any interaction, even non face-to-face, between the patient and the healthcare system or a healthcare provider. | Optional |
| | <CCRDataObjectID> | Defined above. | Required of all CCRDataObjects. | | Required if Encounters Section/Object is included |
| | <DateTime> | Used to define dates and times relevant to the patient and the <Procedure> | For a <Encounter>, <DateTime> should express the <DateTime> the <Encounter> occurred as accurately as possible, but due to the fact that historical <Encounter> data may be collected retrospectively, exact DateTime, an age, an approximate DateTime, or a DateTime range are all valid. | Encounter DateTime | Optional |
| | <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. | | Optional |
| | <Type> | Defines the <Encounter> <Type>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Inpatient Hospitalization, Emergency Room Visit, Physician Office Visit, Rehabilitation, Nursing Facility Stay, Long Term Care Facility, Physical Therapy, etc. | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <Description> | Used to describe the actual <Encounter>, if <Encounter> cannot be more appropriately expressed with <Location> and <Practitioner>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | | Required |
| | <Location> | Used to describe the <Location>(s) of the <Encounter>. | This can be expressed as a <Description> (CodedDescriptionType) or as a link to an <Actor>. | Charity Hospital | Optional |
| | <Practitioner> | Used to describe the <Practitioner>(s) with whom the patient had the <Encounter>. | This is a link to <Actor> and includes an <ActorRole>. | Jane Q. Doe, MD, Admitting Physician | Optional |
| | <Frequency> | Used when more than one occurrence of the same <Encounter> are related (a series of visits/admissions, for example). | This can be expressed as a <Description> (CodedDescriptionType) or as a <FixedFrequency> or a <FrequencyRange>. | Chemotherapy or radiation treatments, physical therapy | Optional |
| | <Duration> | Used when a <Encounter> involves a <Duration>. | This can be expressed as a <Description> (CodedDescriptionType) or as a <FixedDuration> or a <DurationRange>. | Chemotherapy or radiation treatments, physical therapy | Optional |
| | <Indication> | Used to describe the <Indication>(s) for the <Encounter>. | This can be a <Description> or a <Problem> or a link to a <Problem> within the CCR. | Chest pain, myocardial infarction, malignant melanoma, etc. | Optional |
| | <Instructions> | Used to define <Instructions> for a <Encounter>. Used primarily when a <Encounter> is an <OrderRequest>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | NPO after midnight, Hold Beta Blockers for one week prior to procedure, No Aspirin or Non-Steroidal Anti-Inflamatory agents 7 days prior to procedure. | |
| | <Consent> | This is used to document that consent was obtained and documented for the encounter or procedure. | | | Optional |
| | <Source> | Used to define the person, system, or institution that is the <Source> of the <Encounter> history. | Source can be a link to an <Actor> with an <ActorRole> or a <Reference>. <Source> also has children <DateTime> and <Comment>. <Source> is required of all CCRDataObjects. This is so that any data within the CCR can be validated as to its origin/source. | Link to a healthcare provider, the patient, their parent, child, relative, guardian, durable power, a healthcare record, etc. | Required if Encounters Section/Object is included |
| | <InternalCCRLink> | Used to link one CCRDataObject to another CCRDataObject. | This defines internal CCR links and uses a <LinkID> to refer/link to a CCRDataObjectID, which is of type xs:string. <LinkRelationship> defines the relationship to the CCRDataObjectID. | Link of an <Encounter> to a specific <Problem>. | Optional |
| | <ReferenceID> | Used to link the <Encounter> to a <Reference>. | This is a link to <Reference>. | A <Reference> to a prescription, order, clinical note, discharge summary, personal health record, or other documents, system, or healthcare records that support the <Alert>. | Optional |
| | <CommentID> | Used to link to and support a free text or structured <Comment> for the <Encounter>. | This is restricted to legitimate comments only. It is NOT to be used to contain any data that correctly belong under the appropriate explicit tags. | See Comments. | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| Plan of Care | <Plan> | This CCRDataObject is used to list and describe any prospective, that is, active, incomplete, or pending orders, appointments, referrals, procedures, services, or any other pending event of clinical significance to the current and ongoing care of the patient. Plan of care does not include past orders, appointments, etc. | All active, incomplete, or pending orders, appointments, referrals, procedures, services, or any other pending event of clinical significance to the current and ongoing care of the patient should be listed, unless constrained due to issues of privacy. Clinical reminders should also be placed here for purposes of providing prompts that may be used for disease prevention, disease management, patient safety and healthcare quality improvement. This allows any receiving, consulting, admitting provider, system, or healthcare institution to understand the current and pending clinical care for this patient to avoid conflict, assure patient safety, to optimize care and convenience for the patient and their family, and to allow any changes to be communicated appropriately and in a timely manner to all affected providers and organizations. | | Optional |
| | <CCRDataObjectID> | Defined above. | Required of all CCRDataObjects. | | Required if Plan of Care Section/ Object is included |
| | <DateTime> | Used to define dates and times relevant to the patient and the <Plan>. | A <Plan> <DateTime> should be expressed as an <ExactDateTime> or a <DateTimeRange>. | Plan Start DateTime, Plan Completion DateTime | Optional |
| | <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes “external” IDs such as a driver’s license number, Social Security number, product ID number, serial number, or “internal” IDs such as EHR or system-specific IDs for discrete data objects. | | Optional |
| | <Type> | Used to define what <Type> the <Plan> item is. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Reminder, Order, Prescription, Request For Authorization, Authorization, Referral, Request For Consultation, Treatment Recommendation | |
| | <Description> | Used to describe a <Plan> set when there are more than one <OrderRequest>s in a <Plan> such as a detailed Care <Plan> or pre-procedure <Plan>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Postoperative rehabilitation, stroke rehabilitation, pre-procedure work-up and evaluation, etc. | Optional |
| | <Status> | Used to define the <Plan> <Status>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Pending, In Process, On Hold, Cancelled | Optional |
| | <OrderRequest> | <OrderRequest> contains the actual <OrderRequest> data XML string defined as follows below: | Each <Test> is a potential CCRDataObject in its own right, if a specific test result will be referred to as an InternalCCRLink. | | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <DateTime> | Used to define dates and times relevant to the patient and each specific <OrderRequest>. | An <OrderRequest> <DateTime> should be expressed as an <ExactDateTime>. | Procedure DateTime, Encounter DateTime, Appointment DateTime, etc. | Optional |
| | <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. | | Optional |
| | <Type> | Defines the <OrderRequest> <Type>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Order, Encounter, Procedure, Service, Product, Immunization, Medication, Authorization, Referral, Consultation. | Optional |
| | <Description> | Used to describe an <OrderRequest> that is not a <Procedure>, <Product>, <Medication>, <Immunization>, <Service>, <Encounter>, or <Authorization> request. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | | Optional |
| | <Status> | Defines the <OrderRequest> <Status>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Ordered, Requested, Pending, On Hold, Repeat, No Show, Cancelled | Optional |
| | <Procedure> | Used to describe a specific <Procedure> <OrderRequest>. | This is a specific use of <Procedure> as defined, above. The tag <Instructions> can be used to contain specific patient instructions. | CT scan, ultrasound, CBC, biopsy, cholecystectomy, ECG, pulmonary function tests, stress echocardiogram, etc. | Optional |
| | <Product> | Used to describe a specific <Product> <OrderRequest>. | This is a specific use of <Product> as defined, above. | Wheelchair, home nebulizer, prosthesis, etc. | Optional |
| | <Medication> | Used to describe a specific <Medication> <OrderRequest>. | This is a specific use of <Product> (Medication) as defined, above. | Enoxaparin, chemotherapy, etc. | Optional |
| | <Immunization> | Used to describe a specific <Immunization> <OrderRequest>. | This is a specific use of <Product> (Immunization) as defined, above. | Hepatitis A, B, MMR, DPT, etc. | Optional |
| | <Service> | Used to describe a specific <Service> <OrderRequest>. | <Service> is a special use case of EncounterType. The tag <Instructions> can be used to contain specific patient instructions. | Physical therapy, occupational therapy, home health evaluation, social service evaluation, family counseling, financial counseling, etc. | Optional |
| | <Encounter> | Used to describe a specific <Encounter> <OrderRequest>. | This is a specific use of <Encounter> as defined, above. The tag <Instructions> can be used to contain specific patient instructions. | Appointment, Admission | Optional |
| | <Authorization> | Used to describe a specific <Authorization> <OrderRequest>. | This is a specific use of <Authorization> as defined, above. It is to be used only for pending authorization requests. Authorizations that have already been approved should be contained under <Insurance>. | Authorization for treatment, procedure, immunization, brand name medication, etc. | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <Goals> | Use to describe a specific <Goal>(s) for the patient. | <Goal> can be discretely tagged or defined as a CodedDescriptionType under <Description>. | Ambulation without assistance, ability to care for self, custodial care training, etc. | Optional |
| | <Source> | Used to define the person, system, or institution that is the <Source> of the <Plan> or <OrderRequest> data. | Source can be a link to an <Actor> with an <ActorRole> or a <Reference>. <Source> also has children <DateTime> and <Comment>. <Source> is required of all CCRDataObjects. This is so that any data within the CCR can be validated as to its origin/source. | Link to a healthcare provider, the patient, their parent, child, relative, guardian, durable power, a healthcare record, etc. | Required if Plan of Care Section/ Object is included |
| | <InternalCCRLink> | Used to link one CCRDataObject to another CCRDataObject. | This defines internal CCR links and uses a <LinkID> to refer/link to a CCRDataObjectID, which is of type xs:string. <LinkRelationship> defines the relationship to the CCRDataObjectID. | <OrderRequest> to a specific <Problem> or <Encounter>. | Optional |
| | <ReferenceID> | Used to link the <Plan> or <OrderRequest> to a <Reference>. | This is a link to <Reference>. | A <Reference> to a prescription, order, clinical note, discharge summary, personal health record, or other documents, system, or healthcare records that support the <Alert>. | Optional |
| | <CommentID> | Used to link to and support a free text or structured <Comment> for the <Plan> or <OrderRequest>. | This is restricted to legitimate comments only. It is NOT to be used to contain any data that correctly belong under the appropriate explicit tags. | See Comments. | Optional |
| Healthcare Providers | <Providers> | Used to define all healthcare providers involved in the current or pertinent historical care of the patient. | This is a link to an <Actor> with an <ActorRole>. This data object is not used for listing a patient's non-healthcare <Support> providers. <Support> providers are listed under the <Support> section of the CCR. At a minimum, the patient's key healthcare providers should be listed, particularly their primary physician and any active consulting physicians, therapists, and counselors. | Physicians, PAs, NPs, nurses, therapists, counselors, etc. | Optional |
| CCR FOOTER | | | | | |
| Actors | <Actor> | This CCRDataObject is used as a container to define all of the individuals, organizations, locations, and systems associated with the data in the CCR. | <ActorID> in the CCR Header and Body link to the details in this CCR Footer Section. Note that the details of the <Patient>, <From>, and <To> are all contained in this CCR Footer Section as are all <Actors>. | | Required |
| | <ActorObjectID> | This is the CCR Object ID for the <Actor>. | This is the ID that each <ActorID> will link to and is expressed as xs:ID. The <ActorObjectID> must be made up of characters in the set A-Z, a-z, 0-9, dash(-), underscore (_) and period (.). The first character must be from the set A-Z, a-z, 0-9. It can be of any character length. | | Required |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <Person> | Defines the details about a <Person> as an <Actor>. | | | Optional |
| | <Name> | A container for patient name(s) as follows below: | | | Optional |
| | <BirthName> | The name the patient was legally given at birth. | Consists of <Given>, <Middle>, <Family>, <Suffix>, <Title>, <NickName>. | <Given>John <Middle>Quincy <Family>Doe <Suffix>III <Title>MD <Title>PhD <NickName> Jack | Optional |
| | <AdditionalName> | Any prior legal or assumed name set. | Consists of <Given>, <Middle>, <Family>, <Suffix>, <Title>, <NickName>. | See example above. | Optional |
| | <CurrentName> | The patient's current legal name or assumed name set. | Consists of <Given>, <Middle>, <Family>, <Suffix>, <Title>, <NickName>. | See example above. | Optional |
| | <DisplayName> | A text string that represents the <Actor> name as it should be displayed as a simple, untagged, and unparsed string. | A display string for full name representation. | John Q. Doe, III, MD, PhD | Optional |
| | <DateOfBirth> | Defines <DateOfBirth>. | <DateOfBirth> should be as accurate as possible and should use <ExactDateTime>. | | Optional |
| | <Gender> | Defines <Gender>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Male, Female, Other, Unknown | Optional |
| | <Organization> | Defines the details about an <Organization> as an <Actor>. | Expressed by a text string under <Name>. | Southfork Community Clinic | Optional |
| | <InformationSystem> | Defines the details about an <InformationSystem> as an <Actor>. | Expressed by a text string under <Name> with optional <Type> and <Version>. | Acme EHR Version 2.3 | Optional |
| | <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. | | Optional |
| | <Relation> | Defines the <Relation> of the <Actor> to the <Patient>, when applicable. | This primarily applies to family members. This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Parent, child, husband, wife, significant other, etc. | Optional |
| | <Specialty> | Defines the medical or healthcare <Specialty> of the <Actor> when applicable. | This primarily applies to healthcare providers. This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. Ideally, this should be matched to the AMA list of medical and surgical specialties. | Cardiology, primary care, general surgery, etc. | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <Address> | Used to express the <Address> of the <Actor>. Can specify a type (home, office) or priority (primary, preferred), and a status (active, temporary). | <Address> contains <Type>, <Line1>, <Line2>, <City>, <County>, <StateProvince>, <Country>, <PostalCode>, <Priority>, and <Status>. | 1234 Smith Road, Suite 22, San Diego, San Diego County, California, United States, 92013 | Optional |
| | <Telephone> | Used to express the <Telephone> of the <Actor>. | <Telephone> contains <Value>, <Type>, <Priority>, and <Status>. | 555-555-5555 x555 | Optional |
| | <Email> | Used to express the <EMail> of the <Actor>. | <EMail> contains <Value>, <Type>, <Priority>, and <Status>. | jdoe@xxx.com | Optional |
| | <URL> | Used to express the <URL> of the <Actor>. | <URL> contains <Value>, <Type>, <Priority>, and <Status>. | www.xxx.com | Optional |
| | <Status> | Used to express the <Status> of the <Actor> relative to the <Patient>. | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. | Active, Prior History No Longer Active, Unknown | Optional |
| | <Source> | Used to define the person, system, or institution that is the <Source> of the <Actor> data. | Source can be a link to an <Actor> with an <ActorRole> or a <Reference>. <Source> also has children <DateTime> and <Comment>. <Source> is required of all CCRDataObjects. This is so that any data within the CCR can be validated as to its origin/source. | Link to a healthcare provider, the patient, their parent, child, relative, guardian, durable power, a healthcare record, etc. | Required |
| | <InternalCCRLink> | Used to link one CCRDataObject to another CCRDataObject. | This defines internal CCR links and uses a <LinkID> to refer/link to a CCRDataObjectID, which is of type xs:string. <LinkRelationship> defines the relationship to the CCRDataObjectID. | Links <Actor> to a specific <Problem> or <Encounter>. | Optional |
| | <ReferenceID> | Used to link the <Actor> to a <Reference>. | This is a link to <Reference>. | A <Reference> to more detailed information about the <Actor>. | Optional |
| | <CommentID> | Used to link to and support a free text or structured <Comment> for the <Actor>. | This is restricted to legitimate comments only. It is NOT to be used to contain any data that correctly belong under the appropriate explicit tags. | See Comments. | Optional |
| References | <Reference> | This CCRDataObject is used as a container to list the details concerning all references within the CCR to external data sources. | All <ReferenceID>s from the CCR Header, Body, and Footer are pointers to a <Reference>, the details of which are defined in this CCR Footer. | Articles, clinical documents, paper or EPR, document images, etc. | Optional |
| | <ReferenceObjectID> | This is the CCR Object ID for the <Reference>. | This is the ID that each <ReferenceID> will link to and is expressed as xs:ID. The <ReferenceObjectID> must be made up of characters in the set A-Z, a-z, 0-9, dash(-), underscore (_) and period (.). The first character must be from the set A-Z, a-z, 0-9. It can be of any character length. | | Required if References Section/Object is included |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <DateTime> | This is the <Reference> <DateTime>. | <Reference><DateTime> should be as accurate as possible and should refer to the date of origin of the <Reference>. It should be expressed as an <ExactDateTime>. | Reference DateTime | Optional |
| | <Description> | This is a <Description> of the <Reference>. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Admission H&P | Optional |
| | <Source> | This is the <Source> of the <Reference>. | This is an <Actor> reference with <ActorID> and <ActorRole>. | | Optional |
| | <Locations> | This is a pointer to one or more <Locations>(s) where the <Reference> can be accessed or where it is stored. | This can be expressed as a <Description> (CodedDescriptionType) or as a link to an <Actor>. | | Optional |
| Comments | <Comment> | This CCRDataObject contains all text <Comments> associated with any data within the CCR. <Comments> are free text or structured comments that are intended to provide a 'comment' to a CCR data object but are not intended to contain core relevant clinical or administration data that are more appropriately contained within the CCR data object itself. | All <CommentID>s from the CCR Header, Body, and Footer are pointers to a <Comment>, the details of which are defined in this CCR Footer Section. | | Optional |
| | <CommentObjectID> | This is the CCR Object ID for the <Comment>. | This is the ID that each <CommentID> will link to and is expressed as xs:ID. The <CommentObjectID> must be made up of characters in the set A-Z, a-z, 0-9, dash(-), underscore (_) and period (.). The first character must be from the set A-Z, a-z, 0-9. It can be of any character length. | | Required if Comments Section/Object is included |
| | <DateTime> | This is the <Comment> <DateTime>. | <Comment><DateTime> should be as accurate as possible and should refer to the data of origin of the <Comment>. It should be expressed as an <ExactDateTime>. | Comment DateTime | Optional |
| | <Description> | <Description> contains the actual Comment. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. Most <Comments> will be simple text strings that would be placed under <Description><Text>. | Patient's father is an unreliable historian. | Required |
| | <Source> | This is the <Source> of the <Comment> content. | This is an <Actor> reference with <ActorID> and <ActorRole>. | | Optional |
| | <ReferenceID> | Used to link the <Comment> to a <Reference>. | This is a link to <Reference>. | A <Reference> to more detailed information about or referred to in the <Comment>. | Optional |
| Signatures | <CCRSignature> | This is the container for all <Signatures> associated with any data within the CCR. | If <Signatures> are used within the CCR, they must be digital signatures that meet the W3C's XML digital signature standard. | | Optional |

**TABLE A1.** *Continued*

| CCR Attributes and Data Objects | XML | Definition | Explanations, Descriptions, Requirements, and Restrictions | Comments and Examples | Required or Optional |
|---|---|---|---|---|---|
| | <SignatureObjectID> | This is the CCR Object ID for the <Signature>. | This ID is expressed as xs:ID. The <CCRSignatureID> must be made up of characters in the set A-Z, a-z, 0-9, dash(-), underscore (_) and period (.). The first character must be from the set A-Z, a-z, 0-9. It can be of any character length. | | Required if Signatures Section/Object is included |
| | <ExactDateTime> | This is the <Signature> time. | CCR Signature DateTime must be expressed in ISO-8601 date-time format, with precision to include seconds. CCR Signature DateTime must express a timezone offset, either using Z [universal coordinated time, or Zulu time], or an offset in hours and minutes. The CCR further requires that the Timezone offset be a legal time zone. This latter constraint cannot be expressed in the schema, as timezones are determined by political entities [e.g., Nations or States]. There presently exist time zones in the form ##:15 and ##:30. CCR Creation DateTime time should ideally come from a net-based atomic time service and not from an individual computing device's internal clock. | | Optional |
| | <Type> | This defines the <Signature> <Type>, which in all cases must be W3C XML Digital Signature. | This is a CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | W3C Digital Signature. | Optional |
| | <IDs> | This expresses an external <Signature> IDs. This is a bucket to allow any external system that wants ot affix an institutional or other ID to the <Signature> that is external to the W3C XML Digital Signature within <Signature>. | <IDs> contains <DateTime>, <Type>, <ID>, and <IssuedBy>. | | Optional |
| | <Source> | This is the <Source> of the <Signature>. | This is an <Actor> reference with <ActorID> and <ActorRole>. | | Optional |
| | <Signature> | This is a container for a W3C Digital Signature. | Until the release of the CCR Security Standard from ASTM, this tag/container can be used for a proprietary digital signature. | | Optional |

## A2. IMPLEMENTATION GUIDE FOR THE CONTINUITY OF CARE RECORD V1.1

### INTRODUCTION

The Implementation Guide contains instructions for using the CCR XML schema (see the Adjunct to this standard) for generation of a standards-compliant CCR. The Implementation Guide is extremely strict regarding requirements on the use and formatting of the CCR XML and extremely strict regarding the content allowed within each field/XML tag. This is an interoperability standard for data expression and exchange, on paper as well as between healthcare information systems. Note that the XML schema (the Adjunct to this standard ) that accompanies this Implementation Guide (Annex A2) must be used with the Implementation Guide for validation of a CCR under this version of the CCR standard. Other XML expressions of the CCR and related implementation guides may be authorized through joint efforts of ASTM and other standards development organizations.

This Implementation Guide represents a generalized use case and constraints across all instances of the CCR. Use-case specific Implementation Guides may be defined for specific domains that may incorporate further constraints, as appropriate, provided they are derived from and are a part of the formal ASTM CCR ballot process. A generalized use-case and constraints are required due to the explicit fact that the originator of a CCR in the general use-case may not and is not required to know the exact end-use case to which a CCR might be applied.

The constraints in the Implementation Guide are currently not formally expressed as XML constraints. ASTM E31 Committee on Healthcare or others may provide sample XSLT/XPath expressions expressing these constraints as well as sample patient data for use in testing CCR implementations, but it is the responsibility of the entity doing the implementation to assure compliance with the CCR standard, with this Implementation Guide, and with the CCR XMLschema, or with other schemas and related implementation guides that may be authorized through joint efforts of ASTM and other standards development organizations.

The core patient-specific data in the CCR are contained within the Body of the CCR Document Object, as illustrated in Fig. A2.1.

### A2.1 Scope

A2.1.1 This Implementation Guide contains instructions for generating a standards-compliant Continuity of Care Record (CCR) XML document. This Implementation Guide (IG) is extremely strict regarding requirements on the use and formatting of the CCR XML and extremely strict regarding the data content allowed within each field/XML tag.

A2.1.2 The CCR is an interoperability content standard for data expression and exchange, on paper as well as between healthcare information systems, and strict adherence to this Implementation Guide and the accompanying CCR W3C XML Schema (or with other XML Schema and related implementation guides that may be authorized through joint efforts of ASTM and other standards development organizations) are required to support efficient interoperability. Unlike many other standards in use in healthcare, there are no end-user or vendor configurable fields in the CCR. Data optionality, cardinality, enumeration, and specificity of mapping are tightly controlled. Data content, their expression, and where exactly they must be placed are explicitly defined. In many instances the exact, enumerated allowed and required content is also explicitly spelled out. A data element that has no content is not permitted in the CCR XML.

NOTE A2.1—Adherence only to the CCR XML schema is necessary, but not sufficient to support interoperability.

A2.1.3 The implementation guide includes explicit requirements for implementation using specific XML tags, some of which represent changes to the content from the first CCR standard. The CCR Implementation Guide is not a messaging standard and does not allow configurable fields and latitude in implementation. The benefit of current messaging standards in healthcare is that in their abstract original form, they allow a certain amount of latitude so that trading partners and institutions can work out specific implementations relative to concrete use cases and environments. In actual, real world usage, these tend to be static and point-to-point instances of data exchange for a specific use case between or within controlled networks.

A2.1.4 The CCR, on the other hand, is an open, interoperable, content-specific standard for a patient health record summary. It allows data from any entity to be exchanged securely with any other authorized entity that supports the CCR structure and function as outlined within the Implementation Guide. There is no requirement that one entity have any prior knowledge of or about the other, as long as the appropriate security rules and policies are followed, so the CCR must be implemented exactly as outlined in this Implementation Guide. To reiterate, there are no end-user or vendor configurable fields in the CCR.

A2.1.5 This point cannot be made strongly enough: A CCR from one entity must be readable by another entity with no knowledge of how the originating entity created the CCR other than this Implementation Guide and the accompanying XML Schema. Any entity receiving a CCR should be able to follow this Implementation Guide to the letter and be able to parse and display a CCR from any other entity and vice versa.

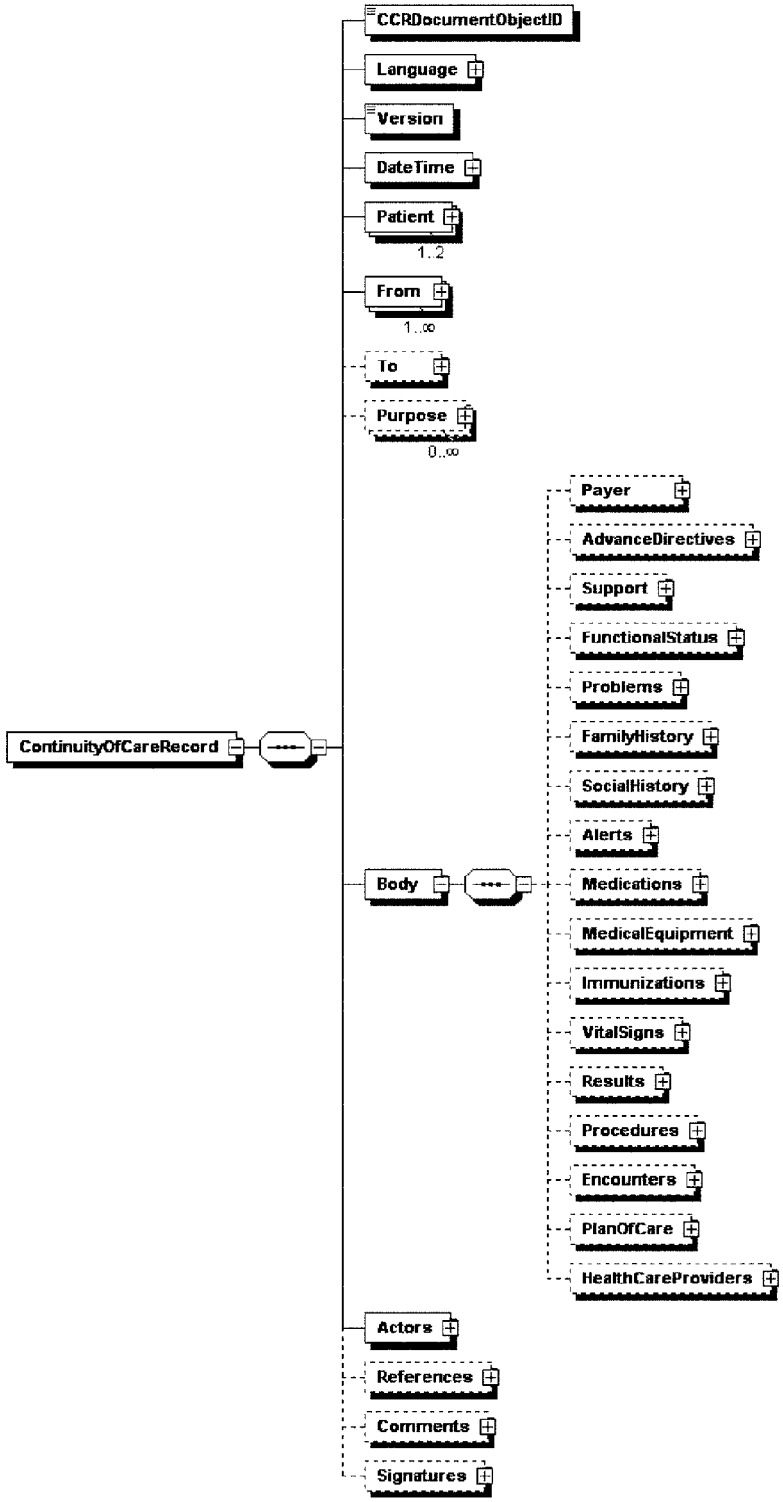


**FIG. A2.1 Core Patient-specific Data are Contained within the Body of the CCR Document Object**

A2.1.6 *Important Note Regarding Compliance With This Standard*—The Implementation Guide is to be used with the CCR XML Schema that is presented in Annex A2 of this standard specification. A CCR instance must be valid against the accompanying schema and the Implementation Guide (or against other XML Schema and related implementation guides that may be development through joint efforts of ASTM and other standards development organizations) in order to conform to this specification. The CCR uses a condensed and partially normalized XML Schema in order to constrain the length and complexity of the XML Schema. This normalization also simplifies versioning of the XML Schema to facilitate the management of the CCR Standard. This means that certain reusable tag and object strings and descriptions are normalized

for the general use case, but may be constrained in actual use cases. All compliance validation must be done against both the Implementation Guide and the XML Schema, not against the XML Schema alone. This Implementation Guide was developed to be rigid in order to avoid the endless customization and variation that have plagued prior attempts to achieve widespread, error-free clinical data exchange. The CCR represents standardized core data about a patient at any given point in time.

A2.1.7 It is the responsibility of the entity doing the implementation to assure compliance with the CCR standard, with this Implementation Guide, and with the CCR XML schema or with other XML Schemas and related implementation guides that may be authorized through joint efforts of ASTM and other standards development organizations.

A2.1.8 In the future, compliance with this implementation guide may be facilitated through XSLT transforms using XPath expressions, Schematron schemas, RelaxNg schemas, and/or other industry-standard mechanisms.

A2.1.9 *Table of Contents:*



## A2.2 CCR Principles and Structure

A2.2.1 The CCR is defined as a data object that represents a "snapshot" of a patient's relevant administrative, demographic, and clinical information at a specific moment in time. The format of the CCR is XML. It must be well-formed XML, and it must conform to the CCR XML Schema and this Implementation Guide or with other XML Schemas and related implementation guides that may be authorized through joint efforts of ASTM and other standards development organizations. The CCR is an XML document, but the use of the word 'document' refers to the XML as a document, not to the CCR as a clinical document – such as a Clinical Note, Encounter Note, History & Physical, or Discharge Summary. To reiterate, the CCR represents a summary of the patient's relevant health record at a specific point in time. In the electronic health record (EHR) world, the CCR represents the patient summary, which for many EHRs is called the 'Overview' of the patient or the 'Patient Summary.'

A2.2.2 The CCR XML is defined using a set of core principles:

A2.2.2.1 *Structure:*

*(1)* The CCR is an XML document that is defined within this Implementation Guide as a Document Object.

*(2)* The CCR Document Object is constructed from a set of discrete XML building blocks, which are defined as Data Objects.

*(3)* The Data Objects are contained within Sections, such as Medications, Immunizations, Problems, and Procedures, in the CCR Document Object.

*(4)* Each discrete Medication, Immunization, Problem, Procedure represents a discrete data object within the CCR.

*(5)* A Medication List or Problem List, therefore, represents a list of discrete Data Objects, within a specific Section and within the CCR Document Object (the CCR itself).

A2.2.2.2 All data within the CCR must be contained within XML tagged elements.

A2.2.2.3 An element that has no content is not permitted in the CCR XML.

A2.2.2.4 No data are allowed in the CCR to be contained within XML tag attributes.

A2.2.2.5 Concepts used more than once are defined as a Complex Data Type, Groups, or Global Elements. Complex Data Types are defined by adding the post-fix 'Type.' Examples: ProblemType; CodedDescriptionType. All efforts have been made to simplify and keep the XML Schema compact, but not at the expense of detailed and explicit data expression. This approach enhances human readability, particularly for clinicians and patients.

A2.2.2.6 Element and attribute names use the Pascal Notation where the first letter of each word is capitalized – example <DateTime>.

A2.2.2.7 Normalization is provided through the use of internal links for all discrete data objects that can potentially be referred to more than once within the document, including Individuals, Organizations, and Information Systems <Actor>, References <Reference>, Comments <Comments>, and Signatures <Signatures>.

A2.2.3 The CCR essentially consists of three core components:

A2.2.3.1 A Set of Header Sections,

A2.2.3.2 A Set of Body Sections, and

A2.2.3.3 A Set of Footer Sections.

A2.2.4 The Header Sections define:

<CCRDocumentObjectID>
<Language>
<Version>
<DateTime>
<Patient>
<From>
<To>
<Purpose>

A2.2.5 The Body Sections contain the <Patient> data, within the following Sections:

<Payers>
<AdvanceDirectives>
<Support>
<FunctionalStatus>
<Problems>
<FamilyHistory>
<SocialHistory>
<Alerts>
<Medications>
<MedicalEquipment>
<Immunizations>
<VitalSigns>
<Results>
<Procedures>
<Encounters>
<PlanOfCare>
<HealthCareProvider>

A2.2.6 The Footer Sections contain the normalized links within the CCR for:

<Actors>
<References>
<Comments>
<Signatures>

A2.2.7 The CCR core structure is represented in Fig. A2.2.

NOTE A2.2—Within this version of the CCR Implementation Guide all figures/diagrams are derived from the proprietary commercial XML tool XMLSpy (© 1998-2005 Altova GmbH & Altova, Inc.) from Altova (www.altova.com). This is for the sole purpose of illustrating the concepts, hierarchy, and object inheritance within the CCR. This is not an endorsement of any product as any number of commercial and proprietary products could have been used to generate the Figures in this Implementation Guide.

A2.2.8 In all Figures and Tables in this Implementation Guide, whether or not a given tag is optional or required is defined as its cardinality. Cardinality is expressed as follows in all Figures and Tables:

| | |
|---|---|
| Required and Bounded To One Instance | 1..1 |
| Required and Bounded To *x* Instances | 1..*x* |
| Required and UnBounded | 1..∞ |
| Optional and Bounded To One Instance | 0..1 |
| Optional and Bounded To x Instances | 0..*x* |
| Optional and UnBounded | 0..∞ |

## A2.3 Data Representation in the CCR

A2.3.1 The Implementation Guide defines the expression of patient-specific healthcare data within the core CCR XML framework in Fig. A2.3. The core structure illustrated in Fig. A2.3 represents the essential categories of data that make up the CCR. These are the 'sections' that are data containers for comprehensive patient data.

A2.3.1.1 Within these sections/content containers, data within the CCR should be expressed in as much detail as possible. The CCR is designed to promote highly structured and coded information to support not only data exchange, but also to support complex data expression as well as both human and automated clinical decision support, through the use of alerts, reminders, performance measures and sophisticated data analysis.

A2.3.1.2 In an ideal world all data expression in healthcare would be to a level of detail and standardization such that data from any system representing a specific concept would be identical to data from another disparate system representing the exact same concept. At the time of publication of this Implementation Guide, that is not the case in healthcare. Therefore the CCR XML has been defined to allow a range of expression of data and data complexity. This standard strongly recommends the use of controlled vocabularies, but these are non-normative suggestions, and the standard has provided a small number of 'escape hatches' for free text where deemed absolutely necessary for those systems that cannot support discretely structured, tagged, and coded data.

A2.3.1.3 As noted earlier, the CCR is set up as a Document Object that is a container for Data Objects. That Document Object is the CCR, and the Data Objects are the medications, problems, procedures, encounters, immunizations, and the like that are contained within the sections illustrated in Fig. A2.3. The CCR supports the detailed parsing of any specific data object into its detailed structured components.

A2.3.1.4 The medication Amoxicillin for example, would represent a data object in the CCR. Its attributes within the CCR are expressed with discrete specificity as attributes of that data object, displayed as tagged data elements in XML. Amoxicillin, therefore, has discrete tags for <BrandName>, <Strength>, <Form>, <Quantity>, <Dose>, <Route>, <Site>, <Indication>, <Instructions>, etc., and each of these is subclassed with a set of tags to promote detailed data specificity. <Dose>, for example, is expressed as a <DoseCalculation> and as <FixedDose> or a <DoseRange> and is further sub-classed to express a <Value> and <Units>, any <Variable>, and an optional <DoseCalculation>. The CCR medication data object

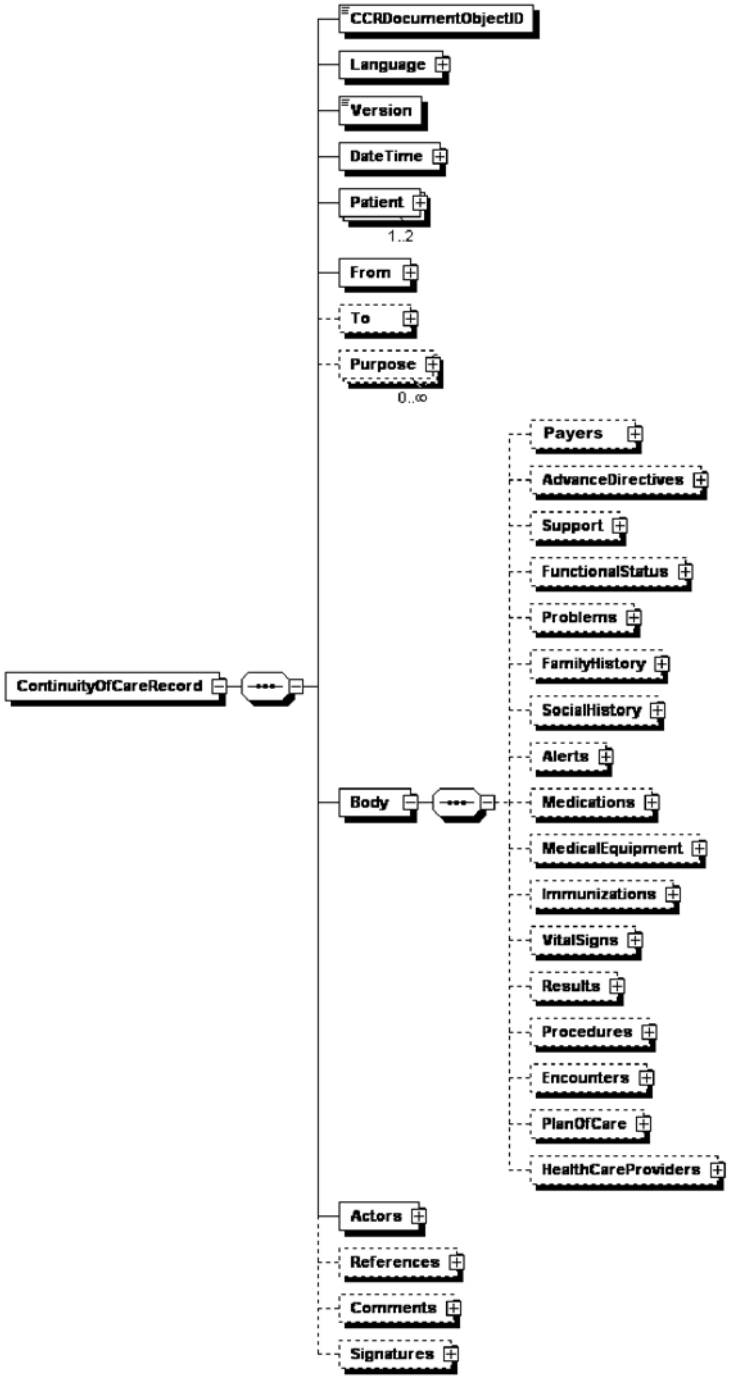


**FIG. A2.2 Overall Structure of CCR**

is structured to comprehensively support all prescriptions. This includes inpatient as well as ambulatory or office-based medication administration, IV admixtures, home health and outpatient administration and infusions, and all instances and ways in which a medication/drug can be delivered to a patient. It also covers medication administration and dosing from the youngest neonatal patients to the oldest in our geriatric population.

A2.3.1.5 Similar levels of detail are supported for all data objects in the CCR, tailored to the specificity needed to express complex clinical and administrative concepts. In addition, the CCR supports detailed coding of data and detailed data attributes with standardized coding methodologies such as SNOMED CT, ICD-9 CM, ICD-10, ICD-10 CM, CPT, LOINC, RxNorm, and the like. Although explicitly constrained terms, term sets, controlled vocabularies, and code sets are not completely defined within this Implementation Guide, future Implementation Guides will contain explicit constraints relative to terms, term sets, controlled vocabularies, and code sets as quickly as these can be defined by the ASTM E31.28 CCR Subcommittee.

NOTE A2.3—The following XML elements are currently defined as

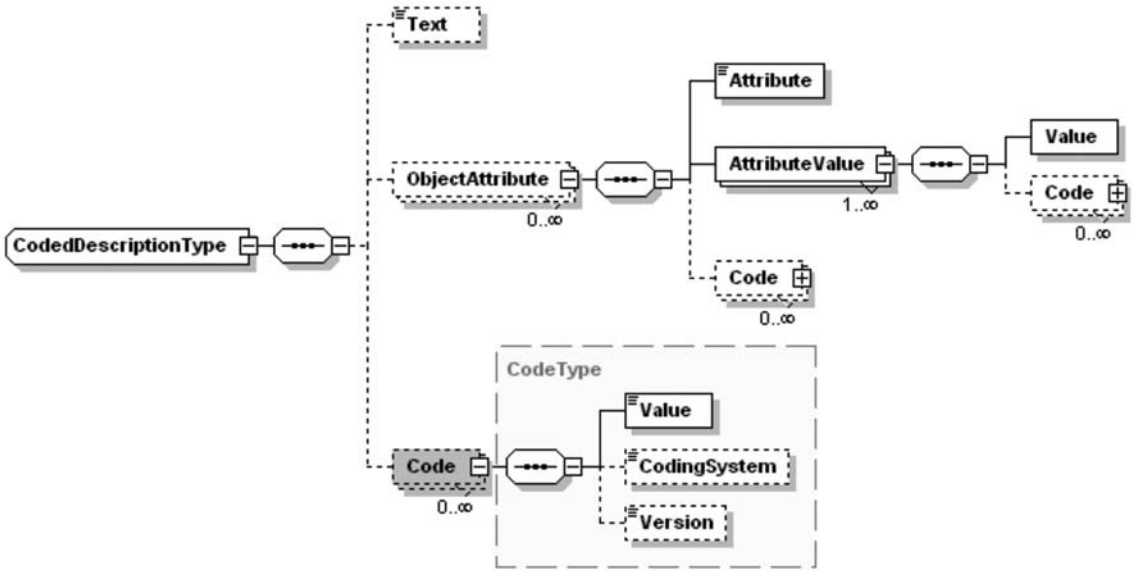


**FIG. A2.3 Complex Data Type CodedDescriptionType**

xs:string, but should not contain arbitrary text strings: Within CodedDescriptionType: ObjectAtribute/Attribute.

A2.3.1.6 In other words, the CCR is a comprehensive tool for the detailed and encoded expression of patient-centric, summarized clinical data. XML is the object-description language used by the CCR to express data objects and their attributes. Ideally all systems using the CCR for interoperable exchange would express data using XML and would conform to the standardized content detail that the CCR is capable of supporting. Unfortunately, due to the lack of any comprehensive and widely used clinical content standards for patient summaries in healthcare, most systems have not been either standardized or are not interoperable, and their capabilities relative to structuring data vary widely.

A2.3.1.7 The emerging use of the IHE Integration Profiles (Integrating the Healthcare Enterprise) created though the collaboration with several standards bodies (HL7, DICOM, ASTM, ISO, OASIS, IETF, etc.) has made great strides in moving the industry towards a structured approach to data. There is marked variability within the industry, however, and in order to deal with this reality, the CCR XML has been designed to allow an expression of data in a range of modalities, as follows:

*(1)* Non-specific text strings,

*(2)* Coded text strings,

*(3)* Coded or un-coded text strings with an arbitrary level of structure, and

*(4)* Fully structured and coded data expression.

A2.3.1.8 A significant amount of thought and effort has gone into mapping the CCR to string-based and other XML healthcare messaging standards and architectures such as NCPDP and NCPDP Script, HL7 2.x and 3.0, HL7 CDA, and X12 (specifically X12 standards such as the 837 claims standard). In general, the CCR Implementation Guide, as noted above, contains greater data specificity than some of these string-based and XML standards, but care has been taken to assure that the data needed to generate a message or document using one of these standards is supported within the CCR. The intent is that the CCR would be fed by data coming from messages and documents expressed in these standards and that a system could generate a message or document consistent with these standards from a CCR. In addition, ASTM International and HL7 have a Memorandum of Understanding, for each organization to work with the other toward the goal of harmonizing HL7 and CCR content. Additional cooperative work is ongoing with IHE, NCPDP, and X12.

A2.3.1.9 To support the continuum of data expression encompassing text strings to fully coded and structured data, the CCR uses an XML data container defined as a CodedDescriptionType. All expressions of data within the CCR where text strings are allowed utilize the CodedDescriptionType or follow the rules defined for the CodedDescriptionType, so it will be defined in detail here, as will other key overarching CCR concepts such as CodingSystem, ObjectIDs, and the expression of date/time within the CCR.

A2.3.2 *CodedDescriptionType:*

A2.3.2.1 All data within the CCR must be the content of an XML tag. As defined earlier, no data are allowed as XML tag attributes. Most data within the CCR are explicitly tagged, and it is recommended that all implementations fully tag data to their maximum granularity and specificity so that complex concepts can be accurately and explicitly represented. It is understood, however, that some systems can only express complex concepts as text strings and cannot parse and express data as discretely tagged and coded data. The Complex Data Type CodedDescriptionType is used within the CCR to support the use of either simple text strings or complete, detailed tagging and coding of discrete data.

NOTE A2.4— <Type> is not intended to be explicitly linked to codes under <Description>. Its intent is for sorting and filtering and will in the future have its own defined controlled vocabulary source terminology.

A2.3.2.2 The CCR CodedDescriptionType is illustrated in Fig. A2.3.

A2.3.2.3 If a system generating a CCR can only generate a text string, then that text string must be placed in its entirety as content of the tag <Text>.

A2.3.2.4 A text 'diagnosis' can be used as an example:

Example 1 – CodedDescriptionType
(Simple Text String)

```
<Text>Acute Antereoseptal Myocardial Infarction</Text>
```

A2.3.2.5 This same text string as a coded diagnosis would be expressed as follows:

Example 2 – CodedDescriptionType
(Coded Simple Text String)

```
<Text>Acute Antereoseptal Myocardial Infarction</Text>
<Code>
 <Value>410.1 </Value>
 <CodingSystem>ICD9CM</CodingSystem>
 <Version> 2004</Version>
</Code>
```

A2.3.2.6 The same text string coded in both ICD-9 CM and SNOMED CT would be expressed as follows:

Example 3 – CodedDescriptionType
(Simple Text String Coded in Two Different Coding Schemes)

```
<Text>Acute Antereoseptal Myocardial Infarction</Text>
<Code>
 <Value>410.1 </Value>
 <CodingSystem>ICD9CM</CodingSystem>
 <Version> 2004</Version>
</Code>
<Code>
 <Value>62695002 </Value>
 <CodingSystem>SNOMED CT</CodingSystem>
 <Version> 20050131</Version>
</Code>
```

A2.3.2.7 The same diagnosis represented as both a text string and fully tagged and coded data object with ICD-9 CM and SNOMED CT coding would be expressed as follows:

Example 4 – CodedDescriptionType
(Coded Simple Text String + Structured Representation)

```
<Text>Acute Antereoseptal Myocardial Infarction</Text>
<Code>
 <Value>410.1 </Value>
 <CodingSystem>ICD9CM</CodingSystem>
 <Version> 2004</Version>
</Code>
<Code>
 <Value>62695002 </Value>
 <CodingSystem>SNOMED CT</CodingSystem>
 <Version> 20050131</Version>
</Code>
<ObjectAttribute>
 <Attribute>Diagnosis</Attribute>
 <AttributeValue>
  <Value>Myocardial Infarction</Value>
  <Code>
   <Value>22298006</Value>
   <CodingSystem>SNOMED CT</CodingSystem>
   <Version>20050131</Version>
  </Code>
 </AttributeValue>
</ObjectAttribute>
<ObjectAttribute>
 <Attribute>Acuity</Attribute>
 <AttributeValue>
  <Value>Acute</Value>
  <Code>
   <Value>53737009</Value>
   <CodingSystem>SNOMED CT</CodingSystem>
   <Version>20050131</Version>
  </Code>
 </AttributeValue>
</ObjectAttribute>
<ObjectAttribute>
 <Attribute>Site</Attribute>
 <AttributeValue>
  <Value>Antereoseptal</Value>
  <Code>
   <Value>20706007</Value>
   <CodingSystem>SNOMED CT</CodingSystem>
   <Version>20050131</Version>
  </Code>
 </AttributeValue>
```

A2.3.2.8 In Example 4, there is no explicit equivalence between coded structures and narratives/text. It is important to note that within <ObjectAttribute> even though the value of the <Attribute> tag is defined of type xs:string in the schema, it cannot contain arbitrary text strings. <Attribute> must be part of a specific vocabulary or code set that although not defined in this Implementation Guide, will be specified in future implementation guides as controlled vocabularies are explicitly defined for the CCR.

A2.3.2.9 Note that qualifiers should only be used according to well-defined rules of controlled vocabularies and post-coordination. A value of type CodedDescriptionType should only have qualifiers if its code system defines the use of such qualifiers or if there is a third code system that specifies how other code systems may be combined.

A2.3.2.10 This diagnosis in the CCR can also be represented as structured, tagged, and coded data object, using only structured and coded data as follows:

Example 5 – CodedDescriptionType
(Structured XML Data Object Representation)

```
<ObjectAttribute>
 <Attribute>Diagnosis</Attribute>
 <AttributeValue>
  <Value>Myocardial Infarction</Value>
  <Code>
   <Value>22298006</Value>
   <CodingSystem>SNOMED CT</CodingSystem>
   <Version>20050131</Version>
  </Code>
 </AttributeValue>
</ObjectAttribute>
<ObjectAttribute>
 <Attribute>Acuity</Attribute>
 <AttributeValue>
  <Value>Acute</Value>
  <Code>
   <Value>53737009</Value>
   <CodingSystem>SNOMED CT</CodingSystem>
   <Version>20050131</Version>
  </Code>
 </AttributeValue>
</ObjectAttribute>
<ObjectAttribute>
 <Attribute>Site</Attribute>
 <AttributeValue>
  <Value>Antereoseptal</Value>
  <Code>
   <Value>20706007</Value>
   <CodingSystem>SNOMED CT</CodingSystem>
   <Version>20050131</Version>
  </Code>
 </AttributeValue>
```

```
</ObjectAttribute>
```

A2.3.2.11 Example 5 represents data representation and granular encoding that is explicit. Note that the text string 'Acute Antereoseptal Myocardial Infarction' can be reconstructed using an XSLT script in XML from the detailed discrete representation in Example 5.

A2.3.2.12 One problem with encoding data in healthcare is the variability and inexactitude of many widely used coding schemes. ICD, CPT, and NDC codes are non-specific in many instances of use, whereas SNOMED CT, LOINC, and RxNorm codes are more granular, specific, and clinically meaningful. The problem in healthcare is that ICD, CPT, and NDC codes are often required for healthcare claims processing and reimbursement (in the United States), and due to these widespread uses and requirements their inclusion and representation in the CCR must be supported.

A2.3.2.13 The CodedDescriptionType provides support for detailed discretely encoded data representation, while also supporting the use of a less specific code—a code such as an ICD-9 CM code in the diagnosis example, as follows:

Example 6 – CodedDescriptionType
(Structured XML Data Object Representation + Roll-Up Code)

```
<ObjectAttribute>
 <Attribute>Diagnosis</Attribute>
 <AttributeValue>
  <Value>Myocardial Infarction</Value>
  <Code>
   <Value>22298006</Value>
   <CodingSystem>SNOMED CT</CodingSystem>
   <Version>20050131</Version>
  </Code>
 </AttributeValue>
</ObjectAttribute>
<ObjectAttribute>
 <Attribute>Acuity</Attribute>
 <AttributeValue>
  <Value>Acute</Value>
  <Code>
   <Value>53737009</Value>
   <CodingSystem>SNOMED CT</CodingSystem>
   <Version>20050131</Version>
  </Code>
 </AttributeValue>
</ObjectAttribute>
<ObjectAttribute>
 <Attribute>Site</Attribute>
 <AttributeValue>
  <Value>Antereoseptal</Value>
  <Code>
   <Value>20706007</Value>
   <CodingSystem>SNOMED CT</CodingSystem>
   <Version>20050131</Version>
  </Code>
 </AttributeValue>
</ObjectAttribute>
<Code>
 <Value>410.1 </Value>
 <CodingSystem>ICD9CM</CodingSystem>
 <Version> 2004</Version>
</Code>
```

A2.3.2.14 This supports structuring the data as a discretely tagged XML data object, coded in SNOMED CT, with a roll-up code in ICD-9 CM for billing purposes.

A2.3.2.15 As a condensed XML string, Example 6 would look as follows:

Example 7 – CodedDescriptionType
(Example 6 As An XML Text Block)

```
<ObjectAttribute><Attribute>Diagnosis</
Attribute><AttributeValue><Value>Myocardial Infarction</
Value><Code><Value>22298006</Value><CodingSystem>
SNOMEDCT</CodeType><Version>20050131</Version></Code></
AttributeValue></ObjectAttribute><ObjectAttribute><Attribute>Acuity</
Attribute><AttributeValue><Value>
Acute</Value><Code><Value>53737009</
Value><CodingSystem>SNOMEDCT</
CodingSystem><Version>20050131</Version></Code></AttributeValue></
ObjectAttribute><Attribute>
Site</Attribute><AttributeValue><Value>Antereoseptal</
Value><Code><Value>20706007</Value><CodingSystem>
SNOMEDCT</CodingSystem><Version>20050131</Version></Code></
AttributeValue></ObjectAttribute><Code><Value>410.1</
Value><CodingSystem>
ICD9CM</CodingSystem><Version>2004</Version></Code>
```

A2.3.2.16 The Definitions for the key XML tags in the CodedDescriptionType are displayed in Table A2.1.

A2.3.3 *CodingSystem:*

A2.3.3.1 The Complex Data Type CodingSystem is used to express codes within the CCR. It is recommended that wherever possible, all data be discretely coded in implementations of the CCR.

A2.3.3.2 CodingSystem is illustrated in Fig. A2.4.

A2.3.3.3 In all instances where a Code is used in the CCR, the Complex Data Type CodingSystem is required. The key XML tags for CodingSystem are defined in Table A2.2.

A2.3.4 *Coding*—Detailed coding is recommended whenever practical within the CCR. The following are specific coding recommendations for the U.S. Note that these are coding suggestions and are nonnormative.

A2.3.4.1 *Problems*—Problems should be coded at the highest level using SNOMED CT and the most recent CMICD-9 CM, ICD-10, OR ICD-10 CM codes at the time the CCR is

**TABLE A2.1 CodedDescriptionType Definition Table**

| CodedDescriptionType | Accepted Values/Formatting | Optionality/Cardinality | Description |
|---|---|---|---|
| <Text> | Text String | Optional and Bounded To One Instance (0..1) | This is the text description as a string and can only be used to represent unstructured data. |
| <Attribute> | Child of <ObjectAttribute> | Required if data are structured and <ObjectAttribute> is used, Bounded (1..1) | This is the container for structured data object-attribute descriptors – 'Diagnosis', 'Acuity', 'Site', 'Severity', 'Laterality', 'Acuity', etc. |
| <Value> | Child of <AttributeValue> | Required if data are structured and <AttributeValue> is used, Bounded (1..1) | This is a container for object attribute values – 'Myocardial Infarction', 'Acute', 'Antereoseptal', 'Mild', 'Left', 'Acute', etc. |
| <Code> | See CodingSystem | Optional UnBounded (0..∞) | <Code> is a Complex Data Type – CodingSystem. It is to be used whenever codes are defined for a given data element. |

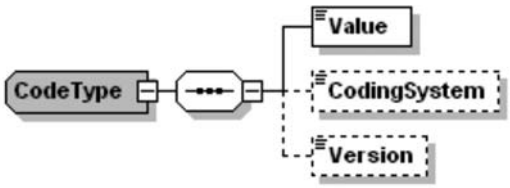


**FIG. A2.4 Complex Data Type CodingSystem**

**TABLE A2.2 CodingSystem Definition Table**

| CodingSystem | Accepted Values/Formatting | Optionality/Cardinality | Description |
|---|---|---|---|
| <Value> | String | Required and Bounded To One Instance (1..1). | This is the Code – numeric or alphanumeric. |
| <CodingSystem> | String | Optional and Bounded To One Instance (0..1). | This defines the coding system – such as ICD-9CM, ICD-10, SNOMED, LOINC, NCPDP, X12, CPT. |
| <Version> | String | Optional and Bounded To One Instance (0..1). | This defines the version – for example if the <CodingSystem> is ICD-9CM, the <Version> might be 2004. |

generated to accommodate the need for the various healthcare entities that will be interacting with the CCR data to have accurate coding for reimbursement purposes. These and other controlled vocabularies are integral to the enhancement of data contained within the CCR to support intelligent clinical decision support. It is recommended that problems be categorized with SNOMED CT codes to as granular a level as possible.

A2.3.4.2 *Procedures*—Procedures should be coded at the highest level using SNOMED CT, LOINC, and the most recent CPT codes at the time the CCR is generated to accommodate the need for the various healthcare entities that will be interacting with the CCR data to have accurate coding for reimbursement purposes as well as potential utilization for clinical decision support functions It is recommended that procedures be coded with SNOMED CT and LOINC codes to as granular a level as possible.

A2.3.4.3 *Products and Agents*—Products and agents should be coded with RxNorm to as granular a level as possible. In addition, they may be coded with another standard as applicable (NDC, for example) or proprietary code, with the type of code and the source and version clearly defined. If any coding system is used, however, an RxNorm code must be included, if legally required.

A2.3.4.4 *Results*—Procedures generating results should be coded with the most recent CPT codes at the time the CCR is generated for procedures and with LOINC for <Result> and <Test>.

A2.3.5 *Object IDs:*

A2.3.5.1 The CCR and all Data Objects contained within the CCR must have ObjectIDs.

A2.3.5.2 The CCR has an ObjectID:

<CCRDocumentObjectID> – a unique ID for the CCR Document Object

A2.3.5.3 All CCR Data Objects have ObjectIDs:

<CCRDataObjectID> – a unique ID for all CCR Data Objects.
<ActorObjectID> – a unique ID for all Actors.
<ReferenceObjectID> – a unique ID for all References.
<CommentObjectID> – a unique ID for all Comments.
<SignatureObjectID> – a unique ID for all Signatures.

A2.3.5.4 CCR Document and Data ObjectIDs are unique IDs used by the generating entity/system to uniquely identify each explicit instance of a CCR and each explicit Data Object. The uniqueness of these ObjectIDs is defined within the generating system. The </CCRDocumentObjectID> should ideally be unique across all CCRs through the use of a UUID or OID or other generally accepted universal unique ID mechanism. Data Object IDs must be unique to and within each CCR, but are not considered unique across the universe of all CCRs. A universal unique ID mechanism such as UUID, OID, or other generally accepted universal unique ID mechanism can be used for data object IDs, but is not required.

Example 8 – <CCRDataObjectID>

<CCRDataObjectID>**AA0001**</CCRDataObjectID>

A2.3.6 *Links Between CCR Data Objects With <InternalCCRLink>:*

A2.3.6.1 <InternalCCRLink> is used to link internal references between CCR Data Objects within the CCR, defined by <CCRDataObjectID> and xs:string.

A2.3.6.2 Links are used to reference data contained within other parts of the document, such as a <Problem> under <Problems> being the <Indication> for a <Procedure> or <Medication>.

A2.3.6.3 Links are made using the Complex Data Type InternalCCRLinkType, which is illustrated in Fig. A2.5.

A2.3.6.4 There is no 'bucket' or section for InternalCCRLinks. They are referentially self-contained, since they are pointers from one data object to another data object.

A2.3.6.5 The Definition Table for InternalCCRLinkType is Table A2.3.

A2.3.7 *Sequentially Repeating Object Attributes:*

A2.3.7.1 XML provides an ideal platform for repeating object attributes, with the default explicit order of repetition defined within XML as the order with which they are listed within the XML string.

A2.3.7.2 To ensure exact order, and to facilitate mapping to string-based messaging standards, such as NCPDPScript 8.0, HL7 2.x, and X12 837, the CCR provides for a <SequencePosition> tag and a <SequenceModifier> tag.

A2.3.7.3 If there is no repeat of an attribute, then these tags are not used. If there are one or more repeats, then the

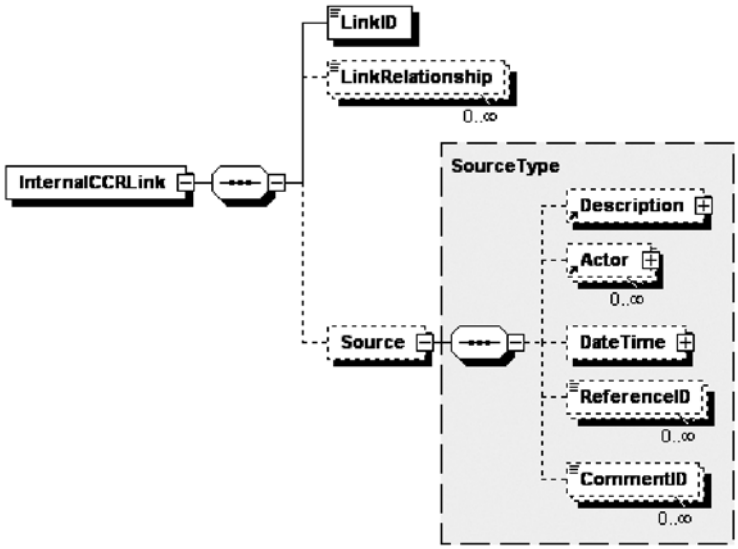


**FIG. A2.5 Complex Data Type InternalCCRLinkType**

**TABLE A2.3 InternalCCRLinkType Definition Table**

| InternalCCRLinkType | Accepted Values/Formatting | Optionality/0 - ∞ | Description |
|---|---|---|---|
| <LinkID> | Internal CCR ObjectIDs Only – xs:string | Required and Bounded To One Instance (1..1). | This must be an internal CCR ObjectID. |
| <LinkRelationship> | Instance of type xs:string that allows enumerated values only. | Optional and UnBounded (0..∞) | Links are internal references within the CCR that link a specific Data Object to another. Enumerated values are not yet defined for Links but will include:<br>“Indication”<br>“Etiology”<br>“Associated With”<br>“Must Occur Before”<br>“Must Occur After” |

<SequencePosition> of the first attribute in order is the integer ‘1’ and that attribute does not use a <SequenceModifier>. For the second and subsequent attribute repeats their <SequencePosition> is an integer ‘2’ or higher in increments of ‘1’, and they each have a <SequenceModifier>.

A2.3.7.4 The <SequenceModifier> is a regular expression, such as AND, OR, TO, THEN, which connects the attributes as follows:

| | | | |
|---|---|---|---|
| Attribute 1 | AND | Attribute 2 | (Inclusive) |
| Attribute 1 | OR | Attribute 2 | (Either/Or) |
| Attribute 1 | TO | Attribute 2 | (Expression of a Range) |
| Attribute 1 | THEN | Attribute 2 | (Sequential) |

A2.3.7.5 <SequencePosition> and <SequenceModifier> are defined by an explicit naming of the tag relative to the attribute to which they apply, for example <FrequencySequencePosition> and <VariableFrequencyModifier>. <SequencePosition> and <SequenceModifier> are used whenever attribute order must be maintained or when there are multiple segment repeats or object repeats within other objects.

A2.3.8 *Representation of Dates and Times in the CCR with DateTimeType*—The CCR provides a mechanism to represent dates and times with exact precision to accommodate the requirements for medical-legal documentation. The CCR also supports inexact clinical dates and times where relative times are all that are available, e.g., ‘a few years ago’ or ‘as a child’, such as when representing after-the-fact historical recollections of clinical events. Time is expressed in the CCR with <DateTime> which is an exact expression of date and time or a Complex Data Type used to delineate an exact (precise) or inexact date or date time, an age, an approximate date, or a timeframe or time range. The Complex Data Type DateTimeType is illustrated in Fig. A2.6. An expanded representation of the DateTimeType, to illustrate its comprehensive approach to the expression of clinically and administratively relevant times in healthcare, is illustrated in Fig. A2.7. The key XML tags for DateTimeType are defined in Table A2.4.

A2.3.8.1 *<ExactDateTime>*

*(1)* <ExactDateTime> must conform to the ISO 8601 Date-Time Standard described at http://www.iso.org/iso/en/prods-services/popstds/datesandtime.html#three and available from ISO (www.iso.org).

*(2)* <ExactDateTime> within the CCR must be defined by a standard time reference to support interoperability of the CCR between systems and across time zones. The clock at Greenwich, England is traditionally used as the standard clock for international reference of time. This time was originally referred to as Greenwich Mean Time or GMT, but the official

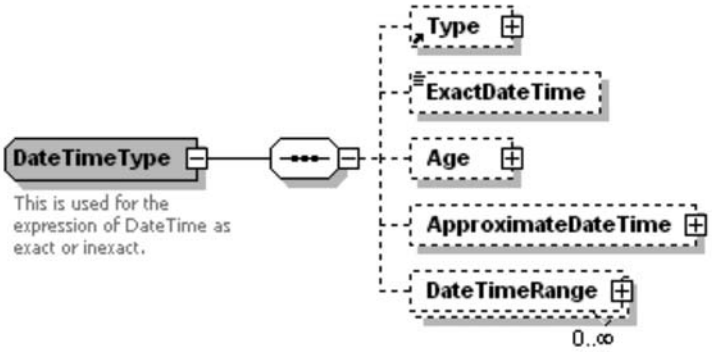


**FIG. A2.6 Complex Data Type DateTimeType**

name is now Coordinated Universal Time or UTC. The letter designator for this clock is Z. Times in UTC are written in military time or 24-hour format such as 1830Z. UTC is the standardized reference time used in the CCR.

*(3)* The required format for <ExactDateTime> to represent a specific time on a specified day within the CCR is the calendar date and time representation as follows, with the capital letter T used to separate the date and time components:

YYYY-MM-DDThh:mm:ss

*(4)* This representation must be immediately followed by a "Z" to indicate that the time is Coordinated Universal Time (UTC) or by a sign, + or -, followed by the difference from UTC represented as hh:mm. For example, to indicate 1:25:34 pm on September 1, 2004, for Eastern Standard Time, which is 5 hours behind Coordinated Universal Time (UTC), the CCR <ExactDateTime> must be represented as:

2004-09-01T13:25:34-05:00.

*(5)* See http://www.iso.org/iso/en/prods-services/popstds/datesandtime.html for more information on UTC formats and examples.

*(6)* Note that <ExactDateTime> is used to express exact dates and times, but these times are not required, depending on their relevance and use in the CCR, to be precise to the seconds. Depending on use, <ExactDateTime> can express time as:

*(a)* Year only [2004].

*(b)* Year and month only [2004-09].

*(c)* Year, month, and day only [2004-09-01].

*(d)* Year, month, day, and hours only [2004-09-01T13:00:00-05:00].

*(e)* Year, month, day, hours, and minutes only [2004-09-01T13:25:00-05:00].

*(f)* Year, month, day, hours, minutes, and seconds only [2004-09-01T13:25:34-05:00].

*(7)* Note that in instances 4 through 6 an offset from UTC is required.

A2.3.8.2 *<Age>*

*(1)* <Age> in the CCR must be represented with a <Value> and <Units>. In addition, <Units> under <Age> are restricted to Days, Weeks, Months, and Years. The expression of <Age> for patients less than 2 years of age must be as follows:

Age <2 Weeks must be expressed in days [__ Days].
Age 2 Weeks – 2 Months must be expressed in weeks [__ Weeks].
Age 2 Months – 2 Years must be expressed in months [__ Months].
Age >2 Years must be expressed in years [__ Years].

*(2)* Examples are as follows:

Example 9 – <Age>

```
<Age><Value>5</Value><Units><Unit>Days</Unit></Units></Age>
<Age><Value>3</Value><Units><Unit>Weeks</Unit></Units></Age>
<Age><Value>18</Value><Units><Unit>Months</Unit></Units></Age>
<Age><Value>45</Value><Units></Unit>Years</Unit></Units></Age>
```

A2.3.8.3 *<ApproximateDateTime>*

*(1)* <ApproximateDateTime> is expressed as a text string using CodedDescriptionType. Since there are no currently encoded values to express <ApproximateDateTime>, CodedDescriptionType is used as a text string container only as illustrated in the following examples:

Example 10 – <ApproximateDateTime>

```
<ApproximateDateTime><Text>One Week Ago</Text></Approximate
 DateTime>
<ApproximateDateTime><Text>As A Child</Text></Approximate
 DateTime>
<ApproximateDateTime><Text>Thirty Years Ago</Text></Approximate
 DateTime>
<ApproximateDateTime><Text>In 30s</Text></Approximate
 DateTime>
```

A2.3.8.4 *<DateTimeRange>*

*(1)* <DateTimeRange> must be expressed using <BeginRange> and <EndRange>. <BeginRange> and <EndRange> can be expressed as an <ExactDateTime>, <Age>, or <ApproximateDateTime> following the rules defined above.

A2.3.8.5 *<Source>*

*(1)* <Source> is required in all instances of data objects in the CCR. <Source> is defined by the Complex Data Type SourceType. SourceType includes a link to <Actor> and a <SourceDateTime>, which is an <ExactDateTime>.

## A2.4 Security and Privacy

A2.4.1 The primary use case for the CCR is for the CCR document instance to provide a snapshot in time containing the relevant clinical, demographic and administrative data for a specific patient. The data contained within the CCR are patient data and, if those data are identifiable, then end-to-end CCR document integrity and confidentiality must be provided while

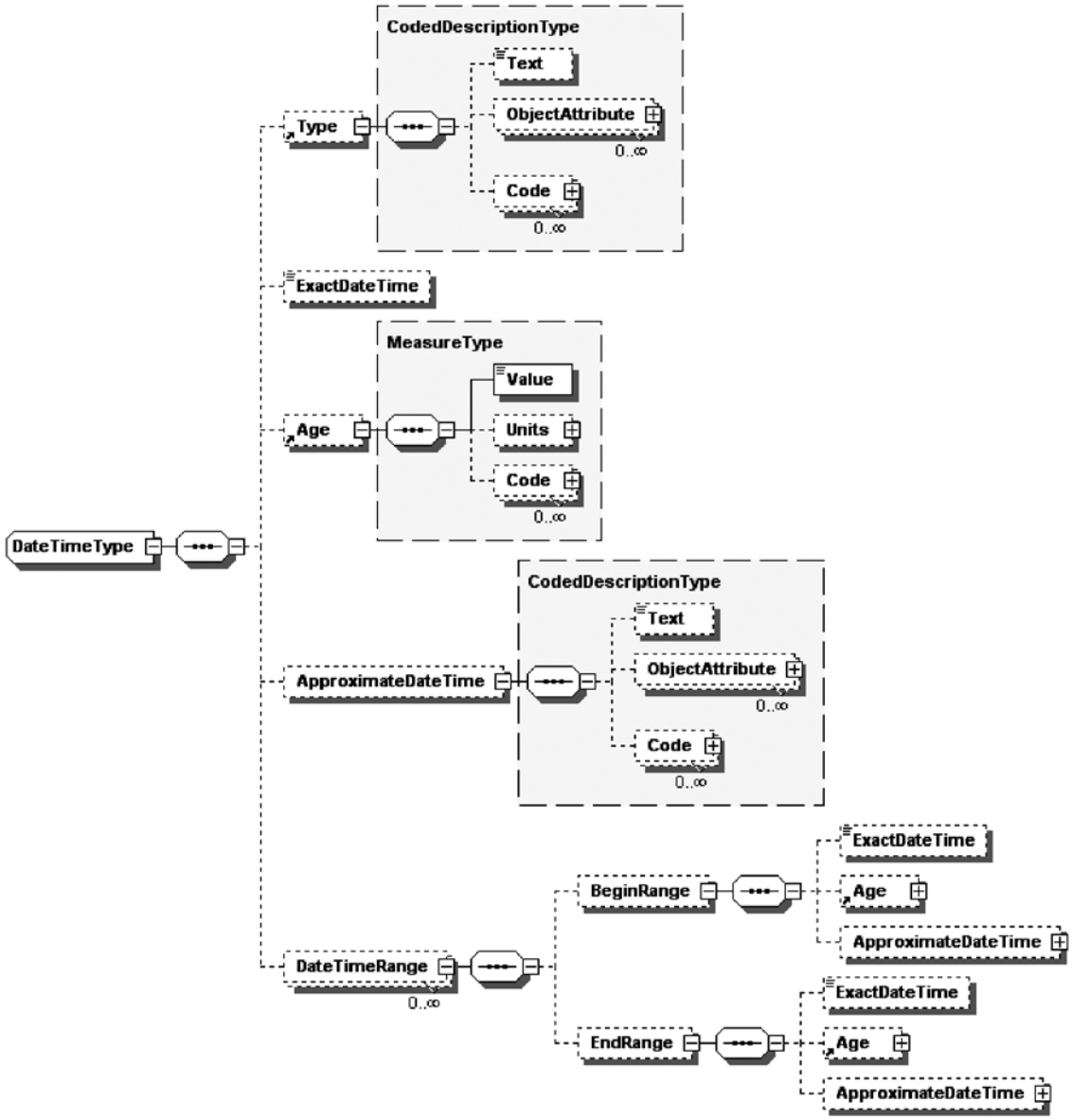


FIG. A2.7 Partially Expanded Data Type DateTimeType

**TABLE A2.4 DateTimeType Definition Table**

| DateTimeType | Accepted Values/Formatting | Optionality/Cardinality | Description |
|---|---|---|---|
| <DateTimeType> | Restricted – acceptable values are to be defined for each instance of use. | Optional and Bounded To One Instance (0..1). | <DateTimeType> defines the type of date/time and is required anytime a DateTimeType is used. Acceptable values are restricted. Specific Types may be required in a particular instance. |
| <ExactDateTime> | Must be in ISO-8601 Date-Time Format – yyyy-mm-ddThh:mm:ss-hh(GMT):mm(GMT) | Optional and Bounded To One Instance (0..1). | A specific Date and Time is the preferred usage of DateTimeType. It can be Year Only; Year and Month; Year, Month, Day; Year, Month, Day, Hour; Year, Month, Day, Hour, Minutes; Year, Month, Day, Hour, Minutes, Seconds. It is required that time have its offset from UDT, when available, (stated as Z or ± GMT/UDT). An example is 2004-01-12T13:30:00-05:00. |
| <Age> | Defined with <Value> and <Units>. | Optional and Bounded To One Instance (0..1). | <Age> is allowed only when appropriate and is defined as a <Value>/<Units> pair. Representations can be exact or approximate. |
| <ApproximateDateTime> | CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Optional and Bounded To One Instance (0..1). | <ApproximateDateTime> is allowed only when appropriate. Examples of Approximate Time are: One Week Ago; As A Child; When 30 Years Old; In 30s. |
| <DateTimeRange> | No content – must contain either one or both <BeginRange> and/or <EndRange>, which in turn must contain a tagged DateTime representation, using one of the DateTime formats defined above. | Optional and Bounded To One Instance (0..1). | Used to represent imprecise or precise date/time ranges. |

conforming to regulations or other security, confidentiality, or privacy protections as applicable within the scope of this standard.

A2.4.2 Conditions of security and privacy for a CCR instance must be established in a way that allows only properly authenticated and authorized access to the CCR document instance or its elements. The CCR document instance must be self protecting when possible and carry sufficient data embedded in the document instance to permit access decisions to be made based upon confidentiality constraints or limitations specific to that instance.

A2.4.3 Additional ASTM E31.20 Subcommittee on Security and Privacy guides, practices, and specifications will be published in support of the security and privacy needs of specific use cases. When a specification is necessary to assure interoperability or other required functionality, the CCR core schema will be extended to meet the profile requirements of the underlying use case—building upon existing standards and specifications whenever possible. For profiles that require digital signatures, W3C's XML digital signature standard (http://www.w3.org/TR/xmldsig-core) will be used. Encryption will be provided using W3C's XML encryption standard (http://www.w3.org/TR/xmlenc-core).

A2.4.4 Until detailed security, confidentiality, and privacy standards can be published by ASTM to support the CCR, the following procedures should be followed in all instances where a CCR will be considered for security purposes 'in-the-clear':

A2.4.4.1 The CCR should have a checksum calculated against the entire document and a W3C XML digital signature applied.

A2.4.4.2 The CCR Body and Footer as well as the Patient section should be encrypted with W3C XML encryption.

A2.4.4.3 The only allowed unencrypted data should be the <CCRDocumentObjectID>, CCR document <DateTime>, <From> containing the minimum data required to define whom the CCR is from, and <To> containing the minimum data to define to whom the CCR is intended.

A2.4.5 The CCR is an interoperability standard and requires a standardized security approach by all parties. As stated earlier in this Implementation Guide, the receiving party should not need to have any prior knowledge of the originating party. This is more difficult to accomplish seamlessly with security and encryption, but until interoperable CCR security standards are finalized, all parties using the CCR should adopt the above-defined methodologies and assist in the standardization process through cooperative agreements between sender and receiver. There are many alternative models and approaches available to provide for secure management and transmission of data, but the above-defined methodologies are the result of significant work in the field and represent the best consensus in the general computer industry on how to handle XML security and non-repudiation. The above methods are compliant with existing ASTM healthcare security standards.

## A2.5 CCR Implementation

A2.5.1 Implementation of the CCR described within this Implementation Guide will be defined in the discrete order in which the XML appears within the CCR, starting at the top of the document (CCR Header), then through the body (CCR Body,) and then to the normalized footer (CCR Footer) – see Fig. A2.2 for reference.

A2.5.2 *The CCR Header*—The CCR Header consists of the CCR XML Document Header, and the following CCR Sections:

<CCRDocumentObjectID>
<Language>
<Version>
<DateTime>
<Patient>
<From>
<To>
<Purpose>

NOTE A2.5—The CCR Header consists of tags, as defined above, but is not contained within a <Header> tag.

A2.5.2.1 *CCR XML Document Header:*

*(1)* The CCR XML Document Header exists within the tag attributes of the tag <ContinuityOfCareRecord>. CCR XML Document Header expression is illustrated in Example 11.

Example 11 – CCR XML Document Header

<ContinuityOfCareRecord xmlns="**urn:astm-org:CCR**"
xmlns:xsi="**http://www.w3.org/2001/XMLSchema-instance**"
xsi:schemaLocation="**urn:astm-org:CCR CCR1.0.xsd**">

*(2)* The Header Tag Attributes are:

*(a)* xmlns—This defines the XML namespace.

*(b)* xmlns:xsi—This defines the xsi and must state "http://www.w3.org/2001/XMLSchema-instance."

A2.5.2.2 *<CCRDocumentObjectID>*

*(1)* <CCRDocumentObjectID> is required and is the unique ID that applies to the entire CCR. The <CCRDocumentObjectID> is generated by the originating entity/system (aka an <Actor>) to uniquely identify each explicit instance of a CCR. The uniqueness of this ObjectID is defined within the generating system and must be unique to a CCR and should ideally be unique across the universe of all CCRs through the use of a UUID, OID, or other generally accepted unique ID mechanism.

*(2)* The uniqueness of a CCR in the universe of CCRs is enhanced through the combination of the <CCRDocumentObjectID>, the CCR <DateTime>, and the <Patient>. However, to make the CCR truly and irrevocably unique, a digital signature and hash should be incorporated within the footer section <Signatures>. In combination with the <CCRDocumentObjectID>, the CCR <DateTime>, and the <Patient> identifiers a digital signature will make any CCR instance truly unique.

Example 12 – <CCRDocumentObjectID>

<CCRDocumentObjectID>**19099377737**</CCRDocumentObjectID>

A2.5.2.3 *<Language>*

*(1)* <Language> is required and refers to the actual language used to generate the CCR and which the CCR is expressed in. <Language> is a CodedDescriptionType and the language should ideally be expressed in a controlled and encoded vocabulary. At a minimum it must express the language as a text string, as in Example 12a, although this usage is discouraged. It is recommended to use ISO 639-1 or ISO 639-2 to encode language.

Example 12a – <Language>

<Language><Text>**English**</Text>
<Code>
<Value>eng</Value>
<CodingSystem>ISO 639</CodingSystem>
<Version>2</Version>
</Code>
</Language>

A2.5.2.4 *<Version>*

*(1)* <Version> is required and refers to the version of the CCR Implementation Guide that is used to create a given instance of a CCR. <Version> is of type xs:string and for this version of the CCR must be expressed as "V1.0", as in Example 12b.

NOTE A2.6—One may think that this tag is redundant due to subsequent versions of the CCR having a different XSD and therefore the SchemaLocation would suffice for versions. This is not the case because future versions may add additional constraints in the implementation guide but not change the XSD.

Example 12b – <Version>

<Version>**V1.1** </Version>

A2.5.2.5 *<DateTime>*

*(1)* <DateTime> is required and refers to the exact time the data on a specific patient were aggregated to create a CCR, which is not necessarily the time the CCR was transmitted, printed, or sent. This CCR Document <DateTime> applies to the entire CCR and is the exact <DateTime> the data within the CCR were collected and aggregated.

*(2)* CCR Document <DateTime> must be expressed in ISO-8601 date-time format, with precision to include seconds and must include a UTC offset. All date times expressed in Hours, Minutes, and/or Seconds in the CCR must express a time zone offset, either using Z [Universal Coordinated Time], or an offset in hours and minutes. The CCR further requires that the time zone offset be a legal time zone. This latter constraint cannot be expressed in the schema, as time zones are determined by political entities [e.g., Nations or States]. There presently exist time zones in the form ##:15 and ##:30. CCR <DateTime> time should ideally come from a net-based atomic time service and not from an individual computing device's internal clock.

*(3)* The ISO-8601 standard defines the time string as CCYY-MM-DDThh:mm:ss-hh:mm. 2005-01-25-T12:15:37-09:00 represents January 25, 2005 12:15:37 PST (Pacific Standard Time), which is minus (-) 9 hours from Universal Coordinated Time). This exact time can also be expressed as Universal Coordinated Time as 2005-01-25-T21:15:37Z, which represents January 25, 2005 21:15:37 Universal Coordinated Time.

Example 13 – CCR Document <DateTime>

<DateTime><ExactDateTime>**2005-01-25-T12:15:37-09:00**
</ExactDateTime></DateTime>

A2.5.2.6 *<Patient>*

*(1)* <Patient> is required and identifies the patient to which the CCR refers. This is a link to <Actor> through an <ActorID> of type xs:string. The actual name and detailed data about this patient are not contained under <Patient>.

*(2)* Detailed data on each <Actor> is maintained in the <Actors> Section in the CCR Footer. The corresponding <Actor> in the <Actors> section of the CCR Footer is identified by an <ActorObjectID>, which is of type xs:string.

*(3)* The CCR can be about only one patient with the rare exception of Conjoined Twins, where it can contain data on two patients. Patient cardinality, therefore, must be at least 1, and at most 2, in the rare case of Conjoined Twins. Other than within that rare exception, the CCR is a snapshot in time of the clinical, demographic, and administrative data of a unique patient.

Example 14 – <Patient>

```
<Patient>
  <ActorID> ________</ActorID>
</Patient>
```

A2.5.2.7 *<From>*

*(1)* <From> is required and bounded to one instance (1..1) to represent one or multiple sources for the CCR. <From> identifies who or what has generated the CCR. This is an ID link to an Actor through <ActorID> of type xs:string and also defines the healthcare role <ActorRole> that the actor is playing when generating the CCR. An Actor and the Role must be specified under <From>. An <ActorLink> with an <ActorID> and <ActorRole> is required and multiple <Actorlink> tags can be used to represent multiple sources for the CCR. <ActorLink> is unbounded (1..∞).

*(2)* <ActorRole> is a CodedDescriptionType. This Implementation Guide does not currently specify a code set for <ActorRole>, so the CodedDescriptionType in this case is used as a free text container with the text string under <Text> defining the actual <ActorRole>. All efforts will be made to specify an appropriate code set and set of coded values to use for <ActorRole> in future releases of the CCR Standard.

*(3)* The following example illustrates a CCR generated by (<From>) the patient's primary care provider's EHR system. Note that both the originating healthcare provider and EHR are referenced in this use case.

Example 15 – <From>

```
<From>
  <ActorLink>
    <ActorID>________</ActorID>
    <ActorRole><Text>Primary Care Provider</Text></ActorRole>
  </ActorLink>
  <ActorLink>
    <ActorID>________</ActorID>
  <ActorRole><Text>Care Facility</Text></ActorRole>
  </ActorLink>
  <ActorLink>
    <ActorID>________</ActorID>
    <ActorRole><Text>EHR System</Text></ActorRole>
  </ActorLink>
</From>
```

A2.5.2.8 *<To>*

*(1)* <To> is optional and bounded to one instance (0..1). It identifies to whom or what the CCR is targeted, and it is an ID link to an <Actor> through an <ActorID>. In addition to <ActorID> the role played in the patient's care should be defined for <To> using <ActorRole>. Multiple <ActorLink> tags can be used to represent multiple recipients for the CCR. <ActorLink> is required and unbound (1..∞).

Example 16 – <To>

```
<To>
  <ActorLink>
    <ActorID>________</ActorID>
    <ActorRole><Text>Long Term Care Facility</Text></ActorRole>
  </ActorLink>
  <ActorLink>
  <ActorID>________</ActorID>
  <ActorRole><Text>Primary Care Provider</Text></ActorRole>
  </ActorLink>
  </To>
```

*(2)* It should also be noted that the <Patient> in some cases may be the <Actor> who is either sending <From> or receiving <To> the CCR when the patient wishes to use the CCR as the basis for a Personal Health Record (PHR).

A2.5.2.9 *<Purpose>*

*(1)* <Purpose> is optional and unbounded. It is a Complex Data Type of PurposeType and is illustrated in Fig. A2.8.

*(2)* <Purpose> defines a specific reason that a CCR is generated. Note that the general use case of the CCR does not require a <Purpose>. <Purpose> should be utilized, however, when the CCR has a specific purpose such as patient admission, transfer, consult/referral, or inpatient discharge. <Purpose> is defined in Table A2.5.

*(3)* Note that if the system generating the CCR can only create a text string as the <Purpose>, and that text string must be placed under <Description><Text> and cannot be placed under <Comment>. To reiterate <Comment> is for legitimate comments and cannot be used for data that belong in structured tags.

Example 17 – <Purpose>

```
<Purpose>
  <DateTime>
    <DateTimeRange>
      <BeginRange>
        <ExactDateTime>2005-01-25</ExactDateTime>
      </BeginRange>
      <EndRange>
        <ExactDateTime>2005-02-25</ExactDateTime>
      </EndRange>
    </DateTimeRange>
  </DateTime>
  <Description>
    <Text>Cardiology Follow-Up</Text>
  </Description>
</Purpose>
```

A2.5.3 *CCR Body and Data Objects*—The core patient-specific data contained within the CCR is within the Body of the CCR Document Object. A CCR without a <Body> is invalid. The patient-specific data objects within the CCR Document Object are contained within the tag <Body>. <Body> is comprised of sections, which contain the discrete data objects that make up the core elements and content of the CCR. All of the data objects are contained within an appropriate CCR <Body> section tag. The tags for the data objects (data items) within the CCR <Body> are defined in Table A2.6. Each one of these sections is optional and bound to one instance (0..1). Sections are required only when they contain

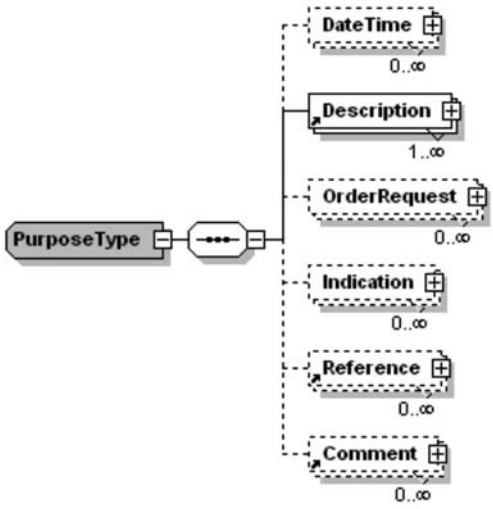


**FIG. A2.8 Complex Data Type PurposeType**

**TABLE A2.5 PurposeType Definition Table**

| PurposeType | Accepted Values/Formatting | Optionality/Cardinality | Description |
|---|---|---|---|
| <DateTime> | DateTimeType | Optional and Bounded To One Instance (0..1). | Defines a DateTime, if applicable, when the <Purpose> is intended to occur. For a CCR with a <Purpose> defined as a request for consult, a range of time (e.g., within two weeks) may be specified, or ASAP, or Today, or a specific date or specific date and time. The same would hold true for a request for procedure, request for follow-up, request for authorization, etc. |
| <Description> | CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. | Required and Unbounded (1.. ∞). | Used to provide a text string or structured and coded <Description> of the <Purpose>. Examples: Request For Consult, Request For Procedure, Request for Service, Request for Encounter, Request for Authorization, Request for Medical Device or Product, Request for Medication, Request for Immunization, For Patient Use (e.g. a PHR). |
| <OrderRequest> | See <OrderRequest> under <PlanOfCare>. | Optional and Unbounded (0.. ∞). | Used to define a specific <OrderRequest> as the <Purpose> of the CCR. |
| <Indication> | IndicationType, see <Indication> under <Medications>/<Product>. | Optional and Unbounded (0.. ∞). | Used to define a specific <Indication> as the <Purpose> of the CCR, usually a diagnosis or problem. |
| <ReferenceID> | This is a link to a <Reference>. | Optional and Unbounded (0.. ∞). | Used to link the <Purpose> to an outside document or record. |
| <CommentID> | This is a link to a <Comment>. | Optional and Unbounded (0.. ∞). | This is restricted to legitimate comments only. It is NOT to be used to contain any data that correctly belong under <Description>, <OrderRequest>, or <Indication>. |

data. The CCR XML Schema is normalized and uses a number of generalized tags and tag sets to simplify and shorten the XML Schema and simplify its maintenance and management as a standard. These will be defined before the discrete data objects are described.

A2.5.3.1 *CCRCodedDataObjectType*—All CCR data objects share a set of common characteristics, most of which are defined in the CCR XML Schema as a base type CCRCodedDataObjectType, which is illustrated in Fig. A2.9. The elements that make up a CCRCodedDataObjectType are defined below.

*(1)* <CCRDataObjectID>

*(a)* <CCRDataObjectID> is required. All data objects in the CCR must have a unique object ID.

*(b)* The ObjectIDs must be unique within the CCR but do not require any uniqueness in the universe outside a specific instance of the CCR.

*(c)* <CCRDataObjectID> is of type xs:string.

Example 18 – <CCRDataObjectID>

<CCRDataObjectID>**5bK74635Hy-.9_uu7K**</CCRDataObjectID>

**TABLE A2.6 CCR <Body> Data Objects**

| Data Object Tag | Description |
|---|---|
| <Payer> | Contains Payer information and basic eligibility data |
| <AdvanceDirectives> | Contains Advance Directives and resuscitation data |
| <Support> | Contains support persons and organizations relevant to patient |
| <FunctionalStatus> | Contains information relating to the patient's functional status and activities of daily living (ADL) |
| <Problems> | Contains Problems |
| <FamilyHistory> | Contains a pertinent or relevant Family Health History |
| <SocialHistory> | Contains a pertinent Social History, such as occupation, marital status, smoking history and other social history and risk factors |
| <Alerts> | Contains the patient's allergies, adverse reactions, and other alerts (for example, enzyme or metabolic pathway deficiencies, pertinent clinical warnings and precautions, and critical lab or result values) |
| <Medications> | Contains the patient's current medications and pertinent medication history |
| <MedicalEquipment> | Contains the patient's medical devices and durable medical equipment (DME) |
| <Immunizations> | Contains the patient's Immunization status/history |
| <VitalSigns> | Contains the patient's pertinent Vital Signs |
| <Results> | Contains the patient's pertinent Results (lab, imaging, interventional) |
| <Procedures> | Contains a history of the patient's pertinent clinical procedures |
| <Encounters> | Contains a history of the patient's pertinent healthcare encounters and pending appointments |
| <PlanOfCare> | Contains all pending orders or other pertinent pending Plan Of Care items including 'Reminders' designed for systems that utilize clinical decision support; it is limited to prospective plans and may not include those from the past |
| <HealthCareProviders> | Contains the patient's relevant healthcare providers (primary provider(s), specialist(s)) |

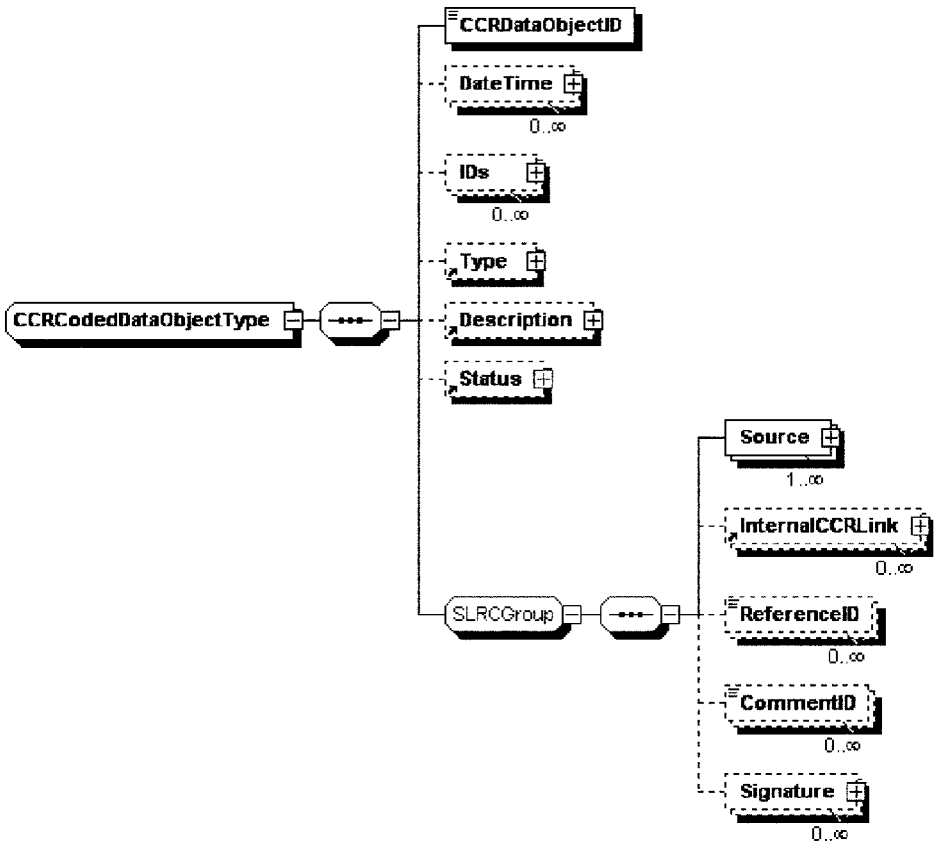


**FIG. A2.9 CCRCodedDataObjectType**

*(2)* <DateTime>

*(a)* <DateTime> is optional and unbound. It is a DateTimeType and is used to express one or more dates/times relevant to the data object.

Example 19 – Data Object <DateTime>

```
<DateTime>
  <Type>
    <Text>Age At Onset</Text>
```

```
  </Type>
  <Age>
    <Value>35</Value>
    <Units><Unit>Years</Unit></Units>
  </Age>
</DateTime>
```

*(3)* <Type>

*(a)* <Type> is optional and is a CodedDescriptionType used to express a <Type> relevant to the data object.

NOTE 1—<Type> is not intended to be explicitly linked to codes under <Description>. Its intent is for sorting and filtering, and it will in the future have its own defined controlled vocabulary source terminology.

Example 20 – Data Object <Type>

```
<Type>
  <Text>Diagnosis </Text>
</Type>
```

*(4)* <Description>

*(a)* <Description> is optional and is a CodedDescriptionType used to describe the concept in the data object as a text string or (preferred) as structured and encoded object-oriented data.

Example 21 – Data Object <Description>

```
<Description>
  <ObjectAttribute>
    <Attribute>Diagnosis</Attribute>
      <AttributeValue>
        <Value>Myocardial Infarction</Value>
        <Code>
          <Value>22298006</Value>
          <CodingSystem>SNOMEDCT</CodingSystem>
          <Version>20050131</Version>
        </Code>
      </AttributeValue>
  </ObjectAttribute>
  <ObjectAttribute>
    <Attribute>Acuity</Attribute>
      <AttributeValue>
        <Value>Acute</Value>
        <Code>
        <Value>53737009</Value>
        <CodingSystem>SNOMEDCT</CodingSystem>
        <Version>20050131</Version>
      </Code>
    </AttributeValue>
  </ObjectAttribute>
  <ObjectAttribute>
    <Attribute>Site</Attribute>
    <AttributeValue>
      <Value>Antereoseptal</Value>
      <Code>
        <Value>20706007</Value>
        <CodingSystem>SNOMEDCT</CodingSystem>
      <Version>20050131</Version>
    </Code>
    </AttributeValue>
  </ObjectAttribute>
  <Code>
    <Value>410.1</Value>
    <CodingSystem>ICD9CM</CodingSystem>
    <Version>2004</Version>
  </Code>
</Description>
```

*(5)* <Status>

*(a)* <Status> is optional and is a CodedDescriptionType used to express a <Status> relevant to the data object.

Example 22 – Data Object <Status>

```
<Status>
  <Text>Active </Text>
</Status>
```

*(6)* <Source>

*(a)* <Source> is unbound and required of all CCRDataObjects so that any data within the CCR can be validated as to its origin/source. It is used to define one or more sources for the data object. It is illustrated in Fig. A2.10 and must be a link to one or more <Actor>, <Reference>, or <Comment>, or it must state under <Description><Text> that the <Source> is 'Unknown' as illustrated in the following example:

Example 23 – <Source> Unknown

```
<Source>
  <Description><Text>Unknown</Text></Description>
</Source>
```

*(b)* <DateTime> under <Source> is optional and is used to define an <ExactDateTime> that the <Source> generated the data object. This is recommended to be included with <Source> as it provides critical clinical knowledge assistance as to how current or recent historically a given data object is.

*(7)* <InternalCCRLink>

*(a)* <InternalCCRLink> is optional and is used to link one CCR data object to another CCR data object. Note that this link is internal within the CCR and is not from one CCR to another CCR. External links, that is, outside the CCR, are defined under <Reference>.

*(b)* <InternalCCRLink> consists of <LinkID>, which is required and is of type xs:string. <LinkID> points to a <CCRDataObjectID> of type xs:string as defined in A2.5.3.1(1). <LinkRelationship> is optional and defines the relationship between the two data objects relative to this link. <Source> is optional, is of type SourceType, and defines the <Source> of the <InternalCCRLink>. It is used to define whom/what established that there was an <InternalCCRLink> between these two data items and what the <LinkRelationship> is. <InternalCCRLink> is defined in detail at the end of this Implementation Guide.

*(8)* <ReferenceID>

*(a)* <ReferenceID> is optional and consists of a link, which is an xs:string to a <ReferenceObjectID> in the <References> section in the CCR Footer. <Reference> is a link to a source external to the CCR and is not to be confused with the <InternalCCRLink>. <Reference> is defined in detail under the CCR Footer section of this Implementation Guide.

*(9)* <CommentID>

*(a)* <CommentID> is optional and consists of a link, which is an xs:string to a <CommentObjectID> in the <Comments> section in the CCR Footer. <Comment> is defined in detail under the CCR Footer section of this Implementation Guide.

A2.5.4 *CCR <Body> Sections:*

A2.5.4.1 *<Payers>*

*(1)* <Payers> contains data on the patient's payer, whether a 'third party' insurance, self-pay, other payer or guarantor, or some combination of payers. <Payers> is used to define which


**FIG. A2.10 SourceType**

entity is the responsible fiduciary for the financial aspects of a patient's care. A patient may have one health plan or many, may have no insurance and be self-pay, or may have a Health Savings Account (HSA) with catastrophic insurance and is otherwise insured or self-pay for the balance.

*(2)* <Payer> is required and unbound (1..∞) and can be used for one or more health plans, worker's compensation, auto insurance, pharmacy benefit manager (PBM), or other pertinent benefit plans, or to list self-pay. At a minimum, the patient's pertinent current payment sources should be listed. <Payers> is illustrated in Fig. A2.11.

*(3)* Also contained within the <Payer> data object is <Authorizations>, which can be used to define pertinent referral, authorization tracking number, procedure, therapy, intervention, device, or similar authorizations for the patient or provider, or both. Authorizations are particularly pertinent to the referral, long-term care, inpatient, and procedure-based/surgical uses for the CCR. <Authorizations> within <Payer> are approved <Authorizations>, not requests for <Authorization>. Requests for <Authorizations> are contained within the <PlanOfCare> section in the CCR Body. The data fields in this CCR Data Object map to the appropriate eligibility and related electronic standards incorporated as the 'Final Rule' in the Codes and Transactions Rules promulgated by the federal HIPAA initiatives under 'Administrative Simplification.'[13]

*(4)* <Payers> is defined in Table A2.7:

Example 24 – Data Object <Payers>

```
<Payers>
<Payer>
 <CCRDataObjectID>_____</CCRDataObjectID>
 <DateTime>
  <Type>
   <Text>Effective Date</Text>
  </Type>
  <ExactDateTime>2005-01-01</ExactDateTime>
 </DateTime>
 <IDs>
   <Type><Text>Subscriber Number</Text></Type>
   <ID>555-55-5555 </ID>
<Source>
 <Actor>
  <ActorID>75871</ActorID>
  <ActorRole><Text>Patient </Text></ActorRole>
 </Actor>
</Source>
 </IDs>
 <IDs>
   <Type><Text>Group Number</Text></Type>
   <ID>H7X8A5 </ID>
<Source>
 <Actor>
  <ActorID>75871</ActorID>
  <ActorRole><Text>Patient </Text></ActorRole>
 </Actor>
</Source>
 </IDs>
 <IDs>
   <Type><Text>Plan Code</Text></Type>
   <ID>520</ID>
<Source>
 <Actor>
  <ActorID>75871</ActorID>
  <ActorRole><Text>Patient </Text></ActorRole>
 </Actor>
</Source>
 </IDs>
 <Type>
  <Text>Supplemental Health Insurance</Text>
```

[13] The most recent modifications were published in the Federal Register on 2/20/2003.

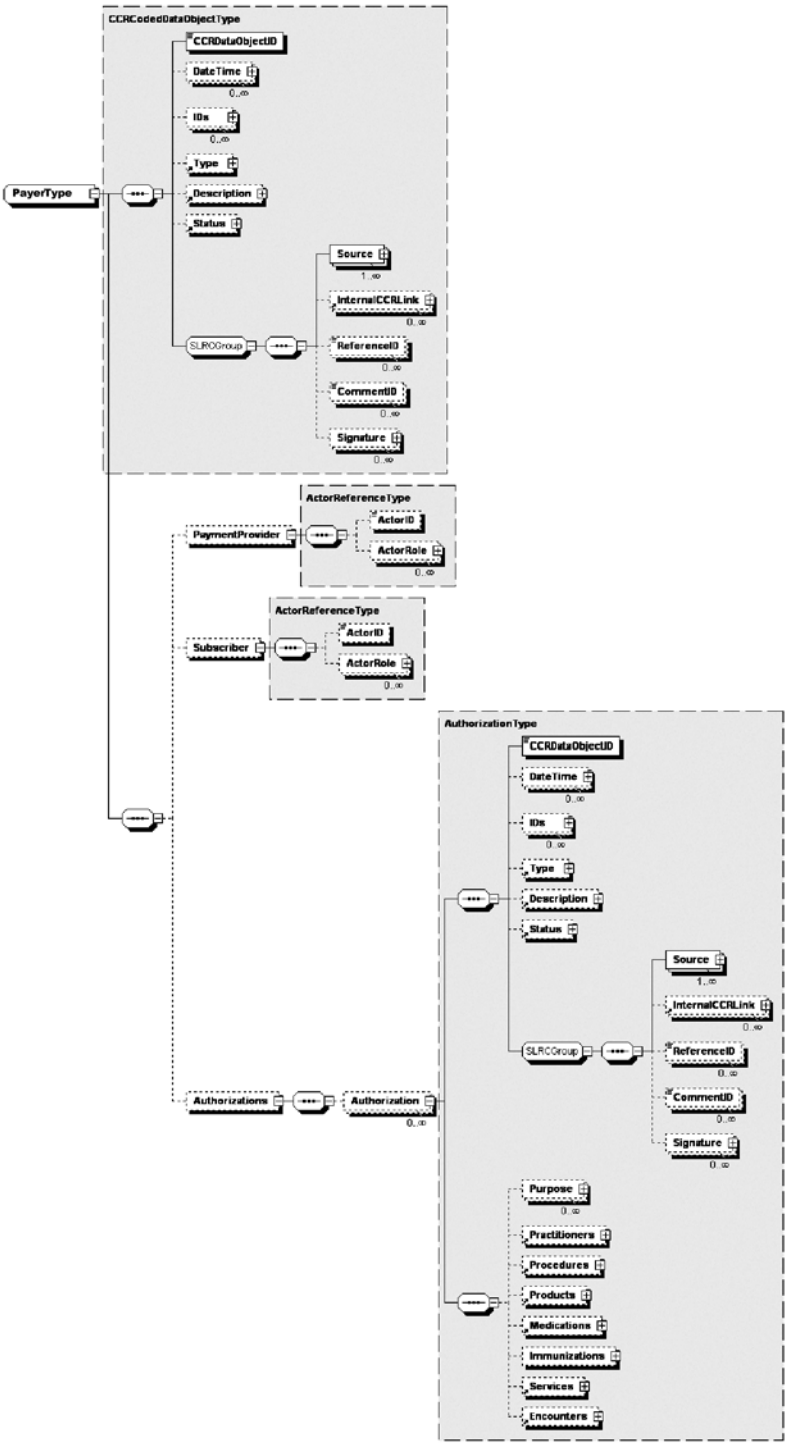


**FIG. A2.11 <Payers> Data Object**

```
  </Type>
<Source>
  <Actor>
    <ActorID>75871</ActorID>
    <ActorRole><Text>Patient </Text></ActorRole>
  </Actor>
</Source>
  <PaymentProvider>
    <ActorID>__________</ActorID>
  </PaymentProvider>
  <Subscriber>
    <ActorID>__________</ActorID>
    <ActorRole><Text>Spouse</Text></ActorRole>
  </Subscriber>
  <Authorizations>
    <Authorization>
<CCRDataObjectID>___________ </CCRDataObjectID>
      <DateTime>
        <Type>
          <Text>Approval Date</Text>
        </Type>
        <ExactDateTime>2004-12-16</ExactDateTime>
```

**TABLE A2.7 <Payers> Object Type Definition Table**

| <Payers> | Accepted Values/Formatting | Optionality/Cardinality | Description |
|---|---|---|---|
| <PaymentProvider> | A link to an <Actor> through <ActorID> of type xs:string with <ActorRole> as 'Payer' | Optional and Bounded to one instance (0..1) | Defines each unique instance of a payer: insurance or self-pay or other, and all the pertinent data needed to contact, bill to, and collect from that payer |
| <DateTime> | Instance of DateType that is restricted to an ExactTime and requires <Type> and <ExactDateTime>, which should be specified to at least the Year/Month/Day. <ExactDateTime> must be expressed as an ISO8601 DateTime | Optional and Unbounded (0.. ∞) | Used to define dates and times relevant to the payer and patient relationship; examples of <DateTimeType> are Benefit Start Date and Benefit Stop Date, used to define the Effective Period or Effective Date, Termination Date, or Renewal Date |
| <Type> | Instance of CodedDescriptionType | Optional and Bounded to one instance (0..1) | This is the type of payer: Healthcare HMO, Healthcare PPO, Healthcare Indemnity, Auto, Worker's Compensation |
| <Subscriber> | This is a link to an Actor through <ActorID> of type xs:string and also defines the role as <ActorRole> that the <Subscriber> plays | Optional and Bounded to one instance (0..1) | Defines the subscriber of the health plan or benefit |
| <IDNumber> | Instance of IDType – see IDType under <Actors> | Optional and Unbounded (0.. ∞) | Examples are Subscriber Number, Member Number (if patient is not subscriber), Plan Number, Group Number, Plan Code, and the like |
| <Authorization> | Instance of AuthorizationType | Optional and Unbounded (0.. ∞) | Can contain all of the specific data regarding an authorization as well as regarding what is authorized or a link to an internal CCR data object that is 'authorized' through this <Authorization> |

```
    </DateTime>
   <IDs>
     <Type><Text>Plan Code</Text></Type>
     <ID>520</ID>
  <Source>
   <Actor>
    <ActorID>75871</ActorID>
    <ActorRole><Text>Patient </Text></ActorRole>
   </Actor>
  </Source>
  </IDs>
     <Type><Text>Referral</Text></Type>
   <Status>
    <Text>Approved</Text>
   </Status>
  <Source>
   <Actor>
    <ActorID>75871</ActorID>
    <ActorRole><Text>Patient </Text></ActorRole>
   </Actor>
  </Source>
   <Encounters>
    <Encounter>
  <CCRDataObjectID>_____ </CCRDataObjectID>
  <Status>
    <Text>Approved</Text>
   </Status>
  <Source>
   <Actor>
    <ActorID>75871</ActorID>
    <ActorRole><Text>Patient </Text></ActorRole>
   </Actor>
  </Source>
     <Practitioners>
      <Practitioner>
       <ActorID>_____</ActorID>
       <ActorRole><Text>Physical Therapy</Text></ActorRole>
      </Practitioner>
     </Practitioners>
      <Frequency>
        <Value>5</Value>
        <Units><Unit>Visits</Unit></Units>
      </Frequency>
      <Indications>
       <Indication>
  <Source>
   <Actor>
    <ActorID>75871</ActorID>
    <ActorRole><Text>Patient </Text></ActorRole>
   </Actor>
  </Source>
        <InternalCCRLink>_____</InternalCCRLink>
       </Indication>
      </Indications>
    </Encounter>
  </Encounters>
     </Authorization>
    </Authorizations>
  </Payer>
  </Payers>
```

A2.5.4.2 *<AdvanceDirectives>*

*(1)* <AdvanceDirectives> is required (if known) in the general use case (requirement is otherwise use-case specific) and bound to one instance (0..1). The <AdvanceDirective> child element is required and unbound (1..∞) and contains data defining the patient's advance directive and any reference to any existing supporting documentation and the physical location of that documentation, such as a durable power of attorney for healthcare. The most recent and up-to-date Advance Directives should be listed in as much detail as possible, and if advance directives are available, they must be included. This section contains data such as the existence of living wills, healthcare proxies, CPR and resuscitation status, etc.

*(2)* <AdvanceDirective> is a CCRCodedDataObjectType as illustrated in Fig. A2.12.

*(3)* <AdvanceDirectives> is defined in Table A2.8.

Example 25 – Data Object <AdvanceDirective>

```
 <AdvanceDirective>
  <CCRDataObjectID>_____</CCRDataObjectID>
  <DateTime>
   <Type>
    <Text>Verification Date</Text>
   </Type>
   <ExactDateTime>2004-09-01T13:25:34-05:00</ExactDateTime>
  </DateTime>
  <Type>
```

**TABLE A2.8 <AdvanceDirective> Object Type Definition Table**

| <Advance Directives> | Accepted Values/Formatting | Optionality/ Cardinality | Description |
|---|---|---|---|
| <DateTime> | Instance of DateType that is restricted to an ExactTime and requires <Type> and <ExactDateTime>. <ExactDateTime> should be specified to at least the Year/Month/Day. <ExactDateTime> must be expressed as an ISO8601 DateTime. | 0..∞ | This should list the DateTime that the Advance Directive was last recorded or verified, or both, and any relevant applicable dates or ranges (applicable from Date A____ to Date B____). DateTime <Type> should express Last Recorded, Verified With Patient, Verified With Parent, Verified With Guardian, Verified With Family, Verified With Durable Power Of Attorney for Healthcare, Verified With Treating Physician, Start Date, End Date. |
| <Type> | An instance of CodedDescriptionType with restricted content that must be one of the defined structured text values. Resuscitation Status, Intubation Status, IV Fluid and Support Status, CPR Status, Antibiotic Status, Life Support Status, Tube Feedings, Other. | 0..1 | Defines the <AdvanceDirective><Type>. |
| <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | 0..∞ | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes “external” IDs such as a driver’s license number, Social Security number, product ID number, serial number, or “internal” IDs such as EHR or system-specific IDs for discrete data objects. |
| <Description> | An instance of CodedDescriptionType | 0..1 | Used to describe the <AdvanceDirective>. Full Code, No Code, No CPR, Cardioversion Only, CPR Drugs Only, No Intubation, IV Fluids Only, No IV Fluids, Antibiotics Only, No Antibiotics, Tube Feedings, No Feeding Tube, No Prolonged Life Support. |
| <Status> | An instance of CodedDescriptionType with restricted content that must be one of the defined structured text values. Current and Verified, Supported By Healthcare Will, Supported By Durable Power of Attorney for Healthcare, Verified With Patient, Verified With Family Only, Verified By Medical Record Only. | 0..1 | This defines the status of the Advance Directive. |

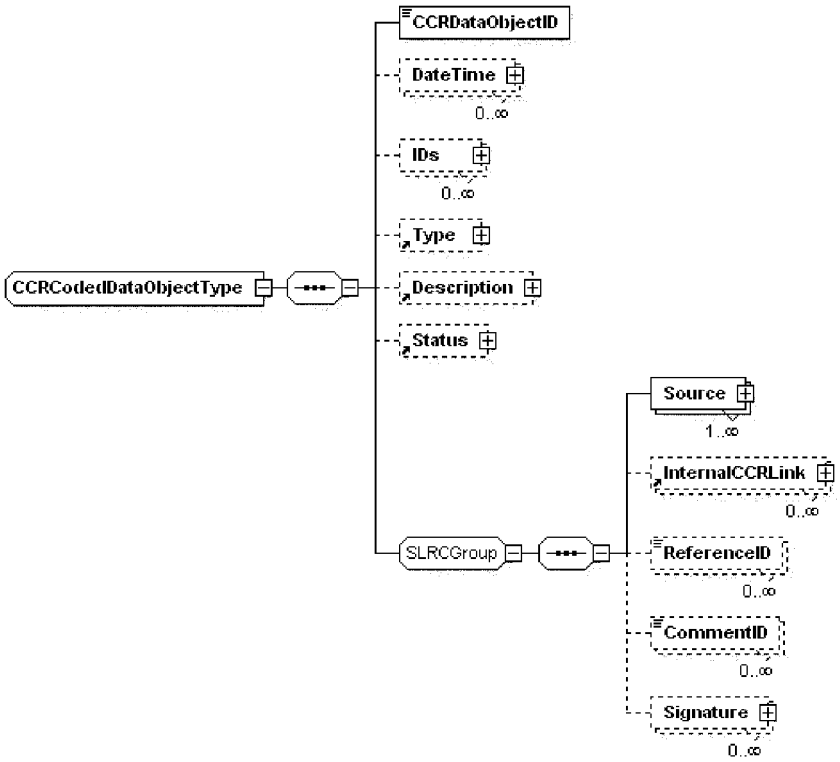


**FIG. A2.12 <AdvanceDirective> Data Object**

```
  <Text>Resuscitation Status</Text>
</Type>
<Description>
  <Text>Full Code</Text>
</Description>
<Status>
  <Text>Verified With Patient</Text>
</Status>
```

```
</AdvanceDirective>
```

A2.5.4.3 *<Support>*

*(1)* <Support> is optional and bound to one instance (0..1). The child element <SupportProvider> is required and unbounded (1..∞) and contains data defining the patient's support providers and contacts – family, 'next of kin,' legal guardian, durable power for healthcare, clergy, caregivers, support organizations – at the time the CCR is generated.

*(2)* This is a link to an Actor through <ActorID> of type xs:string and also defines the role <ActorRole> that the actor is playing when generating the CCR. An Actor and their Role must be specified under <Support>.

*(3)* This data object is not used for listing a patient's healthcare providers, which are listed under the <HealthCareProviders> Section within the CCR Body, with the exception that 'Care Giver' should be listed under <Support>. At a minimum, the patient's key support contacts relative to healthcare decisions, including next of kin, and direct care and patient transport should be listed here.

*(4)* <Support> is illustrated in Fig. A2.13.

Example 26 – Data Object <Support>

```
<Support>
  <SupportProvider>
    <ActorID>_________</ActorID>
    <ActorRole><Text>Mother</Text></ActorRole>
</SupportProvider>
</Support>
```

A2.5.4.4 *<FunctionalStatus>*

*(1)* <FunctionalStatus> is optional and bound to one instance (0..1). The child element <Function> is required and unbounded (1..∞) and contains data defining the patient's functional status—competency, ambulatory status, ability to care for self, activities of daily living—at the time the CCR is generated. Function is essentially a subset of ProblemType (see <Problem> in A2.5.4.5(1)), in that functional problems are essentially clinical problems for the patient. They are specifically defined within the CCR <FunctionalStatus> section, as separate from other clinical problems.

*(2)* <Function> is illustrated in Fig. A2.14.

Example 27 – Data Object <Function>

```
<FunctionalStatus>
 <Function>
 <CCRDataObjectID>___________</CCRDataObjectID>
 <DateTime>
  <Type>
   <Text>Date Of Onset</Text>
  </Type>
  <Age>
   <Value>83</Value>
   <Units><Unit>Years</Unit></Units>
  </Age>
 </DateTime>
  <Type><Text>Mental Status</Text></Type>
 <Description>
  <Text>Does Not Respond To Command</Text>
 </Description>
 <Status><Text>Chronic</Text></Status>
<Source>
 <Actor>
  <ActorID>75307</ActorID>
  <ActorRole><Text>Primary Care Provider</Text></ActorRole>
 </Actor>
</Source>
</Function>
</FunctionalStatus>
```

A2.5.4.5 *<Problems>*

*(1)* <Problem> is optional and bound to one instance (0..1). The child element <Problem> is required and unbounded (1..∞). It contains data defining the patient's relevant clinical problems, conditions, diagnoses, symptoms, findings, and complaints at the time the CCR is generated. At a minimum, a CCR should contain all pertinent current and historical problems relevant to that patient at the point in time a CCR is generated and relative to the <Purpose> of that instance of a CCR. In the special case that the CCR is being created for a referral, each <Problem> should be listed in order of importance for the referral purpose. Otherwise, reverse chronological order of onset should prevail.

*(2)* Problem is an instance of the Complex Data Type ProblemType, which, for example, is also used within <FunctionalStatus>, <FamilyHistory>, <Indication>, and other pertinent data objects in the CCR.

*(3)* <Problem> is illustrated in Fig. A2.15.

*(4)* <Problem> is defined in Table A2.9.

Example 28 – Data Object <Problem>

```
<Problem>
 <CCRDataObjectID>___________</CCRDataObjectID>
 <DateTime>
  <Type>
   <Text>Date of Onset</Text>
  </Type>
  <ExactDateTime>2004-09-01T13:25:34-05:00</ExactDateTime>
 </DateTime>
 <Type>
  <Text>Diagnosis</Text>
 </Type>
 <Description>
  <ObjectAttribute>
  <Attribute>Diagnosis</Attribute>
  <AttributeValue>
   <Value>Myocardial Infarction</Value>
   <Code>
    <Value>22298006</Value>
    <CodingSystem>SNOMEDCT</CodingSystem>
    <Version>20050131</Version>
   </Code>
  </AttributeValue>
 </ObjectAttribute>
 <ObjectAttribute>
  <Attribute>Acuity</Attribute>
```

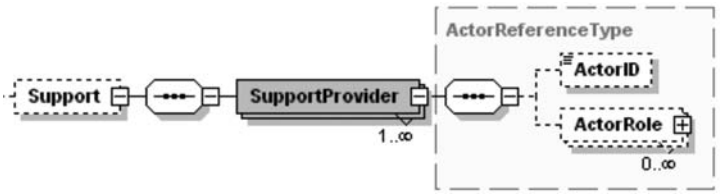


**FIG. A2.13 Data Object <Support>**

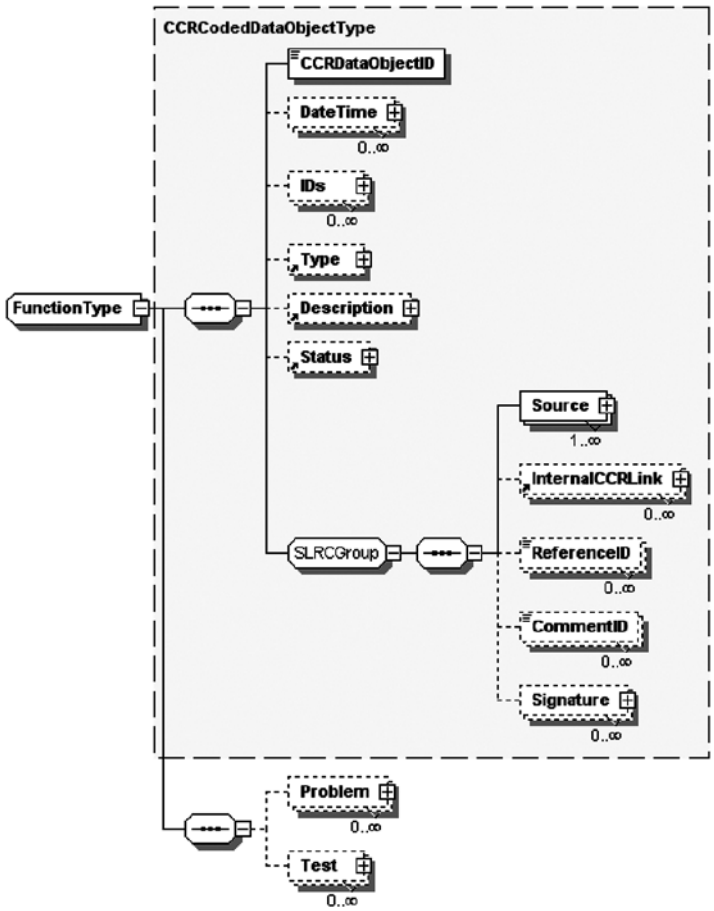


**FIG. A2.14 Data Object <Function>**

```
  <AttributeValue>
    <Value>Acute</Value>
    <Code>
      <Value>53737009</Value>
      <CodingSystem>SNOMEDCT</CodingSystem>
      <Version>20050131</Version>
    </Code>
      </AttributeValue>
 </ObjectAttribute>
 <ObjectAttribute>
      <Attribute>Site</Attribute>
      <AttributeValue>
        <Value>Antereoseptal</Value>
        <Code>
          <Value>20706007</Value>
          <CodingSystem>SNOMEDCT</CodingSystem>
          <Version>20050131</Version>
        </Code>
      </AttributeValue>
    </ObjectAttribute>
  <Code>
    <Value>410.1</Value>
    <CodingSystem>ICD9CM</CodingSystem>
    <Version>2004</Version>
  </Code>
 </Description>
 <Status>
   <Text>Resolved</Text>
 </Status>
<Source>
 <Actor>
   <ActorID>75307</ActorID>
<ActorRole><Text>Primary Care Provider</Text></ActorRole>
 </Actor>
</Source>
 <Episodes>
   <Number>2</Number>
   <Episode>
 <CCRDataObjectID>_____ </CCRDataObjectID>
     <DateTime>
       <Type>
         <Text>Age At Onset</Text>
       </Type>
       <Age>
         <Value>35</Value>
         <Units><Unit>Years</Unit></Units>
       </Age>
     </DateTime>
     <Status>
       <Text>Resolved</Text>
     </Status>
<Source>
 <Actor>
   <ActorID>75307</ActorID>
<ActorRole><Text>Primary Care Provider</Text></ActorRole>
 </Actor>
</Source>
   </Episode>
<Source>
 <Actor>
   <ActorID>75307</ActorID>
<ActorRole><Text>Primary Care Provider</Text></ActorRole>
 </Actor>
</Source>
 </Episodes>
</Problem>
```

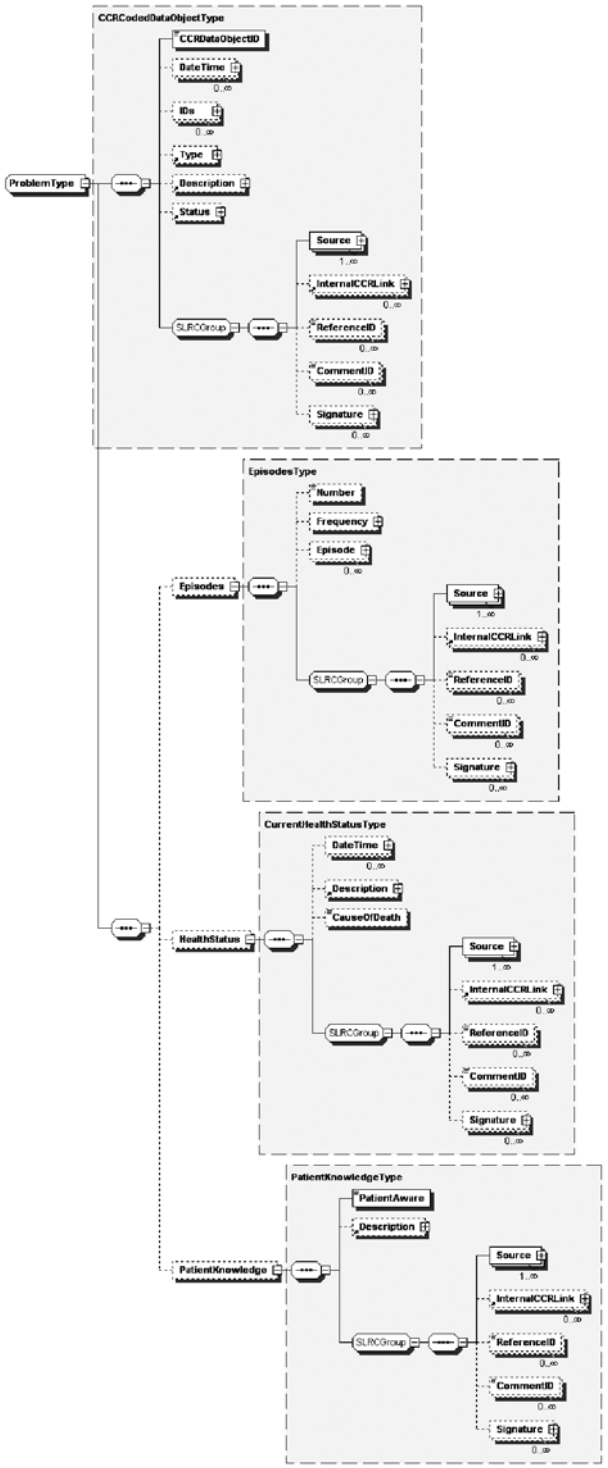


**FIG. A2.15 Data Object <Problem>**

A2.5.4.6 *<FamilyHistory>*

*(1)* <FamilyHistory> is optional and bound to one instance (0..1). The child element <FamilyProblemHistory> is required and unbounded (1..∞) and contains data defining the patient's blood or genetic relatives in terms of possible or relevant risk factors. At a minimum, all family history that has a potential impact on the patient's healthcare risk profile should be listed. Family history is a key risk factor of high predictive value in diagnosis and treatment for many healthcare conditions, and is often difficult to collect at each encounter and maintain between encounters. Therefore, inclusion of <FamilyHistory> data in the CCR is extremely important.

*(2)* <FamilyProblemHistory> includes an instance of the Complex Data Type ProblemType derived by Restriction, which is a variation of <Problem>. If only the <Problem> is known but not which <FamilyMember> or members have or

**TABLE A2.9 <Problem> Object Type Definition Table**

| <Problem> | Accepted Values/Formatting | Optionality/Cardinality | Description |
|---|---|---|---|
| <DateTime> | This can be an exact DateTime, an age, an approximate DateTime, or a DateTime range. | Optional and Unbounded (0..∞). | Used to define dates and times relevant to the patient's <Problem>. Date of Onset, From Date A___ To Date B____, Since Age___, etc. |
| <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | Optional and Unbounded (0..∞). | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. |
| <Type> | An instance of CodedDescriptionType with restricted content that must be one of the defined structured text values. Problem, Condition, Diagnosis, Symptom, Finding, Complaint, Functional Limitation. | Optional and Bounded to one instance (0..1). | Defines the <Problem><Type>. |
| <Description> | An instance of CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. It is recommended that, when possible, all problems be coded (ICD-9CM, ICD-10, or SNOMED, or both). | Optional and Bounded to one instance (0..1). | Myocardial Infarction, Nausea, Headache, Parkinson's Disease, etc. |
| <Status> | An instance of CodedDescriptionType with restricted content that must be one of the defined structured text values. Active, Inactive, Chronic, Intermittent, Recurrent, Rule Out, Ruled Out, Resolved. | Optional and Bounded to one instance (0..1). | Defines the <Status> of the <Problem>. |
| <Episodes> | <Episodes> has children <Number> (0..1), <Frequency> (0..1), <Episode> (0..∞), and <Duration> (0..1). | Optional and Bound to one instance (0..1). | Used to define one or more occurrences of a problem. Episodes should be listed for recurrent or repetitive problems, conditions, diagnoses, or symptoms, rather than listing a problem multiple times in the problem list. |
| <HealthStatus> | Has children <DateTime> (0..∞), <Description> (0..1), <CauseOfDeath> (0..1). <DateTime> can be an Exact DateTime, an age, an approximate DateTime, or a DateTime range. <Description> and <CauseOfDeath> are instances of Coded DescriptionType with restricted content that must be one of the defined structured text values. | Optional and Bound to one instance (0..1). | Used to define the health status of the Actor whom the problem applies to (used more commonly in Family History). <Description> is an instance of a CodedDescriptionType and is confined to the values: Alive And Well, In Remission, Symptom Free, Ill, Chronically Ill, Severely Ill, Critical, Terminal, Disabled, Severely Disabled, Deceased; <CauseOfDeath> defines if this condition was the cause of death of the Actor whom the problem applies to – values are Yes, No, Unknown; <DateTime> is an instance of DateType and could be an exact date or date/time, an age, or an approximate date. <DateTime> is used to set the <DateTime> that applies to the <HealthStatus> and is also used to record the 'Time of Death' for problems that are a <CauseOfDeath>. |
| <PatientKnowledge> | <PatientKnowledge> has children <PatientAware> (0..1) and <Description> (0..1). | Optional and Unbounded (0..1). | Used to define whether or not the patient is aware of a <Problem> and any reason why they are not aware. <PatientAware> restricted to Yes, No, Unknown. <Description> is a CodedDescriptionType with restricted content that must be one of the defined structured text values: Patient Request Not To Know, Family Request For Patient Not To Know, Durable Power Request For Patient Not To Know. |

have had that <Problem>, then only the <Problem> need be listed. If the affected <FamilyMember> is known, then <FamilyMember> must be listed and all problems must be constrained and listed discretely by Family Member. In addition to <Problem>, <FamilyHistory> contains the element <FamilyMember>. Essentially the <FamilyHistory> section of the CCR is designed to contain a <FamilyHistory> of diagnoses, conditions, and problems as well as the current health status of family members as well as what diagnoses, conditions, or problems, or combinations thereof, were the causes of death for a deceased relative. Risk factors relevant to family members, such as a family member's smoking, ETOH, dietary, BMI, activity, toxic exposure, or other risks relative to the family member's own health should also be itemized in <FamilyHistory>.

*(3)* <FamilyProblemHistory> is an instance of the Complex Data Type FamilyHistoryType illustrated in Fig. A2.16.

*(4)* <FamilyProblemHistory> consists of two key elements <Problem> and <FamilyMember>. Note that a single <Problem> can affect one or more <FamilyMember>, and a single <FamilyMember> can have more than one <Problem>. As noted in A2.5.4.6(2), in <FamilyProblemHistory>, all problems must be constrained and listed discretely by Family Member.

*(5)* <FamilyMember> is a link to an <Actor> through an <ActorID> of type xs:string. <FamilyMember> must include an <ActorRole>. Each <FamilyMember> <ActorRole> should reflect the <Relation> of that <FamilyMember> to the <Patient>. <FamilyHistory> is illustrated in Example 29.

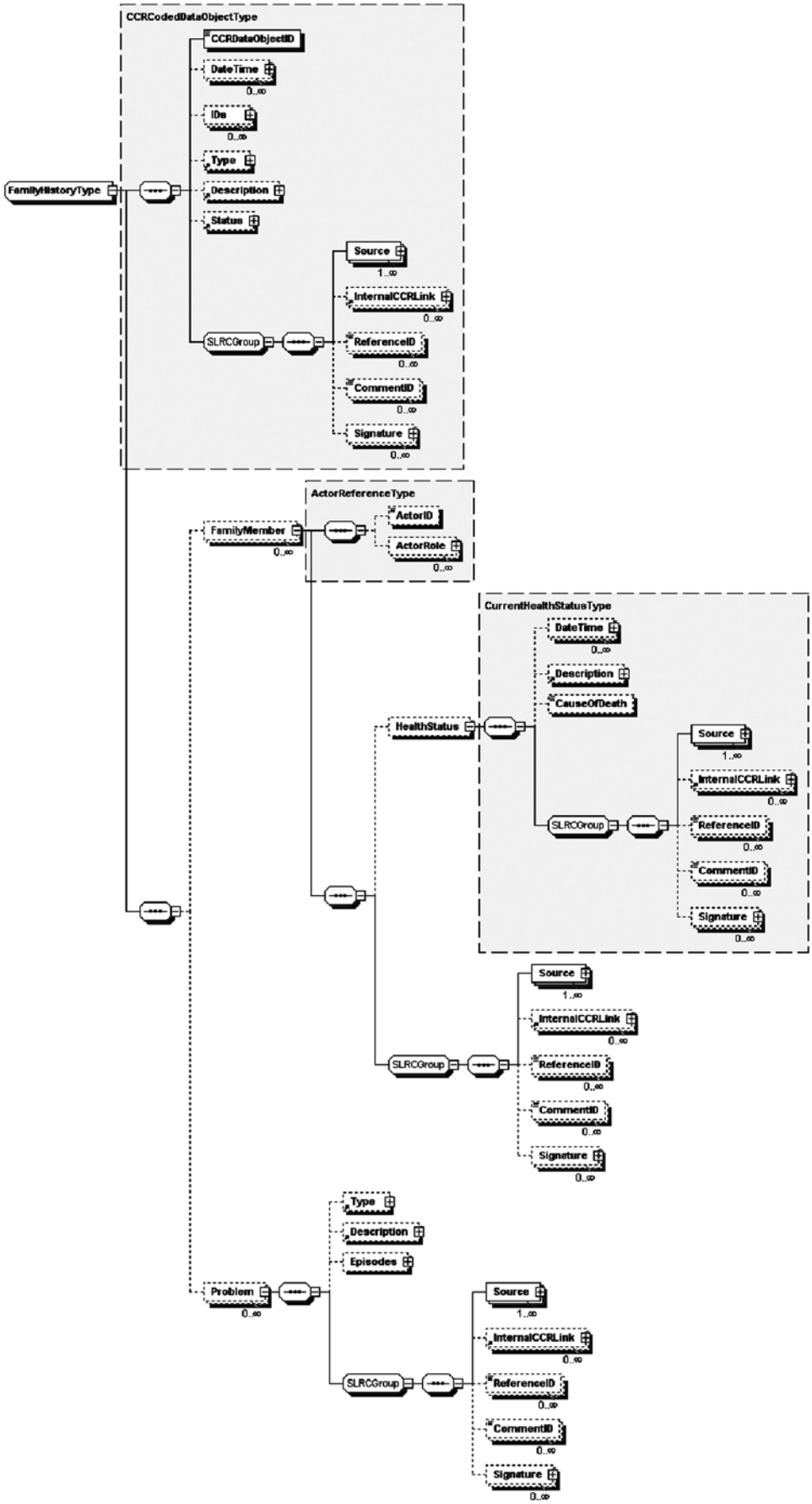


**FIG. A2.16 FamilyHistoryType Data Object**

Example 29 – Data Object <FamilyHistory>

```
<FamilyHistory>
 <FamilyProblemHistory>
  <CCRDataObjectID> _____</CCRDataObjectID>
<Source><Actor><ActorID>_____</ActorID></Actor></
Source>
  <FamilyMember>
    <ActorID>_____</ActorID>
    <ActorRole>
     <Text>Father</Text>
    </ActorRole>
   <HealthStatus>
    <Description>
     <Text>Deceased</Text>
    </Description>
    <CauseOfDeath>Yes</CauseOfDeath>
<Source><Actor><ActorID>_____</ActorID></Actor></
Source>
   </HealthStatus>
<Source><Actor><ActorID>_____</ActorID></Actor></
Source>
  </FamilyMember>
  <Problem>
   <Type>
    <Text>Diagnosis</Text>
   </Type>
   <Description>
    <ObjectAttribute>
     <Attribute>Diagnosis</Attribute>
      <AttributeValue>
       <Value>Myocardial Infarction</Value>
       <Code>
        <Value>22298006</Value>
        <CodingSystem>SNOMEDCT</CodingSystem>
        <Version>20050131</Version>
       </Code>
      </AttributeValue>
    </ObjectAttribute>
   </Description>
   <Episodes>
    <Number>1</Number>
    <Episode>
  <CCRDataObjectID> _____</CCRDataObjectID>
     <DateTime>
      <Type>
       <Text>Age At Onset</Text>
      </Type>
      <Age>
       <Value>57</Value>
       <Units><Unit>Years</Unit></Units>
      </Age>
     </DateTime>
<Source><Actor><ActorID>_____</ActorID></Actor></
Source
    </Episode>
<Source><Actor><ActorID>_____</ActorID></Actor></
Source
  </Episodes>
<Source><Actor><ActorID>_____</ActorID></Actor></
Source
</Problem>
 </FamilyProblemHistory>
</FamilyHistory>
```

A2.5.4.7 *<SocialHistory>*

*(1)* <SocialHistory> is optional and bound to one instance (0..1). The child element <SocialHistoryElement> is required and unbounded (1..∞) and contains data defining the patient's occupational, personal (for example, lifestyle), social, and environmental history and health risk factors. Within the CCR, items commonly grouped under administrative data (ADT) in other healthcare systems and standards are included in <SocialHistory>, such as Marital Status, Race, Ethnicity, and Religious Affiliation, as all of these have relevance to healthcare and possible preferences, optimization, or restrictions on healthcare interventions, or combinations thereof, and therapeutic options for a specific patient. In addition, these ADT data are all highly confidential and private data attributes about a patient and require the identical protections afforded all patient healthcare data.

*(2)* <Type> under <SocialHistoryElement> within <SocialHistory> is a CodedDescriptionType with restricted content that must be one of the defined structured text values. <Type> defines each discrete data object within <SocialHistory>, and each time a new data object is generated, a new instance of <SocialHistoryElement> must be initiated.

*(3)* SocialHistoryType is illustrated in Fig. A2.17.

*(4)* <SocialHistoryElement> is defined in Table A2.10.

Example 30 – Data Object <SocialHistory>

```
<SocialHistory>
 <SocialHistoryElement>
 <CCRDataObjectID>_____</CCRDataObjectID>
 <DateTimeRange>
  <BeginRange>
   <Age>
    <Value> 17</Value>
    <Units>
     <Unit> Year</Unit>
    </Units>
   </Age>
  </BeginRange>
  <EndRange>
   <Age>
    <Value> 67</Value>
    <Units>
     <Unit> Year</Unit>
    </Units>
   </Age>
  </EndRange>
 </DateTimeRange>
</DateTime>
<Type>
 <Text>Tobacco Use</Text>
</Type>
<Description>
 <Object Attribute>
  <Attribute>Type</Attribute>
  <AttributeValue>
   <Value> Cigarettes</Value>
   <Code>
    <Value>_____</Value>
    <CodingSystem> SNOMEDCT</CodingSystem>
    <Version> 20050131</Version>
   </Code>
  </AttributeValue>
 </Object Attribute>
 <Object Attribute>
  <Attribute>Packs Per Day</Attribute>
  <AttributeValue>
   <Value> 1.5</Value>
   <Code>
    <Value>_____</Value>
    <CodingSystem> SNOMEDCT</CodingSystem>
    <Version>20050131 </Version>
   </Code>
  </AttributeValue>
 </Object Attribute>
</Description>
 <Status>
  <Text>Historical</Text>
 </Status>
 </Source>
</SocialHistoryElement>
```

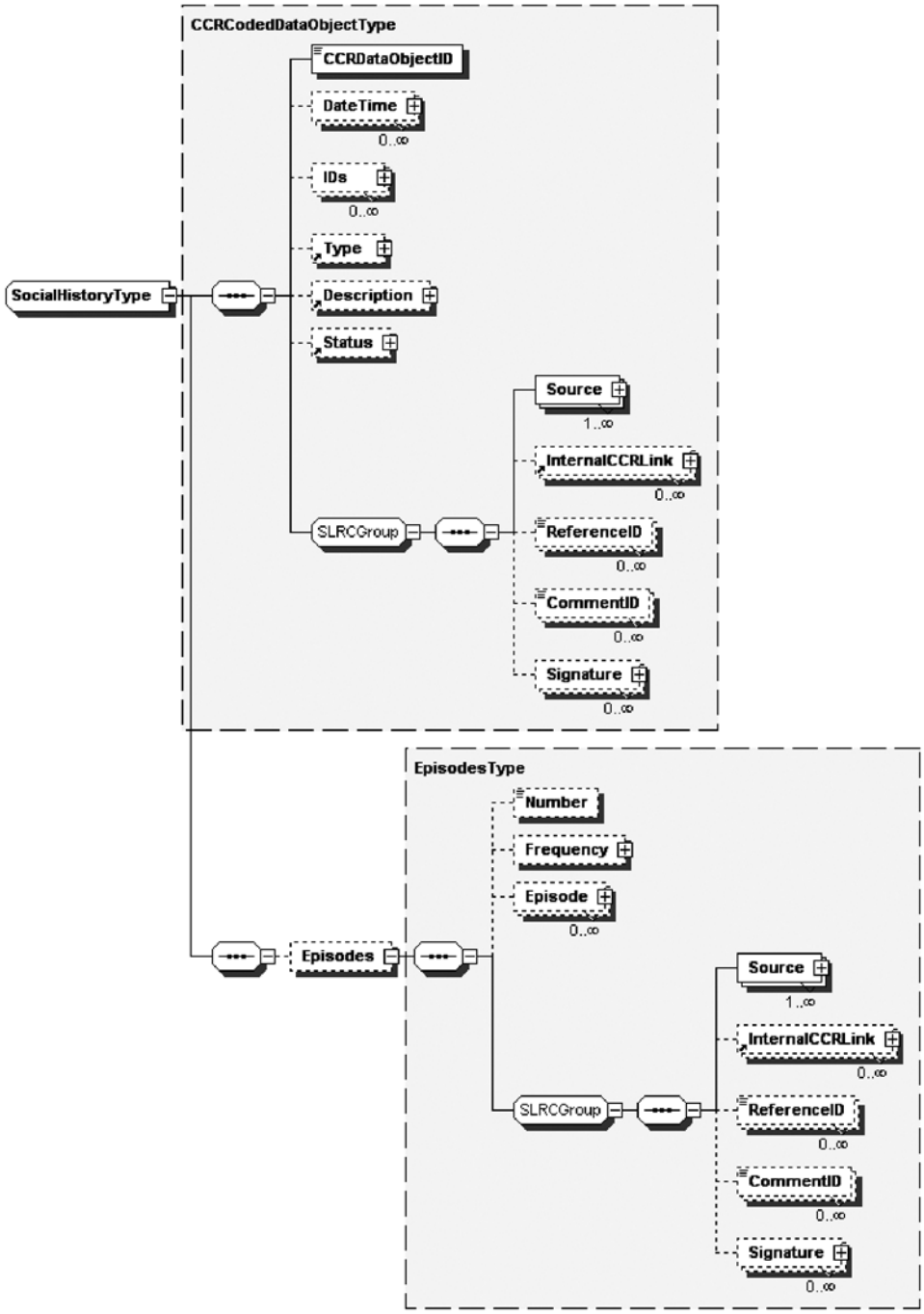


**FIG. A2.17 Data Object <SocialHistoryType>**

A2.5.4.8 *<Alerts>*

*(1)* <Alerts> is optional and bound to one instance (0..1). The child element <Alert> is required and unbounded (1..∞) and contains data used to define a patient's warnings such as allergies, adverse reactions, and other alerts (for example, enzyme or metabolic pathway deficiencies and critical lab or result values). In the CCR, <Alerts> should be used to highlight severe or critical issues, such as a history of an anaphylactic reaction to a bee sting (a severe form of allergy with a life-threatening adverse reaction) or a critical lab value such as potassium level of 6.6 mEQ/l. Other examples of <Alerts> could be the report of a very abnormal Pap smear or a mammogram generated through routine screening.

*(2)* <Alerts> is a data container for data that represent critically important variations from the norm that have temporal relevance in the near term or long term to the patient's condition and therapeutic options. They are prompts for near-term action or consideration of action or for warnings relative to therapeutic options to which the patient could have a potentially harmful outcome. <Alerts> in the CCR are, in

**TABLE A2.10 <SocialHistoryType> Object Type Definition Table**

| <SocialHistory> | Accepted Values/Formatting | Optionality/Cardinality | Description |
|---|---|---|---|
| <DateTime> | This can be an exact DateTime, an age, an approximate DateTime, or a DateTime range. | Optional and Unbounded (0..∞). | Used to define dates and times relevant to the patient's <SocialHistory>. Date of Onset, From Date A___ To Date B____, At Age ____, Since Age___, etc. |
| <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | Optional and Unbounded (0..∞). | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. |
| <Type> | An instance of CodedDescriptionType with restricted content that must be one of the defined structured text values. Marital Status, Race, Ethnicity, Religious Preference, Living Situation, Employment, Tobacco Use, ETOH Use, Recreational Drug Use, Toxic Exposure, Treatment Restrictions. | Optional and Bounded to one instance (0..1). | Defines what <Type> of social history is being defined (Tobacco Use, Living Situation, Marital Status, etc.) <Type> defines each discrete data object within <SocialHistory>, and each time a new data object is generated, a new instance of <RiskFactorHistory> must be initiated. |
| <Description> | An instance of CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. It is recommended that, when possible, all social history entries be coded with SNOMED CT. | Optional and Bounded to one instance (0..1). | Defines the specific attributes of the social history defined under <Type>. |
| <Status> | An instance of CodedDescriptionType with restricted content that must be one of the defined structured text values. Current, Historical. | Optional and Bounded to one instance (0..1). | Defines the <Status> of the <SocialHistory><Description>. |
| <Episodes> | <Episodes> has children <Number> (0..1), <Frequency> (0..1), <Episode> (0..∞), and <Duration> (0..1). | Optional and Bounded to one instance (0..1). | Used to define one or more occurrences of a social history item. Episodes should be listed for social history items that have an episodic component or character, such as changing Marital Status, Tobacco Use, ETOH Use, Employment, etc. |

other words, prompts or warnings related to patient safety. The presence of an <Alert> in the CCR is a conscious effort to emphasize safety even though it may be redundant with data in another section of the CCR. For example, an abnormally elevated potassium level would be a <Result> in the patient's CCR <Results> section. An Alert may have significant historical value, but it is up to the discretion of the author of the CCR to determine the relevance of a specific alert in the context of the <Purpose> for which a specific instance of the CCR is being created. <Alerts> are not to be confused with 'Reminders' that are defined under the <PlanOfCare> section of this Implementation Guide. However, both <Alerts> and 'Reminders' are examples of the types of specific content data fields found within the CCR that support clinical decision support.

*(3)* <Alert> is illustrated in Fig. A2.18.

*(4)* <Alert> is defined in Table A2.11.

Example 31 – <Alert> Data Object

```
<Alert>
 <CCRDataObjectID>_____</CCRDataObjectID>
 <DateTime>
  <Type>
   <Text>Onset Date</Text>
  </Type>
  <ApproximateDateTime>
   <Text>As A Child</Text>
  </ApproximateDateTime>
 </DateTime>
 <Type>
  <Text>Allergy</Text>
 </Type>
 <Status>
  <Text>Current</Text>
 </Status>
<Source><Actor><ActorID>_____</ActorID></Actor></Source>
 <Agent>
  <Products>
   <Product>
 <CCRDataObjectID>_____ </CCRDataObjectID>
      <Description>
       <Text>Penicillin</Text>
       <Code>
        <Value>_____</Value>
        <CodingSystem>RxNorm</CodingSystem>
        <Version>_____</Version>
       </Code>
      </Description>
<Source><Actor><ActorID>_____</ActorID></Actor></Source>
<Product><ProductName><Text>PenVK </Text></ProductName></
Product>
    </Product>
  </Products>
 </Agent>
 <Reaction>
  <Description>
   <ObjectAttribute>
    <Attribute>Reaction</Attribute>
    <AttributeValue>
     <Value>Anyphylaxis</Value>
     <Code>
      <Value>_____</Value>
      <CodingSystem>SNOMEDCT</CodingSystem>
      <Version>20050131</Version>
     </Code>
    </AttributeValue>
   </ObjectAttribute>
  </Description>
  <Severity>
   <ObjectAttribute>
    <Attribute>Severity</Attribute>
   <AttributeValue>
    <Value>Life Threatening</Value>
    <Code>
```

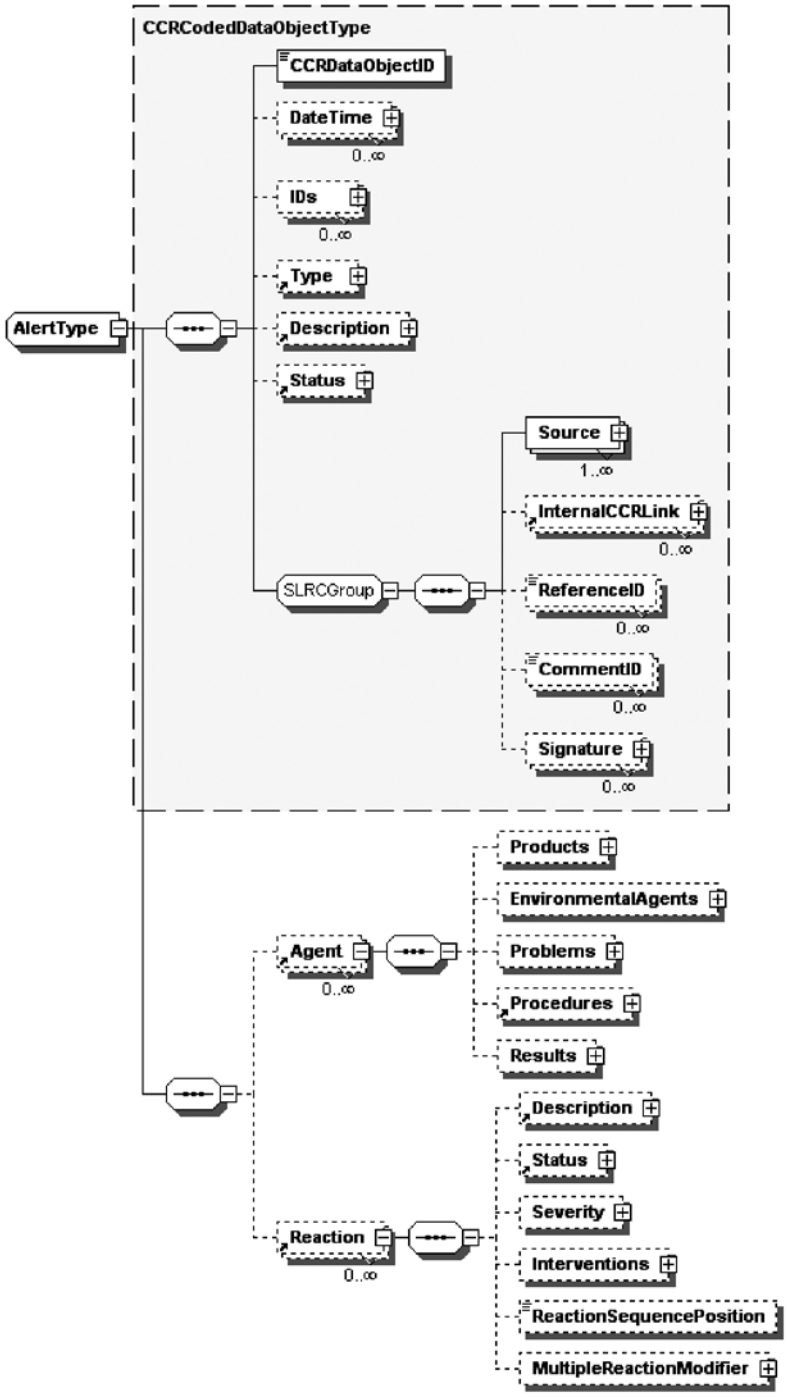


**FIG. A2.18 <Alert> Data Object**

```
        <Value>_____</Value>
        <CodingSystem>SNOMEDCT</CodingSystem>
        <Version>20050131</Version>
      </Code>
    </AttributeValue>
  </ObjectAttribute>
  </Severity>
  <Interventions>
    <Intervention>
<CCRDataObjectID>_____ </CCRDataObjectID>
<Source><Actor><ActorID>_____</ActorID></Actor></Source>
<CCRDataObjectID>_____ </CCRDataObjectID>
          <Description>
            <Text>Cardiopulmonary Resuscitation</Text>
            <Code>
              <Value>_____</Value>
              <CodingSystem>RxNorm</CodingSystem>
              <Version>_____</Version>
            </Code>
          </Description>
<Source><Actor><ActorID>_____</ActorID></Actor></Source>
        </Procedure>
      </Procedures>
    </Intervention>
  </Interventions>
</Reaction>
```

**TABLE A2.11 <Alert> Object Type Definition Table**

| <Alert> | Accepted Values/Formatting | Optionality/Cardinality | Description |
|---|---|---|---|
| <DateTime> | This can be an exact DateTime, an age, an approximate DateTime, or a DateTime range. | Optional and Unbounded (0..∞). | Used to define dates and times relevant to the patient's <Alert>. Date of Onset, From Date A___ To Date B_ ___, At Age ____, Since Age___, and so forth. |
| <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | Optional and Unbounded (0..∞). | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. |
| <Type> | An instance of CodedDescriptionType with restricted content that must be one of the defined structured text values. Allergy, Adverse Reaction, Alert, Critical Result. | Optional and Bounded to one instance (0..1). | Defines what <Type> of <Alert> is being itemized. |
| <Description> | An instance of CodedDescriptionType that supports a free text string, a structured text string or strings, or a structured and coded text string or strings. It is recommended that, when possible, all instances of <Alert> be coded with SNOMED CT. | Optional and Bounded to one instance (0..1). | Defines the specific attributes of the <Alert> defined under<Type>. |
| <Status> | An instance of CodedDescriptionType with restricted content that must be one of the defined structured text values. Current, Historical, Unknown. | Optional and Bounded to one instance (0..1). | Defines the <Status> of the <Alert><Description>. |
| <Agent> | <Agent> has children <Products>, <EnvironmentalAgents>, <Problems>, <Procedures>, and <Results>. | Optional and Unbounded (0..∞). If an <Agent> is unknown, then "Unknown" is required content for <Agent>, | Defines an <Agent> that caused an <Alert>, specifically a <Product> (Penicillin), an <EnvironmentalAgent> (dust, bee stings), a <Problem> (G6PD Deficiency), a <Procedure> (IVP, Endoscopy), or a , <Result> (K+, Na+, Dig Level, Mammogram, PAP, Pathology, Cytology). |
| <Reaction> | <Reaction> has children <Description>, <Severity>, and <Interventions>. | Optional and Unbounded (0..∞). | <Description> is used to describe the <Reaction>, if any, that the <Alert> addresses – Rash, Angioedema, Anaphylaxis, Nausea, and so forth <Description> can be a string or can be used to encode the reaction (recommended/preferred). |
| <Status> | An instance of CodedDescriptionType, <Status> is used to define pertinent positive or pertinent negative reactions. | Optional and Bounded to one instance (0..1). | Pertinent Positive: <Description><Text>Anaphylaxis<Severity>Life Threatening<Intervention>Intubation Pertinent Negative: <Description><Text>Anaphylaxis<Status>Not Present |
| <Severity> | An instance of CodedDescriptionType with restricted content that must be one of the defined structured text values. Minimal, Mild, Moderate, Severe, Life Threatening, Critical. | Optional and Bounded to one instance (0..1). | Defines the <Severity> of the <Reaction>. |
| <Interventions> | <Interventions> has child <Intervention> to support one or more <Interventions> used to respond to a <Reaction>. <Intervention> has children <Procedures>, <Products>, <Medications>, <Immunizations>, <Services>, and <Encounters> | <Interventions> is Optional and Bounded to one instance (0..1). <Intervention> is Required if <Interventions> is used and is Unbounded (0..∞). | Defines any<Intervention>used to treat a <Reaction>. |
| <Reaction Sequence Position> | Type xs:integer. | Optional and Bounded to one instance (0..1). | Used only to define sequence order when there is more than one <Reaction>. <ReactionSequencePosition> must be an integer starting a 1. If there is only one (1) reaction, then this tag is not used. |
| <Mulitple Reaction Modifier> | CodedDescriptionType | Optional and Bounded to one instance (0..1). | Used to define the relationship between reactions when there is more than one <Reaction>. Can contain the values AND, OR, or THEN to denote if for an instance of more than one <Reaction> if all reactions were present together (AND), or if each of the listed reactions might have occurred (OR), or if the reactions were sequential (THEN). |

</Alert>

A2.5.4.9 *<Medications>, <MedicalEquipment>, and <Immunizations>*

*(1)* <Medications>, <MedicalEquipment>, and <Immunizations> are optional and bound to one instance (0..1). Their respective child elements <Medication>, <Equipment>, and <Immunization> are required and unbounded (1..∞) and contain data defining the patient's current and historical <Medications>, <MedicalEquipment>, and <Immunizations>. Each of these categories exist as separate sections in the CCR, but their child elements utilize the same XML data object definition and tagging. They are all instances of the Complex Data Type StructuredProductType.

*(2)* <Medications> is used to define a patient's current medications and pertinent medication history. <MedicalEquipment> is used to define a patient's implanted and external medical devices and equipment that their health status depends on, as well as any pertinent equipment or device history. In

addition, <MedicalEquipment> is used to itemize any pertinent current or historical durable medical equipment (DME) used to help maintain the patient's health status. <Immunizations> is used to define a patient's current <Immunization> status and pertinent <Immunization> history.

*(3)* To reiterate, all medications, immunizations, implanted and external medical devices, as well as all DME, are defined within the CCR as <Products> and are defined by the Complex Data Type StructuredProductType. They are stored within the CCR and intended for display as separate sections. They are defined discretely by <Type>, which is constrained to the values: Medication, IV Fluid, Parental Nutrition, Supplemental Nutrition, Immunization, Disposable, Supplies, Device, Implantable Device, Durable Medical Equipment.

*(4)* Careful consideration has gone to make StructuredProductType within the CCR map explicitly to and support:

*(a)* NCPDP Script and the ongoing cooperative work on SIG definitions for medication prescriptions and orders with NCPDP, HL7, and ASTM.

NOTE 1—The <Directions> under <Product> within this Implementation Guide maps explicitly to the latest available version of NCPCP Script SIG submitted (DERF) by the SIG Workgroup October 7, 2005.

*(b)* Immunization reporting requirements of State and Federal agencies and immunization registries, particularly to support the data needs of the Centers for Disease Control and Prevention (CDC).

*(c)* Product and manufacturer identification and tracking of implanted medical devices.

*(d)* Home oxygen and all other DME tracking, reporting, authorization, and clinical validation/justification under Medicare/Medicaid and X12 837.

*(5)* The Complex Data Type StructuredProductType as illustrated in Fig. A2.19.

*(6)* The Complex Data Type StructuredProductType are defined in Table A2.12.

Example 32 – <Medication>/<Product>

```
<Medication>
 <CCRDataObjectID>_____</CCRDataObjectID>
 <DateTime>
  <Type>
   <Text>Prescription Date</Text>
  </Type>
  <ExactDateTime>2004-09-01T13:25:34-05:00</ExactDateTime>
 </DateTime>
 <Type>
  <Text>Medication</Text>
 </Type>
<Source>
 <Actor>
  <ActorID>75307</ActorID>
  <ActorRole><Text>Primary Care Provider</Text></ActorRole>
 </Actor>
</Source>
 <Product>
  <ProductName>
    <Test>Amoxicillin</Text>
     <Code>
      <Value>_______</Value>
      <CodingSystem>RxNorm</CodingSystem>
      <Version>________</Version>
     </Code>
  </ProductName>
  <BrandName>
    <Test>Amoxil</Text>
    <Code>
     <Value>_______</Value>
     <CodingSystem>RxNorm</CodingSystem>
     <Version>________</Version>
    </Code>
  </BrandName>
  <Strength>
   <Value>250</Value>
   <Units>
   <Unit>mg</Unit>
   </Units>
  </Strength>
 </Product>
 <Quantity>
  <Value>30</Value
   <Units>
  <Unit>Capsules</Unit>
   </Units>
 </Quantity>
 <Directions>
 <Direction>
  <Dose>
   <Value>1</Value>
  </Dose>
  <Route>
    <Text>po</Text>
  </Route>
  <Frequency>
   <Value>tid</Value>
  </Frequency>
  <Duration>
   <Value>10</Value>
   <Units><Unit>Days</Unit></Units>
  </Duration>
 </Direction>
 </Directions>
</Medication>
```

A2.5.4.10 *<VitalSigns> and <Results>*

*(1)* <VitalSigns> and <Results> are optional and bound to one instance (0..1). Their respective child elements, each named <Result>, are required and unbounded (1..∞) and contain data defining the patient's current and historically relevant <VitalSigns> and <Results>. Vital Signs are technically Results ('Observations'), but <VitalSigns> and <Results> exist as separate sections in the CCR, although they utilize the same XML data object definition and tagging. They are both instances of the Complex Data Type ResultType.

*(2)* Vital Signs are defined within the CCR as a section in order to follow clinical convention. At a minimum, pertinent vital signs, such as the most recent, maximum or minimum, or both, baseline, or relevant trends should be listed. For <Results>, all pertinent as well as the most recent results should be included in the CCR.

*(3)* ResultType has been carefully constructed within the CCR to support numeric test result values as well as text-based test result values. ResultType also supports numeric test results with associated text. Particular care has been given to the ResultType data object to support microbiology, imaging, procedure, and pathology results as well as laboratory results. ResultType supports comprehensive structured result reporting as well as structured coding with any code set. It is recommended that all results be coded within the CCR with LOINC and SNOMED CT.

*(4)* ResultType is illustrated in Fig. A2.20.

*(5)* ResultType defines discrete values as a <Result> with one or more instances of <Test> with an instance of a <TestResult>. <Test> is a Complex Data Type TestType. The

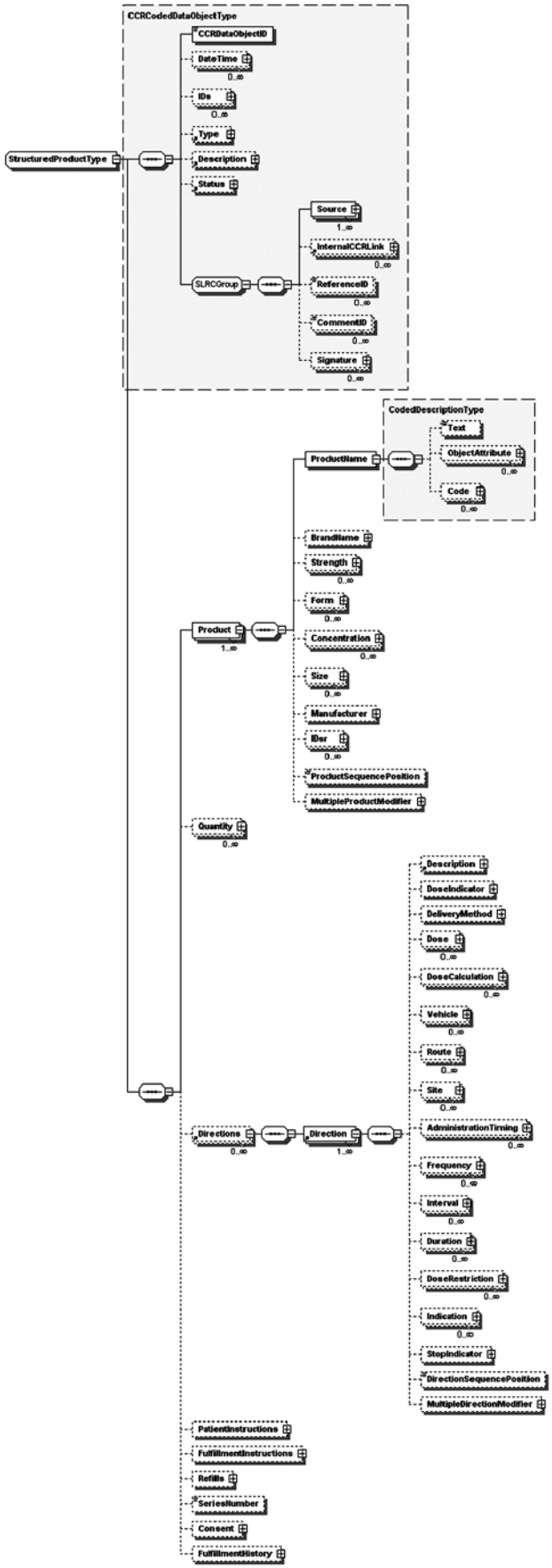


**FIG. A2.19 Complex Data Type StructuredProductType**

**TABLE A2.12 <Product> Object Type (StructuredProductType) Definition Table**

| <Product> | Accepted Values/Formatting | Optionality/Cardinality | Description |
|---|---|---|---|
| <DateTime> | This can be an exact DateTime, an age, an approximate DateTime, or a DateTime range. | Optional and Unbounded (0..∞). | Used to define dates and times relevant to the patient's <Alert>. Date of Onset, From Date A___ To Date B_ ___, At Age ____, Since Age___, and so forth. |
| <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | Optional and Unbounded (0..∞). | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. |
| <Type> | An instance of CodedDescriptionType with restricted content that must be one of the defined structured text values. Medication, Immunization, Disposable, Supplies, Device, Implantable Device, Durable Medical Equipment | Optional and Bounded to one instance (0..1). | Defines the <Product><Type>. |
| <Description> | CodedDescriptionType | Optional and Bounded to one instance (0..1). | An instance of a CodedDescriptionType. <Text> under <Description> is used as a text string container for those systems that cannot generate a structured description of a product. The structured and coded portions of <Description> are used to define the name and overall characteristics of any complex product made up of one or more structured products, such as a GI Cocktail, an Insulin Sliding Scale, or the like. |
| <Status> | Instance of CodedDescriptionType with restricted content that must be one of the defined structured text values. Active, On Hold, Prior History No Longer Active | Optional and Bounded to one instance (0..1). | Defines the <Status> of the <Product>. |
| <Product> | Used as a container for the core descriptive attributes of a <Product>. | Required and Unbounded (0..∞). | Used to define a <Product>. |
| <ProductName> | Instance of CodedDescriptionType. | Required and Bounded to one instance (0..1). | The generic, non-proprietary, name of the product. |
| <BrandName> | Instance of CodedDescriptionType. | Optional and Bounded to one instance (0..1). | The Brand Name. |
| <Manufacturer> | A link to <Actor>. | Optional and Bounded to one instance (0..1). | Links to an <Actor>. |
| <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | Optional and Unbounded (0..∞). | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. |
| <Strength> | Child of Product and instance of MeasureType | Optional and Unbounded (0..∞). | The predefined strength that the medication comes in – 500mg tablets, for example. |
| <Form> | Child of Product and instance of CodedDescriptionType. | Optional and Unbounded (0..∞). | The Form – Tablet, Capsule, Elixir, Suspension, Crème, Powder, Box, Syringe, and so forth. |
| <Concentration> | Child of Product and instance of MeasureType. | Optional and Unbounded (0..∞). | Used to define product concentration, when applicable – 250 mg/ml, for example. |
| <Size> | Child of Product. Can be a text string, structured text, or defined by <Dimensions>. | Optional and Unbounded (0..∞). | Used to define a <Product> <Size>. |
| <Quantity> | Instance of MeasureType. | Optional and Unbounded (0..∞). | Defines the quantity – to be ordered, dispensed, or used, for example. |
| <Directions> | Container for the <Directions>/SIG. This maps explicitly to NCPDP Script SIG as submitted (DERF) October 7, 2005. | Optional and Unbounded (0..∞). | Contains the directions for use. This is the 'SIG' component of the Prescription, for example, or is the use or administration instructions for a <Product>. <Description> can contain a text string or complex, coded data object. |
| <DoseIndicator> | Indicates the action to be taken on the <Description>/SIG. This is a direct map to the NCPDP Script SIG standard. | Optional and Bounded to one instance (0..1). | 1 = Specified - remaining fields populated. 2 = As needed - skip rest of Dose Segment. 3 = As directed - skip rest of Dose Segment. 4 = Unspecified - see free text <Description>. |
| <DeliveryMethod> | The textual representation of the Dose Delivery Method. This is the method in which the dose is delivered (describes how the dose is administered/consumed). | Optional and Bounded to one instance (0..1). | Defines the method: take, apply, swish, swallow, inject, insert, chew, use, give, sprinkle, mix, dissolve… |
| <Dose> | A Child of <Direction>. It is of MeasureType with <Value>, <Units>, and <Code>. Dose also contains <Rate>. | Optional and Unbounded (0..∞). | Defines the dose parameter 125, 250, 500; units mg, mcg, g, U; rate per minute, per hour; and can repeat for multiple doses to support sliding scales, pulse dosing, tapering doses, dose ranges, variable doses. |
| <DoseCalculation> | A Child of <Direction> and instance of DoseCalculationType. | Optional and Unbounded (0..∞). | Used to provide a dose calculation. <Dose> defines the dose parameter 125, 250, 500; <Unit> and <Rate> define the unit parameters mg/kg/hr, for example <Variables> defines dosing variables, which can be more than one. <Calculation> defines the calculation. |

**TABLE A2.12** *Continued*

| <Product> | Accepted Values/Formatting | Optionality/Cardinality | Description |
|---|---|---|---|
| <Vehicle> | A Child of <Direction> and can be expressed as a CodedDescriptionType. (<Description>) or as an <InternalCCRLink> to another <Product>. | Optional and Unbounded (0..∞). | Defines a product that is a vehicle for this product, such as an IV admixture, or vehicle/suspension. |
| <Route> | A Child of <Direction> and instance of CodedDescriptionType. | Optional and Unbounded (0..∞). | This defines the Route of administration – po, pr, sl, in either plain English or Latin abbreviation. |
| <Site> | A Child of <Direction> and instance of CodedDescriptionType. | Optional and Unbounded (0..∞). | Physical location on the patient of use, implantation, or administration, when specified (commonly used in IM, IV, and immunizations, and implantable devices). |
| <AdministrationTiming> | A Child of <Direction> and instance of DateTimeType | Optional and Unbounded (0..∞). | This is used to define a specific administration or use time. Can repeat for more than one administration time. Can be a text string (Morning, Evening, Before Meals, 1 Hour After Meals, 3 Hours After Meals, Before Bed) or an exact time. |
| <Frequency> | A Child of <Direction> and can be expressed as a <Description> (CodedDescriptionType) or a <Value> and <Units>. | Optional and Unbounded (0..∞). | Defines the frequency of administration – qd, bid, tid, qid, 5x/d… |
| <Interval> | A Child of <Direction> and can be expressed as a <Description> (CodedDescriptionType) or a <Value> and <Units>. | Optional and Unbounded (0..∞). | Defines an interval q15m, q2h, q4h, q12h. |
| <Duration> | A Child of <Direction> and can be expressed as a <Description> (CodedDescriptionType) or a <Value> and <Units>. | Optional and Unbounded (0..∞). | Defines the duration of use/administration. |
| <DoseRestriction> | A Child of <Direction> and instance of DoseCalculationType. | Optional and Unbounded (0..∞). | Used to provide a dose restriction. Otherwise, the same as above. |
| <Indication> | A Child of <Direction> and can be a <Description> or a <Problem> or a link to a <Problem> within the CCR, or one or more <PhysiologicalParameter>. Also includes a PRN designator. | Optional and Unbounded (0..∞). | Indication for a product. |
| <StopIndicator> | A Child of <Direction> and an instance of CodedDescriptionType. | Optional and Bounded to one instance (0..1). | Used to express a hard stop, such as the last SIG sequence in a tapering dose, where the last sequence is 'then D/C' or where the therapy/drug is used to treat a condition and that treatment is for a fixed duration with a hard stop, such as antibiotic treatment. |
| <DirectionSequencePosition> | Used when the <Direction> repeats (multiple SIGs) such as with an Insulin sliding scale or tapering dose, etc. | Optional and Bounded to one instance (0..1). | Expressed as an Integer from 1-n. Signifies the order of the directions. Tag is not used if there is no repeat. |
| <MultipleDirectionModifier> | Defines the relationship between multiple directions (SIGs). | Optional and Bounded to one instance (0..1). | Used with the values AND, OR, or THEN to express when there is more than one SIG as to whether all the SIGs must apply (AND) or if any of the SIGs can apply (OR) or if the SIGs are sequential (THEN), in the sequence defined by <DirectionSequencePosition>. |
| <PatientInstructions> | An instance of CodedDescriptionType. | Optional and Unbounded (0..1). | Patient instructions that are not part of the traditional <Directions>/SIG. |
| <FulfillmentInstructions> | An instance of CodedDescriptionType. | Optional and Unbounded (0..1). | Instructions to the dispensing pharmacist or administering provider. |
| <Refill> | A Child of <Refills> and includes <Number>, <Quantity>, <DateTime>, to define 'Last Refill", for example, and <Comment> for any specific <Refill> alerts or comments. | Optional and Unbounded (1..∞). | Number of allowed refills per prescription. |
| <SeriesNumber> | String. | Optional and Bound to one instance (0..1). | Defines number in series, such as a series of immunizations. |
| <Consent> | Must contain a <DateTime>, a <Description>, and <Source>. <Reference> and <Comment> are option. | Optional and Bound to one instance (0..1). | Allows <Description> of consent as well as link to <Actor> or <ExternalReference>. |
| <FulfillmentHistory> | Under <Fulfillment> contains <DateTime>, <Description>, <Provider>, <Location>, and <FulfillmentMethod>. | Optional and Bound to one instance (0..1) | Product fulfillment history – tags as for <OrderRxHistory> above, but applied to fulfillment/dispensing. |
| Various "SequencePosition' and "Modifier" | | Optional | Used when more than one sequence in a product repeats. These fields map discretely and explicitly to NCPDP Script, as proposed in June 2005 through joint work between NCPDP and ASTM. |

elements of ResultType are defined in Table A2.13 followed by the definition of TestType in Table A2.14.

Example 33 – <Result>

```
<Results>
<Result>
```

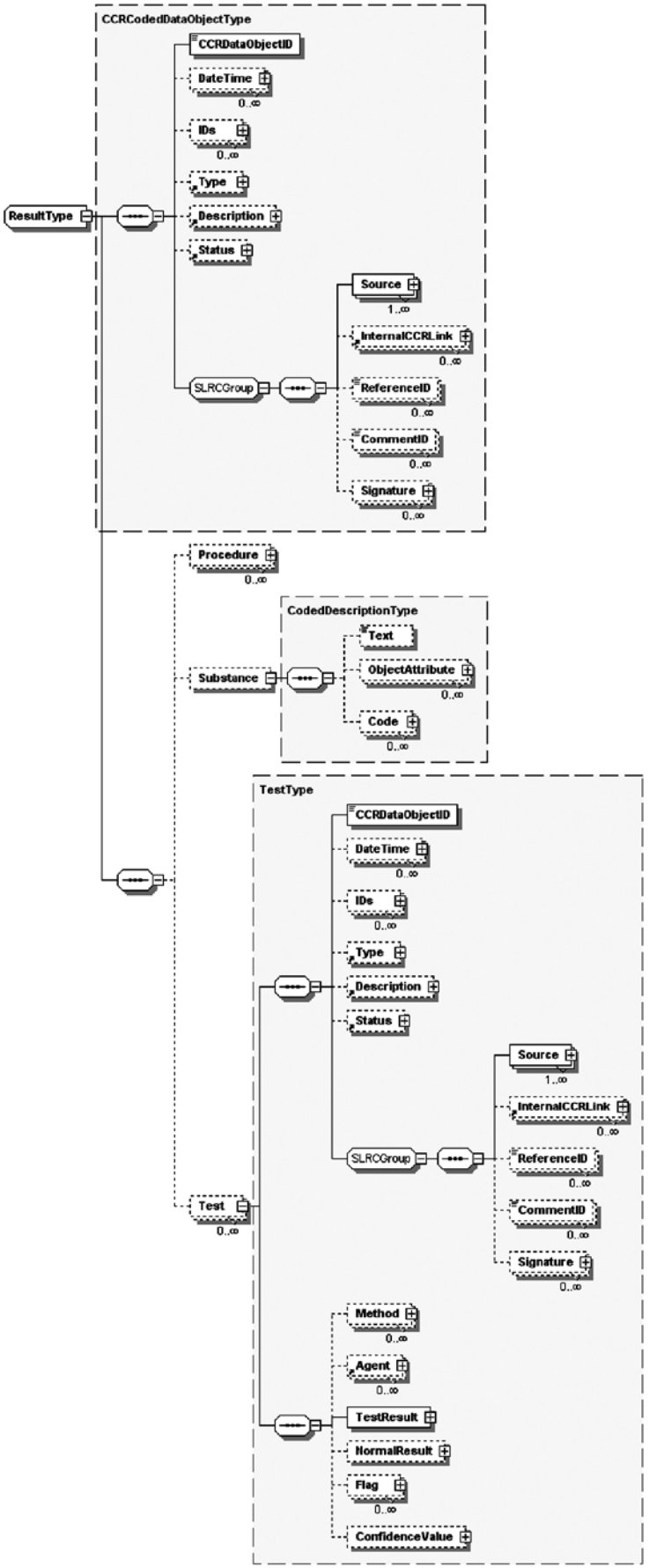


**FIG. A2.20 Data Object ResultType**

**TABLE A2.13 <Result> Object Type Definition Table**

| ResultType | Accepted Values/Formatting | Optionality/Cardinality | Description |
|---|---|---|---|
| <DateTime> | For a <Result> this should be restricted to an exact DateTime, or a DateTime range if a collection was done over a specific time period. At a minimum, the DateTime of collection or physiological measurement should be included. Additional times such as when the <Result> was run, sent, or recorded can be included if and when pertinent. | Optional and Unbounded (0..∞). | Used to define dates and times relevant to the patient and the <Result>. Collection date time, collection start date, collection stop date, measurement time, measurement start date, measurement stop date. |
| <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | Optional and Unbounded (0..∞). | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. |
| <Type> | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. Hematology, Chemistry, Serology, Virology, Toxicology, Microbiology, Imaging - X-ray, Ultrasound, CT, MRI, Angiography, Cardiac Echo, Nuclear Medicine, Pathology, Procedure. | Optional and Bounded to one instance (0..1). | Defines the <Result> <Type>. |
| <Description> | An instance of CodedDescriptionType. <Description> should be coded with SNOMED CT, CPT, and LOINC codes, when applicable. | Optional and Bounded to one instance (0..1). | <Description> of the result – Blood Pressure, Heart Rate, Complete Blood Count (CBC), Urine Culture, Urinalysis. Specifically used to describe a<Result>set when there are more than one <Test> in a <Result>, such as a panel or battery. |
| <Status> | An instance of CodedDescriptionType with restricted content that must be one of the defined structured text values. Current, Historical, Unknown. | Optional and Bounded to one instance (0..1). | Defines the <Status> of the <Result>. |
| <Procedure> | This is a specific use of <Procedure> as defined, below (Procedures). The use of <Procedure> under <Result> should be reserved for instances where listing the <Procedure> has direct clinical relevance to the <Result> or when the <Procedure> used to obtain the <Result> is not obvious or is atypical or specialized. When the <Procedure> is listed in the <Procedures> section of the CCR, <Procedure> under <Result> should be an <InternalCCRLink>. | Optional and Unbounded (0..∞). | This is an instance of a procedure or a link. This is the procedure for which there is the <Result>, or a procedure done to get the <Result>, or both. |
| <Substance> | An instance of CodedDescriptionType | Optional and Bounded to single use (0..1). | Used to define the substance that the <Result> is obtained from. Arterial blood, venous blood, urine, spinal fluid, joint fluid, aspirate, and so forth. |
| <Test> | An instance of the Complex Data Type TestType. <Test> contains the actual result data XML string. | Optional and Unbounded (0..∞). | TestType – defined in the following Table. |

```
<CCRDataObjectID>_____</CCRDataObjectID>
<DateTime>
 <Type>
  <Text>Collection Date</Text>
 </Type>
 <ExactDateTime>2004-09-01T13:25:34-05:00</ExactDateTime>
</DateTime>
<Type>
 <Text>Hematology</Text>
</Type>
<Description>
 <Text>Spun Hematocrit</Text>
 <Code>
  <Value>_____</Value>
  <CodingSystem>SNOMEDCT</CodingSystem>
  <Version>_____</Version>
 </Code>
 <Code>
  <Value>_____</Value>
  <CodingSystem>CPT-4</CodingSystem>
  <Version>_____</Version>
 </Code>
 <Code>
  <Value>_____</Value>
  <CodingSystem>LOINC</CodingSystem>
  <Version>_____</Version>
 </Code>
</Description>
<Source>
 <Actor>
  <ActorID>75307</ActorID>
  <ActorRole><Text>Primary Care Provider</Text></ActorRole>
 </Actor>
</Source>
 <Substance>
  <Text>Venous Blood</Text>
  <Code>
   <Value>_____</Value>
   <CodingSystem>SNOMEDCT</CodingSystem>
   <Version>_____</Version>
```

**TABLE A2.14 TestType Definition Table**

| TestType | Accepted Values/Formatting | Optionality/0 - ∞ | Description |
|---|---|---|---|
| <DateTime> | This can be an exact DateTime, an age, an approximate DateTime, or a DateTime range. | Optional and Unbounded (0..∞). | Used to define dates and times relevant to the patient's <Alert>. Date of Onset, From Date A___ To Date B____, At Age ____, Since Age___, and so forth. |
| <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | Optional and Unbounded (0..∞). | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. |
| <Type> | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. Observation or Result. | Required and Bounded to single use (1..1). | Defines the <TestResult> as an Observation or Result. |
| <Description> | Instance of CodedDescriptionType. | Optional and Bounded to one instance (0..1). | <Description> of the test – Systolic Blood Pressure, Diastolic Blood Pressure, Hct, Hgb, Na, K, BUN, Cr, Urine Specific Gravity, and so forth. |
| <Status> | An instance of CodedDescriptionType with restricted content that must be one of the defined structured text values. Current, Historical, Unknown. | Optional and Bounded to one instance (0..1). | Defines the <Status> of the <Result>. |
| <Method> | Instance of CodedDescriptionType | Optional and Unbounded (0..∞). | Used when a <Description> modifier is needed – currently not used. |
| <Agent> | An instance of Complex Data Type AgentType. Has children <Products>, <EnvironmentalAgents>, <Problems>, <Procedures>, <Results>. | Optional and Unbounded (0..∞). | Allows inclusion of or link to <Agent>, such as a drug name for microbiology/culture sensitivities. |
| <TestResult> | <TestResult> can be a <Value>, <Value> and <Units>, or a <Description> or combinations thereof, which is a CodedDescriptionType supporting a free text string, a structured text string or strings, or a structured and coded text string or strings. | Required and Bounded to single use (0..1). | Contains the Test Result. |
| <NormalResult> | An instance of NormalType. <Normal> can be text, a value/units, and can repeat as a range or variable. | <Normal> under <NormalResult> is Optional and Unbounded (0..∞). | Defines the benchmark normal result or range for the <TestResult>. |
| <Flag> | An instance of CodedDescriptionType | Optional and Unbounded (0..∞). | Defines an abnormal flag for the Test Result – Low, High, Abnormal, Out of Range, Panic Value. |
| <ConfidenceValue> | An instance of CodedDescriptionType | Optional and Bounded to single use (0..1). | Defines a <ConfidenceValue> for the <TestResult>. |

```
    </Code>
  </Substance>
  <Test>
  <CCRDataObjectID>_____ </CCRDataObjectID>
   <Description>
    <Text>HCT</Text>
    <Code>
     <Value>_______</Value>
     <CodingSystem>LOINC</CodingSystem>
     <Version>_______</Version>
    </Code>
   </Description>
 <Source>
  <Actor>
   <ActorID>75307</ActorID>
   <ActorRole><Text>Primary Care Provider</Text></ActorRole>
  </Actor>
 </Source>
    <TestResult>
     <Value>9.2</Value>
     <Units><Unit>%</Unit></Units>
    </TestResult>
    <NormalResult>
     <Normal>
      <Value>14.0</Value>
      <Units><Unit>%</Unit></Units>
      <ValueSequencePosition>1</ValueSequencePosition>
 <Source>
  <Actor>
   <ActorID>75307</ActorID>
   <ActorRole><Text>Primary Care Provider</Text></ActorRole>
  </Actor>
 </Source>
     </Normal>
     <Normal>
      <Value>18.0</Value>
      <Units>%</Units>
      <ValueSequencePosition>2</ValueSequencePosition>
      <VariableNormalModifier>TO</VariableNormalModifier>
 <Source>
  <Actor>
   <ActorID>75307</ActorID>
   <ActorRole><Text>Primary Care Provider</Text></ActorRole>
  </Actor>
 </Source>
     </Normal>
    </NormalResult>
    <Flag>
     <Test>Critical</Text>
    </Description>
   </Flag>
  </Test>
```

```
</Result>
```

A2.5.4.11 *<Procedures>*

*(1)* <Procedures> is optional and bound to one instance (0..1). The child element <Procedure> is required and unbounded (1..∞). and defines all interventional, surgical, diagnostic, or therapeutic procedures or treatments pertinent to the patient historically and at the time the CCR is generated. The preferred controlled vocabulary here is SNOMED CT, as well as the current CPT Codeset for the <Procedure> and LOINC for any <Result>, although revisions to LOINC are recommended to make object definition and standardization more uniform.

*(2)* At a minimum, any recent or historically relevant <Procedure> should be listed. The intent is to list major diagnostic or therapeutic procedures, or both, that have a current or historical impact on the patient's current or future health.

*(3)* <Procedure> is defined by the Complex Data Type ProcedureType, which is illustrated in Fig. A2.21.

*(4)* <Procedure> is defined in Table A2.15.

Example 34 – <Procedure>

```
<Procedure>
 <CCRDataObjectID>_____</CCRDataObjectID>
 <DateTime>
  <Type>
   <Text>Procedure Date</Text>
  </Type>
  <ExactDateTime>2004-09-01T13:25:34-05:00</ExactDateTime>
 </DateTime>
 <Type>
  <Text>Surgery</Text>
 </Type>
 <Description>
  <Text>Appendectomy</Text>
  <Code>
   <Value>_____</Value>
   <CodingSystem>SNOMEDCT</CodingSystem>
   <Version>_____</Version>
  </Code>
  <Code>
   <Value>_____</Value>
   <CodingSystem>CPT-4</CodingSystem>
   <Version>_____</Version>
  </Code>
 </Description>
</Procedure>
```

A2.5.4.12 *<Encounters>*

*(1)* <Encounters> is optional and bound to one instance (0..1). The child element <Encounter> is required and unbounded (1..∞) and contains data defining all pertinent healthcare encounters as well as pending healthcare appointments of the patient at the time the CCR is generated. An encounter is an interaction, regardless of the setting, between a patient and a practitioner who is vested with primary responsibility for diagnosing, evaluating, or treating the patient's condition. It may include visits, appointments, as well as non face-to-face interactions. It is also a contact between a patient and a practitioner who has primary responsibility for assessing and treating the patient at a given contact, exercising independent judgment.

*(2)* <Encounter> is illustrated in Fig. A2.22.

*(3)* <Encounter> is defined in Table A2.16.

Example 35 – <Encounter>

```
<Encounters>
<Encounter>
 <CCRDataObjectID>_____</CCRDataObjectID>
 <DateTime>
  <Type>
   <Text>Encounter Date</Text>
  </Type>
   <ExactDateTime>2003-07</ExactDateTime>
  </DateTime>
  <Type>
   <Text>Inpatient Hospitalization</Text>
  </Type>
<Source><Actor><ActorID>_____</ActorID></Actor></
Source>
  <Locations>
  <Location>
   <Description>
    <Text>Jackson County Hospital</Text>
   </Description>
  </Location>
  </Locations>
  <Indications>
  <Indication>
   <Problem>
 <CCRDataObjectID>_____ </CCRDataObjectID>
     <Description>
      <Text>Pneumonia</Text>
     </Description>
<Source><Actor><ActorID>_____</ActorID></Actor></
Source>
    </Problem>
<Source><Actor><ActorID>_____</ActorID></Actor></
Source>
  </Indication>
  </Indications>
</Encounter>
```

A2.5.4.13 *<PlanOfCare>*

*(1)* <PlanOfCare> is optional and bound to one instance. The child element <Plan> is required and unbounded (1..∞) and contains data defining all pending orders, interventions, encounters, services, and procedures for the patient. It defines what is 'planned' or expected for the care of the patient. It is for prospective, unfulfilled, or incomplete orders and requests only. All active, incomplete, or pending orders, appointments, referrals, procedures, services, or any other pending event of clinical significance to the current and ongoing care of the patient should be listed, unless constrained due to issues of privacy. 'Clinical Reminders' should also be placed here for purposes of providing prompts that may be used for disease prevention, disease management, patient safety (generic), and healthcare quality improvement, including widely accepted performance measures. Clinical Reminders are clinical decision support prompts that are closely related to quality issues or continuous quality improvement (CQI). They have temporal relevance of a longer-term nature than <Alerts> explained earlier in this guide. Consider <Alerts> as specific, patient safety related, near-term warnings and Clinical Reminders as patient quality related, longer term prompts. One example of a Clinical Reminder is the performance measurement set derived from widely accepted guidelines that have been vetted and disseminated through the AMA convened, Physician Consortium for Performance Improvement (PCPI). These measures were chosen by CMS for the DOQ-IT national pilot project. An illustration of the combination of the CCR's Clinical Reminders within the <PlanOfCare> section and related <Reference> section would be the capacity to embed a link to the PCPI

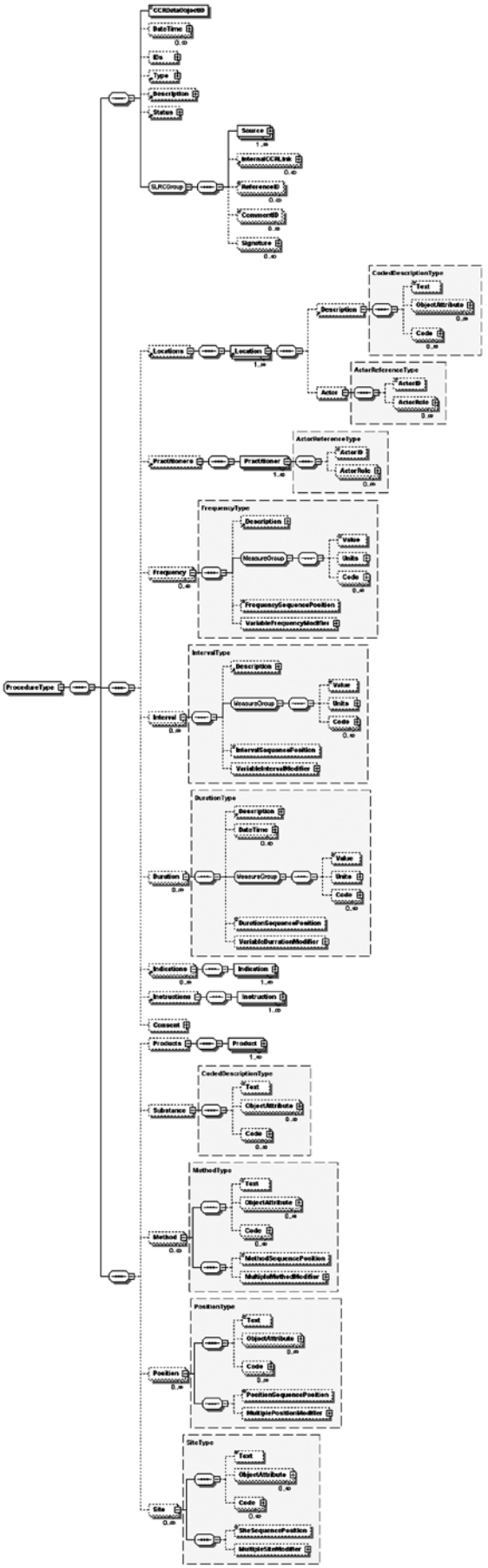


**FIG. A2.21 Data Object <Procedure>**

**TABLE A2.15 <Procedure> Object Type Definition Table**

| <Problem> | Accepted Values/Formatting | Optionality/ Cardinality | Description |
|---|---|---|---|
| <DateTime> | An instance of DateTimeType. | Optional and Unbounded (0..∞). | Used to define dates and times relevant to the patient and the<Procedure>. For a <Procedure>, <DateTime> should express the <DateTime> the <Procedure> occurred, as accurately as possible, but due to the fact that historical <Procedure> data may be collected retrospectively, exact DateTime, an age, an approximate DateTime, or a DateTime range are all valid. |
| <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | Optional and Unbounded (0..∞). | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. |
| <Type> | An instance of CodedDescriptionType. | Optional and Bound to one instance (0..1). | Defines the <Procedure><Type>, Surgical, Cardiac, Imaging, etc. |
| <Description> | An instance of CodedDescriptionType. <Procedure> should be coded with SNOMED, CPT, and LOINC codes, when applicable. | Required and Bounded to one instance (1..1). | <Description> of the Procedure – Cardiac catheterization, transfusion, echocardiogram, exercise stress test, appendectomy, cholecystectomy, endoscopy, etc. |
| <Status> | An instance of CodedDescriptionType with restricted content that must be one of the defined structured text values. Cancelled, On Hold, In Progress, Not Completed, Completed. | Optional and Bounded to one instance (0..1). | Defines the current <Status> of the <Procedure>. |
| <Location> | A child of <Locations> (0..1) and expressed as a <Description> (CodedDescriptionType) or as a link to an <Actor>. | Optional and Unbounded (0..∞). | Defines the <Location>. Location is a physical geographic location *not* a physical location on the patient. Physical location on the patient is defined as <Site>. |
| <Practitioner> | A child of <Practitioners> (0..1). This is a link to <Actor> and includes an <ActorRole>. | Optional and Unbounded (0..∞). | Defines the <Practitioner> who did the procedure. |
| <Frequency> | An instance of FreqDurGroup. | Optional and Unbounded (0..∞). | Defines the <Frequency> of the <Procedure>. |
| <Interval> | Is an instance of IntervalType. It can be expressed as <Description> which is a CodedDescriptionType and as <Value><Unit> or both. | Optional and Unbounded (0..∞). | Defines an interval q15m, q2h, q4h, q12h. |
| <Duration> | An instance of FreqDurGroup. | Optional and Unbounded (0..∞). | Defines the <Duration> of the <Procedure>. |
| <Indication> | Can be a <Description> or a <Problem> or a link to a <Problem> within the CCR, or one or more <PhysiologicalParameter>. Also includes a PRN designator. | Optional and Unbounded (0..∞). | Indication for a <Procedure>. |
| <Instruction> | A child of <Instructions> (0..1) and an instance of InstructionType. | Required and Unbounded (1..∞). | Used to define <Instructions> for a <Procedure>. Used primarily when a <Procedure> is an <OrderRequest>. |
| <Product> | A child of <Products> (0..1) and an instance of StructuredProductType | Required and Unbounded (1..∞). | Defines any <Product> associated with the<Procedure>. |
| <Substance> | An instance of CodedDescriptionType | Optional and Bound to one instance (0..1). | Used to define the substance upon which the <Procedure> was done. Arterial blood, venous blood, urine, spinal fluid, joint fluid, aspirate, etc. |
| <Method> | Instance of CodedDescriptionType. | Optional and Unbounded (0..∞). | <Procedure><Method>. |
| <Position> | Instance of CodedDescriptionType. | Optional and Unbounded (0..∞). | Patient position for/during the <Procedure>. |
| <Site> | Instance of CodedDescriptionType. | Optional and Unbounded (0..∞). | Physical location on the patient of<Procedure>. |

webpage (or another reputable clinical web source) that contains the specific performance measures relevant to the patient's care plan, e.g., diabetes care measures are concisely summarized at: http://www.ama-assn.org/ama1/pub/upload/mm/370/diabetesset.pdf.

*(2)* Thus, the CCR Clinical Reminders in the <PlanOfCare> section can be used as a powerful tool to promote CQI and evidence based medicine (EBM), within the patient's summary and <PlanofCare>. Including Clinical Reminders as one or more data items in <PlanofCare> allows any receiving, consulting, admitting provider, system, or healthcare institution to understand the current and pending clinical care plans for this patient at a specific moment in time. This should help to avoid conflict, assure patient safety, to optimize care and convenience for the patient and their family. This section allows any changes to be communicated appropriately and in a timely manner to all affected providers and organizations. Finally, the <PlanofCare> section is designed to be of great relevance to nursing, particularly in transfers to home care, convalescent and rehab settings after an acute care hospitalization. The intent is that all providers caring for the patient should be aware at all times what is currently planned, scheduled, or recommended to care for the patient and maximize their clinical outcomes.

*(3)* <Plan> is illustrated in Fig. A2.23.

*(4)* <Plan> is defined in Table A2.17.

Example 36 – <PlanOfCare> (<Source> not included to simplify example)

<PlanOfCare>
<Plan>
<CCRDataObjectID>_____ </CCRDataObjectID>

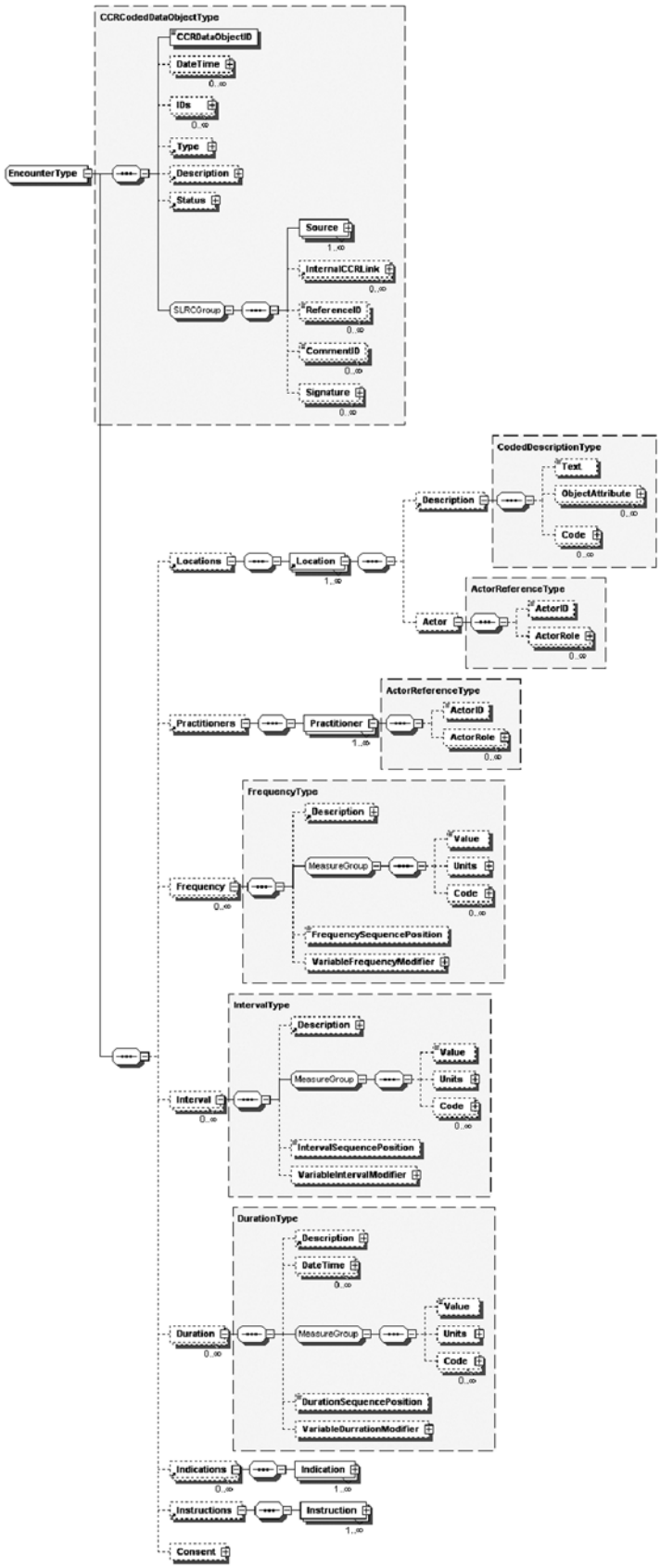


**FIG. A2.22 <Encounter> Data Object**

**TABLE A2.16 <Encounter> Object Type Definition Table**

| <Encounter> | Accepted Values/Formatting | Optionality/ Cardinality | Description |
|---|---|---|---|
| <DateTime> | An instance of DateTimeType. | Optional and Unbounded (0..∞). | Used to define dates and times relevant to the patient and the <Encounter>. For a <Encounter>, <DateTime> should express the <DateTime> the <Encounter> occurred, as accurately as possible, but due to the fact that historical <Encounter> data may be collected retrospectively, exact DateTime, an age, an approximate DateTime, or a DateTime range are all valid. |
| <Type> | An instance of CodedDescriptionType. | Optional and Unbounded (0..∞). | Defines the <Encounter><Type>, Hospitalization, Rehabilitation, Nursing Facility, Emergency Room, Clinic Visit, etc. |
| <Description> | An instance of CodedDescriptionType. <Procedure> should be coded with SNOMED, CPT, and LOINC codes, when applicable. | Required and Bounded to single use (1..1). | Used to describe the actual <Encounter>, if <Encounter> cannot be more appropriately expressed with <Location> and <Practitioner>. |
| <Location> | Expressed as a <Description> (CodedDescriptionType) or as a link to an <Actor>. | Optional and Unbounded (0..∞). | Defines the <Location>. Location is a physical geographic location *not* a physical location on the patient. Physical location on the patient is defined as <Site>. |
| <Practitioner> | This is a link to <Actor> and includes an <ActorRole>. | Optional and Unbounded (0..∞). | Defines the <Practitioner> with whom the <Encounter>occurred. |
| <Frequency> | An instance of FreqDurGroup. | Optional and Unbounded (0..∞). | Defines the <Frequency> of the <Encounter>. |
| <Duration> | An instance of FreqDurGroup. | Optional and Unbounded (0..∞). | Defines the <Duration> of the <Encounter>. |
| <Indication> | Can be a <Description> or a <Problem> or a link to a <Problem> within the CCR, or one or more <PhysiologicalParameter>. Also includes a PRN designator. | Optional and Unbounded (0..∞). | Indication for an <Encounter>. |
| <Instructions> | Instance of InstructionType. | Optional and Bound to one instance (0..1). | Used to define <Instructions> for a <Encounter>. Used primarily when a <Encounter> is an <OrderRequest>. |
| <Consent> | An instance of CCRCodedDateObjectType | Optional and Bound to one instance (0..1). | This is used to document that consent was obtained and documented for the encounter or procedure. The SLRC Group could be used to point to the location of the actual consent. |

```
<Source><Actor><ActorID>_____</ActorID></Actor></
Source>
<OrderRequest>
 <CCRDataObjectID>_____</CCRDataObjectID>
 <DateTime>
  <Type>
   <Text>Request Date</Text>
  </Type>
  <ExactDateTime>2004-09-01T13:25:34-05:00</
ExactDateTime>
 </DateTime>
 <Type>
  <Text>Procedure</Text>
 </Type>
 <Status>
  <Text>Ordered</Text>
 </Status>
<Source><Actor><ActorID>_____</ActorID></Actor></
Source>
 <Procedures>
  <Procedure>
<CCRDataObjectID>_____ </CCRDataObjectID>
    <Description>
     <Text>CBC With Differential</Text>
      <Code>
       <Value>_____</Value>
       <CodingSystem>SNOMEDCT</CodingSystem>
       <Version>_____</Version>
      </Code>
      <Code>
       <Value>_____</Value>
       <CodingSystem>CPT-4</CodingSystem>
       <Version>_____</Version>
      </Code>
      <Code>
       <Value>_____</Value>
       <CodingSystem>LOINC</CodingSystem>
       <Version>_____</Version>
      </Code>
    </Description>
```

```
<Source><Actor><ActorID>_____</ActorID></Actor></
Source>
    <Substance>
     <Text>Venous Blood</Text>
    </Substance>
   </Procedure>
  </Procedures>
 </OrderRequest>
 </Plan>
 <PlanOfCare>
```

A2.5.4.14 *<HealthCareProviders>*

*(1)* <HealthCareProviders> is optional and bound to one instance (0..1). The child element <Provider> is required and unbounded (1..∞) and contains data defining all healthcare providers involved in the current or pertinent historical care of the patient. <Provider> is an ActorReferenceType that links to an <Actor> within the CCR through xs:string.

*(2)* <Provider> is a link to an <Actor> with an <ActorRole>. This data object is not used for listing a patient's non-healthcare <Support> providers. <Support> providers are listed under the <Support> section of the CCR. At a minimum, the patient's key healthcare providers should be listed, particularly the patient's primary physician and any active consulting physicians, therapists, and counselors.

*(3)* <HealthCareProviders> is illustrated in Fig. A2.24.

A2.5.5 *CCR Footer Sections*—Note that the CCR Footer consists of the following sections, but is not contained within a <Footer> tag.

A2.5.5.1 *<Actors> – Persons, Organizations, Locations, Systems*—<Actors> is required and bounded to one instance (1..1) and contains data defining all of the individuals, organizations, locations, and systems associated with the data

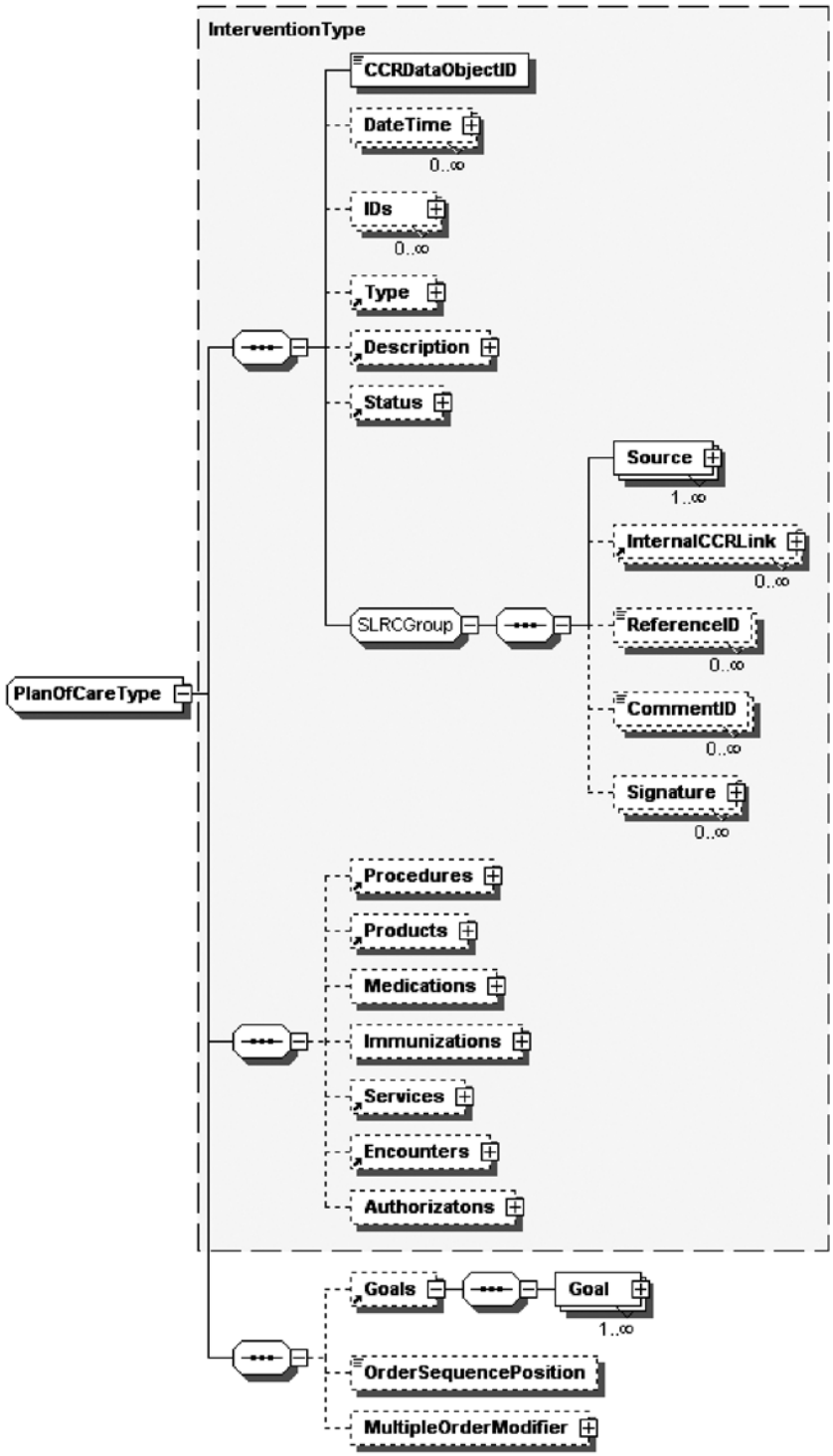


**FIG. A2.23 Data Object <Plan>**

in the CCR. Individuals (Patients, Family, Support, Healthcare Providers), organizations, locations, and systems (IT systems, EHRs, and the like) are *normalized* within the CCR. *Normalized* means that everything about each individual, organization, location, or system is listed once, and only once, in the CCR and any data that are from, about, or in reference to that individual, organization, location, or system are then linked within the CCR to that one listing. Within the CCR, each individual, organization, location, or system is listed separately as an <Actor> in the <Actors> section of the CCR. Actors (<Actor>), are expressed within the CCR by the Complex Data Type ActorType. The specific and detailed information about that individual person, organization, location, or system are fully itemized and tagged under <Actor> within the CCR <Actors> Section and given a CCRDataObjectID (<ActorID>) of type xs:string. Wherever an <Actor> is referred to within the

**TABLE A2.17 <Plan> Object Type Definition Table**

| <Plan> | Accepted Values/Formatting | Optionality/ Cardinality | Description |
|---|---|---|---|
| <DateTime> | An instance of DateTimeType. For <Plan> this should be an exact DateTime, or a DateTime range if an order/request is scheduled or intended to be scheduled. <Age> would be appropriate for clinical reminders, although more exact datetime and/or range calculated against the patient's date of birth would be more helpful and informative to continuity of care providers. | Optional and Unbounded (0..∞). | Used to define dates and times relevant to the patient and the <Plan>. Plan Start DateTime, Plan Completion DateTime. Dates and times of explicit orders/requests are defined under <OrderRequest><DateTime>. |
| <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | Optional and Unbounded (0..∞). | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. |
| <Type> | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. Reminder, Order, Prescription, Request For Authorization, Authorization, Referral, Request For Consultation, Treatment Recommendation. | Optional and Bounded to one instance (0..1). | Defines the <Plan><Type>. |
| <Description> | An instance of CodedDescriptionType. <Description> should be coded with SNOMED CT, CPT, and LOINC codes, when applicable. | Optional and Bounded to one instance (0..1). | Used to describe a <Plan> set when there are more than one <OrderRequest>s in a <Plan> such as a detailed Care <Plan> or pre-procedure <Plan>. Postoperative rehabilitation, stroke rehabilitation, pre-procedure work-up and evaluation, etc. |
| <Status> | An instance of CodedDescriptionType with restricted content that must be one of the defined structured text values. Pending, In Process, On Hold, Cancelled. | Optional and Bounded to one instance (0..1). | Defines the <Plan><Status>. |
| <OrderRequest> | Contains the actual <OrderRequest> XML string. | Required and Unbounded (1..∞). | The actual order/request. This XML object string can repeat within a <Plan>. |
| <DateTime> | An instance of DateTimeType. For <OrderRequest> this should be an exact DateTime, or a DateTime range if an order/request is scheduled or intended to be scheduled. <Age> would be appropriate for clinical reminders, although more exact datetime and/or range calculated against the patient's date of birth would be more helpful and informative to continuity of care providers. | Optional and Unbounded (0..∞). | Used to define dates and times relevant to the patient and the <OrderRequest>. Procedure DateTime, Encounter DateTIme, Appointment DateTime, etc. |
| <Type> | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. Order, Encounter, Procedure, Service, Product, Immunization, Medication, Authorization, Referral, Consultation. | Optional and Bounded to one instance (0..1). | Defines the <OrderRequest><Type>. |
| <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | Optional and Unbounded (0..∞). | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. |
| <Description> | An instance of CodedDescriptionType | Optional and Bounded to one instance (0..∞). | Used to describe an <OrderRequest> that is not a <Procedure>, <Product>, <Medication>, <Immunization>, <Service>, <Encounter>, or <Authorization> request. |
| <Status> | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. Ordered, Requested, Pending, On Hold, Repeat, No Show, Cancelled. | Optional and Bounded to one instance (0..1). | Defines the <OrderRequest><Status>. |
| <Procedures> | The child <Procedure> (1..∞) is an instance of ProcedureType. | Optional and Bounded to one instance (0..1). | CT scan, ultrasound, CBC, biopsy, cholecystectomy, ECG, pulmonary function tests, stress echocardiogram, etc. |
| <Products> | The child <Product> (1..∞) is an instance of StructuredProductType. | Optional and Bounded to one instance (0..1). | Wheelchair, home nebulizer, prosthesis, etc. |

**TABLE A2.17** *Continued*

| <Plan> | Accepted Values/Formatting | Optionality/ Cardinality | Description |
|---|---|---|---|
| <Medications> | The child <Medication> (1..∞) is an instance of StructuredProductType. | Optional and Bounded to one instance (0..1). | Enoxaparin, chemotherapy, etc. |
| <Immunizations> | The child <Immunization> (1..∞) is an instance of StructuredProductType. | Optional and Bounded to one instance (0..1). | Hepatitis A, B, MMR, DPT, etc. |
| <Services> | The child <Services> (1..∞) is an instance of EncounterType. Supports description of <Service> with <Description> (CodedDescriptionType), as well as <Provider> and <Location>. | Optional and Bounded to one instance (0..1). | Physical therapy, occupational therapy, home health evaluation, social service evaluation, family counseling, financial counseling, etc. |
| <Encounters> | The child <Encounter> (1..∞) is an instance of EncounterType. Supports description of <Encounter> with <Description> (CodedDescriptionType), as well as <Provider> and <Location>. | Optional and Bounded to one instance (0..1). | Appointment, Admission |
| <Authorizations> | The child <Authorization> (1..∞) is an instance of AuthorizationType. It is to be used only for pending authorization requests. Authorizations that have already been approved should be contained under <Insurance>. | Optional and Bounded to one instance (0..1). | Authorization for Procedure Requested |
| <Goals> | The child <Goal> (1..∞) is an instance of GoalType – supports text description of <Goal> with <Description> (CodedDescriptionType). | Optional and Bounded to one instance (0..1). | Authorization for treatment, procedure, immunization, brand name medication, etc. |

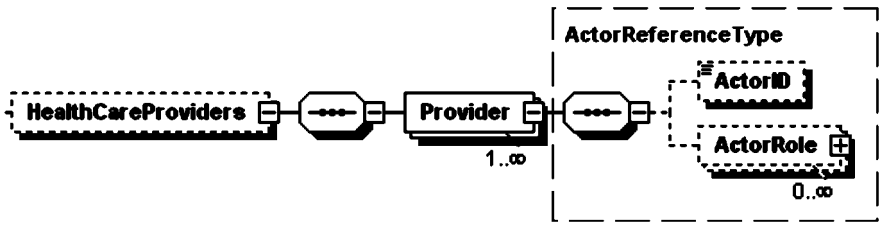


**FIG. A2.24 <HealthCareProviders> Data Object**

CCR, it is referenced through the complex data type ActorReferenceType with an <ActorID> of type xs:string . This allows the details about an <Actor> to be listed once (normalized), while an <Actor> can be referenced as many times as necessary within the CCR. ActorReferenceType also contains <ActorRole>, which is used to define the specific role of that <Actor> in relation to the data at that specific point of reference within the CCR. <ActorRole> defines the healthcare or support role of the <Actor> relative to the patient. <Role> does not define, in itself, an explicit role relative to data security, confidentiality, privacy, or access control. Each time an <Actor> is referenced within the CCR, an <ActorID> is required. <ActorRole> is optional or required, depending on the use, but its use is encouraged in all instances due to the significant value of knowing the specific role the <Actor> plays in each reference to data. ActorReferenceType is illustrated in Fig. A2.25. Each <ActorID> in the CCR Header, Body, or Footer sections points to an <Actor> listed in the CCR Footer section <Actors>. Within the <Actors> section, each <Actor> is represented by a subset of tagged data elements consistent with the representation of them as a <Person>, <Organization> (which includes locations), or <InformationSystem>.

*(1) ActorType*—The overall XML structure of <Actor> is as illustrated in Fig. A2.26. ActorType is defined in Table A2.18. Further definition of the XML within ActorType is as follows:

*(2) <Person>* — <Person> defines the individual as an <Actor>. Its elements are defined in Table A2.19. Other traditionally 'demographic' data on the patient such as Marital Status, Race, Ethnicity, Religious Affiliation/Preference, are all contained in the CCR within <SocialHistory>.

*(3) <Organization>* — <Organization> defines an Organization as an ActorType as in Table A2.20.

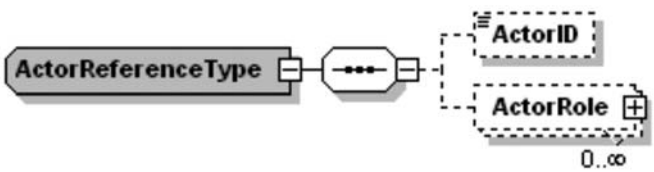


**FIG. A2.25 Data Object ActorReferenceType**

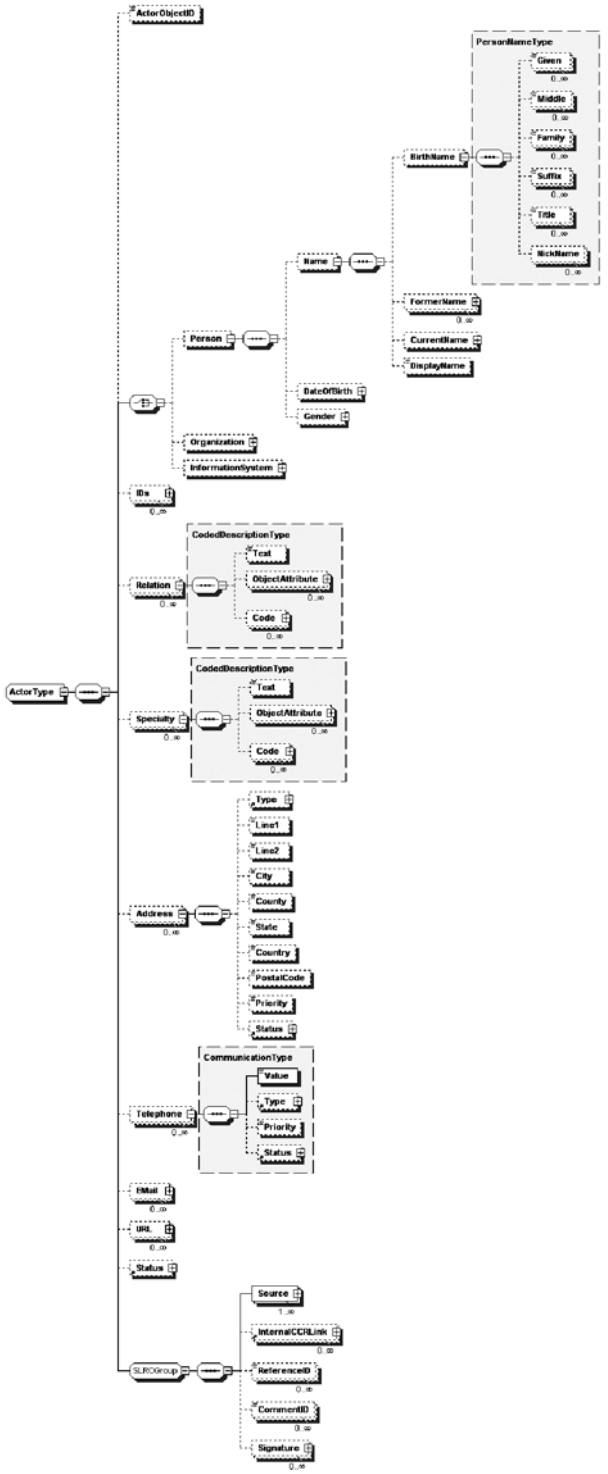


**FIG. A2.26 Complex Data Type ActorType**

*(4)* <*InformationSystem*> — <InformationSystem> defines an Information System as an ActorType as in Table A2.21.

*(5)* Samples of <Actors> are illustrated in Examples 37 and 38 for the <Actor> Patient and Referring Physician.

Example 37 – Patient as <Actor>

```
<Actor>
  <ActorObjectID>AA0001</ActorObjectID>
  <Person>
    <Name>
      <BirthName>
        <Given>Harriet</Given>
        <Middle>Mary</Middle>
        <Family>Kellogg</Family>
      </BirthName>
      <CurrentName>
        <Given>Harriet</Given>
```

**TABLE A2.18 ActorType Definition Table**

| ActorType | Accepted Values/Formatting | Optionality/0 - ∞ | Description |
|---|---|---|---|
| <ActorObjectID> | The ID must be made up of characters in the set A-Z, a-z, 0-9, dash (-), underscore (_) and period (.). The first character must be from the set A-Z, a-z. It can be of any character length. | Required and Bounded to one instance. (1..1). | This is the ObjectID of the <Actor>. |
| <Person> | Defines the details about a <Person> as an <Actor>. | Optional and Bounded to one instance. (0..1). | Used when the <Actor> is a <Person>. |
| <Organization> | Defines the details about a <Organization> as an <Actor>. | Optional and Bounded to one instance. (0..1). | Used when the <Actor> is an <Organization>. |
| <InformationSystem> | Defines the details about a <InformationSystem> as an <Actor>. | Optional and Bounded to one instance. (0..1). | Used when the <Actor> is an <InformationSystem> – example: when the Source of the CCR is an Information System. |
| <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | Optional and Unbounded (0..∞). | <IDs> is a container for any <ID> that applies to a data object but is not the <CCRDataObjectID>. This includes "external" IDs such as a driver's license number, Social Security number, product ID number, serial number, or "internal" IDs such as EHR or system-specific IDs for discrete data objects. |
| <Relation> | An instance of CodedDescriptionType. | Optional and Unbounded (0..∞). | Defines the <Relation> of the <Actor> to the <Patient>, when applicable. Parent, Child, Significant Other, etc. |
| <Specialty> | An instance of CodedDescriptionType. | Optional and Unbounded (0..∞). | Defines the Medical or Healthcare Specialty of the Person or Organization. Ideally, for Medical Specialties, this should be matched to the AMA list of medical and surgical specialties. |
| <Address> | <Address>contains <Type>, <Line1>, <Line2>, <City>, <County>, <StateProvince>, <Country>, <PostalCode>, <Priority>, and <Status>. | Optional and Unbounded (0..∞). | Defines an address of a Person or Organization. Each address can specify a type (Home, Office…), a Priority for contacting (Primary – Preferred, Secondary), and a Status (Active, Temporary…). |
| <Telephone><br><Email><br><URL> | Contain <Value>, <Type>, <Priority>, and <Status>. | Each one is Optional and Unbounded (0..∞). | These are each represented by the Complex Data Type – CommunicationType. They are used to define phone number, email, or url for contacting the Actor. Each can specify a <Type> (Home, Office…). a <Priority> for contacting (Primary – Preferred, Secondary), and a <Status> (Active, Temporary…). |
| <Status> | This is a CodedDescriptionType with restricted content that must be one of the defined structured text values. Active, Prior History No Longer Active, Unknown. | Optional and Bounded to one instance. (0..1). | Defines the current <Status> of the <Actor>. |

**TABLE A2.19 <Person> Definition Table**

| <Person> | Accepted Values/Formatting | Optionality/Cardinality | Description |
|---|---|---|---|
| <Name> | Container for all the different names for the person. | Optional and Bounded to one instance (0..1). | Holds <BirthName>, <FormerName>, <CurrentName>, or <DisplayName> or a combination thereof. |
| <BirthName> | Consists of <Given>, <Middle>, <Family>, <Suffix>, <Title>, <NickName>. | Optional and Bounded to one instance (0..1). | The name the patient was legally given at birth. <Given>John<Middle>Quincy<Family>Doe<Suffix>III<Title> MD<Title>PhD<NickName>Jack |
| <AdditionalName> | Consists of <Given>, <Middle>, <Family>, <Suffix>, <Title>, <NickName>. | Optional and Unbounded (0.. ∞) | Any prior legal or assumed name set. |
| <CurrentName> | Consists of <Given>, <Middle>, <Family>, <Suffix>, <Title>, <NickName>. | Optional and Bounded to one instance (0..1). | The patient's current legal name or assumed name set. |
| <DisplayName> | A text string that represents the<Actor>name as it should be displayed as a simple, untagged, and unparsed string. | Optional and Bounded to one instance (0..1). | John Q. Doe, III, MD, PhD |
| <DateOfBirth> | Instance of DateTimeType. | Optional and Bounded to one instance (0..1). | Defines <DateOfBirth> and should be as accurate as possible, preferably using <ExactDateTime>. |
| <Gender> | Instance of CodedDescriptionType with restricted content that must be one of the defined structured text values. Male, Female, Other, Unknown. | Optional and Bounded to one instance (0..1). | Defines<Gender>. |

**TABLE A2.20 <Organization> Definition Table**

| <Organization> | Accepted Values/Formatting | Optionality/Cardinality | Description |
|---|---|---|---|
| <Name> | String | Optional and Bounded to one instance (0..1). | This is the <Name> of the <Organization>. |

**TABLE A2.21 <InformationSystem> Definition Table**

| <InformationSystem> | Accepted Values/Formatting | Optionality/Cardinality | Description |
|---|---|---|---|
| <Name> | String | Optional and Bounded to one instance (0..1). | This is the <Name> of the <InformationSystem>. |
| <Type> | String | Optional and Bounded to one instance (0..1). | This defines the <Type> of <InformationSystem>. |
| <Version> | String | Optional and Bounded to one instance (0..1). | This defines the <Version> of the <InformationSystem>. |

```
      <Middle>Kellogg</Middle>
      <Family>Parker</Family>
      <Title>Esq.</Title>
    </CurrentName>
  </Name>
  <DateOfBirth>
    <ExactDateTime>1917-01-16</ExactDateTime>
  </DateOfBirth>
  <Gender>
<Text>Female</Text>
</Gender>
 </Person>
 <IDs>
<Type>
<Text>SecurityNumber</Text>
</Type>
  <ID> 000-00-0000</ID>
<Source>
 <Actor>
 <ActorID>_____</ActorID>
 </Actor>
</Source>
 </IDs>
 <Address>
  <Type>
<Text>Home</Text>
</Type>
  <Line1>1010 Morris Road</Line1>
  <City>San Francisco</City>
  <State>CA</State>
  <Country>USA</Country>
  <PostalCode>94304</PostalCode>
 </Address>
 <Telephone>
  <Value>555-555-5555</Value>
  <Type>
<Text>Home</Text>
</Type>
  <Priority>Primary – Preferred</Priority>
 </Telephone>
 <Telephone>
  <Value>555-555-5555</Value>
  <Type>
<Text>Mobile</Text>
</Type>
  <Priority>Secondary</Priority>
 </Telephone>
 <EMail>
  <Value>hparker@whatevermail.com</Value>
 </Email>
<Source>
 <Actor>
 <ActorID>_____</ActorID>
 </Actor>
</Source>
</Actor>
```

Example 38 – Referring Physician as <Actor>

```
<Actor>
 <ActorObjectID>AA0017</ActorObjectID>
 <Person>
  <Name>
   <CurrentName>
    <Given>John</Given>
    <Middle>Q</Middle>
    <Family>Doe</Family>
    <Suffix>Jr.</Suffix>
    <Title>MD</Title>
    <Title>PhD.</Title>
   </CurrentName>
  </Name>
 </Person>
 <IDs>
  <Type><Text>Physician Number</Text></Type>
  <ID>120001</ID>
<Source>
 <Actor>
 <ActorID>_____</ActorID>
 </Actor>
</Source>
</IDs>
 <Specialty>
  <Text>Emergency Medicine</Text>
 </Specialty>
 <Address>
  <Type><Text>Office</Text></Type>
  <Line1>94044 Link Road</Line1>
  <City>San Francisco</City>
  <State>CA</State>
  <Country>USA</Country>
  <PostalCode>94304</PostalCode>
 </Address>
 <Telephone>
  <Value>555-555-5555</Value>
  <Type><Text>Office Phone</Text></Type>
  <Priority>Primary – Preferred</Priority>
  <Status><Text>Active</Text></Status>
 </Telephone>
 <EMail>
  <Value>jqdoe@pacifichealthclinic.org</Value>
 </Email>
 <URL>
  <Value>www.pacifichealthclinic.org</Value>
 </URL>
<Source>
 <Actor>
 <ActorID>_____</ActorID>
 </Actor>
</Source>
 <InternalCCRLink>
  <LinkID>BB0004</LinkID>
  <LinkRelationship>Employer</LinkRelationship>
 </InternalCCRLink>
</Actor>
```

### A2.5.5.2 *<References>*

*(1)* <References> is optional and bound to one instance (0..1). The child element <Reference> is required and unbounded (0..∞) and contains information about external references. External references are data sources/locations that are outside the CCR. External reference data can be URLs,

reference articles, clinical documents, paper or electronic patient records, diagnostic or document images, or any other data that would be of value to the providers using the CCR data for patient care. As with <Actors>, all <References> in the CCR are *normalized*. All defining attributes are listed under a unique instance of <Reference> within the <References> section of the CCR, for each reference. Each <Reference> is defined by a CCRDataObjectID (<ReferenceObjectID>) of type xs:string. Each link to a <Reference> from any other data object within the CCR is through a <ReferenceID> which is of type xs:string.

*(2)* Each <Reference> is a Complex Data Type ReferenceType as illustrated in Fig. A2.27.

*(3)* The Definition Table for ReferenceType is Table A2.22.

A2.5.5.3 <*Comments*>

*(1)* <Comments> is optional and bound to one instance (0..1). The child element <Comment> is required and unbounded (1..∞) and contains all text <Comments> associated with any data within the CCR. As with <Actors> and <References>, all <Comments> in the CCR are *normalized*. All defining attributes are listed under a unique instance of <Comment> within the <Comments> section of the CCR, for each reference. Each <Comment> is defined by a CCRDataObjectID (<CommentObjectID>) of type xs:string. Each link to a <Comment> from any other data object within the CCR is through a <CommentID> which is of type xs:string.

*(2)* <Comments> are intended to provide a 'comment' to a CCR data object but are not intended to contain core relevant clinical or administrative data. All core relevant clinical and administrative data should be mapped to the appropriate data

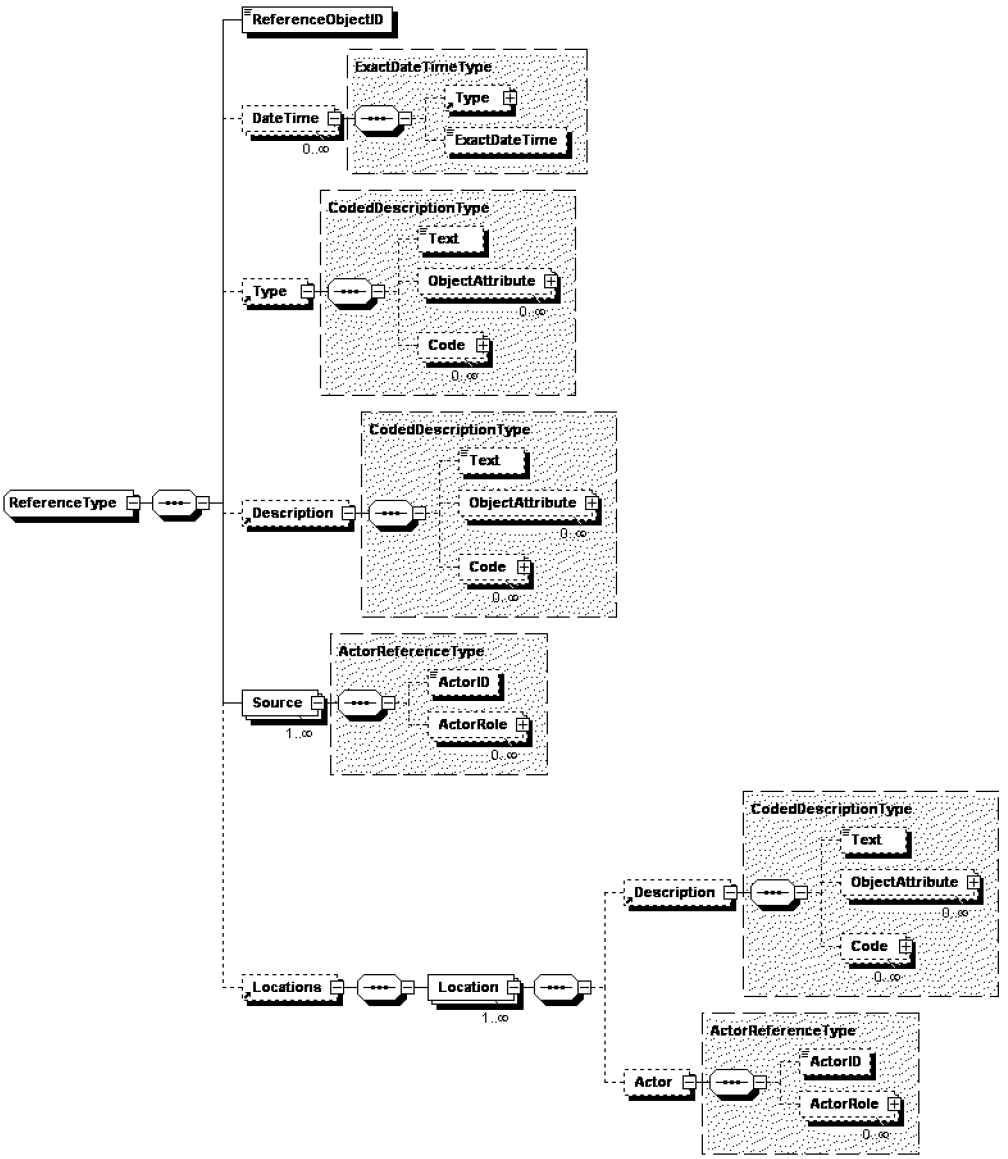


**FIG. A2.27 Complex Data Type ReferenceType**

**TABLE A2.22 ReferenceType Definition Table**

| ReferenceType | Accepted Values/Formatting | Optionality/Cardinality | Description |
|---|---|---|---|
| <ReferenceObjectID> | xs:string<br>AA0000-ZZ9999 | Required and Bounded to one instance (1..1). | This is the <Reference> ObjectID. |
| <DateTime> | Instance of DateTimeType. | Optional and Unbounded (0..∞). | <Reference><DateTime> should be as accurate as possible and should refer to the date of origin of the <Reference>. It should be expressed as an <ExactDateTime>. |
| <Description> | Instance of CodedDescriptionType. | Optional and Bounded to one instance (0..1). | This is a <Description> of the <Reference>. Admission H&P |
| <Source> | This is an <Actor> reference with <ActorID> and <ActorRole>. | Required and Unbounded (1..∞). | This is the <Source> of the <Reference>. |
| <Locations> | This can be expressed as a <Description> (CodedDescriptionType) or as a link to an <Actor>. | Optional and Unbounded (0..∞). | This is a pointer to one or more <Locations>(s) where the <Reference> can be accessed or where it is stored. |

objects within the CCR and contained within that data object within the Body or appropriate Header or Footer sections of the CCR. <Comments> should also not contain pointers to references or other data external to the CCR that applies to a CCR data object. Pointers to references should be contained within the <References> section within the CCR Footer and not in <Comments>.

*(3)* To reiterate, <Comments> is for non-essential comments relevant to a CCR data object, but not containing core data or links that are more appropriately contained within the CCR data object itself.

*(4)* <Comments> are defined within the CCR by the Complex Data Type CommentType as illustrated in Fig. A2.28.

*(5)* The Definition Table for CommentType is Table A2.23.

A2.5.5.4 *<Signatures>*

*(1)* <Signatures> is optional and bound to one instance (0..1). The child element <CCRSignature> is required and unbounded (1..∞) and contains all <Signatures> associated with any data within the CCR. As with <Actors>, <References>, and <Comments>, all <Signatures> within the CCR are *normalized* . All defining attributes are listed under a unique instance of <CCRSignature> within the <Signatures> section of the CCR, for each signature. Each <CCRSignature> is defined by a CCRDataObjectID (<SignatureObjectID>) of type xs:string. Each link to a <CCRSignature> from any other data object within the CCR is through a <SignatureID> that is of type xs:string.

*(2)* If <Signatures> are used within the CCR, they must be digital signatures that meet the W3C's XML digital signature standard (http://www.w3.org/TR/xmldsig-core).

*(3)* It is recommended that, at a minimum, the entire CCR have a checksum calculated at the time of generation and a digital signature applied to the entire document to assure non-repudiation. Additional uses of digital signature for validation of origin, as well as validation of origin and non-repudiation of individual data objects within the CCR, is at the discretion of the originating entity.

*(4)* <Signatures> within the CCR are defined by the Complex Data Type SignatureType as illustrated in Fig. A2.29.

*(5)* The Definition Table for SignatureType is Table A2.24.

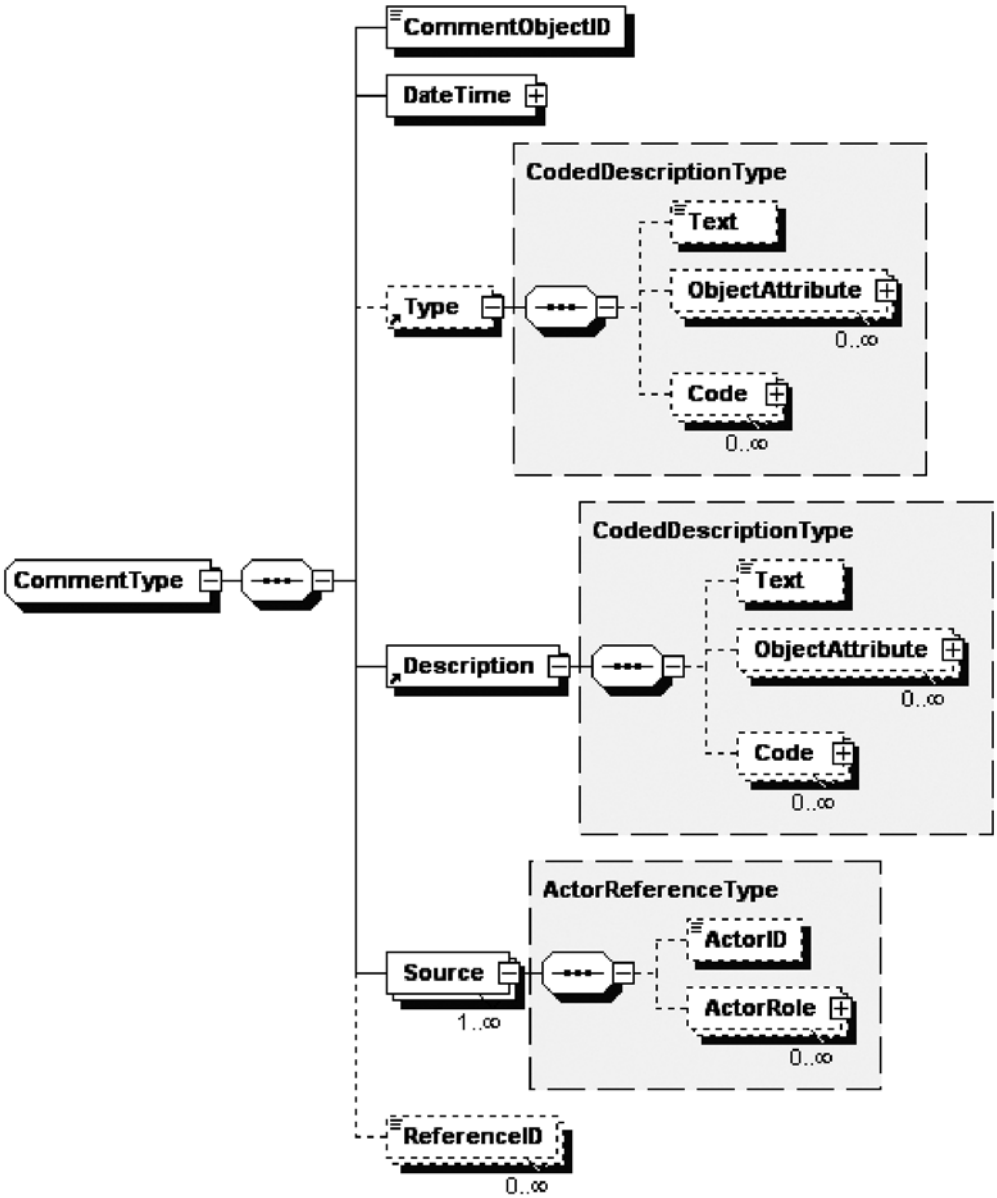


**FIG. A2.28 Complex Data Type CommentType**

**TABLE A2.23 CommentType Definition Table**

| CommentType | Accepted Values/Formatting | Optionality/Cardinality | Description |
|---|---|---|---|
| <CommentObjectID> | This is the ID that each <CommentID> will link to and is expressed as xs:string. | Required and Bounded to one instance (1..1). | This is the CCR Object ID for the <Comment>. |
| <DateTime> | Instance of DateTimeType. | Required and Bounded to one instance (1..1). | This is the <Comment><DateTime>. <Comment><DateTime> should be as accurate as possible and should refer to the data of origin of the <Reference>. It should be expressed as an <ExactDateTime>. |
| <Description> | Instance of CodedDescriptionType. | Required and Bounded to one instance (1..1). | <Description> contains the actual Comment. Example: Patient's father is an unreliable historian. |
| <Source> | This is an <Actor> reference with <ActorID> and <ActorRole>. | Required and Unbounded (1..∞). | This is the <Source> of the <Comment> content. |
| <ReferenceID> | This is a link to <Reference>. | Optional and Unbounded (0..∞). | Used to link the <Comment> to a <Reference> to more detailed information about or referred to in the <Comment>. |

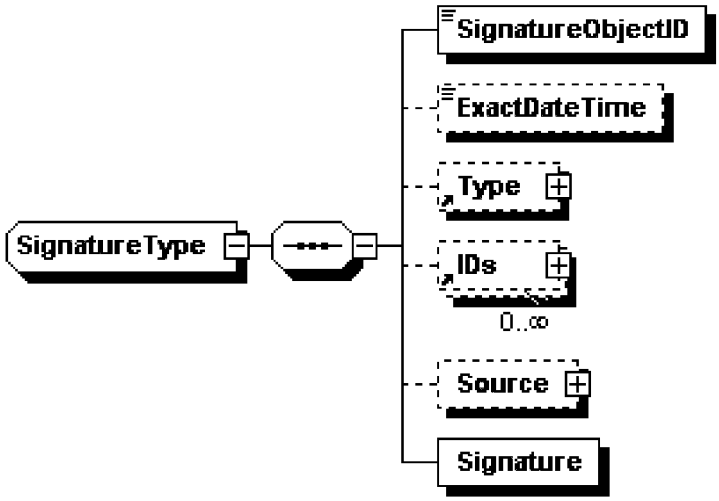


FIG. A2.29 Complex Data Type SignatureType

TABLE A2.24 SignatureType Definition Table

| SignatureType | Accepted Values/Formatting | Optionality/Cardinality | Description |
|---|---|---|---|
| <SignatureObjectID> | Instance of type xs:string. | Required and Bounded to one instance (1..1). | This is the CCR Object ID for the <Signature>. |
| <ExactDateTime> | Instance of ExactDateTimeType. | Optional and Bounded to one instance (0..1). | This is the <Signature> time. |
| <Type> | Instance of CodedDescriptionType. | Optional and Bounded to one instance (0..1). | This defines the <Signature><Type>, which in all cases must be W3C XML Digital Signature. |
| <IDs> | Instance of IDType, which includes child elements <Type>, <ID>, and <IssuedBy>. | Optional and Unbounded (0..∞). | This is a bucket to allow any external system that wants to affix an institutional or other ID to the <Signature> that is external to the W3C XML Digital Signature within <Signature>. |
| <Source> | This is an <Actor> reference with <ActorID> and <ActorRole>. | Optional and Bounded to one instance (0..1). | This is the <Source> of the <Signature>. |
| <Signature> | <Signature> is a tag reserved for the expression of a W3C XML Digital Signature. | Required and Bounded to one instance (1..1). | This is a container for an W3C XML Digital Signature. |

## A3. Adjunct TO STANDARD—REQUIRED W3C XML SCHEMA FOR THE CCR

A3.1 The schema represents how the CCR should be represented in XML. When prepared in a structured electronic format, XML must be used. This .xsd is derived from the XML codes in Annex A1. Strict adherence to this schema, or other schema that may be authorized through joint efforts of ASTM and other standards development organizations, is required to support standards-compliant interoperability.

A3.2 Fig. A3.1 represents the CCR general schema structure.

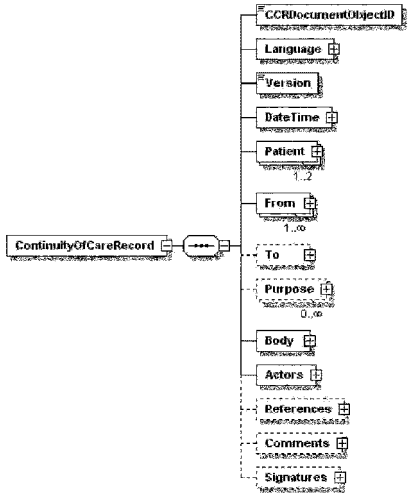


**FIG. A3.1 General Structure of the CCR.xsd**

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**(5)** ICD-9-CM (http://www.cdc.gov/nchs/about/otheract/icd9/abticd9.htm).
**(6)** ICD—10CM (http://www.cdc.gov/nchs/about/otheract/icd9/abticd9.htm).
**(7)** LOINC (http://www.loinc.org/).
**(8)** Multum (www.multum.com/).
**(9)** Bates, D. W., and Gawande, A. A., *The New England Journal of Medicine*, 6/19/2003.
**(10)** NDC (http://www.fda.gov/cder/ndc/).
**(11)** RxNorm (http://www.nlm.nih.gov/research/umls/rxnorm_main.html).
**(12)** SNOMED CT (http://www.snomed.org/).
**(13)** *To Err Is Human: Building a Safer Health System*, Institute of Medicine, 2000.
**(14)** W3C XML digital signature standard (http://www.w3.org/TR/xmldsig-core/).
**(15)** W3C XML encryption standard (http://www.w3.org/TR/xmlenc-core).