HL7 Implementation Guide: XML Implementation for Virtual Medical Record, Release 1

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1 Executive Summary

A Virtual Medical Record (vMR) for Clinical Decision Support (CDS) is a data model for representing clinical information *inputs* and *outputs* that can be used by CDS engines and local clinical information systems, through mechanisms such as CDS services, or execution of standardised clinical support logic such as a GELLO execution engine. The vMR encompasses data about a patient's demographics and clinical history, as well as CDS inferences about the patient (e.g., recommended clinical interventions). A vMR for CDS is needed to enable the design and development of scalable CDS resources that can be used across multiple healthcare institutions and health information systems. Existing clinical data, from any source, is virtualised to present a façade compliant with the vMR class model. Clinical logic can then be executed against the data represented in the vMR model.

The objective of the HL7 CDS Work Group's vMR XML Implementation Guide is to define a set of schemas for the serialization and exchange of vMR-compliant clinical data between parties. This is the first DSTU ballot for this material.

Note that the proposed XML schemas shall be considered *normative* while all accompanying examples and diagrams shall be considered *informative*. The proposed XML schemas are based on the vMR DAM Release 2.

2 XML implementation Guide for VMR

2.1 Overview

The vMR XML specification consists of 5 XSD schema files which follow a similar conceptual categorization compared to the categorization defined in the vMR domain analysis model, release 2:

1. datatypes.xsd
2. vmr.xsd
3. cdsInput.xsd
4. cdsInputSpecification.xsd
5. cdsOutput.xsd

Diagrams have been added for illustrative purposes only. Please note that it is the schemas and not these diagrams that represent the actual specification and source of truth.

The following table lists the schema namespaces

Schema	Namespace
Datatypes.xsd	urn:hl7-org:v3/cdsdt
vmr.xsd	urn:hl7-org:v3/vmr
cdsInput.xsd	urn:hl7-org:v3/vmr
cdsOutput.xsd	urn:hl7-org:v3/vmr
cdsInputSpecification.xsd	urn:hl7-org:v3/vmr

Figure 1 - Schema Namespaces

2.2 datatypes.xsd

This schema defines the base vMR data types which consist of a simplified/constrained subset of ISO 21090 data types. This implementation is based on the abstract HL7 version 3 data types specification, release 2 and derives directly from its corresponding XSD representation. They were originally imported from the ISO21090 xml schema file (source: http://gforge.hl7.org/svn/hl7v3/trunk/dt/iso/iso-21090-datatypes.xsd). For a list of the ISO 21090 data types represented in this schema, please refer to the documentation for the vMR Domain Analysis Model (DAM), Release 2. Note that the HL7 V3 Release 2 data type specification is abstract and cannot be used directly. The ISO21090 xml schema files define content, but not operations.

This schema is imported by all other schemas.

2.3 vmr.xsd

This schema specifies information about a patient relevant for CDS. Note that, associated with each evaluated persons, such as a patient, is a set of clinical statements and demographic information about this person. An evaluated person may be associated with other entities such as people or facilities through the use of entity relationships. Also note that clinical statements may be related to other clinical statements through the use of RelatedClinicalStatement relationships. The vMR schema also allows for the addition of new attributes to clinical statements and entities using a coded name-value pair extension mechanism.

This schema is imported by both the cdsInput.xsd and cdsOutput.xsd schemas. The main components of the vmr.xsd schema are shown below. Please refer to the schema for the actual specification.

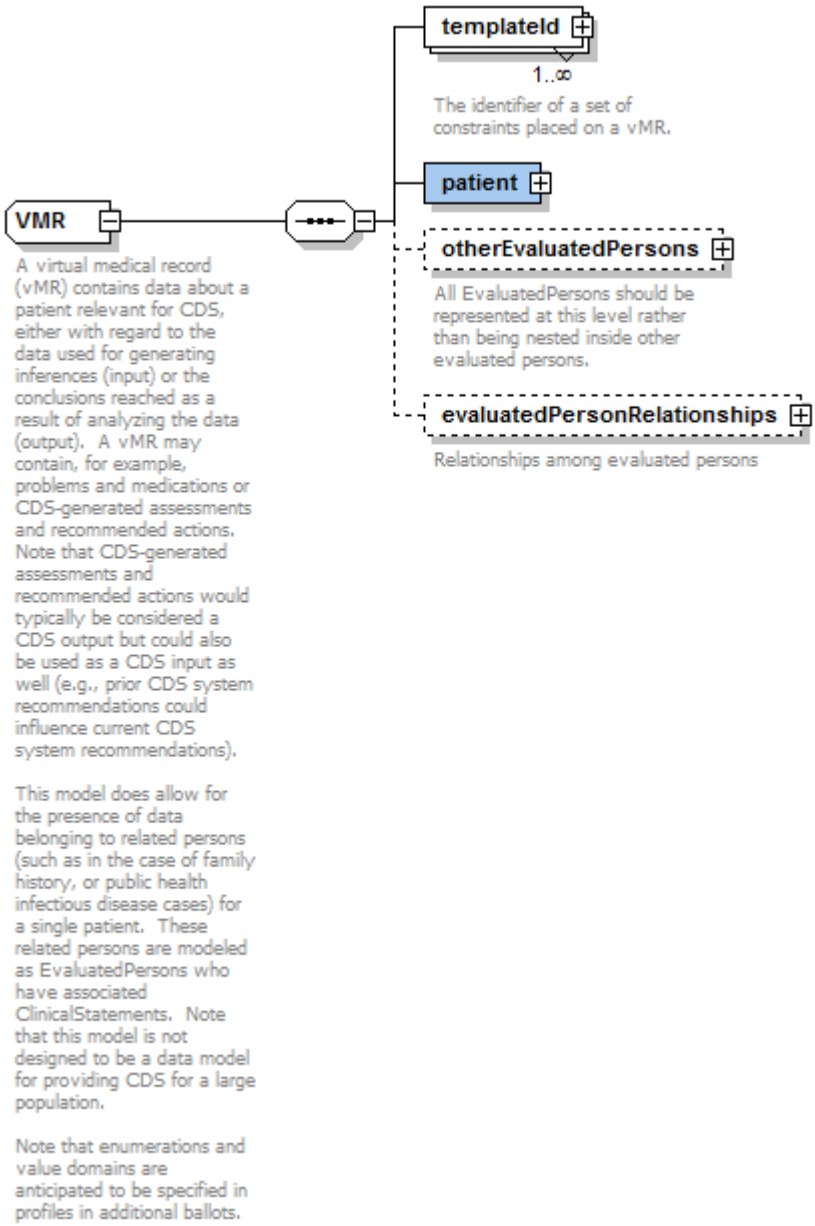


Figure 2 - The VMR complex type

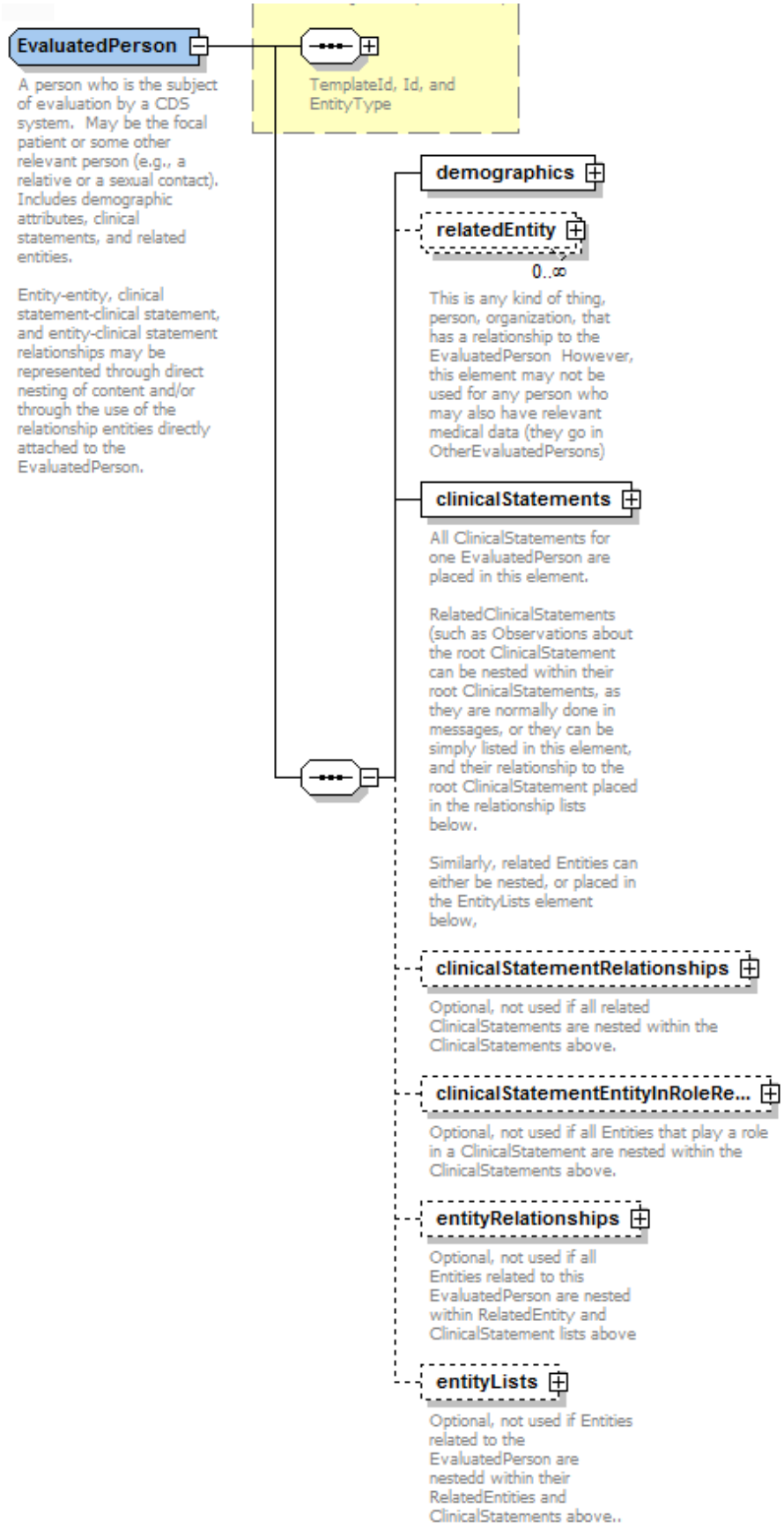


Figure 3 - EvaluatedPerson

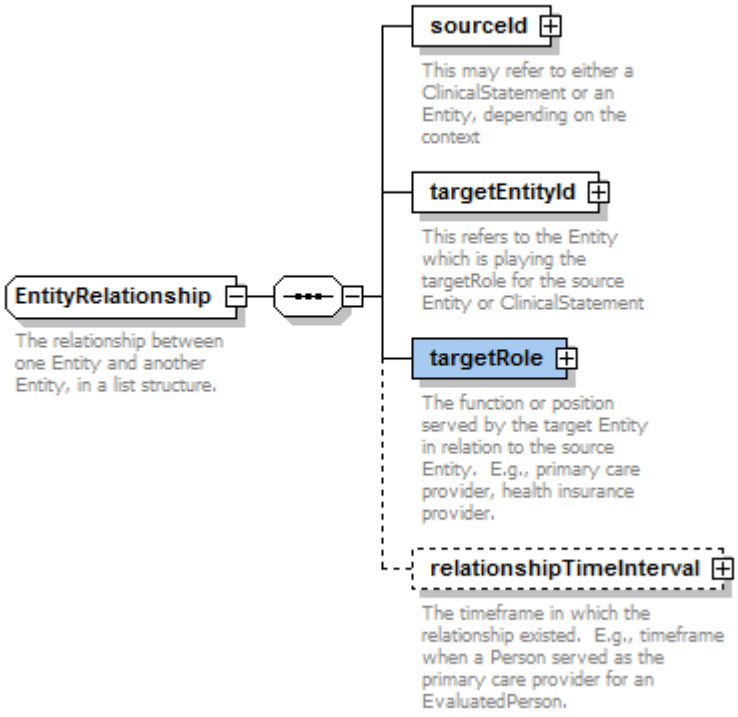


Figure 4 - EntityRelationship relates one entity or clinical statement to another

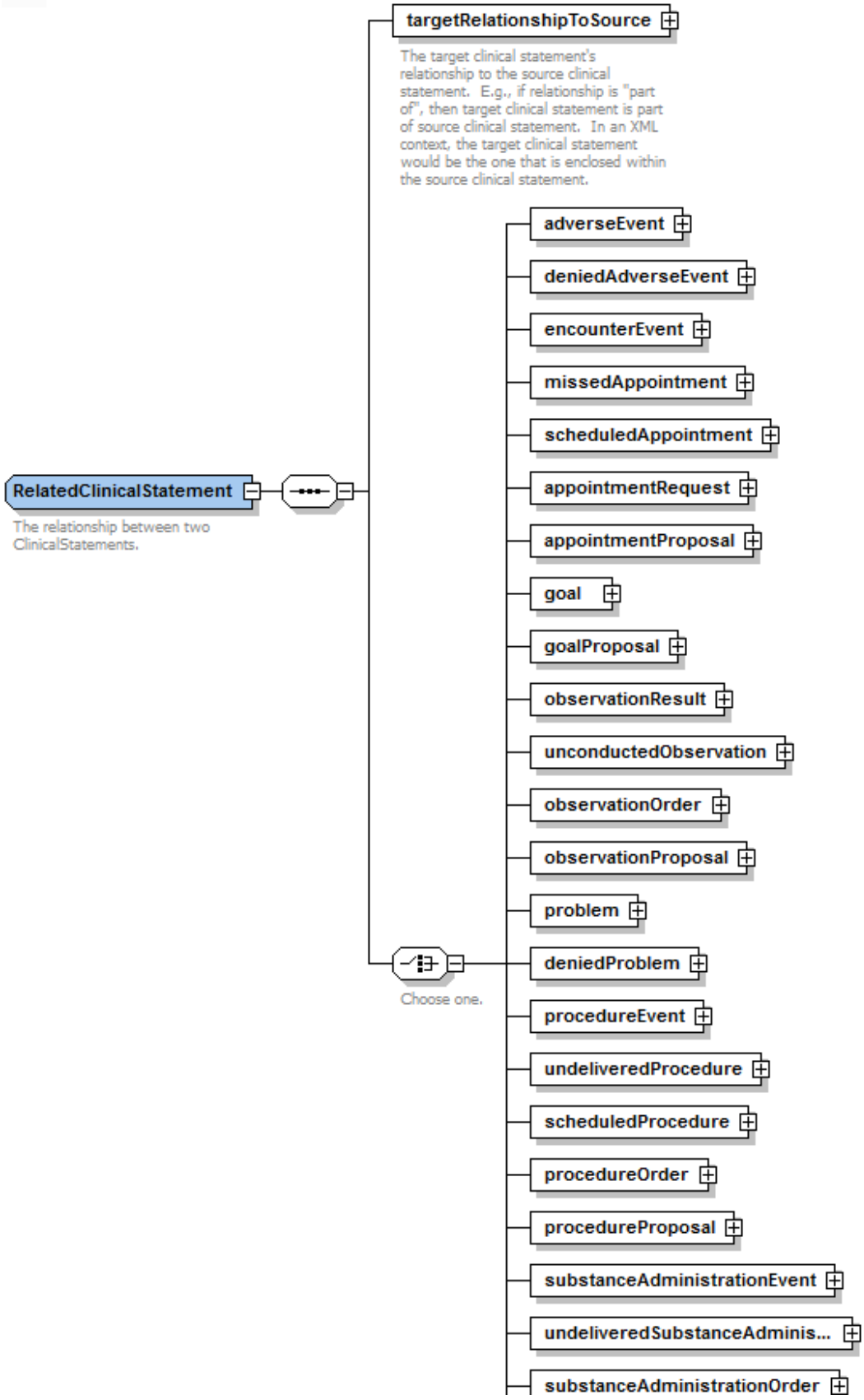


Figure 5 - RelatedClinicalStatement relationships are used to relate clinical statements

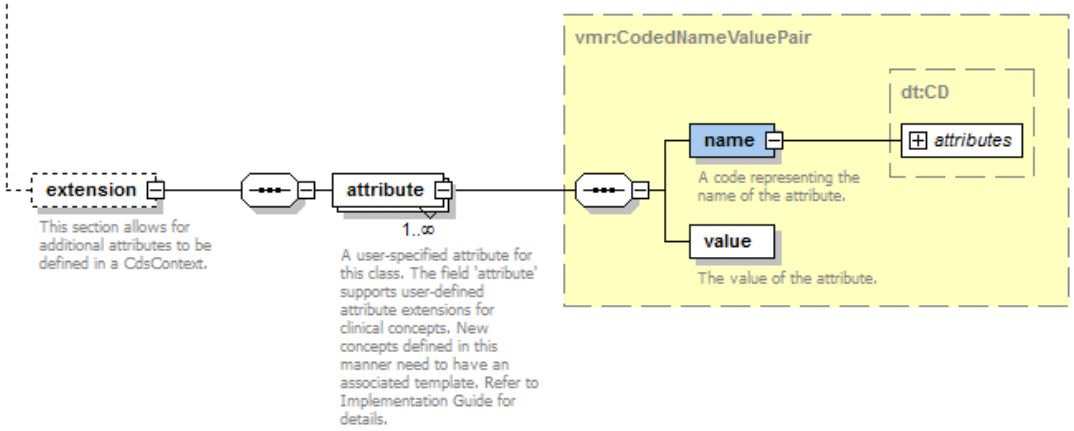
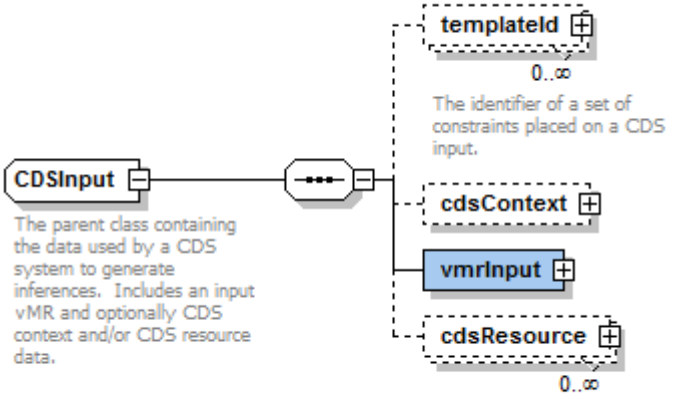


Figure 6 - Name-Value-Pair extension mechanism for clinical statement subclasses and entities

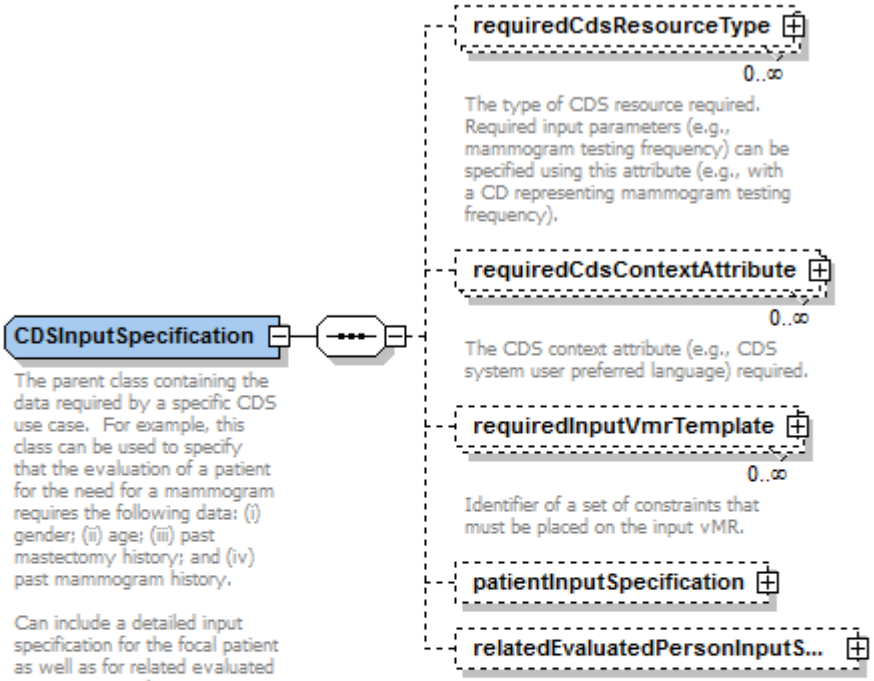
2.4 cdsInput.xsd

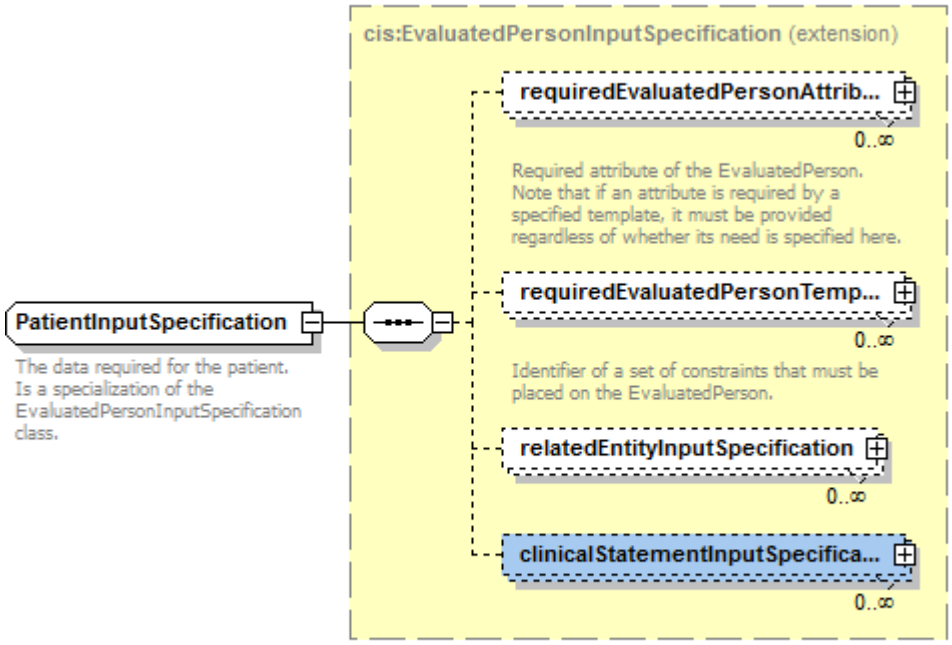
The cdsInput.xsd schema represents input data used by a CDS system. The main components of the cdsInput.xsd schema are shown below. Please refer to the schema for the actual specification.

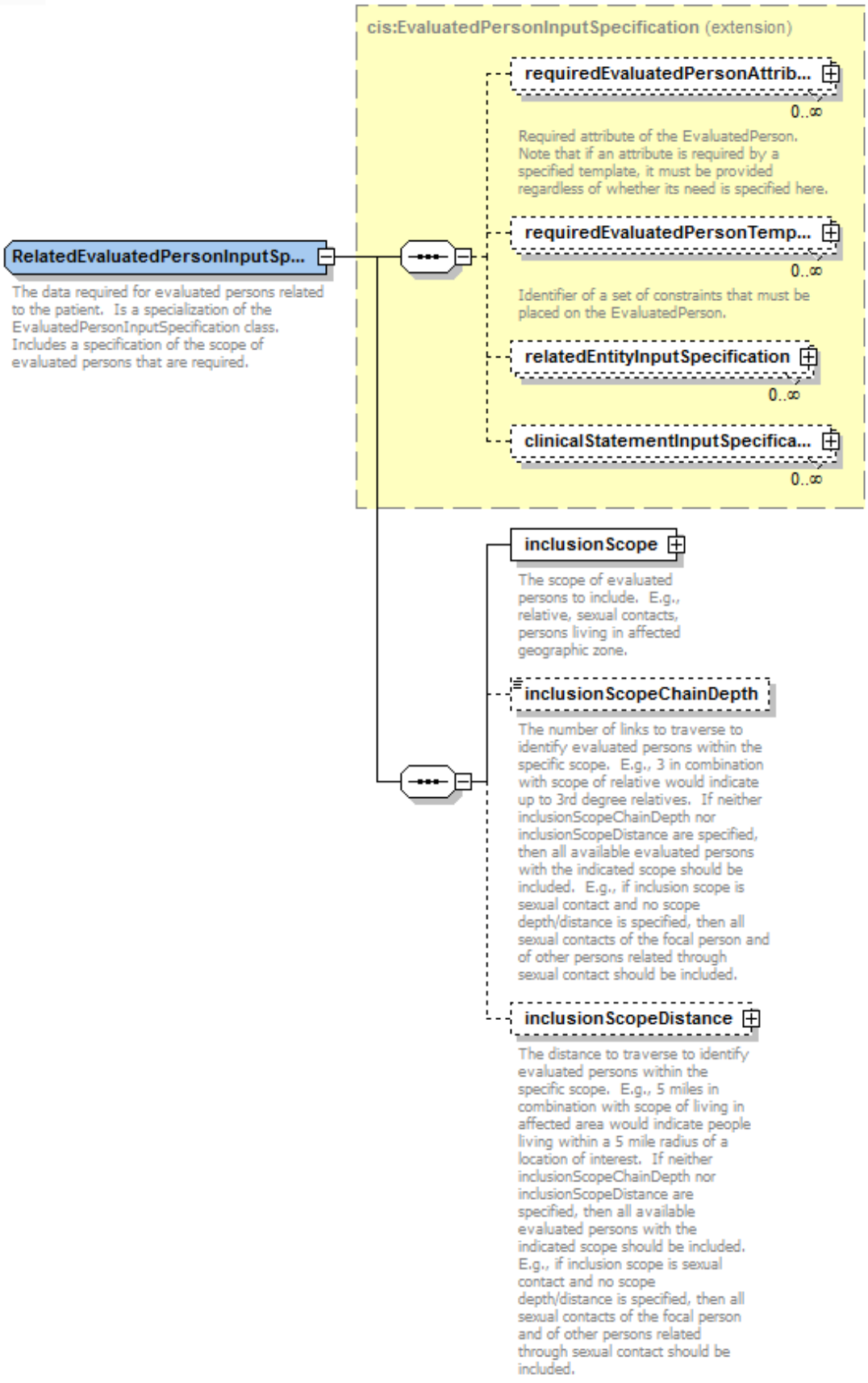


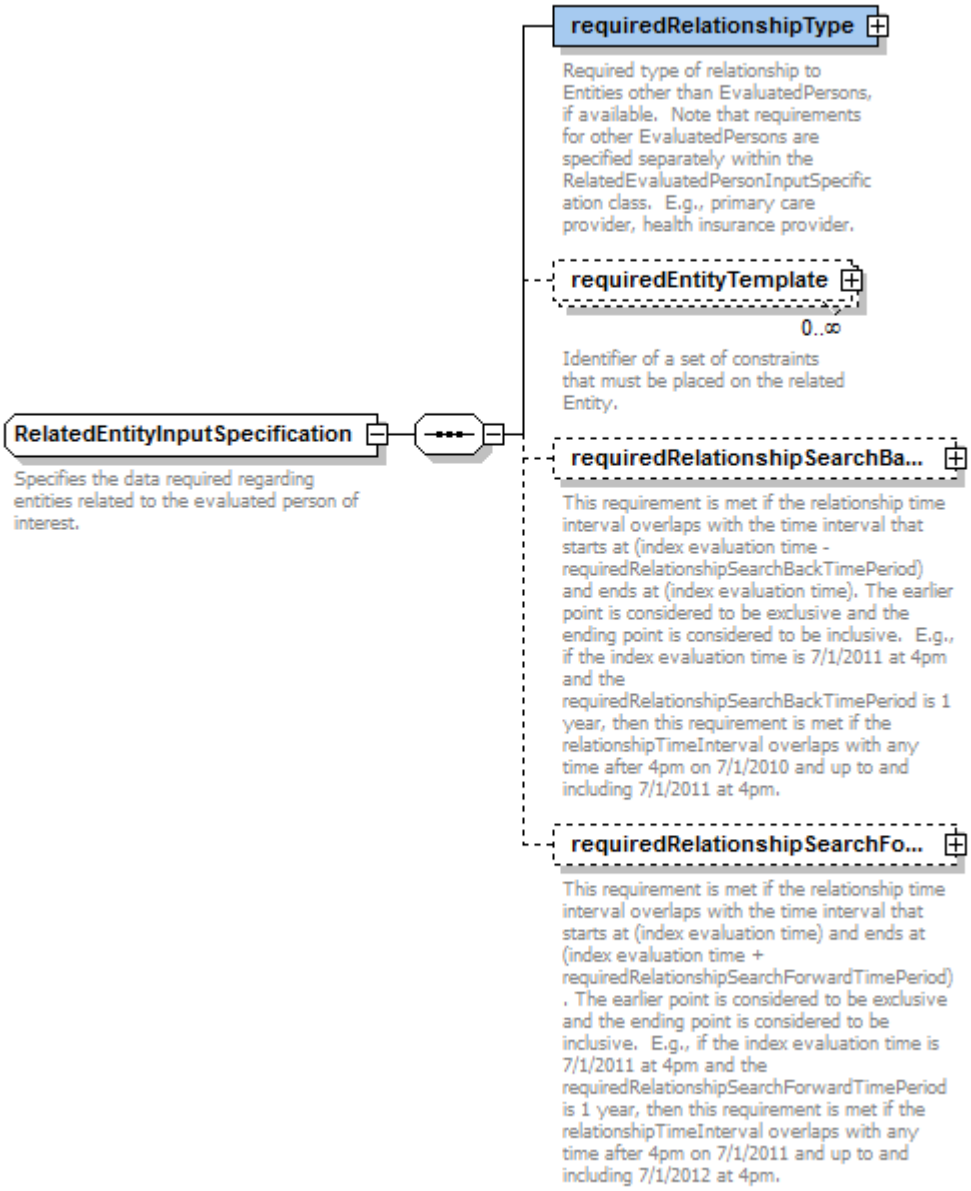
2.5 cdsInputSpecification.xsd

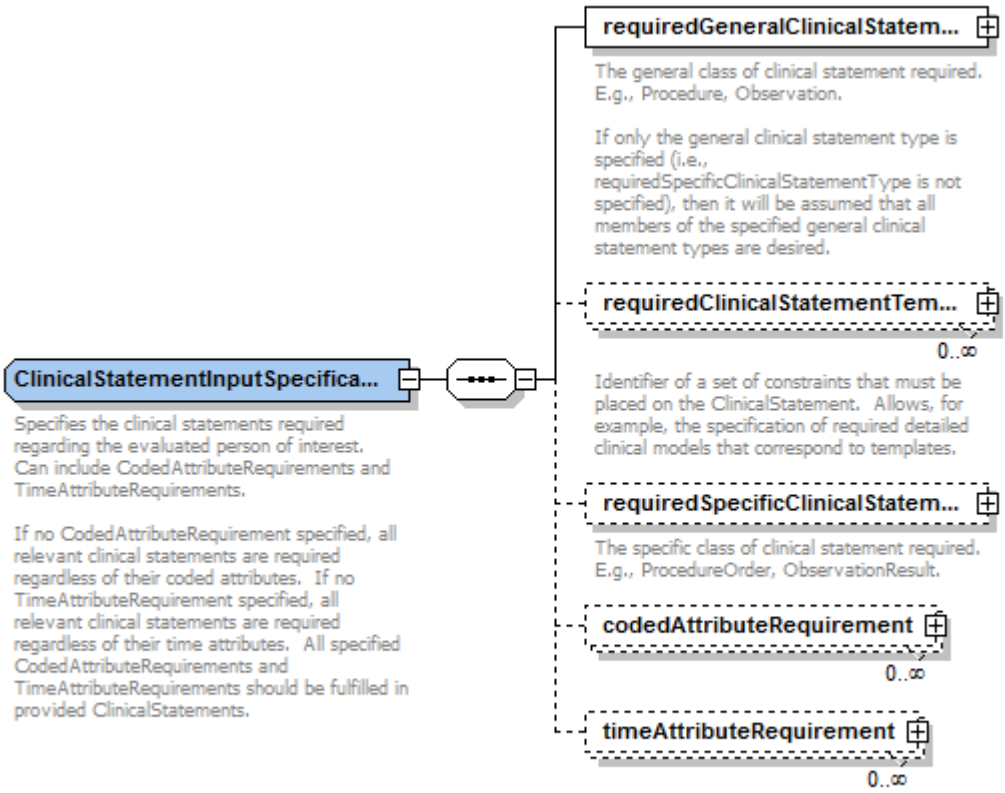
This schema specifies the specific CDS input data required for a specific CDS use case. The main components of the cdsInputSpecification.xsd schema are shown below. Please refer to the schema for the actual specification.

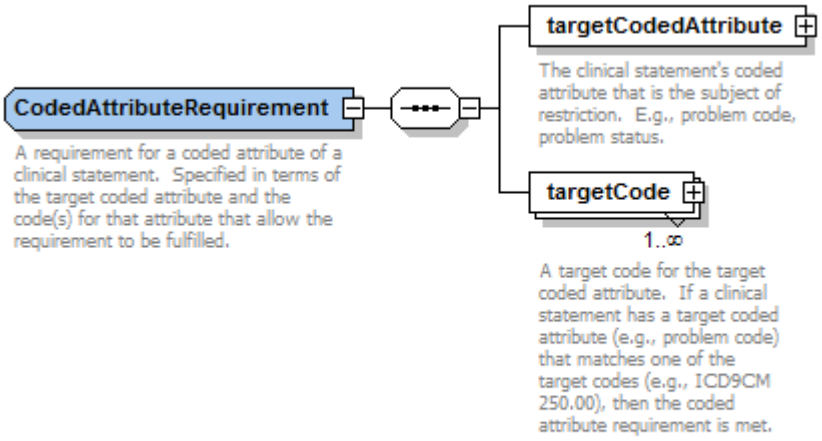

CDSInputSpecification
The parent class containing the data required by a specific CDS use case. For example, this class can be used to specify that the evaluation of a patient for the need for a mammogram requires the following data: (i) gender; (ii) age; (iii) past mastectomy history; and (iv) past mammogram history.
Can include a detailed input specification for the focal patient as well as for related evaluated persons. Note that it is assumed that the superset of data required for related evaluated persons are the same for each of the related evaluated persons (e.g., relatives). If input specifications are not provided regarding patients or other evaluated persons, then this signifies that no further constraints are being placed on required data other than what is expressed through the input data model and its existing template(s).
requiredCdsResourceType
0..∞
The type of CDS resource required. Required input parameters (e.g., mammogram testing frequency) can be specified using this attribute (e.g., with a CD representing mammogram testing frequency).
requiredCdsContextAttribute
0..∞
The CDS context attribute (e.g., CDS system user preferred language) required.
requiredInputVmrTemplate
0..∞
Identifier of a set of constraints that must be placed on the input vMR.
patientInputSpecification
relatedEvaluatedPersonInputS...

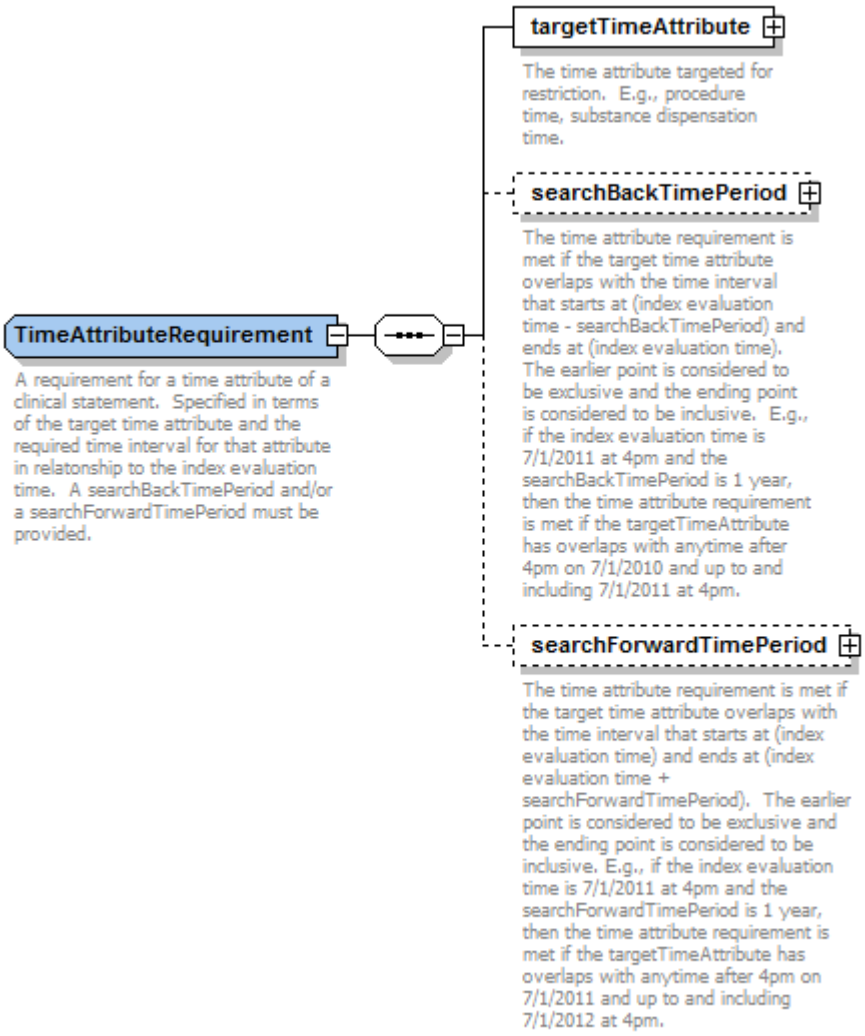

cis:EvaluatedPersonInputSpecification (extension)
requiredEvaluatedPersonAttrib...
0..∞
Required attribute of the EvaluatedPerson. Note that if an attribute is required by a specified template, it must be provided regardless of whether its need is specified here.
requiredEvaluatedPersonTemp...
0..∞
Identifier of a set of constraints that must be placed on the EvaluatedPerson.
relatedEntityInputSpecification
0..∞
clinicalStatementInputSpecifica...
0..∞
PatientInputSpecification
The data required for the patient. Is a specialization of the EvaluatedPersonInputSpecification class.


cis:EvaluatedPersonInputSpecification (extension)
requiredEvaluatedPersonAttrib...
0..∞
Required attribute of the EvaluatedPerson. Note that if an attribute is required by a specified template, it must be provided regardless of whether its need is specified here.
requiredEvaluatedPersonTemp...
0..∞
Identifier of a set of constraints that must be placed on the EvaluatedPerson.
relatedEntityInputSpecification
0..∞
clinicalStatementInputSpecifica...
0..∞
RelatedEvaluatedPersonInputSp...
The data required for evaluated persons related to the patient. Is a specialization of the EvaluatedPersonInputSpecification class. Includes a specification of the scope of evaluated persons that are required.
inclusionScope
The scope of evaluated persons to include. E.g., relative, sexual contacts, persons living in affected geographic zone.
inclusionScopeChainDepth
The number of links to traverse to identify evaluated persons within the specific scope. E.g., 3 in combination with scope of relative would indicate up to 3rd degree relatives. If neither inclusionScopeChainDepth nor inclusionScopeDistance are specified, then all available evaluated persons with the indicated scope should be included. E.g., if inclusion scope is sexual contact and no scope depth/distance is specified, then all sexual contacts of the focal person and of other persons related through sexual contact should be included.
inclusionScopeDistance
The distance to traverse to identify evaluated persons within the specific scope. E.g., 5 miles in combination with scope of living in affected area would indicate people living within a 5 mile radius of a location of interest. If neither inclusionScopeChainDepth nor inclusionScopeDistance are specified, then all available evaluated persons with the indicated scope should be included. E.g., if inclusion scope is sexual contact and no scope depth/distance is specified, then all sexual contacts of the focal person and of other persons related through sexual contact should be included.


RelatedEntityInputSpecification
Specifies the data required regarding entities related to the evaluated person of interest.
requiredRelationshipType
Required type of relationship to Entities other than EvaluatedPersons, if available. Note that requirements for other EvaluatedPersons are specified separately within the RelatedEvaluatedPersonInputSpecification class. E.g., primary care provider, health insurance provider.
requiredEntityTemplate
0..∞
Identifier of a set of constraints that must be placed on the related Entity.
requiredRelationshipSearchBa...
This requirement is met if the relationship time interval overlaps with the time interval that starts at (index evaluation time - requiredRelationshipSearchBackTimePeriod) and ends at (index evaluation time). The earlier point is considered to be exclusive and the ending point is considered to be inclusive. E.g., if the index evaluation time is 7/1/2011 at 4pm and the requiredRelationshipSearchBackTimePeriod is 1 year, then this requirement is met if the relationshipTimeInterval overlaps with any time after 4pm on 7/1/2010 and up to and including 7/1/2011 at 4pm.
requiredRelationshipSearchFo...
This requirement is met if the relationship time interval overlaps with the time interval that starts at (index evaluation time) and ends at (index evaluation time + requiredRelationshipSearchForwardTimePeriod). The earlier point is considered to be exclusive and the ending point is considered to be inclusive. E.g., if the index evaluation time is 7/1/2011 at 4pm and the requiredRelationshipSearchForwardTimePeriod is 1 year, then this requirement is met if the relationshipTimeInterval overlaps with any time after 4pm on 7/1/2011 and up to and including 7/1/2012 at 4pm.

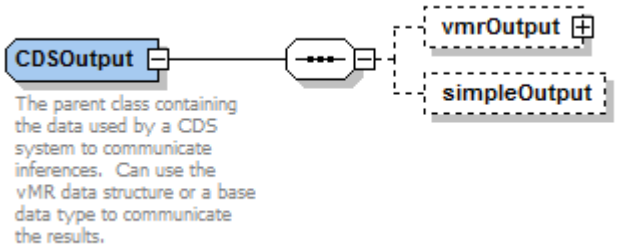

ClinicalStatementInputSpecifica...
Specifies the clinical statements required regarding the evaluated person of interest. Can include CodedAttributeRequirements and TimeAttributeRequirements.
If no CodedAttributeRequirement specified, all relevant clinical statements are required regardless of their coded attributes. If no TimeAttributeRequirement specified, all relevant clinical statements are required regardless of their time attributes. All specified CodedAttributeRequirements and TimeAttributeRequirements should be fulfilled in provided ClinicalStatements.
requiredGeneralClinicalStatem...
The general class of clinical statement required. E.g., Procedure, Observation.
If only the general clinical statement type is specified (i.e., requiredSpecificClinicalStatementType is not specified), then it will be assumed that all members of the specified general clinical statement types are desired.
requiredClinicalStatementTem...
0..∞
Identifier of a set of constraints that must be placed on the ClinicalStatement. Allows, for example, the specification of required detailed clinical models that correspond to templates.
requiredSpecificClinicalStatem...
The specific class of clinical statement required. E.g., ProcedureOrder, ObservationResult.
codedAttributeRequirement
0..∞
timeAttributeRequirement
0..∞


CodedAttributeRequirement
A requirement for a coded attribute of a clinical statement. Specified in terms of the target coded attribute and the code(s) for that attribute that allow the requirement to be fulfilled.
targetCodedAttribute
The clinical statement's coded attribute that is the subject of restriction. E.g., problem code, problem status.
targetCode
1..∞
A target code for the target coded attribute. If a clinical statement has a target coded attribute (e.g., problem code) that matches one of the target codes (e.g., ICD9CM 250.00), then the coded attribute requirement is met.



2.6 cdsOutput.xsd

This schema specifies output data generated by CDS systems. The main components of the cdsOutput.xsd schema are shown below. Please refer to the schema for the actual specification.



2.7 Examples

Seven *informative* examples are provided with this normative specification to illustrate various aspects of vMR serialization:

1. SampleCdsInput_drugAllergyInteractionScreeningRequestContent.xml
2. SampleCdsInput_drugConditionInteractionScreeningRequestContent.xml
3. SampleCdsInput_drugDrugInteractionScreeningRequestContent.xml
4. SampleCdsInput_labResults.xml
5. SampleCdsInput_vaccinations.xml
6. SampleCdsInputSpecification.xml
7. SampleCdsOutput.xml