

**TO: Committee E31 on Healthcare Informatics &
 Subcommittee E31.28 on Electronic Health Record**

FROM: Dan Smith, E31 Staff Manager

RE: Continuity of Care Record (CCR) Ballot

The Continuity of Care Record, CCR, is a standard specification that has been developed jointly by ASTM International, the Massachusetts Medical Society, the 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, and the Mobile Healthcare Alliance (MoHCA).

The CCR has been developed in response to the need to organize and make transportable a set of basic patient information consisting of the most relevant and timely facts about a patient's condition. It is intended to foster and improve continuity of patient care, reduce medical errors, improve patients' roles in managing their health, and assure at least a minimum standard of secure health information transportability.

The initial ballot for the ASTM CCR took place March 5-April 4, 2004. This was a very successful ballot in that there was a 95 % affirmative rate at both the subcommittee and main committee levels and the two outstanding negative votes were unanimously found not persuasive by the subcommittee at their 6 April 2004 meeting in Washington, DC. Shortly following the meeting, it was agreed by the CCR Steering Committee that an Implementation Guide (IG) was needed and that it ought to be included the CCR Specification. The inclusion of the IG is the most significant change from the CCR version that was balloted in Spring 2004. Other improvements have been made for clarity and consistency.

The CCR Steering Committee is planning an E31.28 Subcommittee meeting and E31 Main Committee meeting shortly after the close of the ballot. Details will be distributed to all E31 members shortly.

If you have any questions, please contact Dan Smith at 610-832-9727 or dsmith@astm.org.



Draft Standard Specification for the Continuity of Care Record (CCR)¹

Version 1a (March 2005)

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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. 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 includes a summary of the patient's health status (e.g., 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 Section 5.1 for a description of the CCR's components and sections, and Annex A 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 standard specification is included. When prepared in a structured electronic format, strict adherence to the .xsd (Annex B) and the Implementation Guide (Annex C) is required to support standards-compliant interoperability.
- 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 standard 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 standard are not to be considered normative.
- 1.3 To ensure interchangeability of electronic CCRs, this standard specifies XML coding that is required when the CCR is created in a structured electronic format. This specified

¹ This specification is under the jurisdiction of ASTM Committee E31 on Healthcare Informatics and is the direct responsibility of Subcommittee E31.28 Continuity of Care Record Work Group.

XML coding provides flexibility that will allow users to prepare, transmit, and view the CCR in multiple ways, e.g., 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 Annex B) 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.
- 1.3.2 Using the required XML schema (see Annex B), properly designed 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 while conforming to regulations or other security, confidentiality, or privacy protections as applicable within the scope of this standard.
 - 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 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 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 X.509 v3 or Security Assertion Markup Language (SAML) 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 ASTM International Committee E31 on Healthcare Informatics 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, and the Mobile Healthcare Alliance (MoHCA) as co-leaders with ASTM in the standard's development and adoption, and joins them in inviting the collaboration of all stakeholders, including 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 and legal concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health and legal practices and to determine the applicability of regulatory limitations prior to its use.

2. Referenced Documents

2.1 ASTM Standards:

- 2.1.1 E 1384 Practice for Content and Structure of the Electronic Health Record (EHR)
- 2.1.2 E 2084 Standard Specification for Authentication of Healthcare Information Using Digital Signatures
- 2.1.3 E 2184 Standard Specification for Healthcare Document Formats
- 2.1.4 E 2182 Standard Specification for Clinical XML DTDs in Healthcare
- 2.1.5 E 2183 Guide for XML DTD Design, Architecture, and Implementation

2.2 Other

- 2.2.1 Health Information Portability and Accountability Act, US Congress, 1996.
- 2.2.2 ICD-9-CM (<http://www.cdc.gov/nchs/about/otheract/icd9/abticd9.htm>).
- 2.2.3 LOINC (<http://www.loinc.org/>).
- 2.2.4 Massachusetts Department of Health Patient Care Referral Form.
- 2.2.5 NDC (<http://www.fda.gov/cder/ndc/>).
- 2.2.6 RxNorm (http://www.nlm.nih.gov/research/umls/rxnorm_main.html).
- 2.2.7 SNOMED (<http://www.snomed.org/>).
- 2.2.8 W3C XML digital signature standard (<http://www.w3.org/TR/xmlsig-core/>).
- 2.2.9 W3C XML encryption standard (<http://www.w3.org/TR/xmlenc-core/>).

3. Terminology

- 3.1 *Definitions of Terms Specific to This Standard. These terms also include the common*

terms seen in many documents related to the CCR. See also Annex A for definitions of additional terms specific to this standard.

- 3.1.1 *actors*—All the individuals, organizations, locations, and systems associated with the data in the CCR.
- 3.1.2 *attribute*—For the purposes of this standard, 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.
- 3.1.3 *CCR Body*—Contains the core patient-specific data in a CCR, e.g., Insurance, Medications, Problems, Procedures, and the like
- 3.1.4 *CCR components*—CCR Header, CCR Body, CCR Footer. Each component is made of sections, which in turn are made up of data fields.
- 3.1.4 *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.
- 3.1.5 *CCR Header*—Defines the document parameters, including its unique identifier, 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.
- 3.1.6 *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.
- 3.1.6 *CDA*—The HL7 CDA (Clinical Document Architecture) is a document markup standard for the structure and semantics of exchanged clinical documents. Source: E 2182.
- 3.1.8 *complex data type or a group*—Concepts used more than once; defined by adding the post-fix 'Type'.
- 3.1.9 *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 A for a detailed list of data fields.
- 3.1.10 *CPT—Current Procedural Terminology*, 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.
- 3.1.11 *data fields*—Required or optional data within a section. Data fields may be repeated as often as necessary. (See Annex A.)
- 3.1.13 *data objects*—Discrete patient-specific data (Medications, Problems, Procedures, and the like).
- 3.1.14 *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. Source: E 2084.
- 3.1.15 *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

- 3.1.16 *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 standard specification.
- 3.1.17 *element and attribute names*—The literal names of the XML tags (elements) and attributes of the XML tags (attributes).
- 3.1.18 *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. (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.
Source: Modified from E1384
- 3.1.19 *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.
- 3.1.20 *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. Source: Modified from E1384
- 3.1.21 *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). Source: E 1382.
- 3.1.22 *fields*— See *data fields*.
- 3.1.23 *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.
Source: E 2182.
- 3.1.24 *HIPAA*— Health Information Portability and Accountability Act adopted by US Congress in 1996.
- 3.1.25 *HL7*—See Health Level 7.
- 3.1.26 *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.

- 3.1.27 *ICD-10*—The International Classification of Diseases, Tenth Revision, the World Health Organization.
- 3.1.28 *integrity*—Property that data has not been altered or destroyed in an unauthorized manner. Source: E 2084.
- 3.1.29 *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. Source <http://www.loinc.org/>
- 3.1.30 *messaging standard*—A method of electronic data exchange offered by HL7.
- 3.1.31 *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. Source <http://www.fda.gov/cder/ndc/>.
- 3.1.32 *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.
- 3.1.33 *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 A.)
- 3.1.34 *optionality*—Defining whether or not something is optional or not.
- 3.1.35 *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, 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. Source: E1384
- 3.1.36 *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.
- 3.1.37 *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.
- 3.1.38 *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. Source: E2184
- 3.1.39 *purpose*—The specific reason for which a specific CCR is generated, such as patient admission, transfer, consult/referral, or inpatient discharge.
- 3.1.40 *referral*—The process of transferring all or a portion of a patient's care from one setting or practitioner to another.
- 3.1.41 *references*—Data sources/locations that are outside the CCR, e.g., URLs, diagnostic images, clinical documents.
- 3.1.41 *required field*—A field that must be completed within the CCR (see Annex A).

None or *unknown* is an acceptable entry.

- 3.1.42 *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. Source: http://www.nlm.nih.gov/research/umls/rxnorm_main.html.
- 3.1.12 *section*—A group of data fields within each component of the CCR. (See Annex A.)
- 3.1.13 *sig*—The use or administration instructions for a medication.
- 3.1.44 *SNOMED CT*—SNOMED Clinical Terms is the universal health care terminology that makes health care knowledge usable and accessible wherever and whenever it is needed. Source: <http://www.snomed.org/>.
- 3.1.43 *transfer*—Referral of a patient that results in the physical movement of the patient from one location to another.
- 3.1.45 *vendor configurable fields*—Fields where a vendor can define their use and/or content.
- 3.1.46 *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). Source: E 2182.
- 3.1.47 *XML codes*—Descriptors used to define the fields of the CCR when it is prepared in a structured electronic format.
- 3.1.48 *XML document*—A document constructed of XML tags and data.
- 3.1.49 *XML encryption*—A W3C standard for encrypting XML.
- 3.1.50 *XML schema*—Defines the elements that may appear within the XML document and the attributes that may be associated with an element. 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. Source: Modified from E 2183.
- 3.1.51 *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.
- 3.1.52 *XML tag attributes*—Attributes that apply to a specific XML tag and its data.
- 3.1.53 *xsd*—The XML schema.
- 3.1.54 *xsl*—Extensible Style Language, used to format and transform XML documents into other XML formats or to non-XML data or print formats.
- 3.1.55 *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. Source: E 2182.

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 (e.g., social work, physical therapy, occupational therapy), for example, in the following instances.
 - 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 followup 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.

4.4 Subsequently, the CCR may provide additional content and support for the EHR through domain-specific applications, such as:

- 4.4.1 *Enterprise- and institution-specific information* particularly regarding discharge or transfer, e.g., hospital to nursing and rehabilitation facilities or to home care agencies, and vice versa.
- 4.4.2 *Clinical specialty information*, e.g., Pediatrics, Surgery, OB-GYN, Cardiology, Orthopedics, etc.
- 4.4.3 *Disease management information* to accommodate the recording of disease-specific management information, performance measures, or guidelines, e.g., for diabetes, congestive heart failure, asthma, etc. This 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 useful for claims attachments.
- 4.4.5 Patient-entered *personal health record information*, e.g., 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.

5.1.1.1.1 The uniqueness of the ID is defined within the generating system and must be unique to and within each CCR but it not considered unique across the universe of CCRs

5.1.1.2 *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.

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

5.1.1.3.1 Patient identification is not based on a centralized system or a national patient identifier. Rather, it is based on a federated or 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.

- 5.1.1.3.2 A CCR can be about only one patient with the rare exception of Siamese 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.
- 5.1.1.4 *From* identifies the practitioner(s), person(s), system(s), or organization(s) that generated the CCR and also defines the healthcare role that entity is playing when generating the CCR.
- 5.1.1.5 *To* identifies the intended recipient or recipients (practitioner, person, system, or organization) of the CCR and that recipient's role in relationship to the patient.
- 5.1.1.6 *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.
 - 5.1.2.1 *Insurance* 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.
 - 5.1.2.1.1 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.
 - 5.1.2.1.2 Also contained within the Insurance 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 and/or provider.
 - 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.
 - 5.1.2.3.1 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, e.g., 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 (e.g., lifestyle), social, and environmental history and health risk factors.
- 5.1.2.8 *Alerts* contains data defining the patient's warnings such as allergies, adverse reactions, and other alerts.
 - 5.1.2.8.1 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.
 - 5.1.2.8.2 Alerts are prompts or warnings related to patient safety.
- 5.1.2.9 *Medications* defines a patient's current medications and pertinent medication history.
 - 5.1.2.9.1 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.
- 5.1.2.10 *Immunizations* defines a patient's current immunization status and pertinent immunization history.
- 5.1.2.11 *Vital Signs* defines the patient's current and historically relevant vital signs, e.g., blood pressure, pulse, respiratory rate, height, weight, body mass index, head circumference, crown-to-rump length, pulse oximetry, pulmonary function tests
 - 5.1.2.11.1 At a minimum, pertinent vital signs, such as the most recent, maximum and/or minimum, baseline, or relevant trends should be listed.
- 5.1.2.12 *Results* captures detailed pertinent and most recent laboratory, diagnostic, and therapeutic results data.
- 5.1.2.13 *Procedures* defines all interventional, surgical, diagnostic, or therapeutic procedures or treatments pertinent to the patient historically and at the time the CCR is generated.
 - 5.1.2.13.1 The preferred controlled vocabulary here is SNOMED CT, as well as the current CPT Codeset for the procedure and LOINC for any result,
- 5.1.2.14 *Encounters* contains data defining all pertinent healthcare encounters as well as pending healthcare appointments of the patient at the time the CCR is generated.
 - 5.1.2.14.1 Encounters can be hospitalizations office visits, home health visits, long-term care stays, or any other pertinent encounters.

- 5.1.2.15 *Plan of Care* contains data defining all pending orders, interventions, encounters, services, and procedures for the patient.
 - 5.1.2.15.1 All active, incomplete, or pending orders, appointments, referrals, procedures, services, or any other pending event of clinical significant to the current and ongoing care of the patient should be listed, unless constrained due to issues of privacy.
 - 5.1.2.15.2 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.
- 5.1.2.16 *Practitioners* 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 information about external references, i.e., data sources/locations that are outside the CCR.
 - 5.1.3.2.1 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 comments associated with any data within the CCR.
 - 5.1.3.3.1 Comments are free-text comments that are not intended to contain core relevant clinical or administrative data.
 - 5.3.3.3.1 Comments should also not contain pointers to references or other data external to the CCR that applies to a CCR section.
 - 5.1.3.4 *Signatures* contains all signatures associated with any data within the CCR.
- 5.2 Annex A of this standard specification 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 Annex B provides the XML schema (.xsd) derived from the XML codes in Annex A. When the CCR is prepared in a structured electronic format, this XML .xsd in conjunction with Annex C, the Implementation Guide, must be used to assure interoperability.
- 5.4 Annex C provides the Implementation Guide, which contains instructions for using the XML .xsd (provided in Annex B) 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. Specific coding recommendations include the following.

- 5.5.1 Problems should be coded at the highest level using SNOMED CT and the most recent ICD-9 CM 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. 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.
- 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, medical equipment, medication, normalization, optionality, patient, patient health record, patient health status, patient identifying information, payer, PHR, physiological measurements, plan of care, practitioner, problem, procedure, purpose, referral, reference, required data , result, SAML, Security Assertion Markup Language, sections, security, sig, signature, social history, source, status, support, to, transfer, unique identifier, vendor configurable fields, vital signs, W3C, XML, XML code, XML document, XML schema, XML signature, .xsd, .xml.

(Required Information)**A. Annex A: CCR Data Fields Spreadsheet**

- A.1 The attached spreadsheet lists and describes the document object 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.
 - A.1.1 An XML code. (See Annex B for the required XML .xsd derived from these XML codes.)
 - A.1.3 A definition.
 - A.1.4 Explanations, descriptions, requirements, and restrictions.
 - A.1.5 Comments and examples.
 - A.1.6 Required or optional status.

B. Annex B: Required XML .xsd for the CCR

- B.1 The .xsd or 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 A. Strict adherence to this schema is required to support standards-compliant interoperability.
- B.2 Figure 1 below represents the CCR general schema structure.

CCR General .xsd Structure

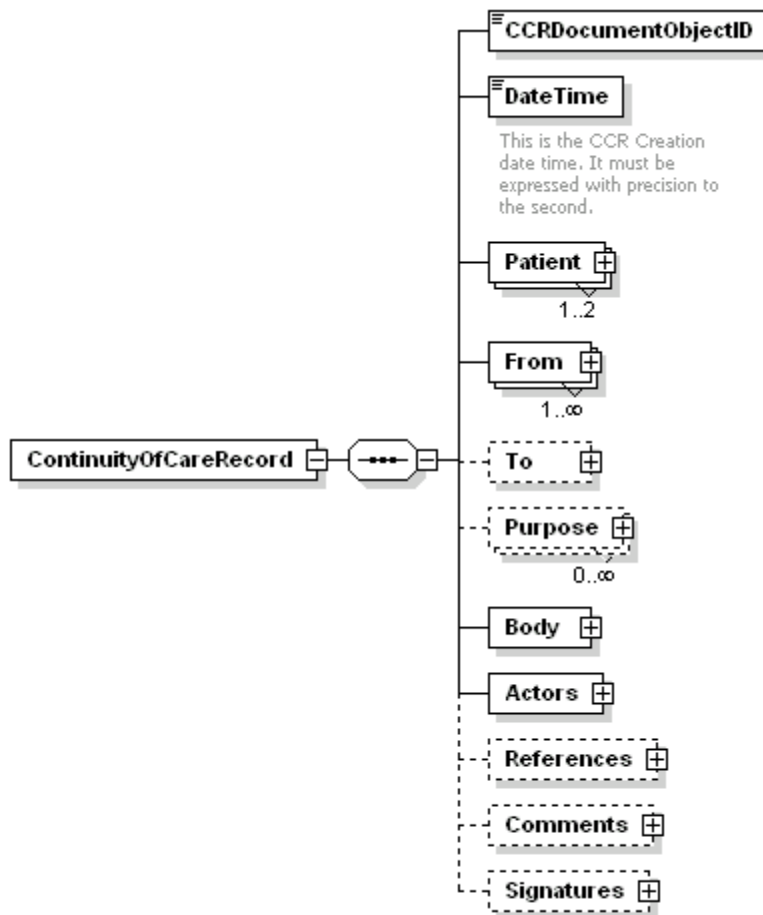


Figure 1: General Structure of the CCR .xsd

C. Annex C: Implementation Guide for the Continuity of Care Record

C.1 The Implementation Guide contains instructions for using the CCR XML .xsd

(See Annex B) 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 .xsd (Annex B) that accompanies this Implementation Guide (Annex C) must be used with the Implementation Guide for validation of a CCR under this version of the CCR standard.

C.1.1 ASTM E31 Committee on Healthcare or others may provide sample .xsl files as well as sample patients 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 XML .xsd.

C.2 The core patient-specific data in the CCR are contained within the Body of the CCR Document Object, as illustrated in Figure 2 below.

CCR XML Structure Expanded To Show Patient-Specific Data

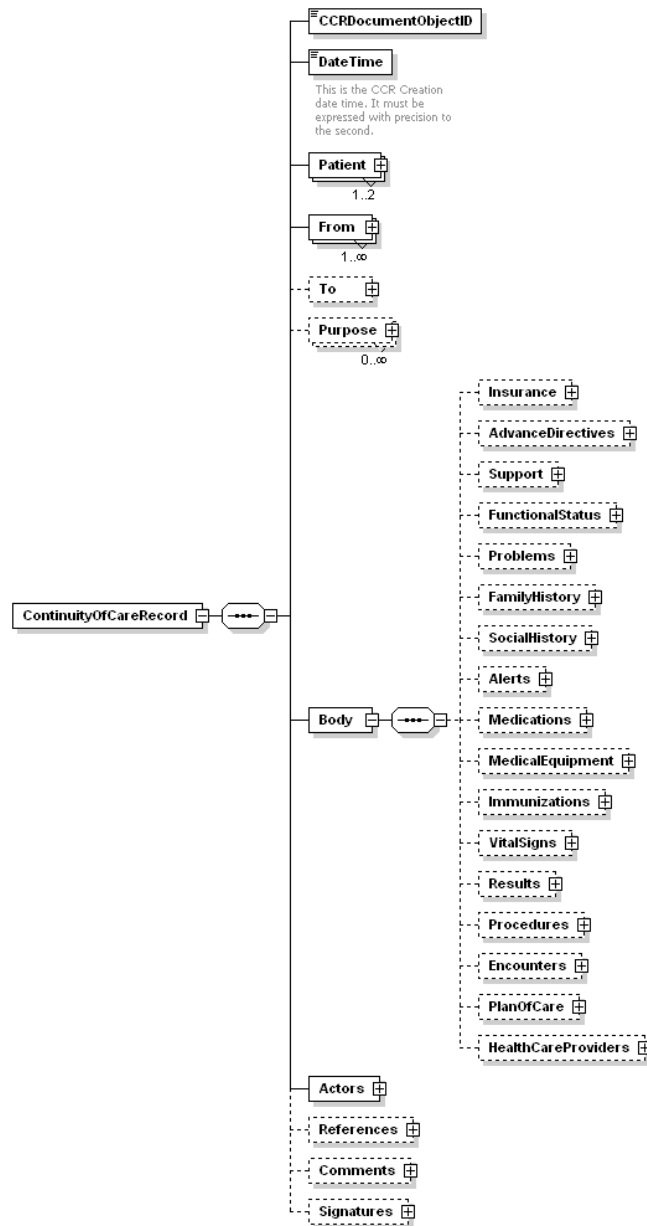


Figure 2: Core patient-specific data are contained within the Body of the CCR Document Object.

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- (5) E 1869 Standard Guide for Confidentiality, Privacy, Access, and Data Security Principles for Health Information Including Electronic Health Records.
- (6) E 1985 Standard Guide for User Authentication and Authorization.
- (7) E 1986 Standard Guide for Information Access Privileges to Health Information.
- (8) E 2084 Standard Specification for Authentication of Healthcare Information Using Digital Signatures.
- (9) E 2085 Standard Guide on Security Framework for Healthcare Information.
- (10) E 2086 Standard Guide for Internet and Intranet Security.
- (11) E 2147 Standard Specification for Audit and Disclosure Logs for Use in Health Information Systems.
- (12) E 2182 Specification for Clinical XML DTDs in Healthcare.
- (13) E 2183 Guide for XML DTD Design, Architecture, and Implementation.
- (14) E 2184 Standard Specification for Healthcare Document Formats.
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	A	B	C	D	E	F
	CCR ATTRIBUTES AND DATA OBJECTS	XML	DEFINITION	EXPLANATIONS, DESCRIPTIONS, REQUIREMENTS, AND RESTRICTIONS	COMMENTS AND EXAMPLES	REQUIRED OR OPTIONAL
1						
2						
3	CCR Document Object Attributes					
4						
5	CCR HEADER					
6	CCR Unique Identifier	<CCRDokumentObjectID>	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 but is not considered unique across the universe of all CCRs.	The <CCRDokumentObjectID> 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.	Ab2827-i8_z21	Required
7	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 [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.	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
8	Patient	<Patient>	Identifies the patient to which the CCR refers. This is a link to <Actor> through an <ActorID> of type xs:IDREF. 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 Siamese 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 Siamese 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
9	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. If the CCR is encrypted, and the sender wants the <From> address to be readable without decrypting the CCR as a whole, <Actor> details can be redundantly placed under <From><Actor>. Note that this is a special use case for encrypted CCRs.	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
10	To	<To>	Identifies to whom or what the CCR is being sent. 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. If the CCR is encrypted, and the sender wants the <To> address to be readable without decrypting the CCR as a whole, <Actor> details can be redundantly placed under <To><Actor>. Note that this is a special use case for encrypted CCRs.	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
11	Purpose	<Purpose>	Defines the <Purpose> for which the CCR was generated.			Optional
12		<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
13		<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
14		<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
15		<Indication>	Defines a specific <Indication> that supports the <Purpose> of this CCR.	See <Indication>.	See <Indication>.	Optional
16		<Reference>	Used to link the <Purpose> to a <Reference>.	This is a link to <Reference>.	See References.	Optional
17		<Comment>	Used to link to and support a free text or structured <Comments> for the <Purpose>.	This is restricted to legitimate free text 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
18						
19	CCR BODY					
20	Insurance	<Insurance>	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
21		<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
22		<CCRDokumentObjectID>	All CCR data objects must have a unique data object ID.	The CCR Document Object 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, 0-9. They can be of any character length. Each <CCRDokumentObjectID> MUST be unique within each instance of the CCR.	See <CCRDokumentObjectID>.	Required if Insurance Section/Object is included
23		<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

	A	B	C	D	E	F
24		<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
25		<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.
26		<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.
27		<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
28		<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
29		<InternalCCRLink>	Used to link one CCRDataObject to another CCRDataObject.	This defines internal CCR links and uses a xs:IDREF to refer/link to a CCRDataObjectID, which is of type xs:ID.	Pharmacy benefit plan to cover medications. <Authorization> to a specific procedure, etc.	Optional
30		<Reference>	Used to link the <Insurance> 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
31		<Comment>	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 <Reference>. This is a link to <Comment>.	See Comments.	Optional
32		<Authorization>	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
33	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 should be listed in as much detail as possible.		Optional
34		<CCRDataObjectID>	Defined above.	Required of all CCRDataObjects.		Required if Advance Directives Section/Object is included
35		<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
36		<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
37		<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
38		<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
39		<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
40		<InternalCCRLink>	Used to link one CCRDataObject to another CCRDataObject.	This defines internal CCR links and uses a xs:IDREF to refer/link to a CCRDataObjectID, which is of type xs:ID.	Advance Directive may be linked to a specific problem/diagnosis such as COPD or metastatic CA, etc.	Optional
41		<Reference>	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
42		<Comment>	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 <Reference>. This is a link to <Comment>.	See Comments.	Optional
43	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 <u>not</u> 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, imam, etc.	Optional

	A	B	C	D	E	F
	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
44		<CCRDataObjectID>	Defined above.	Required of all CCRDataObjects.		Required if Functional Status Section/Object is included
45		<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
46		<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
47		<Problem>	Used when the <FunctionalStatus> is a problem, such as a clinical condition.	See Problems.		Optional
48		<Result>	Used when the <FunctionalStatus> is a result such as a mini-mental status exam or functional assessment.	See Results.		Optional
49		<Description>	Used to express the <FunctionalStatus> <u>if and only if</u> 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
50		<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
51		<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 <u>all</u> 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
52		<InternalCCRLink>	Used to link one CCRDataObject to another CCRDataObject.	This defines internal CCR links and uses a xs:IDREF to refer/link to a CCRDataObjectID, which is of type xs:ID.	<Function> to a specific <Problem>.	Optional
53		<Reference>	Used to link the <FunctionalStatus> to a <Reference>.	This is a link to <Reference>. <Reference> under <FunctionalStatus> <u>must</u> 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
54		<Comment>	Used to link to and support a free text or structured <Comment> for the <FunctionalStatus>.	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>, <Problem>, <Result>, <Source>, or <Reference>. This is a link to <Comment>.	See Comments.	Optional
55	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
56		<CCRDataObjectID>	Defined above.	Required of all CCRDataObjects.		Required if Problem Section/Object is included
57		<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
58		<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
59		<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.	
60		<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
61		<Episodes>	Used to define one or more episodes of a problem.	Episodes should be listed for recurrent or repetitive problems, conditions, diagnoses, or symptoms, <u>rather</u> than listing a problem multiple times in the problem list. <Episodes> has children <Numbers>, <Frequency>, <Episode>, and <Duration>.		Optional
62		<HealthStatus>	Used to define the patient's current <HealthStatus> relative to this <Problem>.	<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
63		<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
64		<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 <u>all</u> 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
65		<InternalCCRLink>	Used to link one CCRDataObject to another CCRDataObject.	This defines internal CCR links and uses a xs:IDREF to refer/link to a CCRDataObjectID, which is of type xs:ID.	Problem to a specific <History>, <Procedure>, <Product>, or <Encounter>, etc.	Optional
66		<Reference>	Used to link the <Problem> to a <Reference>.	This is a link to <Reference>. <Reference> under <Problem> <u>must</u> be a child of <Source>.	A <Reference> to a clinical note, discharge summary, or other documents or healthcare records that support the <Problem>.	Optional
67						

	A	B	C	D	E	F
		<Comment>	Used to link to and support a free text or structured <Comment> for the <Problem>.	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>, <Episodes>, <CurrentHealthStatus>, <PatientKnowledge>, <Source>, or <Reference>. This is a link to <Comment>.	See Comments.	Optional
68	Family History	<History>	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
69		<CCRDataObjectID>	Defined above.	Required of all CCRDataObjects.		Required if Family History Section/Object is included
70		<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
71		<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
72		<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
73		<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
74		<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.	See <Problem>, above.	Optional
75		<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
76		<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
77		<InternalCCRLink>	Used to link one CCRDataObject to another CCRDataObject.	This defines internal CCR links and uses a xs:IDREF to refer/link to a CCRDataObjectID, which is of type xs:ID.	<History> to a specific <Problem>.	Optional
78		<Reference>	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
79		<Comment>	Used to link to and support a free text or structured <Comment> for the <History>.	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>, <Problem>, <FamilyMember>, <Source>, or <Reference>. This is a link to <Comment>.	See Comments.	Optional
80	Social History	<History>	This CCRDataObject is used to define the patient's occupational, personal (e.g., lifestyle), social, and environmental history and health risk factors.	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
81		<CCRDataObjectID>	Defined above.	Required of all CCRDataObjects.		Required if Social History Section/Object is included
82		<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
83		<Type>	Defines the social <History> <Type>.	This is a CodedDescriptionType with restricted content that must be one of the defined structured text values.	Marital Status, Religion, Ethnicity, Race, Language, Smoking, Exercise, Diet, Employment, Toxic Exposure, ETOH Use, Drug Use, Etc.	Optional
84		<Description>	Used to express the <History>.	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
85		<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
86		<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
87		<InternalCCRLink>	Used to link one CCRDataObject to another CCRDataObject.	This defines internal CCR links and uses a xs:IDREF to refer/link to a CCRDataObjectID, which is of type xs:ID.	<History> to a specific <Problem>.	Optional
88		<Reference>	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
89		<Comment>	Used to link to and support a free text or structured <Comment> for the <History>.	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 <Reference>. This is a link to <Comment>.	See Comments.	Optional
90	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
91		<CCRDataObjectID>	Defined above.	Required of all CCRDataObjects.		Required if Alerts Section/Object is included
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93		<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
94		<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
95		<Description>	Used to express the <Alert>.	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
96		<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
97		<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
98		<Reaction>	Describes the <Reaction> that is the result of the <Agents>.	Contains <Description> and <Severity> as CodedDescriptionTypes, and <Intervention>, which can be used to define any <Intervention> that has been successful in treating the <Reaction>.	<Description><Text>Anaphylaxis<Severity>Life Threatening<Intervention>Intubation	Optional
99		<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 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
100		<InternalCCRLink>	Used to link one CCRDataObject to another CCRDataObject.	This defines internal CCR links and uses a xs:IDREF to refer/link to a CCRDataObjectID, which is of type xs:ID.	<Alert> to a specific <Product>, <Problem>, or <Procedure>.	Optional
101		<Reference>	Used to link the <Alert> to a <Reference>.	This is a link to <Reference>. <Reference> under <Alert> <u>must</u> 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
102		<Comment>	Used to link to and support a free text or structured <Comment> for the <Alert>.	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>, <Agent>, <Reaction>, <Source>, or <Reference>. This is a link to <Comment>.	See Comments.	Optional
103	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
104		<CCRDataObjectID>	Defined above.	Required of all CCRDataObjects.		Required if Medications Section/Object is included
105		<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
106		<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
107		<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
108		<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
109		<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.
110		<ProductName>	Defines the GENERIC name 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. An NCD Code or RxNorm Code (preferred) should be used when <Product> is used to describe a medication.	Amoxicillin	Required if <Product> is used.
111		<BrandName>	Defines the <BrandName> 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.	Amoxil	Optional
112		<Manufacturer>	Defines the <Manufacturer> of the <Product>.	This is a link to <Actor>.	Eli Lilly, Pfizer, etc.	Optional
113		<IDNumber>	Defines an <ID> for the <Product>.	An instance of IDType.	Lot Number, Part Number, Serial Number.	Optional
114		<Strength>	Defines the <Strength> of the <Product>.	MeasureType with <Value> and <Units>.	250mg	Optional
115		<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
116		<Concentration>	Defines the <Concentration> of the <Product>.	MeasureType with <Value>, <Units>, and <Code>.	250mg/5ml	Optional
117		<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, 2cm x 15 cm, 24mm diameter.	Optional
118		<Quantity>	Defines the <Quantity> of the <Product>.	MeasureType with <Value>, <Units>, and <Code>.	30	Optional
119		<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

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120		<Description>	Used for text strings that cannot be parsed into discrete data fields to describe a discrete structured product. Note that <Description>, above, is used for text, such as name, for a complex product made up of more than one unique structured product.	<Description> is a CodedDescriptionType and is to be used under <Product> only when a system generating a CCR cannot parse and generate a fully tagged XML SIG string as defined by the following fields. An unstructured SIG text string must be placed under <Description><Text>.	1 po tid x 10 days	Optional
121		<Dose>	Dispensed dose is found under <Strength>, above. 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.	MeasureType with <Value>, <Units>, and <Code>.	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
122		<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>.	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
123		<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.	Includes <Dose><Value> and <Units> as well as a <Variable> and a <DoseCalculation>.	Not to exceed 10 Tablets in 24 Hours' or '1000 mg/kg/hr'.	Optional
124		<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>.	D5W, normal saline, etc.	Optional
125		<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.	po, pr, sl, etc.	Optional
126		<Site>	Used to define a <Site> of administration, if applicable.	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.	Right gluteus, left deltoid, Hickman catheter, etc.	Optional
127		<DateTime>	This is used to define a specific administration or use time. Can repeat for more than one administration time.	An instance of DateTimeType.	Can be a text string (Morning, Evening, Before Meals, 1 Hour After Meals, 3 Hours After Meals, Before Bed) or an exact time.	Optional
128		<Rate>	Use to define a <Product> rate of use/administration.	This can be expressed as a <Description> (CodedDescriptionType) or a <Value> and <Units>.	2mcg/min, 125cc/h, 1Liter over 30 minutes, As Tolerated.	Optional
129		<Frequency>	Use to define a <Product> frequency of use/administration.	This can be expressed as a <Description> (CodedDescriptionType) or a <Value> and <Units>.	qd, bid, tid, qid, qod, etc.	Optional
130		<Interval>	Use to define a <Product> interval of use/administration.	This can be expressed as a <Description> (CodedDescriptionType) or a <Value> and <Units>.	q15m, q2h, q4h, q12h	Optional
131		<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>.	x 10 days	Optional
132		<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.	Can have the value Yes or be Null.		Optional
133		<Indications>	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 <PhysiologicalParameters>. It also includes a PRN designator.	Strep pharyngitis	Optional
134		<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
135		<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
136		<Refills>	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
137		<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
138		<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>. <Reference> and <Comment> are optional.	<Description><Text>Consent Obtained, <Source>Mother	Optional
139		<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
140		<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
141		<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 Section/Object is included
142		<InternalCCRLink>	Used to link one CCRDataObject to another CCRDataObject.	This defines internal CCR links and uses a xs:IDREF to refer/link to a CCRDataObjectID, which is of type xs:ID.	<Product> to a specific <Encounter>, and/or as a link under <Indication> to a specific <Problem>.	Optional
143		<Reference>	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

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		<Comment>	Used to link to and support a free text or structured <Comment> for the <Product>.	This is restricted to legitimate free text comments only. It is NOT to be used to contain any data that correctly belong under the appropriate explicit tags.	See Comments.	Optional
144	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
145	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
146	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
147	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
148		<CCRDataObjectID>	Defined above.	Required of all CCRDataObjects.		Required If Results Section/Object is included
149		<DateTime>	Used to define dates and times relevant to the patient and the <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
150		<Type>	Used to define the <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 Results Section/Object is included
151		<Description>	Used to describe a <Result> set when there are more than one <Test> in a <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
152		<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 <Results> should be an <InternalCCRLink>.	Punch Biopsy Left Shoulder Skin Lesion, Cath Urinalysis	Optional
153		<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
154		<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
155		<Test><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.	
156		<Test><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
157		<Test><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
158		<Test><Method>	Defines the <Test> <Method>.	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
159		<Test><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
160		<Test><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
161		<Test><NormalResult>	The expected <NormalResult>.	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
162		<Test><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
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164		<Test><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
165		<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
166		<InternalCCRLink>	Used to link one CCRDataObject to another CCRDataObject.	This defines internal CCR links and uses a xs:IDREF to refer/link to a CCRDataObjectID, which is of type xs:ID.	<Result> or <TestResult> to a specific <Problem> or <Encounter>.	Optional
167		<Reference>	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
168		<Comment>	Used to link to and support a free text or structured <Comment> for the <Result>.	This is restricted to legitimate free text 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> <u>not</u> . <Comment> is specifically used in <Result> to point out warnings.	See Comments.	Optional
169	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.		Optional
170		<CCRDataObjectID>	Defined above.	Required of all CCRDataObjects.		Required if Procedures Section/Object is included
171		<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
172		<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
173		<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
174		<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
175		<Location>	Used to describe the <Location>(s) where the <Procedure> was done.	This can be expressed as a <Description> (CodedDescriptionType) or as a link to an <Actor>.	Charity Hospital	Optional
176		<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
177		<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
178		<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
179		<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
180		<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
181		<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
182		<Method>	Used to describe a specific procedural <Method>.	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
183		<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
184		<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
185		<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
186		<InternalCCRLink>	Used to link one CCRDataObject to another CCRDataObject.	This defines internal CCR links and uses a xs:IDREF to refer/link to a CCRDataObjectID, which is of type xs:ID.	<Procedure> to a specific <Problem>.	Optional
187		<Reference>	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
188		<Comment>	Used to link to and support a free text or structured <Comment> for the <Procedure>.	This is restricted to legitimate free text comments only. It is NOT to be used to contain any data that correctly belong under the appropriate explicit tags.	See Comments.	Optional

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	Encounters	<Encounter>	This CCRDataObject is used to list and describe any healthcare encounters pertinent to the patients current health status or historical health history. An <Encounter> is defined as 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.	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.		Optional
189		<CCRDataObjectID>	Defined above.	Required of all CCRDataObjects.		Required if Encounters Section/Object is included
190		<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
191		<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
192		<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.		Optional
193		<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
194		<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
195		<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
196		<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
197		<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
198		<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 of Non-Steroidal Anti-Inflammatory agents 7 days prior to procedure.	
199		<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
200		<InternalCCRLink>	Used to link one CCRDataObject to another CCRDataObject.	This defines internal CCR links and uses a xs:IDREF to refer/link to a CCRDataObjectID, which is of type xs:ID.	<Encounter> to a specific <Problem>.	Optional
201		<Reference>	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
202		<Comment>	Used to link to and support a free text or structured <Comment> for the <Encounter>.	This is restricted to legitimate free text comments only. It is NOT to be used to contain any data that correctly belong under the appropriate explicit tags.	See Comments.	Optional
203	Plan of Care	<Plan>	This CCRDataObject is used to list and describe any 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.	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
204		<CCRDataObjectID>	Defined above.	Required of all CCRDataObjects.		Required if Plan of Care Section/Object is included
205		<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
206		<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	
207		<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
208		<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
209		<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
210						

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211		<OrderRequest><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
212		<OrderRequest><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
213		<OrderRequest><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
214		<OrderRequest><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
215		<OrderRequest><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
216		<OrderRequest><Product>	Used to describe a specific <Product> <OrderRequest>.	This is a specific use of <Product> as defined, above.	Wheelchair, home nebulizer, prosthesis, etc.	Optional
217		<OrderRequest><Medication>	Used to describe a specific <Medication> <OrderRequest>.	This is a specific use of <Product> (Medication) as defined, above.	Enoxaparin, chemotherapy, etc.	Optional
218		<OrderRequest><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
219		<OrderRequest><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
220		<OrderRequest><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	Optional
221		<OrderRequest><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
222		<OrderRequest><Goals>	Used 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
223		<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 <u>all</u> 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
224		<InternalCCRLink>	Used to link one CCRDataObject to another CCRDataObject.	This defines internal CCR links and uses a xs:IDREF to refer/link to a CCRDataObjectID, which is of type xs:ID.	<OrderRequest> to a specific <Problem> or <Encounter>.	Optional
225		<Reference>	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
226		<Comment>	Used to link to and support a free text or structured <Comment> for the <Plan> or <OrderRequest>.	This is restricted to legitimate free text comments only. It is NOT to be used to contain any data that correctly belong under the appropriate explicit tags.	See Comments.	Optional
227	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 <u>not</u> used for listing a patient's <u>non-healthcare</u> <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
228	CCR FOOTER					
229	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 <u>all</u> <Actors>.		Required
230		<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
231		<Person>	Defines the details about an <Person> as an <Actor>.			Optional
232		<Name>	A container for patient name(s) as follows below:			Optional
233		<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
234		<FormerName>	Any former names or aliases the patient has had.	Consists of <Given>, <Middle>, <Family>, <Suffix>, <Title>, <NickName>.	See example above.	Optional
235		<CurrentName>	The patient's current legal name or currently used alias.	Consists of <Given>, <Middle>, <Family>, <Suffix>, <Title>, <NickName>.	See example above.	Optional
236		<DisplayName>	A text string that represents the <Actor> name as it should be displayed as a simple, untagged, and unparsed string.		John Q. Doe, III, MD, PhD	Optional
237		<DateOfBirth>	Defines <DateOfBirth>.	<DateOfBirth> should be as accurate as possible and should use <ExactDateTime>.		Optional
238		<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
239		<Organization>	Defines the details about an <Organization> as an <Actor>.	Expressed by a text string under <Name>.	Southfork Community Clinic	Optional
240		<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
241		<ID>	Used to list one or more external/non-CCR unique identifiers that apply to the <Actor>.	<ID> contains <DateTime>, <Type>, <ID>, and <IssuedBy>.	Social Security Number, medical record number(s), etc.	Optional
242		<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

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243		<Specialty>	Defines the <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
244		<Address>	Used to express the <Address> of the <Actor>.	<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
245		<Telephone>	Used to express the <Telephone> of the <Actor>.	<Telephone> contains <Value>, <Type>, <Priority>, and <Status>.	555-555-5555 x555	Optional
246		<Email>	Used to express the <Email> of the <Actor>.	<Email> contains <Value>, <Type>, <Priority>, and <Status>.		Optional
247		<URL>	Used to express the <URL> of the <Actor>.	<URL> contains <Value>, <Type>, <Priority>, and <Status>.		Optional
248		<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
249		<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
250		<InternalCCRLink>	Used to link one CCRDataObject to another CCRDataObject.	This defines internal CCR links and uses a xs:IDREF to refer/link to a CCRDataObjectID, which is of type xs:ID.	Links <Actor> to a specific <Problem> or <Encounter>.	Optional
251		<Reference>	Used to link the <Actor> to a <Reference>.	This is a link to <Reference>.	A <Reference> to more detailed information about the <Actor>.	Optional
252		<Comment>	Used to link to and support a free text or structured <Comment> for the <Actor>.	This is restricted to legitimate free text comments only. It is NOT to be used to contain any data that correctly belong under the appropriate explicit tags.	See Comments.	Optional
253	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.		Optional
254		<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
255		<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
256		<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
257		<Source>	This is the <Source> of the <Reference>.	This is an <Actor> reference with <ActorID> and <ActorRole>.		Optional
258		<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
259	Comments	<Comment>	This CCRDataObject contains all text <Comments> associated with any data within the CCR. <Comments> are free-text 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
260		<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
261		<DateTime>	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>.	Reference DateTime	Optional
262		<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.	
263		<Source>	This is the <Source> of the <Comment> content.	This is an <Actor> reference with <ActorID> and <ActorRole>.		Optional
264		<Reference>	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
265	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 and use X.509v3 or Security Assertion Markup Language (SAML) digital signatures.		Optional
266		<CCRSignatureID>	This is the CCR Object ID for the <Signatures>.	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
267		<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		Optional
268		<Type>	This defines the <Signature> <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.	W3C Digital Signature.	Optional

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269		<IDs>	This expresses an external <Signature> IDs.	<IDNumber> contains <DateTime>, <Type>, <ID>, and <IssuedBy>.		Optional
270		<Source>	This is the <Source> of the <Signature>.	This is an <Actor> reference with <ActorID> and <ActorRole>.		Optional
271		<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

ccr20050305.xsd

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- edited with XMLSpy v2005 sp1 U (http://www.xmlspy.com) by Richard Peters (American Academy of Family Physicians) -->
<xs:schema targetNamespace="urn:astm-org:CCR" elementFormDefault="qualified" attributeFormDefault="unqualified"
xmlns="urn:astm-org:CCR" xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:ccr="urn:astm-org:CCR">
  <xs:element name="ContinuityOfCareRecord">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="CCRDObjectID" type="xs:string"/>
        <xs:element name="DateTime" type="ISO8601DateTimeSeconds">
          <xs:annotation>
            <xs:documentation>This is the CCR Creation date time. It must be expressed with precision to the
second.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="Patient" maxOccurs="2">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="ActorID" type="xs:IDREF"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element name="From" maxOccurs="unbounded">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="ActorLink" type="ActorReferenceType" maxOccurs="unbounded"/>
              <xs:element name="Actor" type="ActorType" minOccurs="0" maxOccurs="unbounded"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element name="To" minOccurs="0">
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              <xs:element name="Actor" type="ActorType" minOccurs="0" maxOccurs="unbounded"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element name="Purpose" type="PurposeType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="Body">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="Insurance" minOccurs="0">
                <xs:complexType>
                  <xs:sequence>
                    <xs:element name="Payer" type="InsuranceType" maxOccurs="unbounded"/>
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                </xs:complexType>
              </xs:element>
              <xs:element name="AdvanceDirectives" minOccurs="0">
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                  <xs:sequence>
                    <xs:element name="AdvanceDirective" type="CCRCodedDataObjectType"
maxOccurs="unbounded"/>
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                </xs:complexType>
              </xs:element>
              <xs:element name="Support" minOccurs="0">
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                    <xs:element name="SupportProvider" type="ActorReferenceType" maxOccurs="unbounded"/>
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                </xs:complexType>
              </xs:element>
              <xs:element name="FunctionalStatus" minOccurs="0">
                <xs:complexType>
                  <xs:sequence>
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      </xs:sequence>
    </xs:complexType>
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</xs:schema>
```

```

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    </xs:complexType>
  </xs:element>
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  </xs:element>
  <xs:element name="SocialHistory" minOccurs="0">
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              </xs:extension>
            </xs:complexContent>
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        </xs:element>
      </xs:sequence>
    </xs:complexType>
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    </xs:complexType>
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```



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    </xs:element>
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      </xs:complexType>
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      </xs:complexType>
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      </xs:complexType>
    </xs:element>
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  </xs:complexType>
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    <xs:sequence>
      <xs:element name="CCRSignature" type="SignatureType" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
</xs:sequence>
</xs:complexType>

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```
</xs:element>
<!--CCR Complex Types-->
<xs:complexType name="PurposeType">
  <xs:sequence>
    <xs:element name="DateTime" type="DateTimeType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element ref="Description" maxOccurs="unbounded"/>
    <xs:element name="OrderRequest" type="PlanOfCareType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="Indication" type="IndicationType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element ref="Reference" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element ref="Comment" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="InsuranceType">
  <xs:complexContent>
    <xs:extension base="CCRCodedDataObjectType">
      <xs:sequence>
        <xs:element name="PaymentProvider" type="ActorReferenceType" minOccurs="0"/>
        <xs:element name="Subscriber" type="ActorReferenceType" minOccurs="0"/>
        <xs:element ref="IDs" minOccurs="0"/>
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          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name="FunctionType">
  <xs:complexContent>
    <xs:extension base="CCRCodedDataObjectType">
      <xs:sequence>
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        <xs:element name="Result" type="ResultType" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name="HistoryType">
  <xs:complexContent>
    <xs:extension base="CCRCodedDataObjectType">
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        <xs:element name="Problem" minOccurs="0" maxOccurs="unbounded">
          <xs:complexType>
            <xs:complexContent>
              <xs:restriction base="ProblemType">
                <xs:sequence>
                  <xs:element ref="Type" minOccurs="0"/>
                  <xs:element ref="Description" minOccurs="0"/>
                  <xs:group ref="SLRCGroup"/>
                </xs:sequence>
              </xs:restriction>
            </xs:complexContent>
          </xs:complexType>
        </xs:element>
        <xs:element name="FamilyMember" minOccurs="0" maxOccurs="unbounded">
          <xs:complexType>
            <xs:complexContent>
              <xs:extension base="ActorReferenceType">
                <xs:sequence>
                  <xs:element name="Episodes" type="EpisodesType" minOccurs="0"/>
                  <xs:element name="HealthStatus" type="CurrentHealthStatusType" minOccurs="0"/>
                  <xs:group ref="SLRCGroup"/>
                </xs:sequence>
              </xs:extension>
            </xs:complexContent>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

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        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="ProblemType">
  <xs:complexContent>
    <xs:extension base="CCRCodedDataObjectType">
      <xs:sequence>
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        <xs:element name="HealthStatus" type="CurrentHealthStatusType" minOccurs="0"/>
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      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
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  <xs:complexContent>
    <xs:extension base="CCRCodedDataObjectType">
      <xs:sequence>
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      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
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  <xs:sequence>
    <xs:element name="ActorObjectID" type="xs:ID"/>
    <xs:choice>
      <xs:element name="Person">
        <xs:complexType>
          <xs:sequence>
            <xs:element name="Name">
              <xs:complexType>
                <xs:sequence>
                  <xs:element name="BirthName" type="PersonNameType" minOccurs="0"/>
                  <xs:element name="FormerName" type="PersonNameType" minOccurs="0"
maxOccurs="unbounded"/>
                  <xs:element name="CurrentName" type="PersonNameType" minOccurs="0"/>
                  <xs:element name="DisplayName" type="xs:string" minOccurs="0"/>
                </xs:sequence>
              </xs:complexType>
            </xs:element>
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        </xs:complexType>
      </xs:element>
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        </xs:complexType>
      </xs:element>
      <xs:element name="InformationSystem">
        <xs:complexType>
          <xs:sequence>
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            <xs:element name="Type" type="xs:string" minOccurs="0"/>
            <xs:element name="Version" type="xs:string" minOccurs="0"/>
          </xs:sequence>
        </xs:complexType>
      </xs:element>
    </xs:choice>
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</xs:complexType>

```

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<xs:element name="Relation" type="CodedDescriptionType" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="Specialty" type="CodedDescriptionType" minOccurs="0" maxOccurs="unbounded"/>
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      <xs:element name="County" type="xs:string" minOccurs="0"/>
      <xs:element name="State" type="xs:string" minOccurs="0"/>
      <xs:element name="Country" type="xs:string" minOccurs="0"/>
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      <xs:element name="Priority" type="xs:string" minOccurs="0"/>
      <xs:element ref="Status" minOccurs="0"/>
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  </xs:complexType>
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<xs:element name="EMail" type="CommunicationType" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="URL" type="CommunicationType" minOccurs="0" maxOccurs="unbounded"/>
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  <xs:complexContent>
    <xs:extension base="CCRCodedDataObjectType">
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          <xs:complexType>
            <xs:sequence>
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              <xs:element name="BrandName" type="CodedDescriptionType" minOccurs="0"/>
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                        <xs:element name="StrengthSequencePosition" type="xs:integer" minOccurs="0"/>
                        <xs:element name="VariableStrengthModifier" type="CodedDescriptionType"
minOccurs="0"/>
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                    </xs:extension>
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                        <xs:element name="FormSequencePosition" type="xs:integer" minOccurs="0"/>
                        <xs:element name="MultipleFormModifier" type="CodedDescriptionType"
minOccurs="0"/>
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                    </xs:extension>
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                </xs:complexType>
              </xs:element>
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                        <xs:element name="ConcentrationSequencePosition" type="xs:integer"
minOccurs="0"/>
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                    </xs:extension>
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            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>

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```
minOccurs="0"/>
    <xs:element name="VariableConcentrationModifier" type="CodedDescriptionType"
    </xs:sequence>
    </xs:extension>
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</xs:complexType>
</xs:element>
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                        <xs:sequence>
                          <xs:element ref="Description"/>
                        </xs:sequence>
                      </xs:extension>
                    </xs:complexContent>
                  </xs:complexType>
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              </xs:sequence>
            </xs:complexType>
          </xs:element>
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minOccurs="0"/>
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    </xs:extension>
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<xs:element name="MultipleProductModifier" type="CodedDescriptionType" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
</xs:element>
<!-- Dosing/ordering information -->
<xs:element name="Quantity" type="QuantityType" minOccurs="0" maxOccurs="unbounded"/>
<xs:element ref="Directions" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="PatientInstructions" minOccurs="0">
  <xs:annotation>
    <xs:documentation>This tag is used for instructions to the patient separate from the "SIG", such as 'Take
With Food".
  </xs:documentation>
  </xs:annotation>
</xs:complexType>
  <xs:sequence>
    <xs:element name="Instruction" type="InstructionType" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="FulfillmentInstructions" minOccurs="0">
  <xs:annotation>
    <xs:documentation>This tag is used for dispensing or fulfillment instructions to the pharmacist, such as 'Label
in Spanish', 'Generic Substitution OK', 'Dispense As Written', or the the Lab, such as 'Save Specimen', 'Freeze Specimen', etc.
  </xs:documentation>
  </xs:annotation>
</xs:complexType>
  <xs:sequence>
    <xs:element name="Instruction" type="InstructionType" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
</xs:element>
```

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```

    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="Refills" minOccurs="0">
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    <xs:sequence>
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                  <xs:minInclusive value="0"/>
                </xs:restriction>
              </xs:simpleType>
            </xs:element>
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            <xs:element name="DateTime" type="ExactDateTimeType" minOccurs="0"
maxOccurs="unbounded"/>
            <xs:element name="Comment" type="CommentType" minOccurs="0"
maxOccurs="unbounded"/>
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        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
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<xs:element name="FulfillmentHistory" minOccurs="0">
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    </xs:sequence>
  </xs:complexType>
</xs:element>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="SimpleProductType">
  <xs:complexContent>
    <xs:restriction base="StructuredProductType">
      <xs:sequence>
        <xs:sequence>
          <xs:element name="CCRDataObjectID" type="xs:ID">
            <xs:annotation>
              <xs:documentation>The is the unique object ID of this data object and is required.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="DateTime" type="DateTimeType" minOccurs="0" maxOccurs="unbounded"/>
          <xs:element ref="Type" minOccurs="0"/>
          <xs:element ref="Description" minOccurs="0"/>
          <xs:element ref="Status" minOccurs="0"/>
          <xs:group ref="SLRCGroup"/>
        </xs:sequence>
        <xs:sequence>
          <xs:element name="Product" maxOccurs="unbounded">
            <xs:complexType>
              <xs:sequence>
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                <xs:element name="BrandName" type="CodedDescriptionType" minOccurs="0"/>
                <xs:element name="Strength" minOccurs="0" maxOccurs="unbounded">
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                    <xs:complexContent>
                      <xs:extension base="MeasureType">
                        <xs:sequence>

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```

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                                <xs:element name="VariableStrengthModifier" type="CodedDescriptionType"
minOccurs="0"/>
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                                </xs:extension>
                                </xs:complexContent>
                                </xs:complexType>
                                </xs:element>
                                <xs:element name="Form" minOccurs="0" maxOccurs="unbounded">
                                <xs:complexType>
                                <xs:complexContent>
                                <xs:extension base="CodedDescriptionType">
                                <xs:sequence>
                                <xs:element name="FormSequencePosition" type="xs:integer" minOccurs="0"/>
                                <xs:element name="MultipleFormModifier" type="CodedDescriptionType"
minOccurs="0"/>
                                </xs:sequence>
                                </xs:extension>
                                </xs:complexContent>
                                </xs:complexType>
                                </xs:element>
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                                <xs:complexContent>
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                                <xs:sequence>
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minOccurs="0"/>
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minOccurs="0"/>
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                                </xs:extension>
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                                </xs:complexType>
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                                <xs:complexType>
                                <xs:complexContent>
                                <xs:extension base="CodedDescriptionType">
                                <xs:sequence>
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                                <xs:element name="VariableSizeModifier" type="CodedDescriptionType"
minOccurs="0"/>
                                </xs:sequence>
                                </xs:extension>
                                </xs:complexContent>
                                </xs:complexType>
                                </xs:element>
                                <xs:element name="ProductSequencePosition" type="xs:integer" minOccurs="0"/>
                                <xs:element name="MultipleProductModifier" type="CodedDescriptionType" minOccurs="0"/>
                                </xs:sequence>
                                </xs:complexType>
                                </xs:element>
                                <xs:element name="Manufacturer" type="ActorReferenceType" minOccurs="0"/>
                                <!-- Dosing/ordering information -->
                                <xs:element name="IDNumber" type="IDType" minOccurs="0" maxOccurs="unbounded"/>
                                <xs:element ref="Directions" minOccurs="0" maxOccurs="unbounded"/>
                                </xs:sequence>
                                </xs:sequence>
                                </xs:restriction>
                                </xs:complexContent>
                                </xs:complexType>
                                <xs:complexType name="ResultType">
                                <xs:complexContent>
                                <xs:extension base="CCRCodedDataObjectType">
                                <xs:sequence>
                                <xs:element name="Procedure" type="ProcedureType" minOccurs="0" maxOccurs="unbounded"/>
                                <xs:element name="Substance" type="CodedDescriptionType" minOccurs="0"/>

```

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```
<xs:element name="Test" type="TestType" minOccurs="0" maxOccurs="unbounded"/>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="TestType">
  <xs:complexContent>
    <xs:extension base="CCRCodedDataObjectType">
      <xs:sequence>
        <xs:element name="Method" type="CodedDescriptionType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="Agent" type="AgentType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="TestResult" type="TestResultType"/>
        <xs:element name="NormalResult" minOccurs="0">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="Normal" type="NormalType" maxOccurs="unbounded"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element name="Flag" type="CodedDescriptionType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="ConfidenceValue" type="CodedDescriptionType" minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name="EncounterType">
  <xs:complexContent>
    <xs:extension base="CCRCodedDataObjectType">
      <xs:sequence>
        <xs:element ref="Locations" minOccurs="0"/>
        <xs:element ref="Practitioners" minOccurs="0"/>
        <xs:group ref="FreqDurGroup"/>
        <xs:element ref="Indication" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element ref="Instructions" minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name="ProcedureType">
  <xs:complexContent>
    <xs:extension base="EncounterType">
      <xs:sequence>
        <xs:element ref="Products" minOccurs="0"/>
        <xs:element name="Substance" type="CodedDescriptionType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="Method" type="MethodType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="Position" type="PositionType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="Site" type="SiteType" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name="GoalType">
  <xs:complexContent>
    <xs:extension base="EncounterType">
      <xs:sequence>
        <xs:element name="Milestones" minOccurs="0">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="Outcome" type="CCRCodedDataObjectType" maxOccurs="unbounded"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name="PlanType">
  <xs:complexContent>
```


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```
<xs:extension base="CCRCodedDataObjectType">
  <xs:sequence>
    <xs:element name="OrderRequest" type="PlanOfCareType" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="InterventionType">
  <xs:complexContent>
    <xs:extension base="CCRCodedDataObjectType">
      <xs:sequence>
        <xs:element ref="Procedures" minOccurs="0"/>
        <xs:element ref="Products" minOccurs="0"/>
        <xs:element name="Medications" minOccurs="0">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="Medication" type="StructuredProductType" maxOccurs="unbounded"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element name="Immunizations" minOccurs="0">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="Immunization" type="StructuredProductType" maxOccurs="unbounded"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element ref="Services" minOccurs="0"/>
        <xs:element ref="Encounters" minOccurs="0"/>
        <xs:element name="Authorizatons" minOccurs="0">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="Authorization" type="AuthorizationType" maxOccurs="unbounded"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name="PlanOfCareType">
  <xs:complexContent>
    <xs:extension base="InterventionType">
      <xs:sequence>
        <xs:element ref="Goals" minOccurs="0"/>
        <xs:element name="OrderSequencePosition" type="xs:integer" minOccurs="0"/>
        <xs:element name="MultipleOrderModifier" type="CodedDescriptionType" minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name="OrderRxHistoryType">
  <xs:complexContent>
    <xs:extension base="CCRCodedDataObjectType">
      <xs:sequence>
        <xs:element name="FulfillmentMethod" type="CodedDescriptionType" minOccurs="0"/>
        <xs:element name="Provider" type="ActorReferenceType" minOccurs="0"/>
        <xs:element name="Location" type="ActorReferenceType" minOccurs="0"/>
        <xs:element name="Reaction" type="ReactionType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="ProductName" type="CodedDescriptionType" minOccurs="0"/>
        <xs:element name="BrandName" type="xs:string" minOccurs="0"/>
        <xs:element name="Manufacturer" type="ActorReferenceType" minOccurs="0"/>
        <xs:element name="IDNumber" type="IDType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="Strength" type="MeasureType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="Form" type="CodedDescriptionType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="Concentration" type="MeasureType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="Quantity" type="MeasureType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="LabelInstructions" type="InstructionType" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

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```
<xs:element name="SeriesNumber" type="xs:string" minOccurs="0"/>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="ActorReferenceType">
  <xs:sequence>
    <xs:element name="ActorID" type="xs:IDREF" minOccurs="0"/>
    <xs:element name="ActorRole" type="CodedDescriptionType" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="PersonNameType">
  <xs:sequence>
    <xs:element name="Given" type="xs:string" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="Middle" type="xs:string" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="Family" type="xs:string" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="Suffix" type="xs:string" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="Title" type="xs:string" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="NickName" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="CodedDescriptionType">
  <xs:sequence>
    <xs:element name="Text" type="xs:string" minOccurs="0"/>
    <xs:element name="ObjectAttribute" minOccurs="0" maxOccurs="unbounded">
      <xs:complexType>
        <xs:sequence>
          <xs:element name="Attribute" type="xs:string"/>
          <xs:element name="AttributeValue" maxOccurs="unbounded">
            <xs:complexType>
              <xs:sequence>
                <xs:element name="Value"/>
                <xs:element name="Code" type="CodeType" minOccurs="0" maxOccurs="unbounded"/>
              </xs:sequence>
            </xs:complexType>
          </xs:element>
          <xs:element name="Code" type="CodeType" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:complexType>
      <xs:unique name="UniqueValues">
        <xs:selector xpath="/AttributeValue"/>
        <xs:field xpath="Value"/>
      </xs:unique>
    </xs:element>
    <xs:element name="Code" type="CodeType" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="IDType">
  <xs:sequence>
    <xs:element name="DateTime" type="DateTimeType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element ref="Type" minOccurs="0"/>
    <xs:element name="ID" type="xs:string"/>
    <xs:element name="IssuedBy" type="ActorReferenceType" minOccurs="0"/>
    <xs:group ref="SLRCGroup"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="CodeType">
  <xs:sequence>
    <xs:element name="Value" type="xs:string"/>
    <xs:element name="CodingSystem" type="xs:string" minOccurs="0"/>
    <xs:element name="Version" type="xs:string" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="CommentType">
  <xs:sequence>
    <xs:element name="CommentObjectID" type="xs:ID"/>
    <xs:element name="DateTime" type="ISO8601DateTime"/>
    <xs:element ref="Type" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
```

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```
<xs:element ref="Description"/>
<xs:element name="Source" type="ActorReferenceType" maxOccurs="unbounded"/>
<xs:element ref="Reference"/>
</xs:sequence>
</xs:complexType>
<xs:complexType name="ReferenceType">
  <xs:sequence>
    <xs:element name="ReferenceObjectID" type="xs:ID"/>
    <xs:element name="DateTime" type="ExactDateTimeType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element ref="Type" minOccurs="0"/>
    <xs:element ref="Description" minOccurs="0"/>
    <xs:element name="Source" type="ActorReferenceType" maxOccurs="unbounded"/>
    <xs:element ref="Locations" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="SourceType">
  <xs:sequence>
    <xs:element ref="Description" minOccurs="0"/>
    <xs:element ref="Actor" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="DateTime" type="ExactDateTimeType" minOccurs="0"/>
    <xs:element ref="Reference" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element ref="Comment" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="SignatureType">
  <xs:sequence>
    <xs:element name="SignatureObjectID" type="xs:ID"/>
    <xs:element name="ExactDateTime" type="ISO8601DateTimeSeconds" minOccurs="0"/>
    <xs:element ref="Type" minOccurs="0"/>
    <xs:element ref="IDs" minOccurs="0"/>
    <xs:element name="Source" type="ActorReferenceType" minOccurs="0"/>
    <xs:element name="Signature"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="InternalCCRLinkType">
  <xs:sequence>
    <xs:element name="LinkID" type="xs:IDREF">
      <xs:annotation>
        <xs:documentation>This is an xs:IDREF to the CCRDataObjectID of the data object in the CCR to which this data
object is linked.</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="LinkRelationship" type="xs:string" minOccurs="0" maxOccurs="unbounded">
      <xs:annotation>
        <xs:documentation>This defines the relationship between the two data objects relative to this
link.</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="Source" minOccurs="0">
      <xs:annotation>
        <xs:documentation>This defines the Source of the Link - whom/what defined that there was a link between these two
data items and what the LinkRelationship is.</xs:documentation>
      </xs:annotation>
    </xs:complexType>
    <xs:complexContent>
      <xs:extension base="SourceType"/>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
</xs:sequence>
</xs:complexType>
<xs:complexType name="IndicationType">
  <xs:sequence>
    <xs:element name="PRNFlag" type="CodedDescriptionType" minOccurs="0">
      <xs:annotation>
        <xs:documentation>This is used to define a constraint or modifier on the Indication, such as
"PRN".</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>
```

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```
</xs:element>
<xs:element ref="Description" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="Problem" type="ProblemType" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="PhysiologicalParameter" minOccurs="0" maxOccurs="unbounded">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MeasureType">
        <xs:sequence>
          <xs:element name="ParameterSequencePosition" type="xs:integer" minOccurs="0"/>
          <xs:element name="VariableParameterModifier" type="CodedDescriptionType" minOccurs="0"/>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
<xs:group ref="SLRCGroup"/>
<xs:element name="IndicationSequencePosition" type="xs:integer" minOccurs="0"/>
<xs:element name="MultipleIndicationModifier" type="CodedDescriptionType" minOccurs="0"/>
</xs:sequence>
</xs:complexType>
<xs:complexType name="NormalType">
  <xs:sequence>
    <xs:element ref="Description" minOccurs="0"/>
    <xs:element ref="Type" minOccurs="0"/>
    <xs:group ref="MeasureGroup"/>
    <xs:element name="ValueSequencePosition" type="xs:integer" minOccurs="0"/>
    <xs:element name="VariableNormalModifier" type="CodedDescriptionType" minOccurs="0"/>
    <xs:group ref="SLRCGroup"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="CommunicationType">
  <xs:sequence>
    <xs:element name="Value" type="xs:string"/>
    <xs:element ref="Type" minOccurs="0"/>
    <xs:element name="Priority" type="xs:string" minOccurs="0"/>
    <xs:element ref="Status" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="PatientKnowledgeType">
  <xs:sequence>
    <xs:element name="PatientAware" type="YesNoUnknown"/>
    <xs:element ref="Description" minOccurs="0"/>
    <xs:group ref="SLRCGroup"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="CurrentHealthStatusType">
  <xs:sequence>
    <xs:element name="DateTime" type="DateTimeType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element ref="Description" minOccurs="0"/>
    <xs:element name="CauseOfDeath" type="YesNoUnknown" minOccurs="0"/>
    <xs:group ref="SLRCGroup"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="AgentType">
  <xs:sequence>
    <xs:element name="Products" minOccurs="0">
      <xs:complexType>
        <xs:sequence>
          <xs:element name="Product" type="SimpleProductType" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
    <xs:element name="EnvironmentalAgents" minOccurs="0">
      <xs:complexType>
        <xs:sequence>
          <xs:element name="EnvironmentalAgent" type="CCRCodedDataObjectType" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
</xs:complexType>
```

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```

    </xs:element>
    <xs:element name="Problems" minOccurs="0">
      <xs:complexType>
        <xs:sequence>
          <xs:element name="Problem" type="ProblemType" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
    <xs:element ref="Procedures" minOccurs="0"/>
    <xs:element name="Results" minOccurs="0">
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        <xs:sequence>
          <xs:element name="Result" type="ResultType" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="EpisodeType">
  <xs:complexContent>
    <xs:extension base="CCRCodedDataObjectType">
      <xs:sequence>
        <xs:element name="Duration" type="DurationType" minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name="ReactionType">
  <xs:sequence>
    <xs:element ref="Description" minOccurs="0"/>
    <xs:element name="Severity" type="CodedDescriptionType" minOccurs="0"/>
    <xs:element name="Interventions" minOccurs="0">
      <xs:complexType>
        <xs:sequence>
          <xs:element name="Intervention" maxOccurs="unbounded">
            <xs:complexType>
              <xs:complexContent>
                <xs:restriction base="InterventionType">
                  <xs:sequence>
                    <xs:sequence>
                      <xs:element name="CCRDDataObjectID" type="xs:ID">
                        <xs:annotation>
                          <xs:documentation>The is the unique object ID of this data object and is
required.</xs:documentation>
                        </xs:annotation>
                      </xs:element>
                      <xs:element name="DateTime" type="DateTimeType" minOccurs="0"
maxOccurs="unbounded"/>
                      <xs:element ref="Type" minOccurs="0"/>
                      <xs:element ref="Description" minOccurs="0"/>
                      <xs:element ref="Status" minOccurs="0"/>
                      <xs:group ref="SLRCGroup"/>
                    </xs:sequence>
                  </xs:sequence>
                </xs:restriction>
              </xs:complexContent>
            </xs:complexType>
          </xs:element>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
</xs:complexType>

```

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```
</xs:element>
<xs:element name="ReactionSequencePosition" type="xs:integer" minOccurs="0"/>
<xs:element name="MultipleReactionModifier" type="CodedDescriptionType" minOccurs="0"/>
</xs:sequence>
</xs:complexType>
<xs:complexType name="MeasureType">
  <xs:sequence>
    <xs:element name="Value" type="xs:string"/>
    <xs:element name="Units" type="xs:string" minOccurs="0"/>
    <xs:element name="Code" type="CodeType" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="DurationType">
  <xs:sequence>
    <xs:element ref="Description" minOccurs="0"/>
    <xs:sequence>
      <xs:element name="DateTime" type="DateTimeType" minOccurs="0" maxOccurs="unbounded"/>
      <xs:group ref="MeasureGroup"/>
    </xs:sequence>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="DoseCalculationType">
  <xs:sequence>
    <xs:element name="Dose" type="MeasureType" minOccurs="0">
      <xs:annotation>
        <xs:documentation>This defines the dose value and units.</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="Variable" minOccurs="0" maxOccurs="unbounded">
      <xs:annotation>
        <xs:documentation>This defines one or more variables that when calculated with the dose define the actual
dose.</xs:documentation>
      </xs:annotation>
      <xs:complexType>
        <xs:complexContent>
          <xs:extension base="MeasureType">
            <xs:sequence>
              <xs:element name="VariableIdentifier" type="xs:string">
                <xs:annotation>
                  <xs:documentation>This is a term that identifies this variable in the Dose Calculation
Equation.</xs:documentation>
                </xs:annotation>
              </xs:element>
              <xs:element name="VariableSequencePosition" minOccurs="0">
                <xs:annotation>
                  <xs:documentation>This is the Sequence Position of this variable in the Dose Calculation
Equation.</xs:documentation>
                </xs:annotation>
                <xs:simpleType>
                  <xs:restriction base="xs:integer">
                    <xs:minInclusive value="1"/>
                  </xs:restriction>
                </xs:simpleType>
              </xs:element>
              <xs:element name="VariableModifier" type="CodedDescriptionType" minOccurs="0">
                <xs:annotation>
                  <xs:documentation>This is text or text and coded Modifier for the Variable.</xs:documentation>
                </xs:annotation>
              </xs:element>
            </xs:sequence>
          </xs:extension>
        </xs:complexContent>
      </xs:complexType>
    </xs:element>
    <xs:element name="CalculationEquation" type="xs:string" minOccurs="0">
      <xs:annotation>
        <xs:documentation>This is a string that is the Dose Calculation Equation used to calculate the actual dose. It uses,
as its parameters, the Dose and the VariableIdentifier to describe the dose.</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>
```

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```
</xs:annotation>
</xs:element>
</xs:sequence>
</xs:complexType>
<xs:complexType name="DurationSubType"/>
<xs:complexType name="FrequencyType">
  <xs:sequence>
    <xs:element ref="Description" minOccurs="0"/>
    <xs:group ref="MeasureGroup"/>
    <xs:element name="FrequencySequencePosition" type="xs:integer" minOccurs="0"/>
    <xs:element name="VariableFrequencyModifier" type="CodedDescriptionType" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="AuthorizationType">
  <xs:complexContent>
    <xs:extension base="CCRCodedDataObjectType">
      <xs:sequence>
        <xs:element name="Purpose" type="PurposeType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element ref="Practitioners" minOccurs="0"/>
        <xs:element ref="Procedures" minOccurs="0"/>
        <xs:element ref="Products" minOccurs="0"/>
        <xs:element ref="Medications" minOccurs="0"/>
        <xs:element name="Immunizations" minOccurs="0">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="Immunization" type="SimpleProductType" maxOccurs="unbounded"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element ref="Services" minOccurs="0"/>
        <xs:element ref="Encounters" minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name="EpisodesType">
  <xs:sequence>
    <xs:element name="Number" type="xs:string" minOccurs="0"/>
    <xs:element name="Frequency" type="MeasureType" minOccurs="0"/>
    <xs:element name="Episode" type="EpisodeType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:group ref="SLRCGroup"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="VehicleType">
  <xs:sequence>
    <xs:element ref="Description" minOccurs="0"/>
    <xs:element name="Product" minOccurs="0" maxOccurs="unbounded">
      <xs:complexType>
        <xs:sequence>
          <xs:element name="ProductName" type="CodedDescriptionType"/>
          <xs:element name="BrandName" type="CodedDescriptionType" minOccurs="0"/>
          <xs:element name="Strength" minOccurs="0" maxOccurs="unbounded">
            <xs:complexType>
              <xs:complexContent>
                <xs:extension base="MeasureType">
                  <xs:sequence>
                    <xs:element name="StrengthSequencePosition" type="xs:integer" minOccurs="0"/>
                    <xs:element name="VariableStrengthModifier" type="CodedDescriptionType" minOccurs="0"/>
                  </xs:sequence>
                </xs:extension>
              </xs:complexContent>
            </xs:complexType>
          </xs:element>
          <xs:element name="Form" minOccurs="0" maxOccurs="unbounded">
            <xs:complexType>
              <xs:complexContent>
                <xs:extension base="CodedDescriptionType">
                  <xs:sequence>
```

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```

        <xs:element name="FormSequencePosition" type="xs:integer" minOccurs="0"/>
        <xs:element name="MultipleFormModifier" type="CodedDescriptionType" minOccurs="0"/>
    </xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
</xs:element>
<xs:element name="Concentration" minOccurs="0" maxOccurs="unbounded">
    <xs:complexType>
        <xs:complexContent>
            <xs:extension base="MeasureType">
                <xs:sequence>
                    <xs:element name="ConcentrationSequencePosition" type="xs:integer" minOccurs="0"/>
                    <xs:element name="VariableConcentrationModifier" type="CodedDescriptionType"
minOccurs="0"/>
                </xs:sequence>
            </xs:extension>
        </xs:complexContent>
    </xs:complexType>
</xs:element>
<xs:element name="Size" minOccurs="0" maxOccurs="unbounded">
    <xs:complexType>
        <xs:complexContent>
            <xs:extension base="CodedDescriptionType">
                <xs:sequence>
                    <xs:element name="SizeSequencePosition" type="xs:integer" minOccurs="0"/>
                    <xs:element name="VariableSizeModifier" type="CodedDescriptionType" minOccurs="0"/>
                </xs:sequence>
            </xs:extension>
        </xs:complexContent>
    </xs:complexType>
</xs:element>
<xs:element name="ProductSequencePosition" type="xs:integer" minOccurs="0"/>
<xs:element name="MultipleProductModifier" type="CodedDescriptionType" minOccurs="0"/>
</xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="Manufacturer" type="ActorReferenceType" minOccurs="0"/>
<xs:element ref="IDs" minOccurs="0"/>
<xs:element name="Quantity" minOccurs="0" maxOccurs="unbounded">
    <xs:complexType>
        <xs:complexContent>
            <xs:extension base="MeasureType">
                <xs:sequence>
                    <xs:element name="QuantitySequencePosition" type="xs:integer" minOccurs="0"/>
                    <xs:element name="VariableQuantityModifier" type="CodedDescriptionType" minOccurs="0"/>
                </xs:sequence>
            </xs:extension>
        </xs:complexContent>
    </xs:complexType>
</xs:element>
<xs:element name="VehicleSequencePosition" type="xs:integer" minOccurs="0"/>
<xs:element name="MultipleVehicleModifier" type="CodedDescriptionType" minOccurs="0"/>
<xs:element ref="InternalCCRLink" minOccurs="0"/>
</xs:sequence>
</xs:complexType>
<xs:complexType name="IntervalType">
    <xs:sequence>
        <xs:element ref="Description" minOccurs="0"/>
        <xs:group ref="MeasureGroup"/>
        <xs:element name="IntervalSequencePosition" type="xs:integer" minOccurs="0"/>
        <xs:element name="VariableIntervalModifier" type="CodedDescriptionType" minOccurs="0"/>
    </xs:sequence>
</xs:complexType>
<xs:complexType name="QuantityType">
    <xs:complexContent>
        <xs:extension base="MeasureType">
            <xs:sequence>

```


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```

        <xs:element name="QuantitySequencePosition" type="xs:integer" minOccurs="0"/>
        <xs:element name="VariableQuantityModifier" type="CodedDescriptionType" minOccurs="0"/>
    </xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="InstructionType">
    <xs:complexContent>
        <xs:extension base="CodedDescriptionType">
            <xs:sequence>
                <xs:element name="instructionSequencePosition" type="xs:integer" minOccurs="0"/>
                <xs:element name="MultipleInstructionModifier" type="CodedDescriptionType" minOccurs="0"/>
            </xs:sequence>
        </xs:extension>
    </xs:complexContent>
</xs:complexType>
<xs:complexType name="SiteType">
    <xs:complexContent>
        <xs:extension base="CodedDescriptionType">
            <xs:sequence>
                <xs:element name="SiteSequencePosition" type="xs:integer" minOccurs="0"/>
                <xs:element name="MultipleSiteModifier" type="CodedDescriptionType" minOccurs="0"/>
            </xs:sequence>
        </xs:extension>
    </xs:complexContent>
</xs:complexType>
<xs:complexType name="PositionType">
    <xs:complexContent>
        <xs:extension base="CodedDescriptionType">
            <xs:sequence>
                <xs:element name="PositionSequencePosition" type="xs:integer" minOccurs="0"/>
                <xs:element name="MultiplePositionModifier" type="CodedDescriptionType" minOccurs="0"/>
            </xs:sequence>
        </xs:extension>
    </xs:complexContent>
</xs:complexType>
<xs:complexType name="MethodType">
    <xs:complexContent>
        <xs:extension base="CodedDescriptionType">
            <xs:sequence>
                <xs:element name="MethodSequencePosition" type="xs:integer" minOccurs="0"/>
                <xs:element name="MultipleMethodModifier" type="CodedDescriptionType" minOccurs="0"/>
            </xs:sequence>
        </xs:extension>
    </xs:complexContent>
</xs:complexType>
<xs:complexType name="RateType">
    <xs:sequence>
        <xs:element ref="Description" minOccurs="0"/>
        <xs:group ref="MeasureGroup"/>
        <xs:element name="RateSequencePosition" type="xs:integer" minOccurs="0"/>
        <xs:element name="VariableRateModifier" type="CodedDescriptionType" minOccurs="0"/>
    </xs:sequence>
</xs:complexType>
<xs:complexType name="TestResultType">
    <xs:sequence>
        <xs:group ref="MeasureGroup"/>
        <xs:element ref="Description" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="ResultSequencePosition" type="xs:integer" minOccurs="0"/>
        <xs:element name="VariableResultModifier" type="CodedDescriptionType" minOccurs="0"/>
    </xs:sequence>
</xs:complexType>
<!--Groups Used Repeatedly in the CCR-->
<xs:group name="SLRCGroup">
    <xs:annotation>
        <xs:documentation>This is a Group that combines Source, InternalCCRLink, Reference, Comment, and Signature to simplify
their reiterative use in the CCR .xsd.</xs:documentation>
    </xs:annotation>
</xs:group>

```

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```
<xs:sequence>
  <xs:element name="Source" type="SourceType" maxOccurs="unbounded">
    <xs:annotation>
      <xs:documentation>This defines the Source for the data object - which defines whom/what the data are from. Source
is required.</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:element ref="InternalCCRLink" minOccurs="0" maxOccurs="unbounded"/>
  <xs:element ref="Reference" minOccurs="0" maxOccurs="unbounded"/>
  <xs:element ref="Comment" minOccurs="0" maxOccurs="unbounded"/>
  <xs:element name="Signature" minOccurs="0" maxOccurs="unbounded">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="SignatureID" type="xs:IDREF">
          <xs:annotation>
            <xs:documentation>This is an xs:IDREF to the SignatureObjectID in the Signatures Section of the
CCR.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
</xs:sequence>
</xs:group>
<xs:group name="FreqDurGroup">
  <!-- FreqDurGroup is used in many places where frequency and duration may both need to be indicated. -->
  <xs:sequence>
    <xs:element name="DateTime" minOccurs="0" maxOccurs="unbounded">
      <xs:complexType>
        <xs:complexContent>
          <xs:extension base="DateTimeType">
            <xs:sequence>
              <xs:element name="DateTimeSequencePosition" type="xs:integer" minOccurs="0"/>
              <xs:element name="MultipleDateTimeModifier" type="CodedDescriptionType" minOccurs="0"/>
            </xs:sequence>
          </xs:extension>
        </xs:complexContent>
      </xs:complexType>
    </xs:element>
    <xs:element name="Rate" type="RateType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="Frequency" type="FrequencyType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="Interval" type="IntervalType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="Duration" type="DurationType" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:group>
<xs:group name="MeasureGroup">
  <!-- MeasureGroup is used where a measure is needed. The value must be present, and the units should be present. -->
  <xs:sequence>
    <xs:element name="Value" type="xs:string" minOccurs="0"/>
    <xs:element name="Units" type="xs:string" minOccurs="0"/>
  </xs:sequence>
</xs:group>
<!--These are the Various Expressions of Time in the CCR-->
<xs:complexType name="DateTimeType">
  <xs:annotation>
    <xs:documentation>This is used for the expression of DateTime as exact or inexact.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element ref="Type" minOccurs="0"/>
    <xs:element name="ExactDateTime" type="ISO8601DateTime" minOccurs="0"/>
    <xs:element ref="Age" minOccurs="0"/>
    <xs:element name="ApproximateDateTime" type="CodedDescriptionType" minOccurs="0"/>
    <xs:element name="DateTimeRange" minOccurs="0" maxOccurs="unbounded">
      <xs:complexType>
        <xs:sequence>
          <xs:element name="BeginRange" minOccurs="0">
            <xs:complexType>
              <xs:sequence>
```

```

        <xs:element name="ExactDateTime" type="ISO8601DateTime" minOccurs="0"/>
        <xs:element ref="Age" minOccurs="0"/>
        <xs:element name="ApproximateDateTime" type="CodedDescriptionType" minOccurs="0"/>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="EndRange" minOccurs="0">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="ExactDateTime" type="ISO8601DateTime" minOccurs="0"/>
        <xs:element ref="Age" minOccurs="0"/>
        <xs:element name="ApproximateDateTime" type="CodedDescriptionType" minOccurs="0"/>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
</xs:sequence>
</xs:complexType>
</xs:element>
</xs:sequence>
</xs:complexType>
</xs:sequence>
<xs:complexType name="ExactDateTimeType">
  <xs:annotation>
    <xs:documentation>This is used to express time as exact, but not necessarily down to the second.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element ref="Type" minOccurs="0"/>
    <xs:element name="ExactDateTime" type="ISO8601DateTime" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<xs:simpleType name="ISO8601DateTimeSeconds">
  <xs:annotation>
    <xs:documentation>
      This is a simple type that allows date times to be expressed as ISO-8601 date-time formats,
      with precision of at least seconds.
    </xs:documentation>
  </xs:annotation>
  <xs:restriction base="ISO8601DateTime">
    <xs:pattern value="\d\d\d\d\d\d\d\d\d\dT\d\d:\d\d:\d\d(Z|([+])\d\d:\d\d)"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="ISO8601DateTime">
  <xs:annotation>
    <xs:documentation>
      This is a simple type that allows date times to be expressed as ISO-8601 date-time formats, e.g.,
      CCYY[-MM[-DD[Thh[:mm[:ss]]]]]Z
      CCYY[-MM[-DD[Thh[:mm[:ss]]]]+hh:mm
      CCYY[-MM[-DD[Thh[:mm[:ss]]]]-hh:mm
    </xs:documentation>
    <xs:documentation>
      All date times in the CCR 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 time
      zones are determined by political entities [e.g., Nations or States]. There presently exist time
      zones in the form ##:15 and ##:30.
    </xs:documentation>
  </xs:annotation>
  <xs:union>
    <xs:simpleType>
      <xs:restriction base="xs:string">
        <xs:annotation>
          <xs:documentation>Every month except February can have 30 days</xs:documentation>
        </xs:annotation>
        <xs:pattern value="\d\d\d\d\d\d\d\d\d\d(0|13-9)[1012])(\d\d\d\d\d\d\d\d\d\d(0|1-9)[1\d|2\d|30])(T(0\d|1\d|2[0-3])(:[0-5]\d){0,2})?)?(Z|(\d\d|(\d\d|1\d|2[0-3])(:[0-5]\d))?)"/>
      </xs:restriction>
    </xs:simpleType>
    <xs:simpleType>
      <xs:restriction base="xs:string">
        <xs:annotation>

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```

    <xs:documentation>Jan, Mar, May, Jul, Aug, Oct, and Dec can have 31 days</xs:documentation>
  </xs:annotation>
  <xs:pattern value="d\d\d\d(\-(0[13578][1[02]]\)-31(T(0\d|1\d|2[0-3])(:[0-5]\d){0,2})?)?(Z|(\-|+)(0\d|1\d|2[0-3])(:[0-
5]\d))"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType>
  <xs:restriction base="xs:string">
    <xs:annotation>
      <xs:documentation>Feb in any year can have 28 days</xs:documentation>
    </xs:annotation>
    <xs:pattern value="d\d\d\d(\-(0[1-9][1\d|2[0-8]](T(0\d|1\d|2[0-3])(:[0-5]\d){0,2})?)?(Z|(\-|+)(0\d|1\d|2[0-3])(:[0-
5]\d))"/>
    </xs:restriction>
  </xs:simpleType>
</xs:simpleType>
  <xs:restriction base="xs:string">
    <xs:annotation>
      <xs:documentation>Feb in years ending in 04 or 08 can have 29 days </xs:documentation>
    </xs:annotation>
    <xs:pattern value="d\d[0][48](\-(02(\-29(T(0\d|1\d|2[0-3])(:[0-5]\d){0,2})?)?(Z|(\-|+)(0\d|1\d|2[0-3])(:[0-5]\d))"/>
    </xs:restriction>
  </xs:simpleType>
</xs:simpleType>
  <xs:restriction base="xs:string">
    <xs:annotation>
      <xs:documentation>Feb in years ending in 20, 24, 28, 40, 44, 48, 60, 64, 68, 80, 84 or 88 can have 29 days
</xs:documentation>
    </xs:annotation>
    <xs:pattern value="d\d[2468][48](\-(02(\-29(T(0\d|1\d|2[0-3])(:[0-5]\d){0,2})?)?(Z|(\-|+)(0\d|1\d|2[0-3])(:[0-5]\d))"/>
    </xs:restriction>
  </xs:simpleType>
</xs:simpleType>
  <xs:restriction base="xs:string">
    <xs:annotation>
      <xs:documentation>Feb in years ending in 12, 16, 32, 36, 52, 56, 72, 76, 92 or 96 can have 29 days
</xs:documentation>
    </xs:annotation>
    <xs:pattern value="d\d[13579][26](\-(02(\-29(T(0\d|1\d|2[0-3])(:[0-5]\d){0,2})?)?(Z|(\-|+)(0\d|1\d|2[0-3])(:[0-5]\d))"/>
    </xs:restriction>
  </xs:simpleType>
</xs:simpleType>
  <xs:restriction base="xs:string">
    <xs:annotation>
      <xs:documentation>Feb in Centuries divisible by 4 can have 29 days</xs:documentation>
    </xs:annotation>
    <xs:pattern value="[02468][048]00(\-(02(\-29(T(0\d|1\d|2[0-3])(:[0-5]\d){0,2})?)?(Z|(\-|+)(0\d|1\d|2[0-3])(:[0-5]\d))"/>
    </xs:restriction>
  </xs:simpleType>
</xs:simpleType>
  <xs:restriction base="xs:string">
    <xs:annotation>
      <xs:documentation>Feb in Centuries divisible by 4 can have 29 days</xs:documentation>
    </xs:annotation>
    <xs:pattern value="[13579][26]00(\-(02(\-29(T(0\d|1\d|2[0-3])(:[0-5]\d){0,2})?)?(Z|(\-|+)(0\d|1\d|2[0-3])(:[0-5]\d))"/>
    </xs:restriction>
  </xs:simpleType>
</xs:union>
</xs:simpleType>
<!-- Enumerations -->
<xs:simpleType name="ActorRoleEnum">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Patient"/>
    <xs:enumeration value="Physician"/>
    <xs:enumeration value="Fellow"/>
    <xs:enumeration value="Chief Resident Physician"/>
    <xs:enumeration value="Resident Physician"/>
    <xs:enumeration value="Medical Student"/>
  </xs:restriction>
</xs:simpleType>
```

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```
<xs:enumeration value="Pharmacist"/>
<xs:enumeration value="Ophthalmologist"/>
<xs:enumeration value="Psychologist"/>
<xs:enumeration value="Physician Assistant"/>
<xs:enumeration value="Nurse Practitioner"/>
<xs:enumeration value="Registered Nurse"/>
<xs:enumeration value="Licensed Vocational Nurse"/>
<xs:enumeration value="Nursing Aide"/>
<xs:enumeration value="Medical Assistant"/>
<xs:enumeration value="Clerk"/>
<xs:enumeration value="Ancillary Care Provider"/>
<xs:enumeration value="Guarantor"/>
<xs:enumeration value="Durable Power of Attorney"/>
<xs:enumeration value="Relative"/>
<xs:enumeration value="Family Member"/>
<xs:enumeration value="Spouse"/>
<xs:enumeration value="Legal Guardian"/>
<xs:enumeration value="Caregiver"/>
<xs:enumeration value="Respiratory Therapist"/>
<xs:enumeration value="Physical Therapist"/>
<xs:enumeration value="Occupational Therapist"/>
<xs:enumeration value="Technician"/>
<xs:enumeration value="Pharmacy Technician"/>
<xs:enumeration value="Cardiac Echography Technician"/>
<xs:enumeration value="Radiology Technician"/>
<xs:enumeration value="Ultrasound Technician"/>
<xs:enumeration value="Non-Invasive Vascular Technician"/>
<xs:enumeration value="Social Worker"/>
<xs:enumeration value="Psychiatric Social Worker"/>
<xs:enumeration value="Friend"/>
<xs:enumeration value="Family Friend"/>
<xs:enumeration value="Significant Other"/>
<xs:enumeration value="Organ or Tissue Donor"/>
</xs:restriction>
</xs:simpleType>
<xs:simpleType name="GenderEnum">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Male"/>
    <xs:enumeration value="Female"/>
    <xs:enumeration value="Unknown"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="PaymentProviderEnum">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Self Pay"/>
    <xs:enumeration value="Primary Health Insurance"/>
    <xs:enumeration value="Supplemental Health Insurance"/>
    <xs:enumeration value="Health Savings Account"/>
    <xs:enumeration value="Prescription Drug Benefit"/>
    <xs:enumeration value="Worker's Compensation Insurance"/>
    <xs:enumeration value="Auto Insurance"/>
    <xs:enumeration value="Dental Insurance"/>
    <xs:enumeration value="Long Term Care Insurance"/>
    <xs:enumeration value="Other"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="DirectiveEnum">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Resuscitation Status"/>
    <xs:enumeration value="IV"/>
    <xs:enumeration value="Intubation"/>
    <xs:enumeration value="CPR"/>
    <xs:enumeration value="Antibiotics"/>
    <xs:enumeration value="Tube Feeding"/>
    <xs:enumeration value="Life Support"/>
    <xs:enumeration value="Other"/>
  </xs:restriction>
</xs:simpleType>
```

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```
<xs:simpleType name="ProblemTypeEnum">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Problem"/>
    <xs:enumeration value="Condition"/>
    <xs:enumeration value="Diagnosis"/>
    <xs:enumeration value="Symptom"/>
    <xs:enumeration value="Finding"/>
    <xs:enumeration value="Complaint"/>
    <xs:enumeration value="Functional Limitation"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="RiskFactorEnum">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Occupation"/>
    <xs:enumeration value="Tobacco Use and Exposure"/>
    <xs:enumeration value="Alcohol Use"/>
    <xs:enumeration value="Recreational Drug Use"/>
    <xs:enumeration value="Diet"/>
    <xs:enumeration value="Exercise"/>
    <xs:enumeration value="Toxic Exposure"/>
    <xs:enumeration value="Lifestyle Risks"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="AlertTypeEnum">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Allergy"/>
    <xs:enumeration value="AdverseReaction"/>
    <xs:enumeration value="Alert"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="ProductTypeEnum">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Medication"/>
    <xs:enumeration value="Immunization"/>
    <xs:enumeration value="Disposable"/>
    <xs:enumeration value="Medical Device"/>
    <xs:enumeration value="Implantable Medical Device"/>
    <xs:enumeration value="Durable Medical Equipment"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="YesNo">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Yes"/>
    <xs:enumeration value="No"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="YesNoUnknown">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Yes"/>
    <xs:enumeration value="No"/>
    <xs:enumeration value="Unknown"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="TestTypeEnum">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Observation"/>
    <xs:enumeration value="Result"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="NormalTypeEnum">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Exact Value"/>
    <xs:enumeration value="Range"/>
    <xs:enumeration value="Less Than"/>
    <xs:enumeration value="Greater Than"/>
    <xs:enumeration value="Minimum"/>
    <xs:enumeration value="Maximum"/>
    <xs:enumeration value="Other"/>
  </xs:restriction>
</xs:simpleType>
```

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```
</xs:restriction>
</xs:simpleType>
<xs:simpleType name="ReactionTypeEnum">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Mild"/>
    <xs:enumeration value="Moderate"/>
    <xs:enumeration value="Severe"/>
    <xs:enumeration value="Life Threatening"/>
  </xs:restriction>
</xs:simpleType>
<!-- Reusable Global Elements -->
<xs:complexType name="CCRCodedDataObjectType">
  <xs:annotation>
    <xs:documentation>This defines a Base Type used to capture: a) the Data Object ID; b) the DateTime; c) a Type descriptor;
d) the text Description of a data object and any appropriate coding; e) a Status descriptor; f) the Source; g) any Link; h) any Reference;
i) any Comment, to simplify their reiterative use in the CCR .xsd.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="CCRDataObjectID" type="xs:ID">
      <xs:annotation>
        <xs:documentation>The is the unique object ID of this data object and is required.</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="DateTime" type="DateTimeType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element ref="Type" minOccurs="0"/>
    <xs:element ref="Description" minOccurs="0"/>
    <xs:element ref="Status" minOccurs="0"/>
    <xs:group ref="SLRCGroup"/>
  </xs:sequence>
</xs:complexType>
<xs:element name="Directions">
  <xs:annotation>
    <xs:documentation>This is the SIG or administration instruction portion of a prescription or order, or the Directions for use of
any product.
  </xs:documentation>
  </xs:annotation>
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="Description" minOccurs="0"/>
      <xs:element name="Dose" minOccurs="0" maxOccurs="unbounded">
        <xs:complexType>
          <xs:complexContent>
            <xs:extension base="MeasureType">
              <xs:sequence>
                <xs:element name="DoseSequencePosition" type="xs:integer" minOccurs="0"/>
                <xs:element name="VariableDoseModifier" type="CodedDescriptionType" minOccurs="0">
                  <xs:annotation>
                    <xs:documentation>This is a text Modifier for a variable dose and is
Optional.</xs:documentation>
                  </xs:annotation>
                </xs:element>
              </xs:sequence>
            </xs:extension>
          </xs:complexContent>
        </xs:complexType>
      </xs:element>
      <xs:element name="DoseCalculation" minOccurs="0" maxOccurs="unbounded">
        <xs:complexType>
          <xs:complexContent>
            <xs:extension base="DoseCalculationType">
              <xs:sequence>
                <xs:element name="CalculationSequencePosition" minOccurs="0">
                  <xs:simpleType>
                    <xs:restriction base="xs:integer">
                      <xs:minInclusive value="1"/>
                    </xs:restriction>
                  </xs:simpleType>
                </xs:element>
              </xs:sequence>
            </xs:extension>
          </xs:complexContent>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
</xs:element>
```

```

        <xs:element name="VariableCalculationModifier" type="CodedDescriptionType" minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
</xs:element>
<xs:element name="DoseRestriction" minOccurs="0" maxOccurs="unbounded">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="DoseCalculationType">
        <xs:sequence>
          <xs:element name="RestrictionSequencePosition" minOccurs="0">
            <xs:simpleType>
              <xs:restriction base="xs:integer">
                <xs:minInclusive value="1"/>
              </xs:restriction>
            </xs:simpleType>
          </xs:element>
          <xs:element name="VariableRestrictionModifier" type="CodedDescriptionType" minOccurs="0"/>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
<xs:element name="Vehicle" type="VehicleType" minOccurs="0" maxOccurs="unbounded">
  <xs:annotation>
    <xs:documentation>
    </xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name="Route" minOccurs="0" maxOccurs="unbounded">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="CodedDescriptionType">
        <xs:sequence>
          <xs:element name="RouteSequencePosition" type="xs:integer" minOccurs="0"/>
          <xs:element name="MultipleRouteModifier" type="CodedDescriptionType" minOccurs="0"/>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
<xs:element name="Site" type="SiteType" minOccurs="0" maxOccurs="unbounded"/>
<xs:group ref="FreqDurGroup"/>
<xs:element name="StopIndicator" minOccurs="0">
  <xs:simpleType>
    <xs:restriction base="xs:string">
      <xs:enumeration value="Yes"/>
    </xs:restriction>
  </xs:simpleType>
</xs:element>
<xs:element ref="Indication" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="DirectionsSequencePosition" type="xs:integer" minOccurs="0"/>
<xs:element name="MultipleDirectionsModifier" type="CodedDescriptionType" minOccurs="0"/>
</xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="Locations">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="Location" maxOccurs="unbounded">
        <xs:complexType>
          <xs:sequence>
            <xs:element ref="Description" minOccurs="0"/>
            <xs:element name="Actor" type="ActorReferenceType" minOccurs="0"/>
          </xs:sequence>
        </xs:complexType>
      </xs:element>

```


ccr20050305.xsd

```

    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="Practitioners">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="Practitioner" type="ActorReferenceType" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="Indications" type="IndicationType"/>
<xs:element name="Instructions">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="Instruction" type="CodedDescriptionType" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="Products">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="Product" type="StructuredProductType" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="Procedures">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="Procedure" maxOccurs="unbounded">
        <xs:complexType>
          <xs:complexContent>
            <xs:restriction base="ProcedureType">
              <xs:sequence>
                <xs:sequence>
                  <xs:element name="CCRDDataObjectID" type="xs:ID">
                    <xs:annotation>
                      <xs:documentation>The is the unique object ID of this data object and is
required.</xs:documentation>
                    </xs:annotation>
                  </xs:element>
                  <xs:element name="DateTime" type="DateTimeType" minOccurs="0" maxOccurs="unbounded"/>
                  <xs:element ref="Type" minOccurs="0"/>
                  <xs:element ref="Description" minOccurs="0"/>
                  <xs:element ref="Status" minOccurs="0"/>
                  <xs:group ref="SLRCGroup"/>
                </xs:sequence>
                <xs:sequence>
                  <xs:element ref="Locations" minOccurs="0"/>
                  <xs:element ref="Practitioners" minOccurs="0"/>
                  <xs:group ref="FreqDurGroup"/>
                  <xs:element ref="Indication" minOccurs="0" maxOccurs="unbounded"/>
                  <xs:element ref="Instructions" minOccurs="0"/>
                </xs:sequence>
                <xs:sequence>
                  <xs:element name="Products" minOccurs="0">
                    <xs:complexType>
                      <xs:sequence>
                        <xs:element name="Product" type="SimpleProductType" maxOccurs="unbounded"/>
                      </xs:sequence>
                    </xs:complexType>
                  </xs:element>
                  <xs:element name="Substance" type="CodedDescriptionType" minOccurs="0"/>
                  <xs:element name="Method" type="MethodType" minOccurs="0" maxOccurs="unbounded"/>
                  <xs:element name="Position" type="PositionType" minOccurs="0" maxOccurs="unbounded"/>
                  <xs:element name="Site" type="SiteType" minOccurs="0" maxOccurs="unbounded"/>
                </xs:sequence>
              </xs:sequence>
            </xs:restriction>
          </xs:complexContent>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
</xs:element>
</xs:sequence>
</xs:restriction>

```

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```

        </xs:complexContent>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="Medications">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="Medication" type="SimpleProductType" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="Immunizations">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="Immunization" type="SimpleProductType" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="Services">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="Service" type="EncounterType" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="Encounters">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="Encounter" type="EncounterType" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="Goals">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="Goal" type="GoalType" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="IDs">
  <xs:complexType>
    <xs:sequence/>
  </xs:complexType>
</xs:element>
<xs:element name="ReferenceID" type="xs:IDREF"/>
<xs:element name="Status" type="CodedDescriptionType"/>
<xs:element name="Type" type="CodedDescriptionType"/>
<xs:element name="Description" type="CodedDescriptionType"/>
<xs:element name="Reference">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="ReferenceID" type="xs:IDREF">
        <xs:annotation>
          <xs:documentation>This is an xs:IDREF to the ReferenceObjectID in the References Section of the
CCR.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="Comment">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="CommentID" type="xs:IDREF">
        <xs:annotation>
```

ccr20050305.xsd

```

    <xs:documentation>This is an xs:IDREF to the CommentObjectID in the Comments Section of the
CCR.</xs:documentation>
    </xs:annotation>
  </xs:element>
</xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="Actor" type="ActorReferenceType"/>
<xs:element name="InternalCCRLink" type="InternalCCRLinkType"/>
<xs:element name="Age" type="MeasureType"/>
<xs:element name="Indication" type="IndicationType"/>
</xs:schema>
```

ANNEX C

Implementation Guide for the Continuity of Care Record (CCR)¹

**Version 1.a
March 2005**

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¹ This specification is under the jurisdiction of ASTM Committee E31 on Healthcare Informatics and is the direct responsibility of Subcommittee E31.28 Continuity of Care Record Work Group.

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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.

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 XML Schema (.xsd) 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.

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.

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.

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 .xsd. 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.

Important Note Regarding Compliance With This Standard: The Implementation Guide is to be used with the CCR XML .xsd that is presented in Annex B of this standard specification. A CCR instance must be valid against the accompanying schema and the Implementation Guide in order to conform to this specification. The CCR uses a condensed and partially normalized .xsd in order to constrain the length and complexity of

the .xsd. This normalization also simplifies versioning of the .xsd 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. As a consequence, within the CCR there are XML <Tags> which are listed and supported in various parts of the .xsd that are not allowed under the Implementation Guide or that are optional in the .xsd but are required in specific instances of use within the CCR. Where possible, these exceptions have been constrained, but all compliance validation must be done against both the Implementation Guide and the .xsd, not against the .xsd alone. This Implementation Guide was developed to be rigid in order to avoid the endless customization and variation that has 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.

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 (.xsd).

CCR Principles and Structure

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 .xsd and this Implementation Guide. 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.’

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

- 1) The CCR structure and architecture are object-oriented.
 - a) The CCR is an XML document that is defined within this Implementation Guide as a Document Object.
 - b) The CCR Document Object is constructed from a set of discrete XML building blocks, which are defined as Data Objects.
 - c) The Data Objects are contained within Sections, such as Medications, Immunizations, Problems, and Procedures, in the CCR Document Object.
 - d) Each discrete Medication, Immunization, Problem, Procedure represents a discrete data object within the CCR.
 - e) 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).

- 2) All data within the CCR must be contained within XML tagged elements.
- 3) No data are allowed in the CCR to be contained within XML tag attributes.
- 4) 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 .xsd compact, but not at the expense of detailed and explicit data expression. This approach enhances human readability, particularly for clinicians and patients.
- 5) Element and attribute names use the Pascal Notation where the first letter of each word is capitalized – example <DateTime>.
- 6) 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>.

The CCR essentially consists of three core components:

- 1) A Set of Header Sections
- 2) A Set of Body Sections
- 3) A Set of Footer Sections

The Header Sections define:

<CCRDObjectID>
<DateTime>
<Patient>
<From>
<To>
<Purpose>

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

<Insurance>
<AdvanceDirectives>
<Support>
<FunctionalStatus>
<Problems>
<FamilyHistory>
<SocialHistory>
<Alerts>
<Medications>
<MedicalEquipment>

<Immunizations>
<VitalSigns>
<Results>
<Procedures>
<Encounters>
<PlanOfCare>
<HealthCareProviders>

The Footer Sections contain the normalized links within the CCR for:

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

The CCR core structure is represented in *Figure 1*.

Note: 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.

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.. ∞

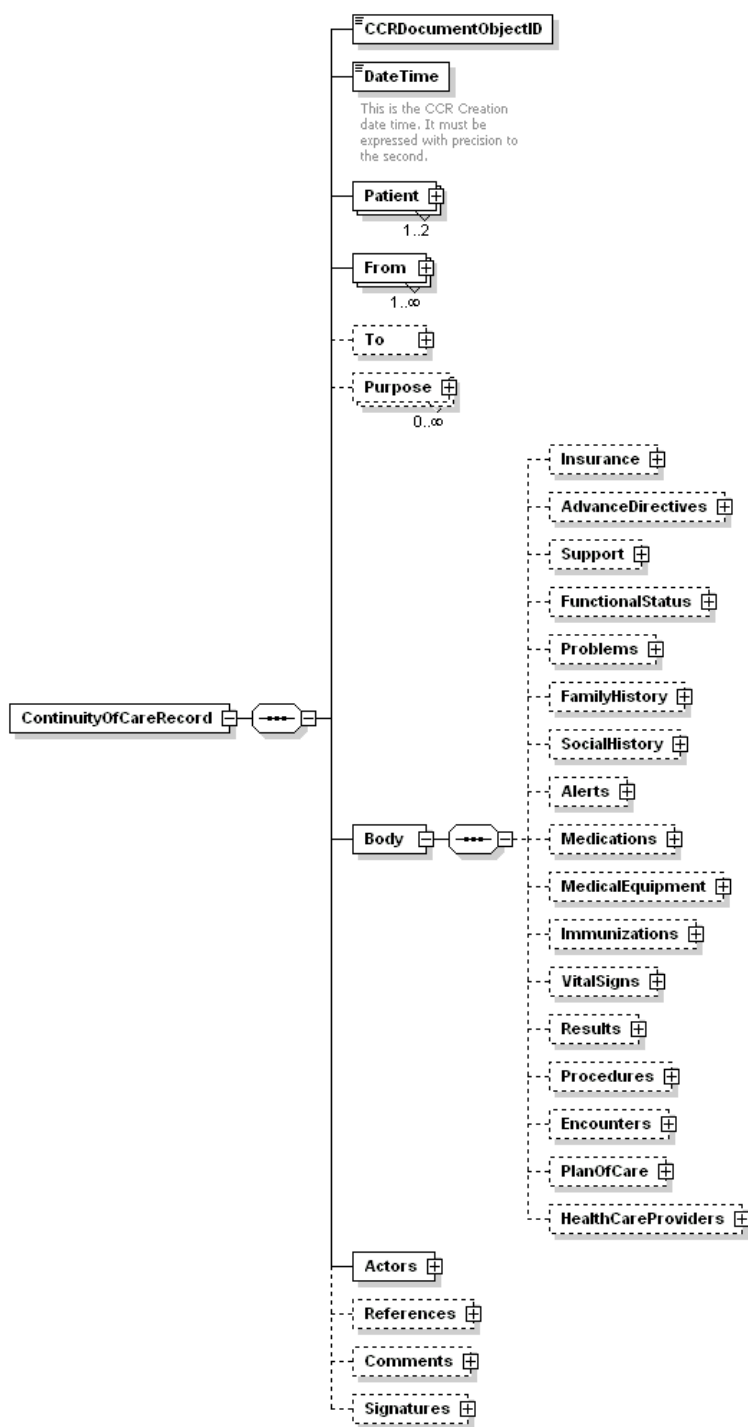


Figure 1 – Overall Structure of CCR

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Data Representation in the CCR

The Implementation Guide defines the expression of patient-specific healthcare data within the core CCR XML framework in *Figure 2*. The core structure illustrated in *Figure 2* represents the essential categories of data that make up the CCR. These are the ‘sections’ that are data containers for comprehensive patient data.

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.

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 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.

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 *Figure 2*. The CCR supports the detailed parsing of any specific data object into its detailed structured components.

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 sub-classed 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 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.

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, CPT, LOINC, RxNorm, and the like.

In other words, the CCR is a comprehensive tool for the detailed and encoded object-oriented 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 in an object-oriented approach 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. In addition, most current systems are not object-oriented in their expression of data.

The emerging use of the DICOM imaging standards and the associated 'Integration Profiles' created through the collaboration of the members of IHE (Integrating the Healthcare Enterprise) and collaborative work between HL7, NCPDP, and ASTM have 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:

- Non-specific text strings.
- Coded text strings.
- Coded or un-coded text strings with an arbitrary level of structure.
- Fully structured and coded object-oriented data expression.

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 fully 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.

To support the continuum of data expression encompassing text strings to fully coded and structured object-oriented 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 CodeType, ObjectIDs, and the expression of date/time within the CCR.

CodedDescriptionType

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 object-oriented data.

The CCR CodedDescriptionType is illustrated in *Figure 2*.

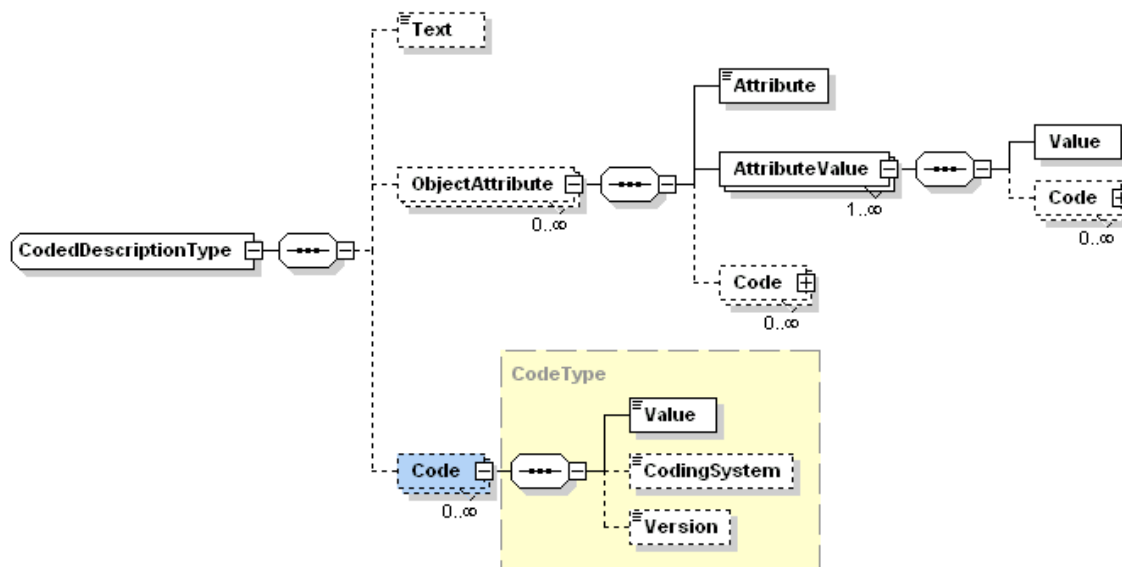


Figure 2 – Complex Data Type CodedDescriptionType

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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>.

A text ‘diagnosis’ can be used as an example:

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

Example 1 – CodedDescriptionType (Simple Text String)

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

```
<Text>Acute Antereoseptal Myocardial Infarction</Text>
<Code>
  <Value>410.1</Value>
  <CodeType>ICD-9 CM</CodeType>
  <Version>2004</Version>
</Code>
```

Example 2 – CodedDescriptionType (Coded Simple Text String)

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

```
<Text>Acute Antereoseptal Myocardial Infarction</Text>
<Code>
  <Value>410.1</Value>
  <CodeType>ICD-9 CM</CodeType>
  <Version>2004</Version>
</Code>
<Code>
  <Value>62695002</Value>
  <CodeType>SNOMED CT</CodeType>
  <Version>20050131</Version>
</Code>
```

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

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:

```
<Text>Acute Antereoseptal Myocardial Infarction</Text>
<Code>
  <Value>410.1</Value>
  <CodeType>ICD-9 CM</CodeType>
  <Version>2004</Version>
</Code>
<Code>
  <Value>62695002</Value>
  <CodeType>SNOMED CT</CodeType>
  <Version>20050131</Version>
</Code>
```

```

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

```

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

Example 4 is not considered ideal, as it represents a compromise data representation using a text string and structured representation of exactly the same data. This representation may seem the most flexible, but it inherently leads to data inexactitude and redundant data representation.

The ideal way to represent this diagnosis in the CCR is as structured, tagged, and coded object-oriented data object, using only structured and coded data as follows:

```

<ObjectAttribute>
  <Attribute>Diagnosis</Attribute>
  <AttributeValue>
    <Value>Myocardial Infarction</Value>
    <Code>
      <Value>22298006</Value>
      <CodeType>SNOMED CT</CodeType>
      <Version>20050131</Version>
    </Code>
  </AttributeValue>
  <Attribute>Acuity</Attribute>
  <AttributeValue>
    <Value>Acute</Value>
    <Code>
      <Value>53737009</Value>

```



```

        <CodeType>SNOMED CT</CodeType>
        <Version>20050131</Version>
    </Code>
</AttributeValue>
<Attribute>Site</Attribute>
<AttributeValue>
    <Value>Antereoseptal</Value>
    <Code>
        <Value>20706007</Value>
        <CodeType>SNOMED CT</CodeType>
        <Version>20050131</Version>
    </Code>
</AttributeValue>
</ObjectAttribute>

```

Example 5 – CodedDescriptionType (Structured XML Data Object Representation)

Example 5 represents precise data representation and granular encoding that is explicit and exact. Note that the text string ‘**Acute Antereoseptal Myocardial Infarction**’ can easily be reconstructed using a XSLT script in XML from the object-oriented representation in *Example 5*. There is no advantage and considerable disadvantage to represent data in both forms as in *Example 4* rather than as in *Example 5*. Again, object-oriented and fully encoded data representation as in *Example 5* is the preferred data representation in the CCR.

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.

The CodedDescriptionType provides support for detailed object-oriented and 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:

```

<ObjectAttribute>
    <Attribute>Diagnosis</Attribute>
    <AttributeValue>
        <Value>Myocardial Infarction</Value>
        <Code>
            <Value>22298006</Value>
            <CodeType>SNOMED CT</CodeType>
            <Version>20050131</Version>
        </Code>
    </AttributeValue>
    <Attribute>Acuity</Attribute>
    <AttributeValue>
        <Value>Acute</Value>
        <Code>

```

```

        <Value>53737009</Value>
        <CodeType>SNOMED CT</CodeType>
        <Version>20050131</Version>
    </Code>
</AttributeValue>
<Attribute>Site</Attribute>
<AttributeValue>
    <Value>Antereoseptal</Value>
    <Code>
        <Value>20706007</Value>
        <CodeType>SNOMED CT</CodeType>
        <Version>20050131</Version>
    </Code>
</AttributeValue>
</ObjectAttribute>
<Code>
    <Value>410.1</Value>
    <CodeType>ICD-9 CM</CodeType>
    <Version>2004</Version>
</Code>

```

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

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.

As a condensed XML string, *Example 6* would look as follows:

```

<ObjectAttribute><Attribute>Diagnosis</Attribute><AttributeValue><Value>Myocardial Infarction</Value><Code><Value>22298006</Value><CodeType>SNOMED CT</CodeType><Version>20050131</Version></Code></AttributeValue><Attribute>Acuity</Attribute><AttributeValue><Value>Acute</Value><Code><Value>53737009</Value><CodeType>SNOMED CT</CodeType><Version>20050131</Version></Code></AttributeValue><Attribute>Site</Attribute><AttributeValue><Value>Antereoseptal</Value><Code><Value>20706007</Value><CodeType>SNOMED CT</CodeType><Version>20050131</Version></Code></AttributeValue></ObjectAttribute><Code><Value>410.1</Value><CodeType>ICD-9 CM</CodeType><Version>2004</Version></Code>

```

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

The Definitions for the key XML tags in the CodedDescriptionType are displayed in *Table 1*:

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 <u>only</u> be used to represent <u>unstructured</u> data.
<Attribute>	Child of <ObjectAttribute>.	Required if data are structured and <ObjectAttribute> is used, UnBounded (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	This is a container for object attribute values – ‘Myocardial

		<AttributeValue> is used, UnBounded (1..∞)	Infarction', 'Acute', 'Anteroseptal', 'Mild', 'Left', 'Acute', etc.
<Code>	See CodeType.	Optional UnBounded (0..∞)	<Code> is a Complex Data Type – CodeType. It is to be used whenever codes are defined for a given data element.

Table 1 – CodedDescriptionType Definition Table

CodeType

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

CodeType is illustrated in *Figure 3*.

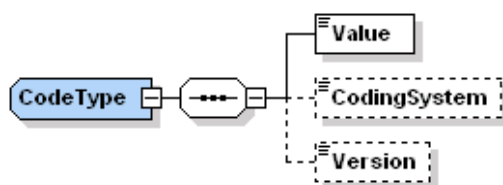


Figure 3 – Complex Data Type CodeType

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

CodeType	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.

Table 2 – CodeType Definition Table

Coding

Detailed coded is recommended whenever practical within the CCR. The following are specific coding recommendations:

Problems

Problems should be coded at the highest level using SNOMED CT and the most recent ICD-9 CM 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. 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.

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.

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.

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>.

Object IDs

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

The CCR has an ObjectID:

<CCRDokumentObjectID> - a unique ID for the CCR Document Object

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.

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. They must be unique to and within each CCR, and are not considered unique across the universe of all CCRs.

All CCR Object IDs:

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.

Can be of any character length.

The ObjectIDs must be unique within the CCR but do not have any singularity or uniqueness in the universe outside a specific instance of the CCR.

Important Note: ObjectIDs are unique to each instance of the CCR. If a CCR is imported into one system, then exported again, the new instance of the CCR must generate new ObjectIDs. ObjectIDs do not migrate from one instance of the CCR to another.

Example:

<CCRDataObjectID>AA0001</CCRDataObjectID>

Example 8 – <CCRDataObjectID>

Links Between CCR Data Objects With <InternalCCRLink>

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

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>.

Links are made using the Complex Data Type InternalCCRLinkType, which is illustrated in *Figure 3a*.

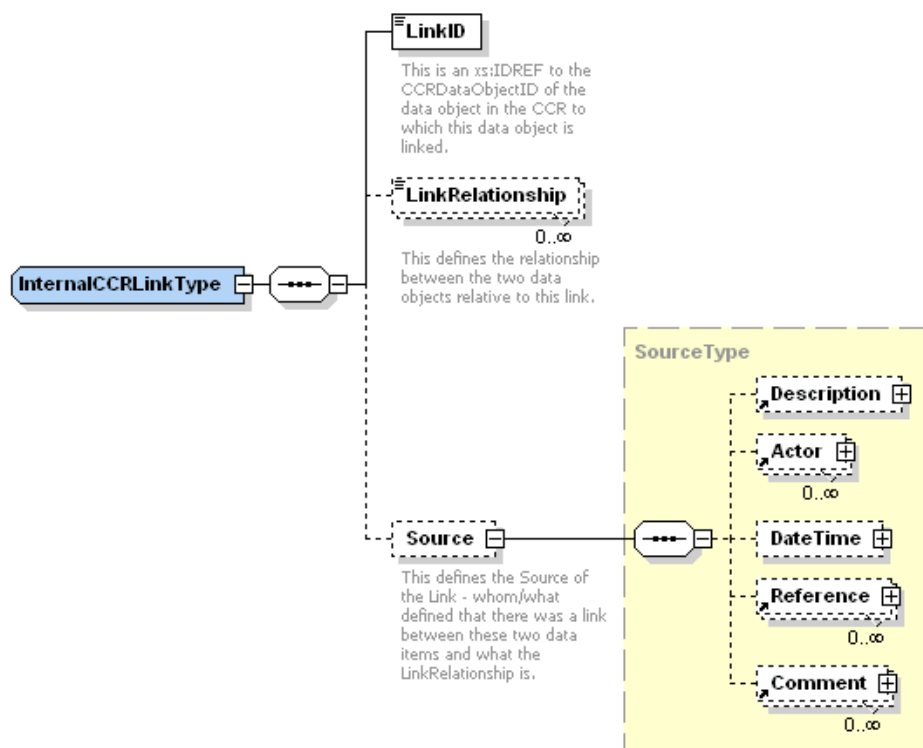


Figure 3a – Complex Data Type InternalCCRLinkType

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.

The Definition Table for InternalCCRLinkType is *Table 2a*:

InternalCCRLinkType	Accepted Values/Formatting	Optionality/0 - ∞	Description
<LinkID>	Internal CCR ObjectIDs <u>Only</u> = <u>xs:IDREF</u>	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 <u>only</u> .	Optional and Bounded To One Instance (0..1).	Links are <u>internal</u> references within the CCR that link a specific Data Object to another. Enumerated values are not yet defined for Links but will include: “Indication” “Etiology” “Associated With” “Must Occur Before” “Must Occur After”

Table 2a – InternalCCRLinkType Definition Table

Sequentially Repeating Object Attributes

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.

To assure 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.

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

The <SequenceModifier> is a regular expression, such as AND, OR, TO, THEN which connect 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)

<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.

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 *Figure 4*.

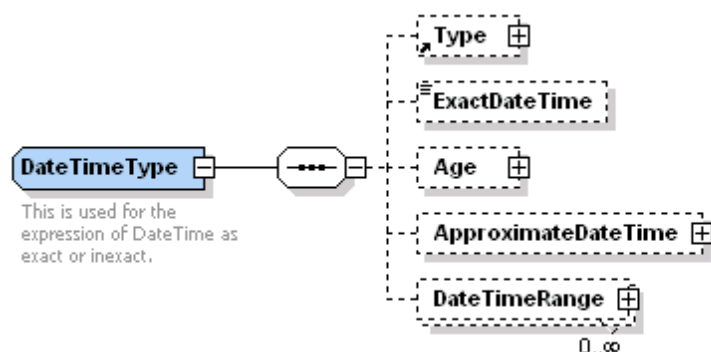


Figure 4 – Complex Data Type DateTimeType

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 *Figure 5*.

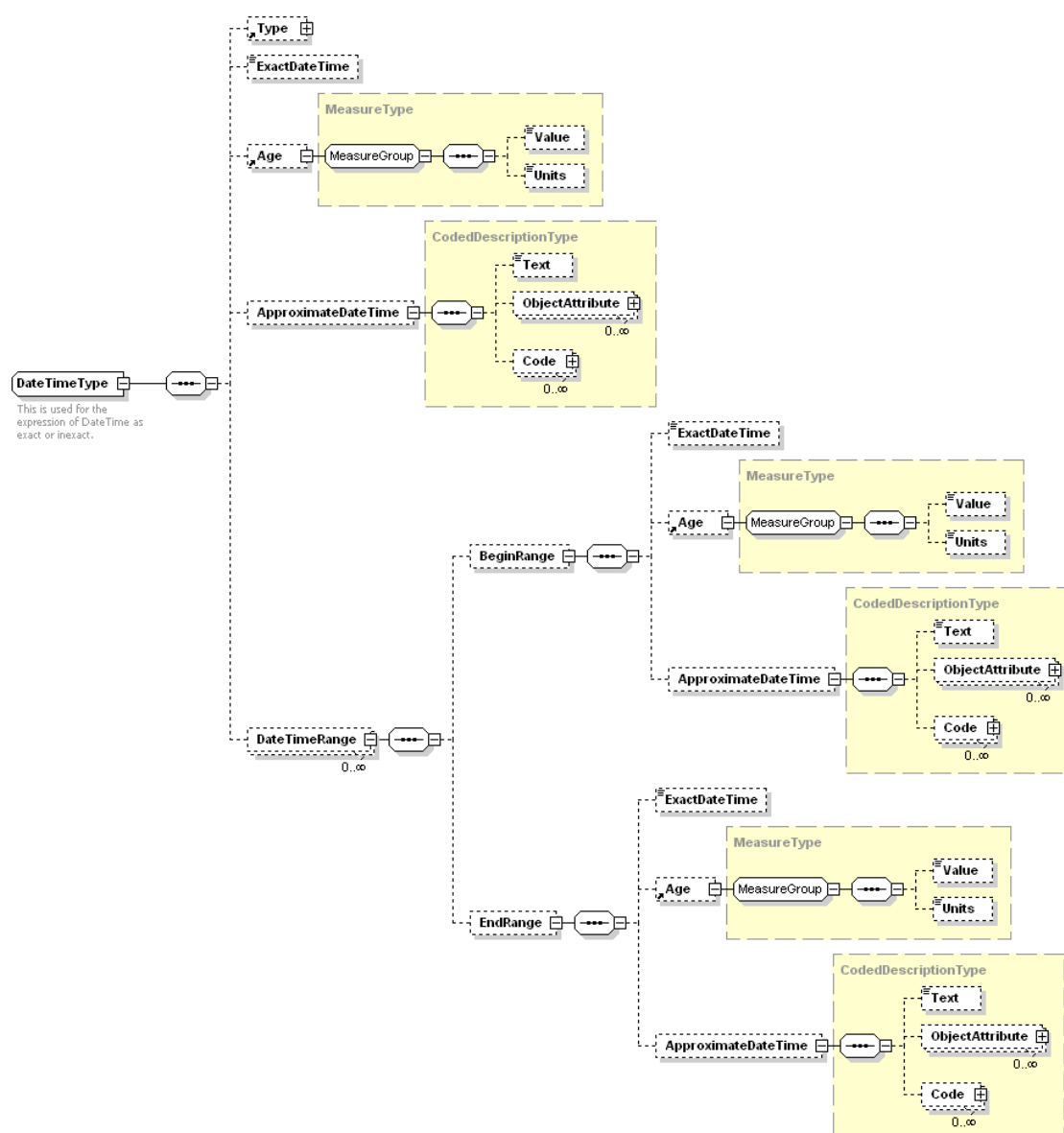


Figure 5 – Partially Expanded Data Type DateTimeType

The key XML tags for DateTimeType are defined in *Table 3*.

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.

Table 3 – DateTimeType Definition Table

<ExactDateTime>

<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).

NOTE: This document is not an ASTM standard. It is under consideration within an ASTM technical committee but has not received all approvals required to become an ASTM standard. It shall not be reproduced or circulated or quoted in whole or in part, outside of ASTM committee activities except with the approval of the chair of the committee having jurisdiction and the president of the society.

<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 name is now Coordinated Universal Time or UTC. The letter designator for this clock is Z, and UTC is sometimes referred to as Zulu Time. 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.

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

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.

See <http://www.iso.org/iso/en/prods-services/popstds/datesandtime.html> for more information on UTC formats and examples.

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:

- 1) Year only [2004].
- 2) Year and month only [2004-09].
- 3) Year, month, and day only [2004-09-01].
- 4) Year, month, day, and hours only [2004-09-01T13:00:00-05:00].
- 5) Year, month day, hours, and minutes only [2004-09-01T13:25:00-05:00].
- 6) Year, month day, hours, minutes, and seconds only [2004-09-01T13:25:34-05:00].

Note that in instances 4 through 6 an offset from UTC is required.

<Age>

<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].

Examples are as follows:

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

Example 9 – <Age>

<ApproximateDateTime>

<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:

```
<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>
```

Example 10 – <ApproximateDateTime>

<DateTimeRange>

<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.

<Source>

<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>.

Security and Privacy

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

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.

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 with X.509 v3 or Security Assertion Markup Language (SAML) digital certificates. Encryption will be provided using W3C's XML encryption standard (<http://www.w3.org/TR/xmlenc-core>).

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':

1. The CCR should have a checksum calculated against the entire document and a W3C XML digital signature applied. The certificate should be a X.509 v3 or Security Assertion Markup Language (SAML) digital certificate.
2. The CCR Body and Footer as well as the Patient section should be encrypted with W3C XML encryption.
3. The only allowed unencrypted data should be the <CCRDObjectID>, 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.

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.

CCR Implementation

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 *Figure 1* for reference.

The CCR Header

The CCR Header consists of the CCR XML Document Header, and the following CCR Sections:

```
<CCRDocumentObjectID>  
<DateTime>).  
<Patient>  
<From>  
<To>  
<Purpose>
```

CCR XML Document Header

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

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

Example 11 – CCR XML Document Header

The Header Tag Attributes are:

xmlns – This defines the XML namespace.

xmlns:xsi – This defines the xsi and must state “http://www.w3.org/2001/XMLSchema-instance”.

xsi:schemaLocation – This defines the schema location.

<CCRDObjectID>

<CCRDObjectID> is required and is the unique ID that applies to the entire CCR. The <CCRDObjectID> 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 but is not considered unique across the universe of all CCRs.

What makes a CCR unique in the universe of CCRs is the combination of the <CCRDObjectID>, 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 <CCRDObjectID>, the CCR <DateTime>, and the <Patient> identifiers a digital signature will make any CCR instance truly unique.

The <CCRDObjectID> 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.

```
<CCRDObjectID>Ab2827-i8_.zZ1</ CCRDObjectID>
```

Example 12 – <CCRDObjectID>

<DateTime>

<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.

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 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 [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.

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.

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

Example 12 – CCR Document <DateTime>

<Patient>

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

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:ID.

The CCR can be about only one patient with the rare exception of Siamese 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 Siamese 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.


```
<Patient>
  <ActorID>_____</ActorID>
</Patient>
```

Example 13 –<Patient>

<From>

<From> is required and unbounded to represent one or multiple sources for the CCR. <From> identifies who or what has generated the CCR. This is a link to an Actor through <ActorID> of type xs:IDREF 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.

<ActorRole> is a CodedDescriptionType. This Implementation Guide does not currently specify a code set for <ActorRole> as none is currently available, 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.

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.

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

Example 14 – <From>

If the CCR is encrypted, and the sender wants the <From> address to be readable without decrypting the CCR as a whole, pertinent <Actor> details can be redundantly placed under <From><Actor>. Note that this is a special use case for encrypted CCRs where <From> supports listing specific data about an <Actor> in the case where the CCR Body and CCR Footer sections will be encrypted, allowing whom the CCR is <From> to be discerned

without decrypting sensitive patient data. In this use case, only the essential data about that <Actor> should be listed under <From>. <From> still requires an <ActorLink> with <ActorID> and <ActorRole> in this special encryption use case, and requires the full listing of all <Actor> data in the <Actors> section, including any data listed under <Actor> within <From>.

```
<From>
  <ActorLink>
    <ActorID>_____</ActorID>
    <ActorRole>
      <Text>Primary Care Provider</Text>
    </ActorRole>
  </ActorLink>
  <ActorLink>
    <ActorID>_____</ActorID>
    <ActorRole>
      <Text>EHR System</Text>
    </ActorRole>
  </ActorLink>
  <Actor>
    <Person>
      <Name>
        <CurrentName>
          <Given>John</Given>
          <Middle>Q</Middle>
          <Family>Doe</Family>
          <Suffix>Jr.</Suffix>
          <Title>MD</Title>
          <Title>PhD.</Title>
        </CurrentName>
        <DisplayName>John Q. Doe, Jr., MD, PhD.</DisplayName>
      </Name>
    </Person>
    <Specialty>
      <Text>Internal Medicine</Text>
    </Specialty>
    <Telephone>
      <Value>555-555-5555</Value>
      <Type>Office</Type>
    </Telephone>
    <EMail>
      <Value>jqdoe@pacifichealthclinic.org</Value>
    </EMail>
  </Actor>
</From>
```

Example 15 – <From> As An ‘In-The-Clear’ Expression Within An Otherwise Encrypted CCR

<To>

<To> is optional and unbounded, and is a 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>.

```
<To>
  <ActorLink>
    <ActorID>_____</ActorID>
    <ActorRole><Text>Long Term Care Facility</Text></ActorRole>
  </ActorLink>
</To>
```

Example 16 – <To>

If the CCR is encrypted, and the sender wants the <To> address to be readable without decrypting the CCR as a whole, pertinent <Actor> details can be redundantly placed under <To><Actor>. Note that this is a special use case for encrypted CCRs and follows the exact rules laid out for <From> in the same use case. In this use case, only the essential data about that <Actor> should be listed under <To>. <To> still requires an <ActorID> and <ActorRole> in this special encryption use case, and requires the full listing of all <Actor> data in the <Actors> section, including any data listed under <Actor> within <To>. See *Example 15* under <From>, which illustrates an example of this use case that can be extrapolated to <To>.

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).

<Purpose>

<Purpose> is optional and unbounded. It is a Complex Data Type of PurposeType and is illustrated in *Figure 6*.

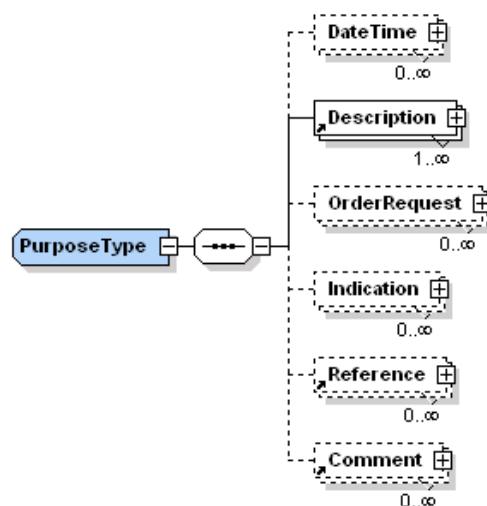


Figure 6 – Complex Data Type PurposeType

<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 4*.

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 (0.. ∞).	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	Optional and	Used to define a specific

	<PlanOfCare>.	Unbounded (0.. ∞).	<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.
<Reference>	This is a link to a <Reference>.	Optional and Unbounded (0.. ∞).	Used to link the <Purpose> to an outside document or record.
<Comment>	This is a link to a <Comment>.	Optional and Unbounded (0.. ∞).	This is restricted to legitimate free text comments only. It is NOT to be used to contain any data that correctly belong under <Description>, <OrderRequest>, or <Indication>.

Table 4 – PurposeType Definition Table

Note that if the system generating the CCR can only create a text string as the <Purpose>, 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.

```

<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>

```

Example 17 – <Purpose>

CCR Body and Data Objects

The core patient-specific data contained within the CCR is within the Body of the CCR Document Object.

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 5*:

Data Object Tag	Description
<Insurance>	Contains Insurance 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.
<HealthCareProviders>	Contains the patient's relevant healthcare providers (Primary Provider(s), Specialist (s)).

Table 5 – CCR <Body> Data Objects

Each one of these sections is optional and unbounded (∞). Sections are required only when they contain data.

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

CCRCodedDataObjectType

All CCR data objects share a set of common characteristics, most of which are defined in the CCR .xsd as a base type CCRCodedDataObjectType, which is illustrated in *Figure 7*.

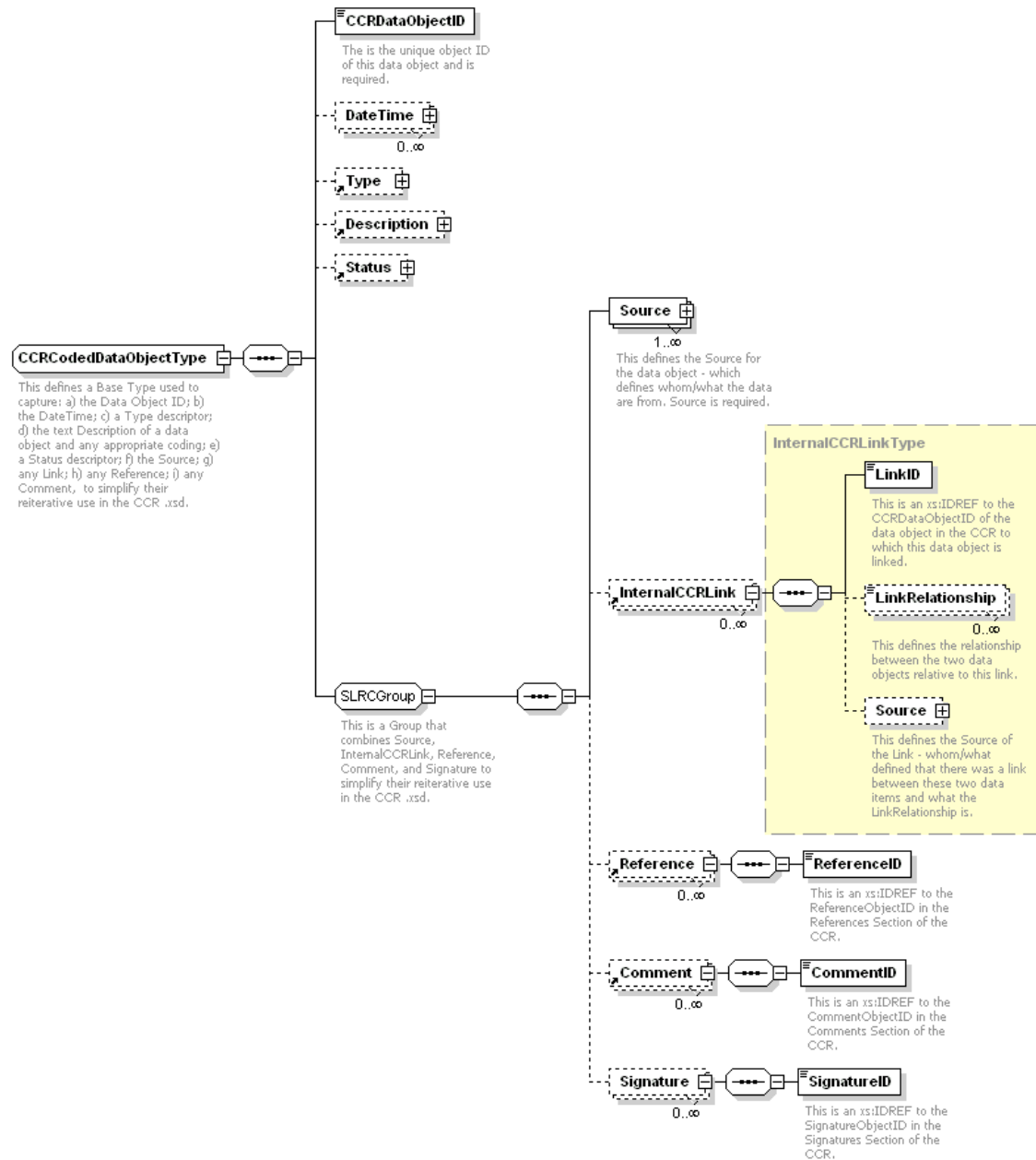


Figure 7 – CCRCodedDataObjectType

The elements that make up a CCRCodedDataObjectType are defined below.

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<CCRDataObjectID>

<CCRDataObjectID> is required. All data objects in the CCR must have a unique object ID. As with all unique IDs in the CCR, all CCR Data ObjectIDs:

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.

Can be of any character length.

The ObjectIDs must be unique within the CCR but do not have any uniqueness in the universe outside a specific instance of the CCR.

<CCRObjID> is of type xs:ID.

`<CCRObjID>5bK74635Hy-.9_uu7K</CCRObjID>`

Example 18 – <CCRDataObjectID>

<DateTime>

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

```
<DateTime>
  <Type>
    <Text>Age At Onset</Text>
  </Type>
  <Age>
    <Value>35</Value>
    <Units>Years</Units>
  </Age>
</DateTime>
```

Example 19 – Data Object <DateTime>

<Type>

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

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


`</Type>`

Example 20 – Data Object `<Type>`

<Description>

`<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.

```

<Description>
  <ObjectAttribute>
    <Attribute>Diagnosis</Attribute>
    <AttributeValue>
      <Value>Myocardial Infarction</Value>
      <Code>
        <Value>22298006</Value>
        <CodeType>SNOMED CT</CodeType>
        <Version>20050131</Version>
      </Code>
    </AttributeValue>
    <Attribute>Acuity</Attribute>
    <AttributeValue>
      <Value>Acute</Value>
      <Code>
        <Value>53737009</Value>
        <CodeType>SNOMED CT</CodeType>
        <Version>20050131</Version>
      </Code>
    </AttributeValue>
    <Attribute>Site</Attribute>
    <AttributeValue>
      <Value>Anteroseptal</Value>
      <Code>
        <Value>20706007</Value>
        <CodeType>SNOMED CT</CodeType>
        <Version>20050131</Version>
      </Code>
    </AttributeValue>
  </ObjectAttribute>
  <Code>
    <Value>410.1</Value>
    <CodeType>ICD-9 CM</CodeType>
    <Version>2004</Version>
  </Code>
</Description>

```

Example 21 – Data Object `<Description>`

<Status>

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

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

Example 22 – Data Object <Status>

<Source>

<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 *Figure 8* 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:

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

Example 23 – <Source> Unknown

<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.

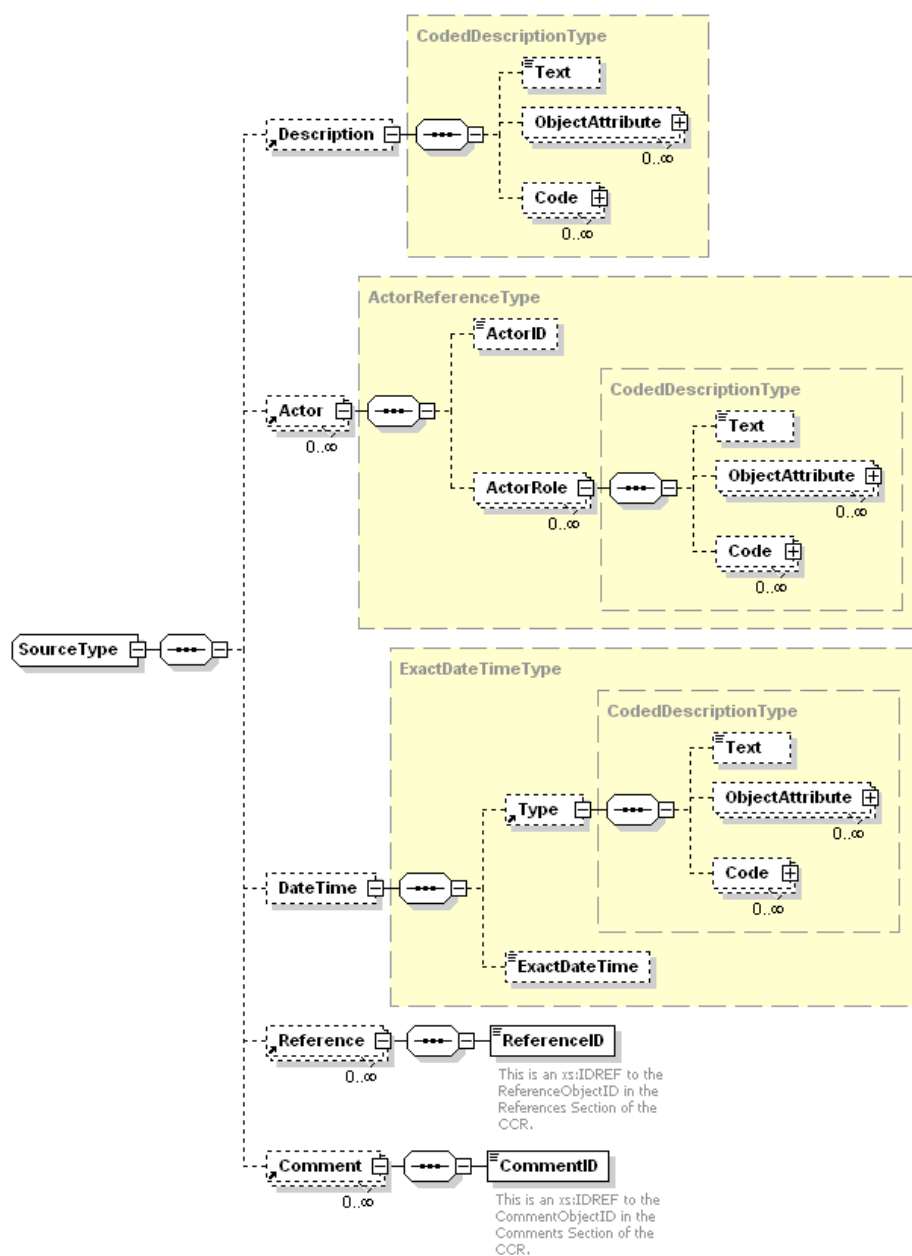


Figure 8 – SourceType

<InternalCCRLink>

<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, i.e., outside the CCR, are defined under <Reference>.

<InternalCCRLink> consists of <LinkID>, which is required and is of type xs:IDREF. <LinkID> points to a <CCRObjectID> of type xs:ID as defined above. <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.

<Reference>

<Reference> is optional and consists of a link to a <ReferenceID>, which is an xs:IDREF 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.

<Comment>

<Comment> is optional and consists of a link to a <CommentID>, which is an xs:IDREF 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.

CCR <Body> Sections

<Insurance>

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

<Insurance> is optional and unbounded (0..∞) 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. <Insurance> is illustrated in *Figure 9*.

Also contained within the <Insurance> 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 and/or provider. Authorizations are particularly pertinent to the referral, long-term care, inpatient, and procedure-based/surgical uses for the CCR. <Authorizations> within <Insurance> 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'.²

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

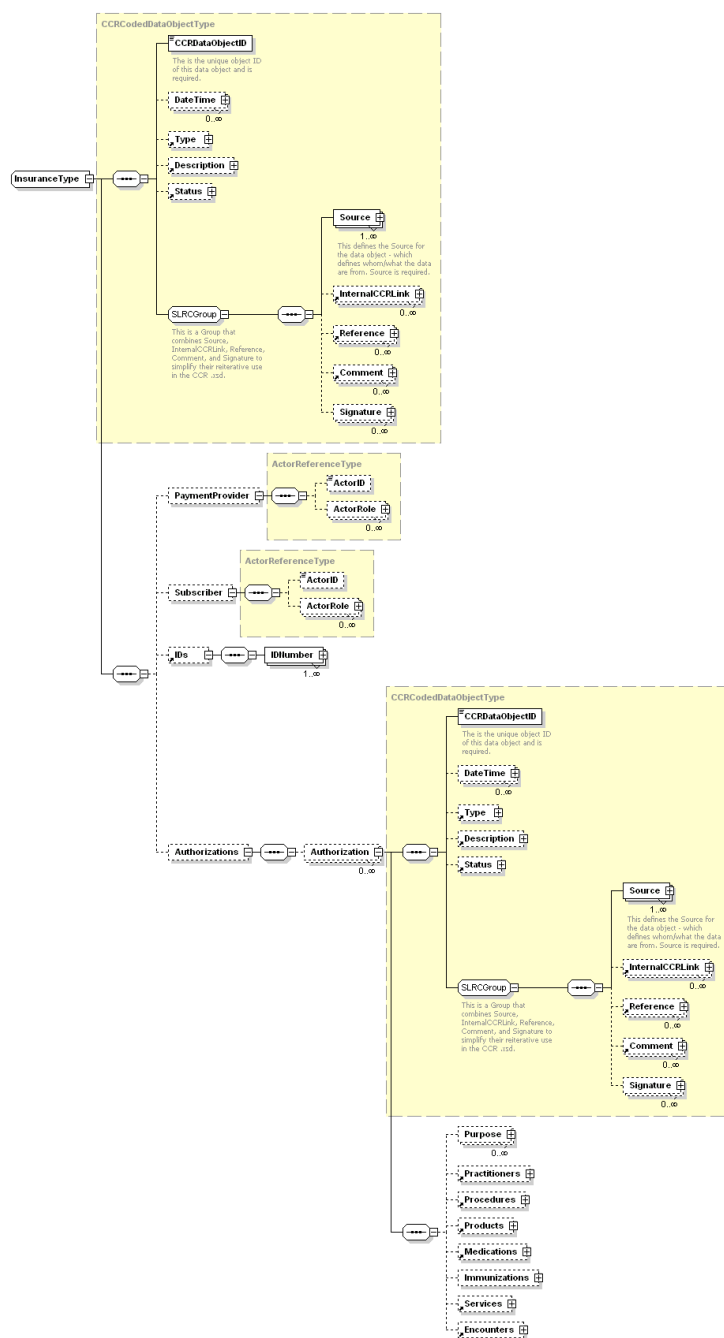


Figure 9 – <Insurance> Data Object

<Insurance> is defined in Table 6:

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<Insurance>	Accepted Values/Formatting	Optionality/Cardinality	Description
<PaymentProvider>	A link to an <Actor> through <ActorID> of type xs:IDREF 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 DateTimeType 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> would be 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 insurance – Healthcare HMO, Healthcare PPO, Healthcare Indemnity, Auto, Worker's Compensation...
<Subscriber>	This is a link to an Actor through <ActorID> of type xs:IDREF 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, insurance, 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>.

Table 6 – <Insurance> Object Type Definition Table

```

<Insurance>
  <CCRDataObjectID>_____</CCRDataObjectID>
  <DateTime>
    <Type>
      <Text>Effective Date</Text>
    </Type>
    <ExactDateTime>2005-01-01</ExactDateTime>
  </DateTime>
  <Type>
    <Text>Supplemental Health Insurance</Text>
  </Type>
  <PaymentProvider>
    <ActorID>_____</ActorID>

```

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```

</PaymentProvider>
<Subscriber>
  <ActorID>_____</ActorID>
  <ActorRole>Spouse</ActorRole>
</Subscriber>
<IDs>
  <IDNumber>
    <Type>Subscriber Number</Type>
    <ID>555-55-5555</ID>
  </IDNumber>
  <IDNumber>
    <Type>Group Number</Type>
    <ID>H7X8A5</ID>
  </IDNumber>
  <IDNumber>
    <Type>Plan Code</Type>
    <ID>520</ID>
  </IDNumber>
<Authorizations>
  <Authorization>
    <DateTime>
      <Type>
        <Text>Approval Date</Text>
      </Type>
      <ExactDateTime>2004-12-16</ExactDateTime>
    </DateTime>
    <Type>Plan Code</Type>
    <ID>520</ID>
  </IDNumber>
  <Type>
    <Text>Referral</Text>
  </Type>
  <Status>
    <Text>Approved</Text>
  </Status>
  <Encounters>
    <Text>Approved</Text>
  </Encounters>
  <Practitioners>
    <Practitioner>
      <ActorID>_____</ActorID>
      <ActorRole>Physical Therapy</ActorRole>
    </Practitioner>
    <Frequency>
      <FixedFrequency>
        <Value>5</Value>
        <Units>Visits</Units>
      </FixedFrequency>
    </Frequency>
    <Indications>
      <Indication>

```



```
        <InternalCCRLink>_____</InternalCCRLink>
      </Indication>
    </Indications>
  </Authorization>
</Authorizations>
</Insurance>
```

Example 24 – Data Object <Insurance>

<AdvanceDirectives>

<AdvanceDirective> is optional and unbounded (0 - ∞) and 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 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.

<AdvanceDirective> is illustrated in *Figure 10*.

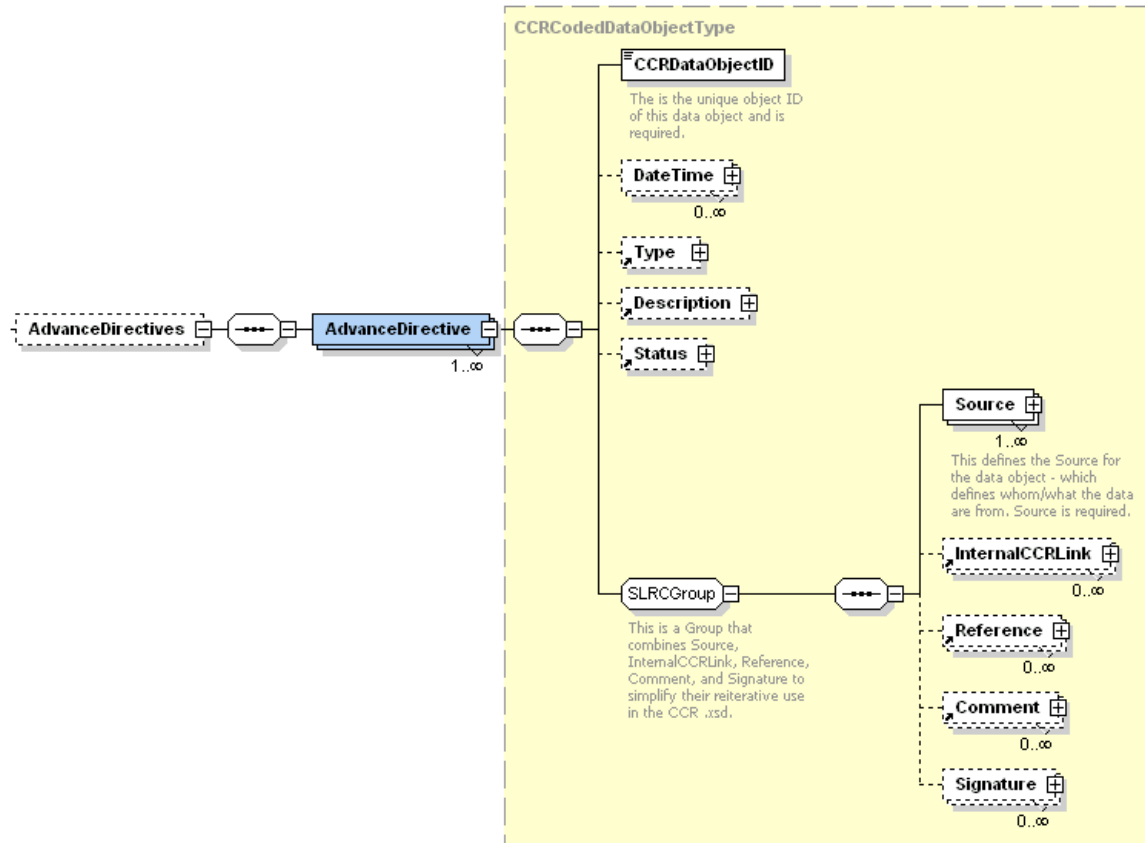


Figure 10 – <AdvanceDirective> Data Object

<AdvanceDirectives> is defined in Table 7:

<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 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.
<Type>	An instance of CodedDescriptionType with	0..1	Defines the <AdvanceDirective> <Type>.

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	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.		
<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.

Table 7 – <AdvanceDirective> Object Type Definition Table

```

<AdvanceDirective>
  <CCRDataObjectID>_____</CCRDataObjectID>
  <DateTime>
    <Type>
      <Text>Verification Date</Text>
    </Type>
    <ExactDateTime>2004-09-01T13:25:34-05:00</ExactDateTime>
  </DateTime>
  <Type>
    <Text>Resuscitation Status</Text>
  </Type>
  <Description>
    <Text>Full Code</Text>
  </Description>
  <Status>
    <Text>Verified With Patient</Text>
  </Status>
</AdvanceDirective>

```

Example 25 – Data Object <AdvanceDirective>

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<Support>

<Support> is optional and unbounded (0 - ∞) 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.

This is a link to an Actor through <ActorID> of type xs:IDREF 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>.

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.

<Support> is illustrated in *Figure 11*.

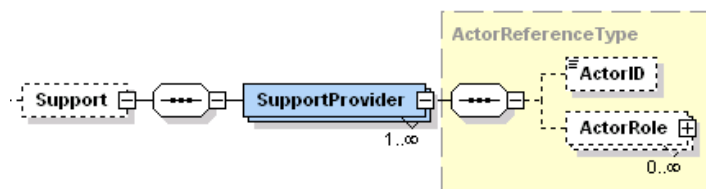


Figure 11 – Data Object <Support>

```
<Support>
  <ActorLink>
    <ActorID>_____</ActorID>
    <ActorRole><Text>Mother</Text></ActorRole>
  </ActorLink>
</Support>
```

Example 26 – Data Object <Support>

<FunctionalStatus>

<FunctionalStatus> is optional and unbounded (0 - ∞) 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. Functional Status is essentially a subset of ProblemType (see <Problem> below), 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.

<FunctionalStatus> is illustrated in *Figure 12*.

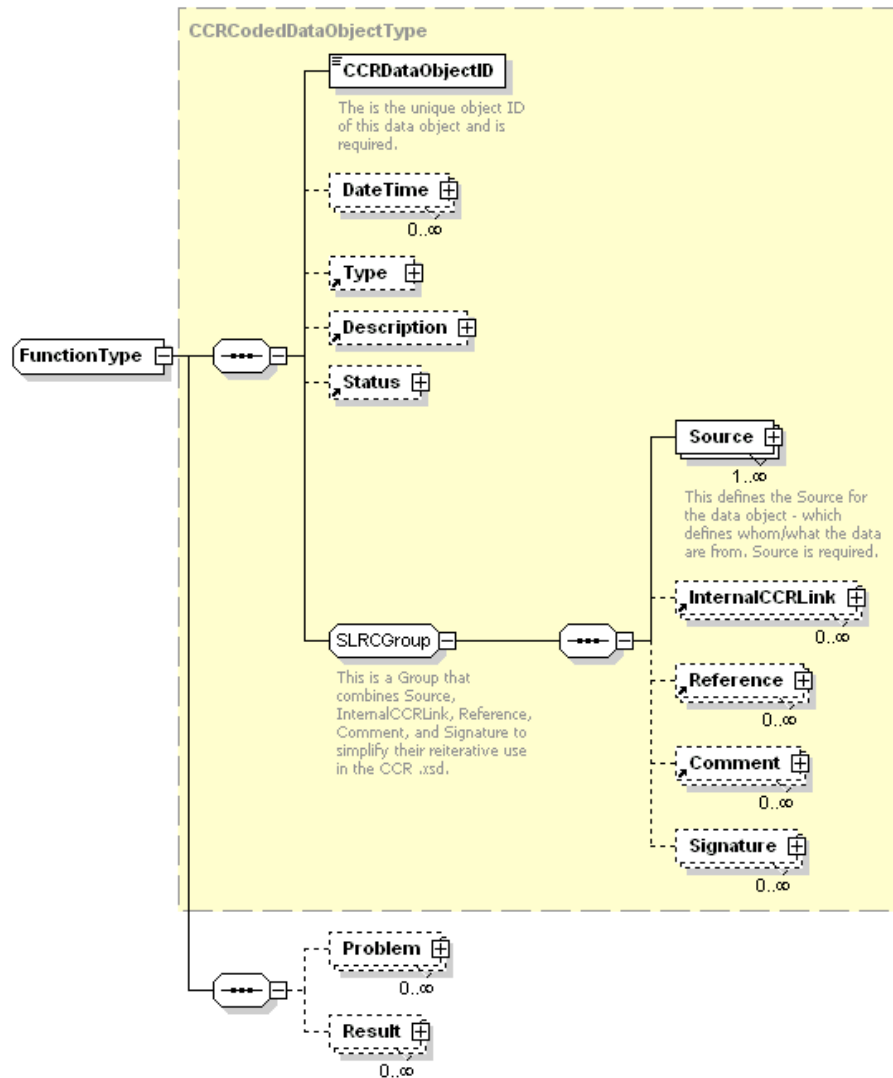


Figure 12 – Data Object <FunctionalStatus>

```
<FunctionalStatus>
  <CCRDataObjectID> _____ </CCRDataObjectID>
  <DateTime>
```

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```

    <Type>
      <Text>Date Of Onset</Text>
    </Type>
    <Age>
      <Value>83</Value>
      <Units>Years</Units>
    </Age>
  </DateTime>
  <Type>
    <Text>Mental Status</Text>
  </Type>
  <Description>
    <Text>Does Not Respond To Command</Text>
  </Description>
  <Status>
    <Text>Chronic</Text>
  </Status>
</FunctionalStatus>

```

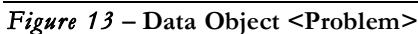
Example 27 – Data Object <FunctionalStatus>

<Problems>

<Problem> is optional and unbounded (0..∞) and 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.

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.

< Problem> is illustrated in *Figure 13*.



<Problem> is defined in *Table 8*:

<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.
<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, and/or SNOMED).	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 Unbounded (0..∞).	Used to define one or more episodes 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	Optional and Unbounded (0..∞).	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

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	defined structured text values.		of the Actor whom the problem applies to – values are Yes, No, Unknown; <DateTime> is an instance of DateTimeType 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> and <Description>.	Optional and Unbounded (0..∞).	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.

Table 8 – <Problem> Object Type Definition Table

```

<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>
          <CodeType>SNOMED CT</CodeType>
          <Version>20050131</Version>
        </Code>
      </AttributeValue>
      <Attribute>Acuity</Attribute>
      <AttributeValue>
        <Value>Acute</Value>

```

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```

        <Code>
            <Value>53737009</Value>
            <CodeType>SNOMED CT</CodeType>
            <Version>20050131</Version>
        </Code>
    </AttributeValue>
    <Attribute>Site</Attribute>
    <AttributeValue>
        <Value>Antereoseptal</Value>
        <Code>
            <Value>20706007</Value>
            <CodeType>SNOMED CT</CodeType>
            <Version>20050131</Version>
        </Code>
    </AttributeValue>
</ObjectAttribute>
<Code>
    <Value>410.1</Value>
    <CodeType>ICD-9 CM</CodeType>
    <Version>2004</Version>
</Code>
</Description>
<Status>
    <Text>Resolved</Text>
</Status>
<Episodes>
    <Number>2</Number>
    <Episode>
        <DateTime>
            <Type>
                <Text>Age At Onset</Text>
            </Type>
            <Age>
                <Value>35</Value>
                <Units>Years</Units>
            </Age>
        </DateTime>
        <Status>
            <Text>Resolved</Text>
        </Status>
    </Episode>
</Episodes>
</Problem>

```

Example 28 – Data Object <Problem>

<FamilyHistory>

<FamilyHistory> is optional and unbounded (0..∞) 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.

<FamilyHistory> includes an instance of the Complex Data Type ProblemType derived by Restriction, which is a variation of <Problem>. 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, and/or problems 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>.

<FamilyHistory> is an instance of the Complex Data Type HistoryType illustrated in *Figure 14*.

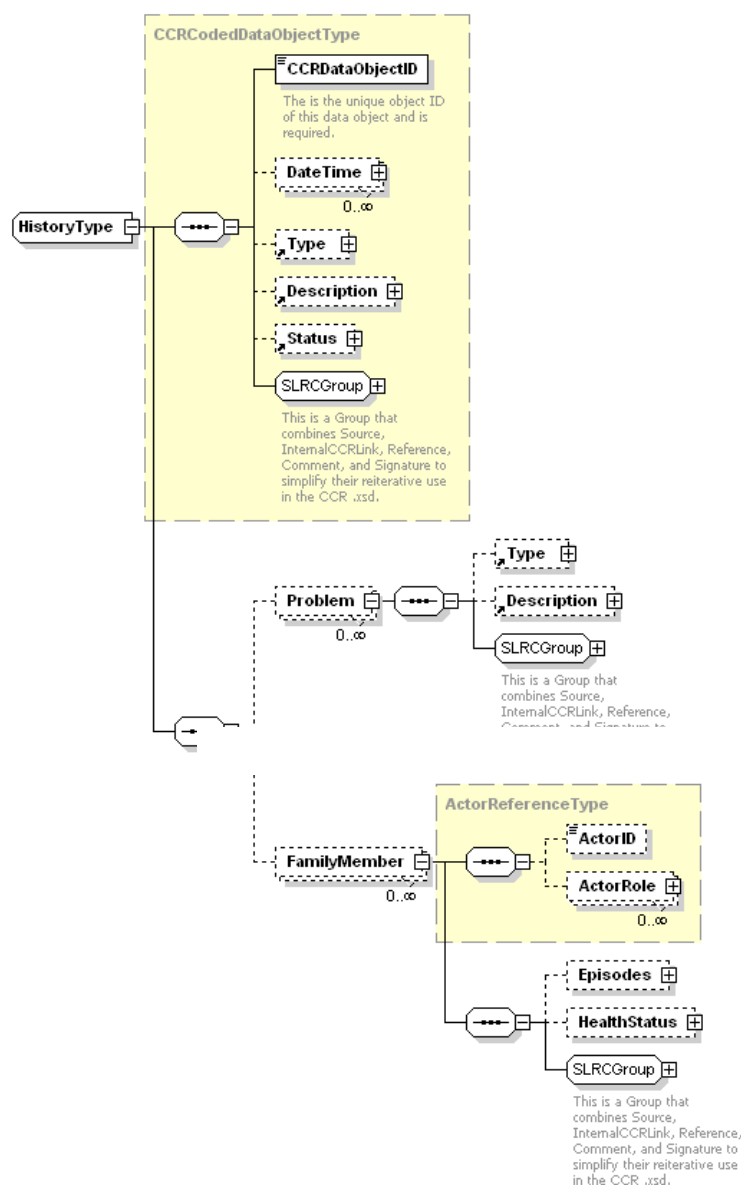


Figure 14 – HistoryType Data Object

<FamilyHistory> 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>. The CCR supports a one-to-many relation from <Problem> to <FamilyMember> and from <FamilyMember> to <Problem>.

The preferred usage in the CCR, however, is to list each <Problem> as a discrete entity and then list all family members who have or have had that problem. <Problem> is defined in the preceding section of this Implementation Guide. <FamilyMember> is a link to an <Actor> through an <ActorID> of type xs:IDREF. <FamilyMember> must include an <ActorRole>. Each <FamilyMember> <ActorRole> should reflect the <Relation> of that <FamilyMember> to the <Patient>. In addition, under <FamilyHistory>, <Episodes> and <HealthStatus> are children of <FamilyMember> and not children of <Problem>. The reason for this is that each <FamilyMember> who may have a specific <Problem> will have a different episodic history of that problem and a different <HealthStatus> than another <FamilyMember> with the same problem. <FamilyHistory> is illustrated in *Example 29*.

```
<FamilyHistory>
  <History>
    <CCRDataObjectID>_____</CCRDataObjectID>
    <Problem>
      <Type>
        <Text>Diagnosis</Text>
      </Type>
      <Description>
        <ObjectAttribute>
          <Attribute>Diagnosis</Attribute>
          <AttributeValue>
            <Value>Myocardial Infarction</Value>
            <Code>
              <Value>22298006</Value>
              <CodeType>SNOMED CT</CodeType>
              <Version>20050131</Version>
            </Code>
          </AttributeValue>
        </ObjectAttribute>
      </Description>
    </Problem>
    <FamilyMember>
      <ActorID>_____</ActorID>
      <ActorRole>
        <Text>Father</Text>
      </ActorRole>
      <Episodes>
        <Number>1</Number>
        <Episode>
          <DateTime>
            <Type>
              <Text>Age At Onset</Text>
            </Type>
            <Age>
              <Value>57</Value>
              <Units>Years</Units>
            </Age>
          </DateTime>

```

```
        </Episode>
    </Episodes>
    <HealthStatus>
        <Description>
            <Text>Deceased</Text>
        </Description>
        <CauseOfDeath>Yes</CauseOfDeath>
    </HealthStatus>
</FamilyMember>
</History>
</FamilyHistory>
```

Example 29 – Data Object <FamilyHistory>

<SocialHistory>

<SocialHistory> is optional and unbounded (0..∞) and contains data defining the patient's occupational, personal (e.g., lifestyle), social, and environmental history and health risk factors. Within the CCR things commonly grouped under administrative (ADT) data 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, and/or restrictions on healthcare interventions and therapeutic options for a specific patient. In addition, these are all highly confidential and private data attributes about a patient and require the identical protections afforded all patient healthcare data.

Social History is illustrated in *Figure 15*.

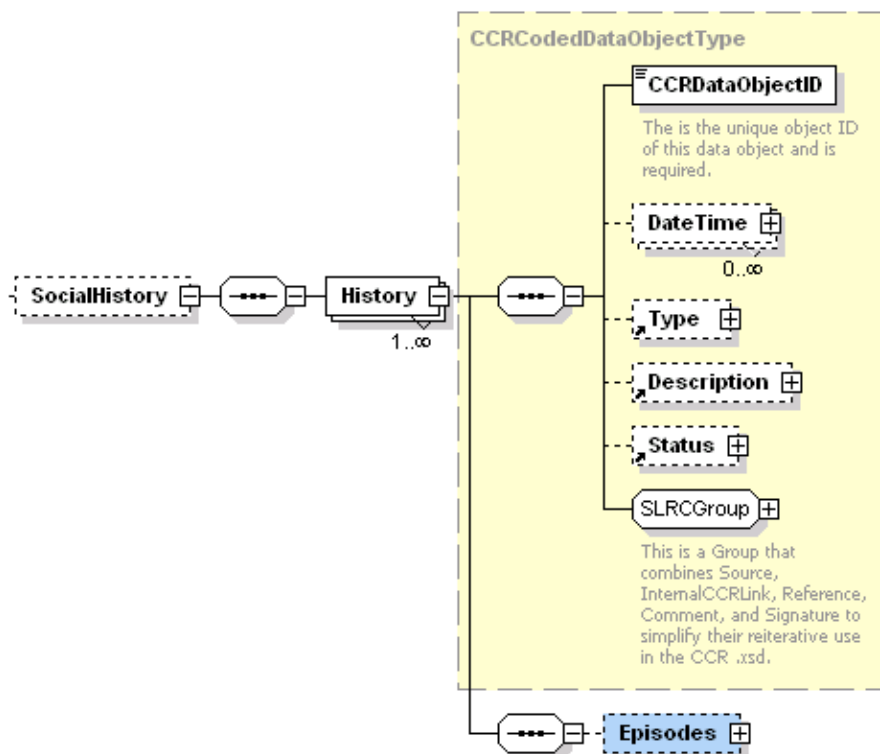


Figure 15 – Data Object <SocialHistory>

<SocialHistory> is defined in Table 9.

<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.
<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.)
<Description>	An instance of CodedDescriptionType that	Optional and Bounded to one instance (0..1).	Defines the specific attributes of the social history defined under <Type>.

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	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.		
<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 Unbounded (0..∞).	Used to define one or more episodes 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.

Table 9 – <SocialHistory> Object Type Definition Table

```

<History>
  <CCRDataObjectID>_____</CCRDataObjectID>
  <DateTime>
    <Type>
      <Text>Start Date</Text>
    </Type>
    <Age>
      <Value>17</Value>
      <Units>Years</Units>
    </Age>
    <Type>
      <Text>Stop Date</Text>
    </Type>
    <Age>
      <Value>67</Value>
      <Units>Years</Units>
    </Age>
  </DateTime>
  <Type>
    <Text>Tobacco Use</Text>
  </Type>
  <Description>
    <ObjectAttribute>
      <Attribute>Type</Attribute>
      <AttributeValue>
        <Value>Cigarettes</Value>
        <Code>
          <Value>_____</Value>
          <CodeType>SNOMED CT</CodeType>
        </Code>
      </AttributeValue>
    </ObjectAttribute>
  </Description>

```

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```

        <Version>20050131</Version>
      </Code>
    </AttributeValue>
    <Attribute>Packs Per Day</Attribute>
    <AttributeValue>
      <Value>1.5</Value>
      <Code>
        <Value>_____</Value>
        <CodeType>SNOMED CT</CodeType>
        <Version>20050131</Version>
      </Code>
    </AttributeValue>
  <Status>
    <Text>Historical</Text>
  </Status>
</History>

```

Example 30 – Data Object <SocialHistory>

<Alerts>

<Alerts> is optional and unbounded (0..∞) 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 though routine screening.

<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 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.

<Alert> is illustrated in *Figure 16*.

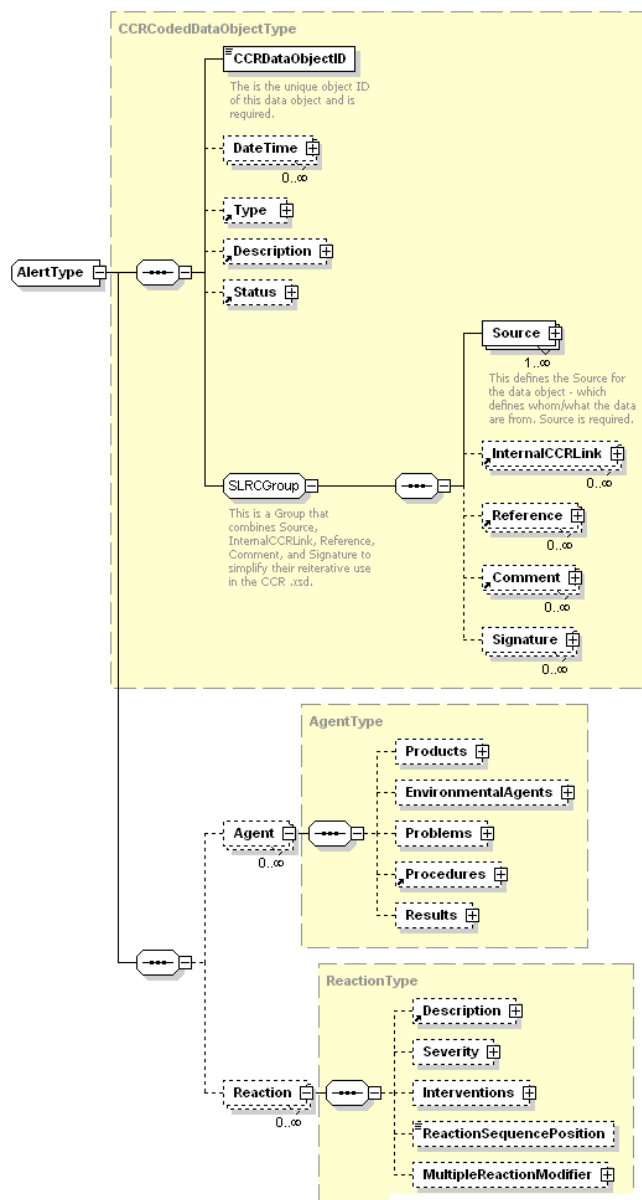


Figure 16 – <Alert> Data Object

<Alerts> are defined in *Table 10*:

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<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____, etc.
<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>, <Results>.	Optional and Unbounded (0..∞).	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, etc. <Description> can be a string or can be used to encode the reaction (recommended/preferred).
<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	Optional	Defines any <Intervention> used to

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	<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..∞).	treat a <Reaction>.
--	---	--	---------------------

Table 10 – <Alert> Object Type Definition Table

```

<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>
  <Agent>
    <Products>
      <Product>
        <SingleProduct>
          <Description>
            <Text>Penicillin</Text>
          <Code>
            <Value>_____</Value>
            <CodeType>RxNorm</CodeType>
            <Version>_____</Version>
          </Code>
        </SingleProduct>
      </Product>
    </Products>
  </Agent>
  <Reaction>
    <Description>
      <ObjectAttribute>
        <Attribute>Reaction</Attribute>
        <AttributeValue>
          <Value>Anyphylaxis</Value>
          <Code>
            <Value>_____</Value>
            <CodeType>SNOMED CT</CodeType>

```

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```

        <Version>20050131</Version>
      </Code>
    </AttributeValue>
  </ObjectAttribute>
</Description>
<Severity>
  <Description>
    <ObjectAttribute>
      <Attribute>Severity</Attribute>
      <AttributeValue>
        <Value>Life Threatening</Value>
        <Code>
          <Value>_____</Value>
          <CodeType>SNOMED CT</CodeType>
          <Version>20050131</Version>
        </Code>
      </AttributeValue>
    </Severity>
  <Interventions>
    <Intervention>
      <Procedures>
        <Procedure>
          <Description>
            <Text>Cardiopulmonary Resuscitation</Text>
            <Code>
              <Value>_____</Value>
              <CodeType>RxNorm</CodeType>
              <Version>_____</Version>
            </Code>
          </Description>
        </Procedure>
      </Procedures>
    </Intervention>
  </Interventions>
</Reaction>
</Alert>

```

Example 31 – <Alert> Data Object

<Medications>, <MedicalEquipment>, and <Immunizations>

<Medications>, <MedicalEquipment>, and <Immunizations> are optional and unbounded (0..∞) 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 all utilize the same XML data object definition and tagging. They are all instances of the Complex Data Type StructuredProductType.

<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.

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.

Careful consideration has gone to make StructuredProductType within the CCR map explicitly to and support:

- NCPDPScript and the ongoing cooperative work on SIG definitions for medication prescriptions and orders with NCPDP, HL7, and ASTM.
- 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).
- Product and manufacturer identification and tracking of implanted medical devices.
- Home oxygen tracking, reporting, authorization, and clinical validation/justification under Medicare/Medicaid and X12 837.

There is another instance of <Product> that involves a simplified object view defined as SimpleProductType. SimpleProductType is used within the CCR when a product (Medication, IV Fluid, Parental Nutrition, Supplemental Nutrition, Immunization, Disposable, Supplies, Device, Implantable Device, Durable Medical Equipment) is used as an attribute of another CCR data object, such as a product associated with, or part of a <Procedure> or a <Result>, for example. SimpleProductType is a restricted attribute set of StructuredProductType.

The Complex Data Type StructuredProductType as illustrated in *Figure 17*.



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<Product>	Accepted Values/Formatting	Optionality/ Cardinality	Description
<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 Bounded to one instance (0..1).	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>.
<IDNumber>	Instance of IDType	Optional and Unbounded (0..∞).	Can be used for Product Number, Lot Number, Serial Number, or the like.
<Strength>	Instance of MeasureType	Optional and Unbounded (0..∞).	The predefined strength that the medication comes in – 500mg tablets, for example.
<Form>	Instance of CodedDescriptionType.	Optional and Unbounded (0..∞).	The Form– Tablet, Capsule, Elixir, Suspension, Crème, Powder, Box, Syringe, etc.
<Concentration>	Instance of MeasureType.	Optional and Unbounded (0..∞).	Used to define product concentration, when applicable – 250 mg/ml, for example.
<Size>	Can be a text string, structured text, or defined by	Optional and Unbounded (0..∞).	Used to define a <Product> <Size>.

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	<Dimensions>.		
<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.	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.
<Dose>	MeasureType with <Value>, <Units>, and <Code>.	Optional and Unbounded (0..∞).	<Dose> defines the dose parameter 125, 250, 500; <Unit> defines the units.
<DoseCalculation>	Instance of DoseCalculationType.	Optional and Unbounded (0..∞).	Used to provide a dose calculation. <Dose> defines the dose parameter 125, 250, 500; <Unit> defines the unit parameters mg/kg/hr, for example <Variables> defines dosing variables, which can be more than one. <Calculation> defines the calculation.
<DoseRestriction>	Instance of DoseCalculationType.	Optional and Unbounded (0..∞).	Used to provide a dose restriction. Otherwise, the same as above.
<Vehicle>	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>	Instance of CodedDescriptionType.	Optional and Unbounded (0..∞).	This defines the Route of administration – po, pr, sl, in either plain English or Latin abbreviation.
<Site>	Instance of CodedDescriptionType.	Optional and Unbounded (0..∞).	Site of use, implantation, or administration, when specified (commonly used in IM, IV, and immunizations, and implantable devices).
<DateTime>	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.
<Rate>	Can be expressed as a <Description> (CodedDescriptionType) or a <Value> and <Units>.	Optional and Unbounded (0..∞).	Defines a rate of administration.
<Frequency>	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>	Can be expressed as a	Optional and	Defines an interval q15m, q2h, q4h,

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	<Description> (CodedDescriptionType) or a <Value> and <Units>.	Unbounded (0..∞).	q12h.
<Duration>	Can be expressed as a <Description> (CodedDescriptionType) or a <Value> and <Units>.	Optional and Unbounded (0..∞).	Defines the duration of use/administration.
<StopIndicator>	Can be 'Yes' or Null.	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.
<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 product.
<PatientInstructions>	An instance of CodedDescriptionType.	Optional and Unbounded (0..∞).	Patient instructions that are <u>not</u> part of the traditional <Directions>/SIG.
<FulfillmentInstructions>	An instance of CodedDescriptionType.	Optional and Unbounded (0..∞).	Instructions to the dispensing pharmacist or administering provider.
<Refill>	Includes <Number>, <Quantity>, <DateTime>, to define 'Last Refill', for example, and <Comment> for any specific <Refill> alerts or comments.	Optional and Unbounded (0..∞).	Number of allowed refills per prescription.
<SeriesNumber>	String	Optional and Unbounded (0..∞).	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 Unbounded (0..∞).	Allows <Description> of consent as well as link to <Actor> or <ExternalReference>.
<Reaction>	Instance of ReactionType.	Optional UnBounded (0 - ∞)	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. Defines the reaction - Rash, Angioedema, Anaphylaxis, Nausea, etc. <Description> can be a string or can be used to encode the reaction; “Severity” is recommended as an <Attribute> to define the severity of the reaction.
<FulfillmentHistory>	Under <Fulfillment> contains <DateTime>, <Description>.	Optional UnBounded (0 - ∞)	Product fulfillment history – tags as for <OrderRxHistory> above, but

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	<Provider>, <Location>, and <FulfillmentMethod>.		applied to fulfillment/dispensing.
--	---	--	------------------------------------

Table 11 – <Product> Object Type Definition Table

```

<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>
  <Product>
    <ProductName>
      <Description>
        <Text>Amoxicillin</Text>
        <Code>
          <Value>_____</Value>
          <CodeType>RxNorm</CodeType>
          <Version>_____</Version>
        </Code>
      </Description>
    </ProductName>
    <BrandName>
      <Description>
        <Text>Amoxil</Text>
        <Code>
          <Value>_____</Value>
          <CodeType>RxNorm</CodeType>
          <Version>_____</Version>
        </Code>
      </Description>
    </BrandName>
    <Strength>
      <Value>250</Value>
      <Units>mg</Units>
    </Strength>
  </Product>
  <Quantity>
    <Value>30</Value>
    <Units>Capsules</Units>
  </Quantity>
  <Directions>
    <Dose>
      <Value>1</Value>
    </Dose>
    <Route>

```

```

        <Description>
            <Test>po</Text>
        </Description>
    </Route>
    <Frequency>
        <Value>tid</Value>
    </Frequency>
    <Duration>
        <Value>10</Value>
        <Units>Days</Units>
    </Duration>
    </Directions>
</Medication>

```

Example 11 – <Medication>/<Product>

<VitalSigns> and <Results>

<VitalSigns> and <Results> are optional and unbounded (0..∞) 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.

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 and/or minimum, baseline, or relevant trends should be listed. For <Results>, all pertinent as well as the most recent results should be included in the CCR.

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.

ResultType is illustrated in *Figure 18*.

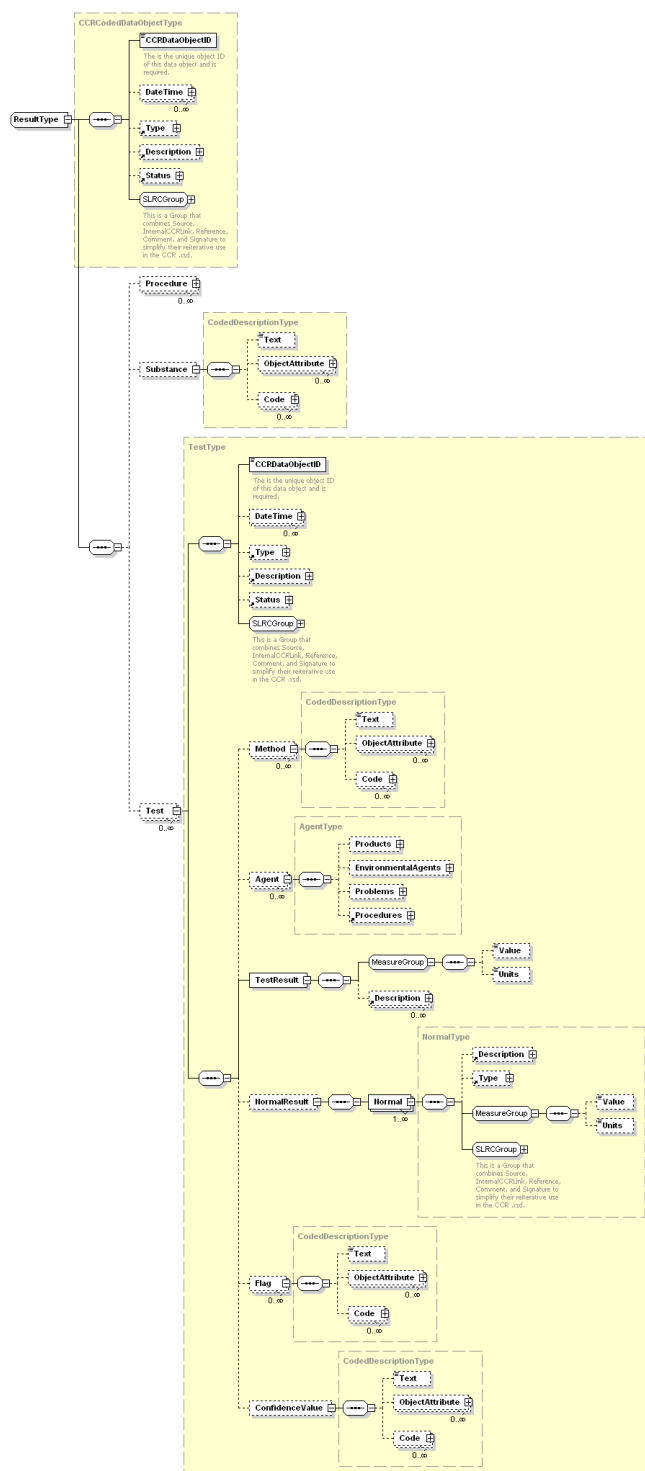


Figure 18 – Data Object ResultType

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ResultType defines discrete values as a <Test> with a <TestResult>. <Test> is a Complex Data Type TestType. The elements of ResultType are defined in *Table 12* followed by the definition of TestType in *Table 13*.

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.
<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 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.
<Procedure>	This is a specific use of <Procedure> as defined, below (<i>Procedures</i>). 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	Optional and Unbounded (0..∞).	This is an instance of a procedure or a link. This is the procedure for which there is the <Result>, and/or a procedure done to get the <Result>.

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	<InternalCCRLink>.		
<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, etc.
<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.

Table 12 – <Result> Object Type Definition Table

TestType	Accepted Values/Formatting	Optionality/0 - ∞	Description
<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.	Required and Bounded to single use (1..1).	<Description> of the test – Systolic Blood Pressure, Diastolic Blood Pressure, Hct, Hgb, Na, K, BUN, Cr, Urine Specific Gravity, etc...
<Method>	Instance of CodedDescriptionType	Optional and Unbounded (0..∞).	Used when a <Description> modifier is needed – currently <u>not</u> 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>, 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.	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 expected 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>.

Table 13 – TestType Definition Table

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```

<Result>
  <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>
      <CodeType>SNOMED CT</CodeType>
      <Version>_____</Version>
    </Code>
    <Code>
      <Value>_____</Value>
      <CodeType>CPT-4</CodeType>
      <Version>_____</Version>
    </Code>
    <Code>
      <Value>_____</Value>
      <CodeType>LOINC</CodeType>
      <Version>_____</Version>
    </Code>
  </Description>
  <Substance>
    <Description>
      <Text>Venous Blood</Text>
      <Code>
        <Value>_____</Value>
        <CodeType>SNOMED CT</CodeType>
        <Version>_____</Version>
      </Code>
    </Description>
  </Substance>
  <Test>
    <Description>
      <Text>HCT</Text>
      <Code>
        <Value>_____</Value>
        <CodeType>LOINC</CodeType>
        <Version>_____</Version>
      </Code>
    </Description>
    <TestResult>
      <Value>9.2</Value>
      <Units>%</Units>
    </TestResult>
  </Test>

```



```

</TestResult>
<NormalResult>
  <Normal>
    <Value>14.0</Value>
    <Units>%</Units>
    <ValueSequencePosition>1</ValueSequencePosition>
  </Normal>
  <Normal>
    <Value>18.0</Value>
    <Units>%</Units>
    <ValueSequencePosition>2</ValueSequencePosition>
    <VariableNormalModifier>TO</VariableNormalModifier>
  </Normal>
</NormalResult>
<Flag>
  <Description>
    <Test>Critical</Text>
  </Description>
</Flag>
</Test>
</Result>

```

Example 33 – <Result>

<Procedures>

<Procedures> is optional and unbounded (0..∞) 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.

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.

<Procedure> is defined by the Complex Data Type ProcedureType, which is illustrated in *Figure 19*.

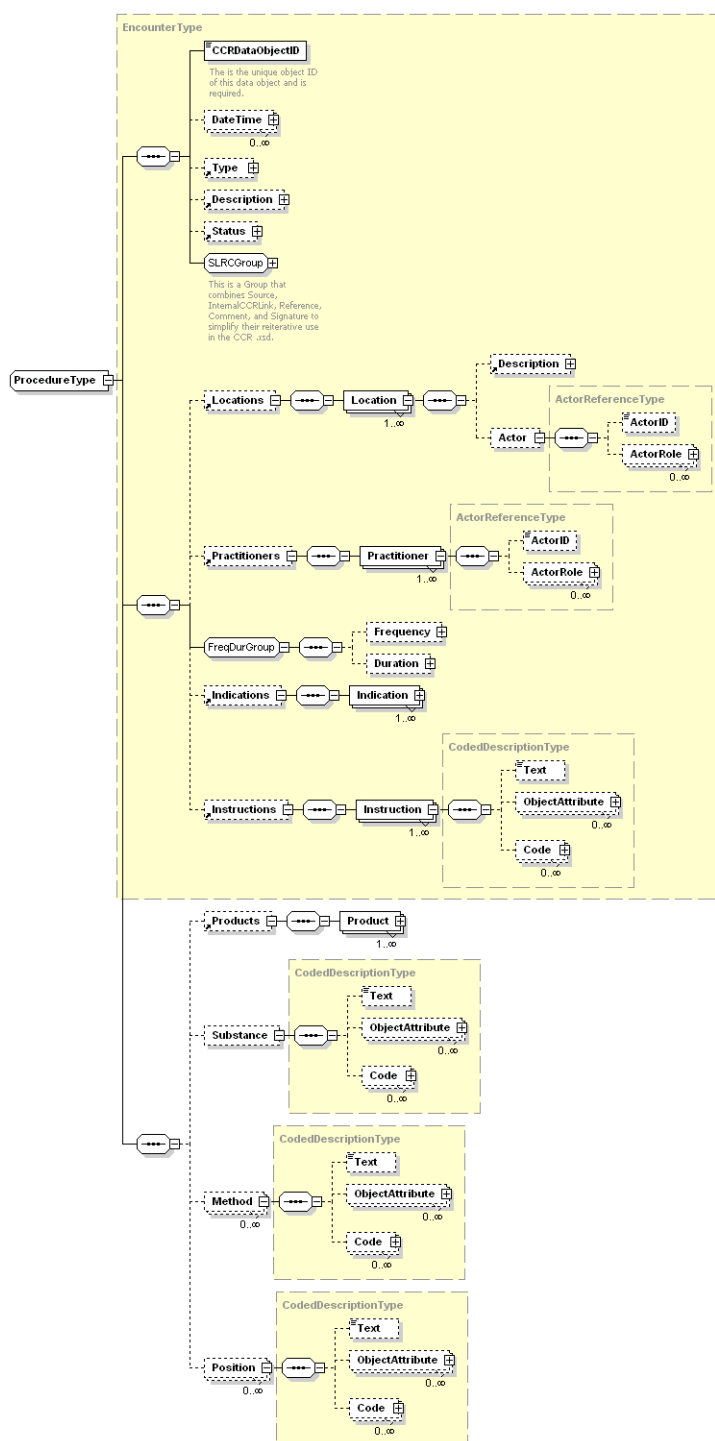


Figure 19 – Data Object <Procedure>

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<Procedure> is defined in *Table 14*:

<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.
<Type>	An instance of CodedDescriptionType.	Optional and Unbounded (0..∞).	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 single use (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 single use (0..1).	Defines the current <Status> of the <Procedure>.
<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 <u>not</u> 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> who did the procedure.
<Frequency>	An instance of FreqDurGroup.	Optional and Unbounded (0..∞).	Defines the <Frequency> of the <Procedure>.
<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>	Instance of InstructionType.	Optional and Unbounded (0..∞).	Used to define <Instructions> for a <Procedure>. Used primarily when a <Procedure> is an <OrderRequest>.
<Product>	Instance of	Optional and	Defines any <Product> associated

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	StructuredProductType	Unbounded (0..∞).	with the <Procedure>.
<Substance>	An instance of CodedDescriptionType	Optional and Unbounded (0..∞).	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..∞).	Site of <Procedure>.

Table 14 – <Procedure> Object Type Definition Table

```

<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>
      <CodeType>SNOMED CT</CodeType>
      <Version>_____</Version>
    </Code>
    <Code>
      <Value>_____</Value>
      <CodeType>CPT-4</CodeType>
      <Version>_____</Version>
    </Code>
  </Description>
</Procedure>

```

Example 34 – <Procedure>

<Encounters>

<Encounters> is optional and unbounded (0..∞) and contains data defining all pertinent healthcare encounters as well as pending healthcare appointments of the patient at the time

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the CCR is generated. Encounters can be Hospitalization, Office Visit, Home Health Visit, Long-Term Care, or any other pertinent encounter.

<Encounter> is illustrated in *Figure 20*.

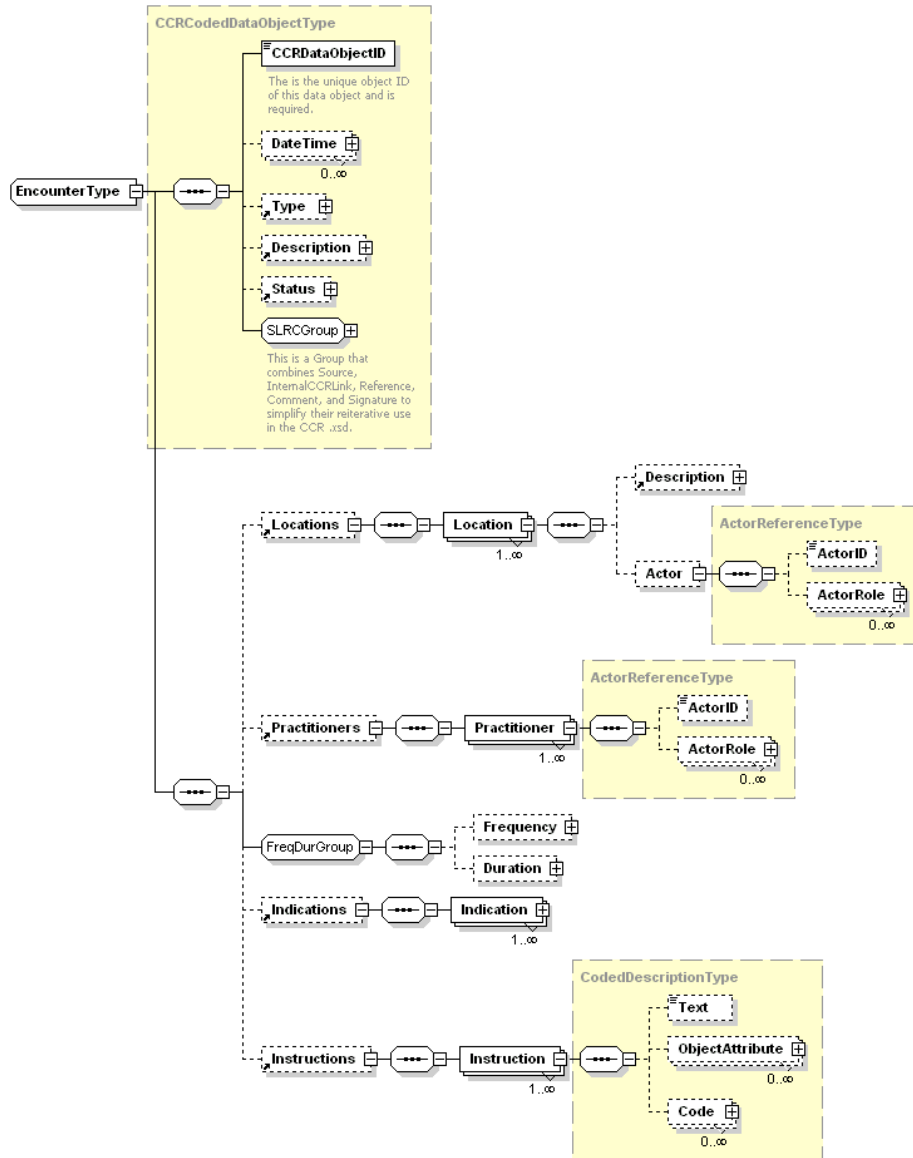


Figure 20 – <Encounter> Data Object

<Encounter> is defined in *Table 15*:

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<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 <u>not</u> 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 Unbounded (0..∞).	Used to define <Instructions> for a <Encounter>. Used primarily when a <Encounter> is an <OrderRequest>.

Table 15 – <Encounter> Object Type Definition Table

```

<Encounter>
  <CCRDataObjectID>_____</CCRDataObjectID>
  <DateTime>
    <Type>
      <Text>Encounter Date</Text>
    </Type>

```

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```

    <ExactDateTime>2003-07</ExactDateTime>
  </DateTime>
  <Type>
    <Text>Inpatient Hospitalization</Text>
  </Type>
  <Location>
    <Description>
      <Text>Jackson County Hospital</Text>
    </Description>
  </Location>
  <Indication>
    <Problem>
      <Description>
        <Text>Pneumonia</Text>
      </Description>
    </Problem>
  </Indication>
</Encounter>

```

Example 35 – <Encounter>

<PlanOfCare>

<PlanOfCare> is optional and unbounded (0..∞) 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. 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 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>

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.

<PlanOfCare> is illustrated in *Figure 21*.

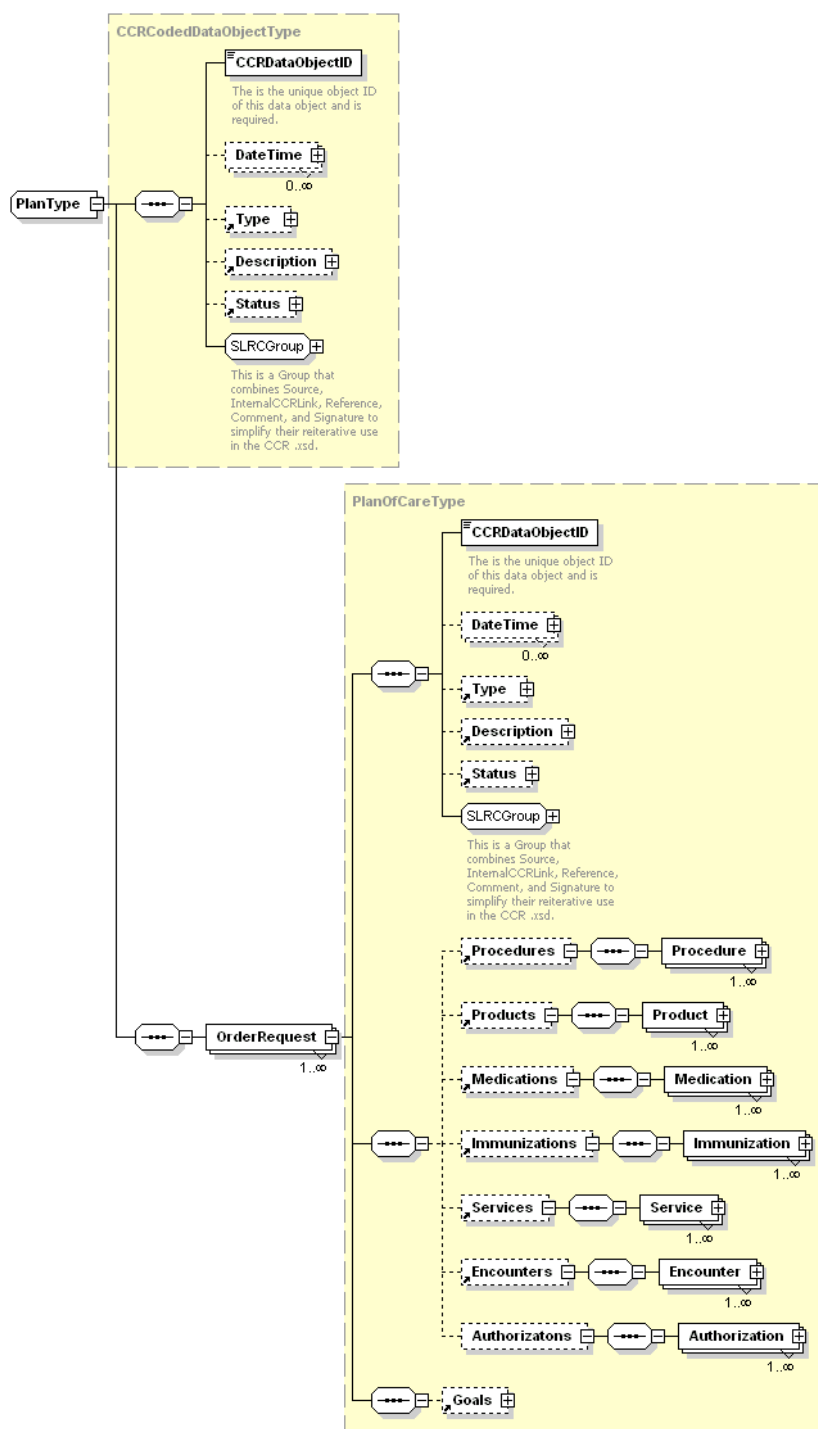


Figure 21 – Data Object <PlanOfCare>

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<PlanOfCare> is defined in *Table 16*:

<PlanOfCare>	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>.
<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	Optional and Unbounded (0..∞).	Used to define dates and times relevant to the patient and the <OrderRequest>. Procedure DateTime, Encounter DateTime, Appointment DateTime, etc.

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	exact datetime and/or range calculated against the patient's date of birth would be more helpful and informative to continuity of care providers.		
<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>.
<Description>	An instance of CodedDescriptionType	Optional and Unbounded (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>	An instance of ProcedureType.	Optional and Unbounded (0..∞).	CT scan, ultrasound, CBC, biopsy, cholecystectomy, ECG, pulmonary function tests, stress echocardiogram, etc.
<Products>	An instance of StructuredProductType.	Optional and Unbounded (0..∞).	Wheelchair, home nebulizer, prosthesis, etc.
<Medications>	An instance of StructuredProductType.	Optional and Unbounded (0..∞).	Enoxaparin, chemotherapy, etc.
<Immunizations>	An instance of StructuredProductType.	Optional and Unbounded (0..∞).	Hepatitis A, B, MMR, DPT, etc.
<Services>	Instance of EncounterType. Supports description of <Service> with <Description> (CodedDescriptionType), and well as <Provider> and <Location>.	Optional and Unbounded (0..∞).	Physical therapy, occupational therapy, home health evaluation, social service evaluation, family counseling, financial counseling, etc.
<Encounters>	Instance of EncounterType. Supports description of <Encounter> with <Description> (CodedDescriptionType), and well as <Provider> and <Location>.	Optional and Unbounded (0..∞).	Appointment, Admission
<Authorizations>	Instance of AuthorizationType. It is to be used only for pending authorization requests. Authorizations that have already	Optional and Unbounded (0..∞).	Authorization for Procedure Requested

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	been approved should be contained under <Insurance>.		
<Goals>	Instance of GoalType – supports text description of <Goal> with <Description> (CodedDescriptionType).	Optional and Unbounded (0..∞).	Authorization for treatment, procedure, immunization, brand name medication, etc.

Table 16 – <PlanOfCare> Object Type Definition Table

```

<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>
  <Procedures>
    <Procedure>
      <Description>
        <Text>CBC With Differential</Text>
        <Code>
          <Value>_____</Value>
          <CodeType>SNOMED CT</CodeType>
          <Version>_____</Version>
        </Code>
        <Code>
          <Value>_____</Value>
          <CodeType>CPT-4</CodeType>
          <Version>_____</Version>
        </Code>
        <Code>
          <Value>_____</Value>
          <CodeType>LOINC</CodeType>
          <Version>_____</Version>
        </Code>
      </Description>
      <Substance>
        <Text>Venous Blood</Text>
      </Substance>
    </Procedure>
  </Procedures>
</OrderRequest>

```

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Example 36 – <PlanOfCare>

<HealthCareProviders>

<HealthCareProviders> is optional and unbounded (0..∞) 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:IDREF.

<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.

<HealthCareProviders> is illustrated in Figure 22.

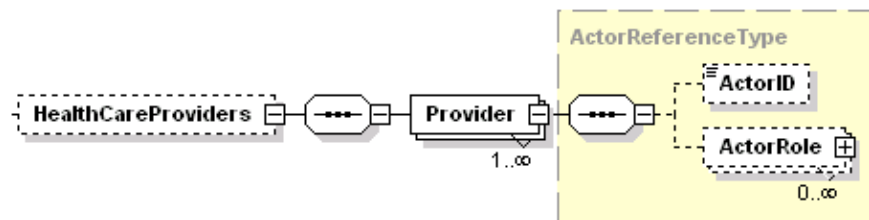


Figure 22 – <HealthCareProviders> Data Object

CCR Footer Sections

<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 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:ID.

Wherever an <Actor> is referred to within the CCR, it is referenced through the complex data type ActorReferenceType with an <ActorID> of type xs:IDREF . 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.

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 *Figure 23*.

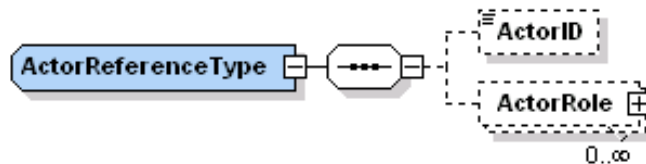


Figure 23 – Data Object ActorReferenceType

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>.

ActorType

The overall XML structure of <Actor> is as illustrated in *Figure 24*.

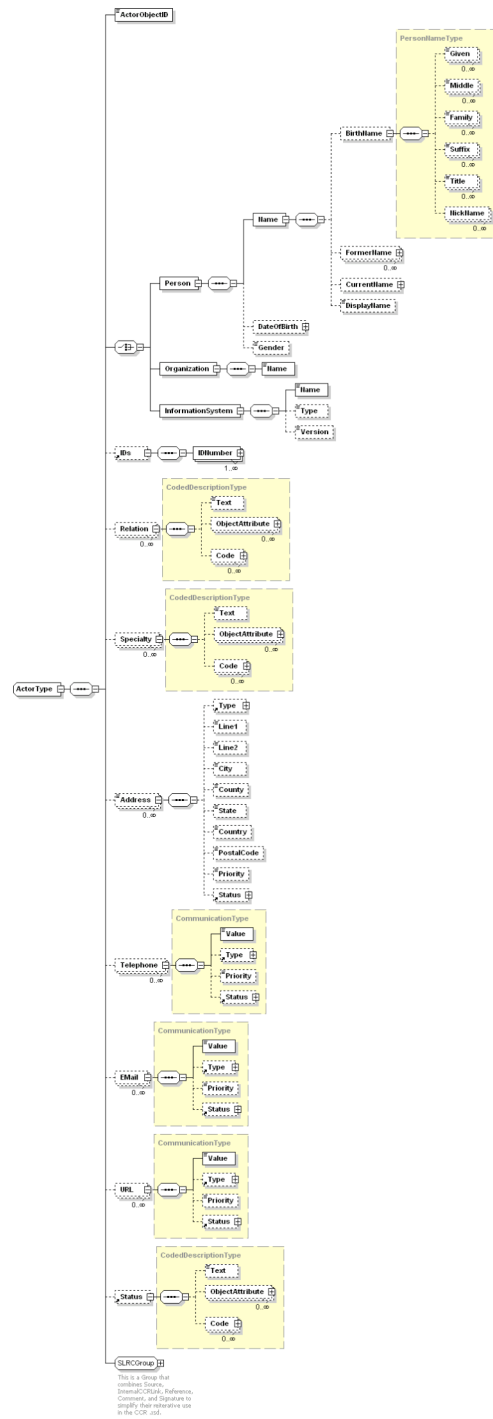


Figure 24 – Complex Data Type ActorType

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ActorType is defined in *Table 17*:

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 Unbounded (0..∞).	Used when the <Actor> is a <Person>.
<Organization>	Defines the details about a <Organization> as an <Actor>.	Optional and Unbounded (0..∞).	Used when the <Actor> is an <Organization>.
<InformationSystem>	Defines the details about a <InformationSystem> as an <Actor>.	Optional and Unbounded (0..∞).	Used when the <Actor> is an <InformationSystem> – example: when the Source of the CCR is an Information System.
<ID>	Instance of IDType. <ID> contains <DateTime>, <Type>, <ID>, and <IssuedBy>.	Optional and Unbounded (0..∞).	Contains real world IDs for the actor (SSN, MRN, Provider ID...).
<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> <Email> <URL>	Contain <Value>, <Type>, <Priority>, and <Status>.	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 Unbounded (0..∞).	Defines the current <Status> of the <Actor>.

Table 17 – ActorType Definition Table

Further definition of the XML within ActorType is as follows:

<Person>

<Person> defines the individual as an <Actor>. Its elements are defined in *Table 18*.

<Person>	Accepted Values/Formatting	Optionality/Cardinality	Description
<Name>	Contains the actual XML string for <Person><Name>.	Optional and Unbounded 0.. ∞	
<BirthName>	Consists of <Given>, <Middle>, <Family>, <Suffix>, <Title>, <NickName>.	Optional and Unbounded 0.. ∞	The name the patient was legally given at birth. <Given>John <Middle>Quincy <Family>Doe <Suffix>III <Title>MD <Title>PhD <NickName> Jack
<FormerName>	Consists of <Given>, <Middle>, <Family>, <Suffix>, <Title>, <NickName>.	Optional and Unbounded 0.. ∞	Any former names or aliases the patient has had.
<CurrentName>	Consists of <Given>, <Middle>, <Family>, <Suffix>, <Title>, <NickName>.	Optional and Unbounded 0.. ∞	The patient's current legal name or currently used alias.
<DisplayName>	A text string that represents the <Actor> name as it should be displayed as a simple, untagged, and unparsed string.	Optional and Unbounded 0.. ∞	John Q. Doe, III, MD, PhD
<DateOfBirth>	Instance of DateTimeType.	Optional and Unbounded 0.. ∞	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 Unbounded 0.. ∞	Defines <Gender>.

Table 18 –<Person> Definition Table

Other traditionally ‘demographic’ data on the patient such as Marital Status, Race, Ethnicity, Religious Affiliation/Preference, are all contained in the CCR within <SocialHistory>.

<Organization>

<Organization> defines an Organization as an ActorType as in *Table 19*.

<Organization>	Accepted Values/Formatting	Optionality/Cardinality	Description
<Name>	String	Optional and Unbounded 0.. ∞.	This is the <Name> of the <Organization>.

Table 19 – <Organization> Definition Table

<InformationSystem>

<InformationSystem> defines an Information System as an ActorType as in *Table 20*.

<InformationSystem>	Accepted Values/Formatting	Optionality/Cardinality	Description
<Name>	String	Optional and Unbounded 0.. ∞.	This is the <Name> of the <InformationSystem>.
<Type>	String	Optional and Unbounded 0.. ∞.	This defines the <Type> of <InformationSystem>.
<Version>	String	Optional and Unbounded 0.. ∞.	This defines the <Version> of the <InformationSystem>.

Table 20 – <InformationSystem> Definition Table

Samples of <Actors> are illustrated with examples in *Tables 37* and *38* for the <Actor> *Patient* and *Referring Physician*.

```

<Actor>
  <ActorObjectID>AA0001</ActorObjectID>
  <Person>
    <Name>
      <BirthName>
        <Given>Harriet</Given>
        <Middle>Mary</Middle>
        <Family>Kellogg</Family>
      </BirthName>
      <CurrentName>
        <Given>Harriet</Given>
        <Middle>Kellogg</Middle>
        <Family>Parker</Family>
        <Title>Esq.</Title>
      </CurrentName>
    </Name>
    <DateOfBirth>
      <DateTime>
        <ExactDateTime>1917-01-16</ExactDateTime>
      </DateTime>
    </DateOfBirth>
  </Person>

```

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```

    <Gender>Female</Gender>
  </Person>
  <IDs>
    <ID>000-00-0000</ID>
    <IDType>Social Security Number</IDType>
  </IDs>
  <Address>
    <Type>Home</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>Home</Type>
    <Priority>Primary - Preferred</Priority>
  </Telephone>
  <Telephone>
    <Value>555-555-5555</Value>
    <Type>Mobile</Type>
    <Priority>Secondary</Priority>
  </Telephone>
  <EMail>
    <Value>hparker@whatevermail.com</Value>
  </EMail>
</Actor>

```

Example 37 – Patient 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>
    <ID>120001</ID>
    <IDType>Physician Number</IDType>
  </IDs>
  <Specialty>
    <Text>Emergency Medicine</Text>
  </Specialty>
  <Address>
    <Type>Office</Type>
    <Line1>94044 Link Road</Line1>
    <City>San Francisco</City>
    <State>CA</State>
    <Country>USA</Country>
  </Address>

```

```

        <PostalCode>94304</PostalCode>
    </Address>
    <Telephone>
        <Value>555-555-5555</Value>
        <Type>Office Phone</Type>
        <Priority>Primary - Preferred</Priority>
        <Status>Active</Status>
    </Telephone>
    <EMail>
        <Value>jqdoe@pacifichealthclinic.org</Value>
    </Email>
    <URL>
        <Value>www.pacifichealthclinic.org</Value>
    </URL>
    <InternalCCRLink>
        <CCRDataObjectID>BB0004</CCRDataObjectID>
        <LinkRelationship>Employer</LinkRelationship>
    </InternalCCRLink>
</Actor>

```

Example 38 – Referring Physician as <Actor>

<References>

<References> is optional 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:ID. Each link to a <Reference> from any other data object within the CCR is through a <ReferenceID> which is of type xs:IDREF.

Each <Reference> is a Complex Data Type ReferenceType as illustrated in *Figure 25*.

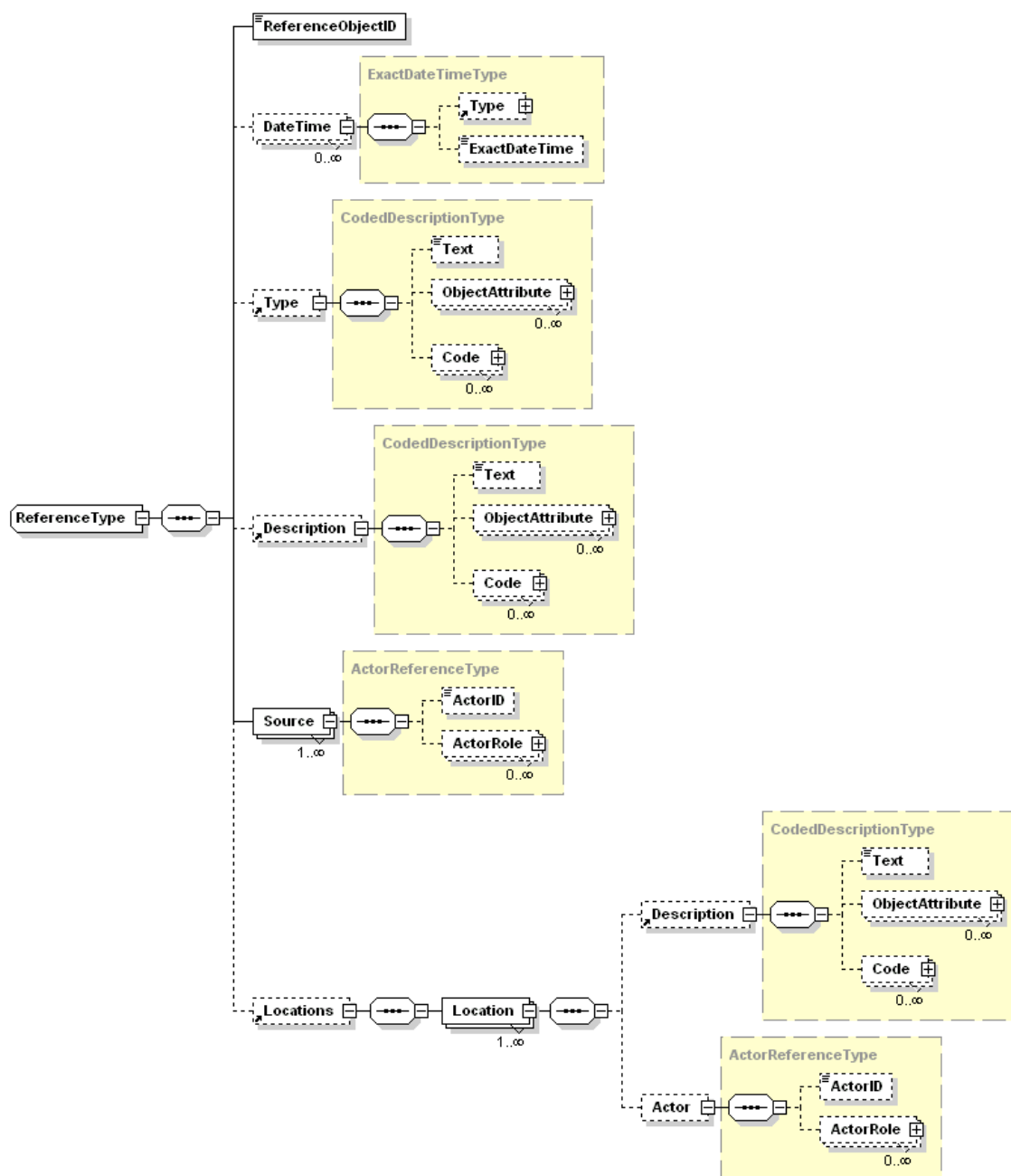


Figure 25 – Complex Data Type ReferenceType

The Definition Table for ReferenceType is Table 21:

ReferenceType	Accepted Values/Formatting	Optionality/Cardinality	Description
<ReferenceObjectID>	xs:ID 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>.	Optional and Unbounded (0..∞).	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.

Table 21 – ReferenceType Definition Table

<Comments>

<Comments> is optional and unbounded (0..∞) 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:ID. Each link to a <Comment> from any other data object within the CCR is through a <CommentID> which is of type xs:IDREF.

<Comments> are free-text comments that 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 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>.

To reiterate <Comments> is for non-essential text-based 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.

<Comments> are defined within the CCR by the Complex Data Type CommentType as illustrated in *Figure 26*.

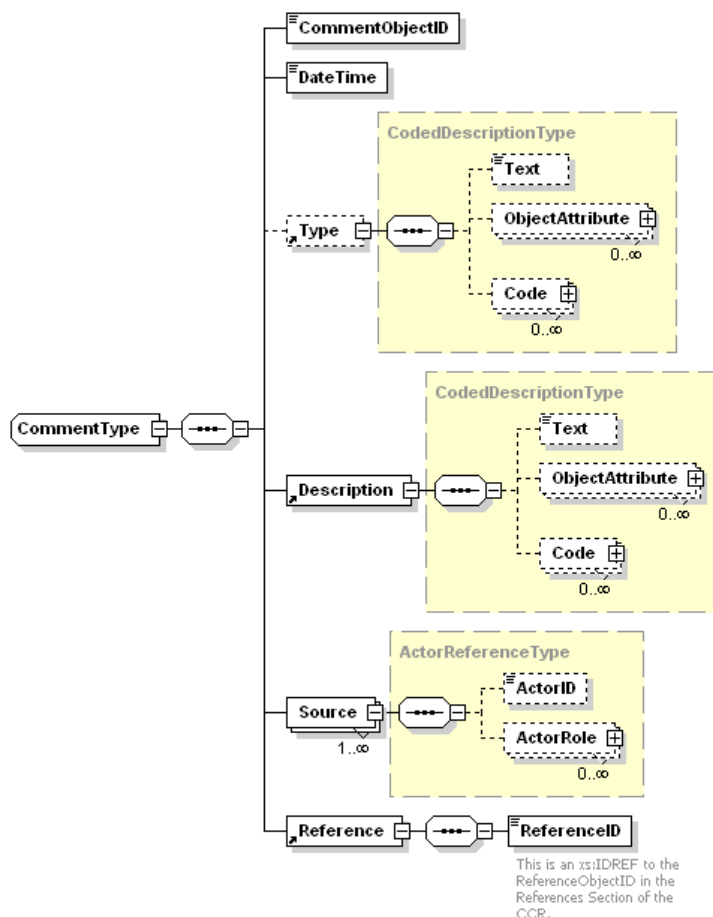


Figure 26 – Complex Data Type CommentType

The Definition Table for CommentType is *Table 22*:

CommentType	Accepted Values/Formatting	Optionality/Cardinality	Description
<CommentObjectID>	This is the ID that each <CommentID> will link to and is expressed as xs:ID.	Required and Bounded to one instance (1..1).	This is the CCR Object ID for the <Comment>.
<DateTime>	Instance of DateTimeType.	Optional and Unbounded (0..∞).	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.	Optional and Bounded to one instance (0..1).	<Description> contains the actual Comment. Example: Patient's father is an unreliable historian.
<Source>	This is an <Actor> reference with <ActorID> and <ActorRole>.	Optional and Unbounded (0..∞).	This is the <Source> of the <Comment> content.
<Reference>	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>.

Table 22 – CommentType Definition Table

<Signatures>

<Signatures> is optional and unbounded (0..∞) 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:ID. Each link to a <CCRSignature> from any other data object within the CCR is through a <SignatureID> that is of type xs:IDREF.

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/xmlsig-core>) and use X.509 v3 or Security Assertion Markup Language (SAML) digital certificates.

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.

<Signatures> within the CCR are defined by the Complex Data Type SignatureType as illustrated in *Figure 27*.

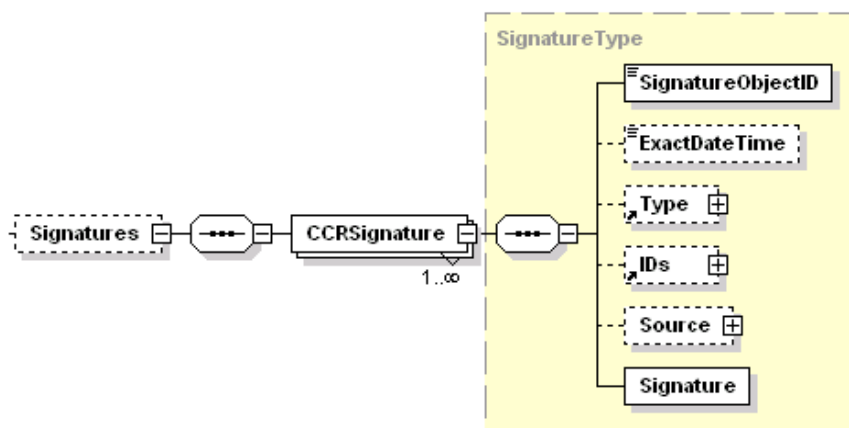


Figure 27 – Complex Data Type SignatureType

The Definition Table for SignatureType is Table 23:

SignatureType	Accepted Values/Formatting	Optionality/Cardinality	Description
<CCRSignatureID>	Instance of type xs:ID.	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 <u>must</u> be W3C XML Digital Signature.
<IDs>	<ID> contains <DateTime>, <Type>, <ID>, and <IssuedBy>.	Optional and Unbounded (0..∞).	This is a bucket to allow any external system that wants to affix a 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.

Table 23 – SignatureType Definition Table