HL7 Virtual Medical Record for Clinical Decision Support (vMR-CDS) XML Implementation Technology Specification, Release 2

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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.

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 3.

2 XML implementation Guide for VMR

2.1 Overview

The vMR XML specification consists of 6 XSD schema files which follow a similar conceptual categorization compared to the categorization defined in the vMR Domain Analysis Model, release 3:

1. datatypes.xsd
2. vmr.xsd
3. cdsInput.xsd
4. cdsInputSpecification.xsd
5. cdsOutput.xsd
6. cdsOutputspecification.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:r3
vmr.xsd	urn:hl7-org:v3:vmr:r3
cdsInput.xsd	urn:hl7-org:v3:cdsinput:r3
cdsOutput.xsd	urn:hl7-org:v3:cdsoutput:r3
cdsInputSpecification.xsd	urn:hl7-org:v3:cdsinputspecification:r3
cdsOutputSpecification.xsd	urn:hl7-org:v3:cdsoutputspecification:r3

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 3. 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 person, 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. Also note that clinical statements may be related to other clinical statements. 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.
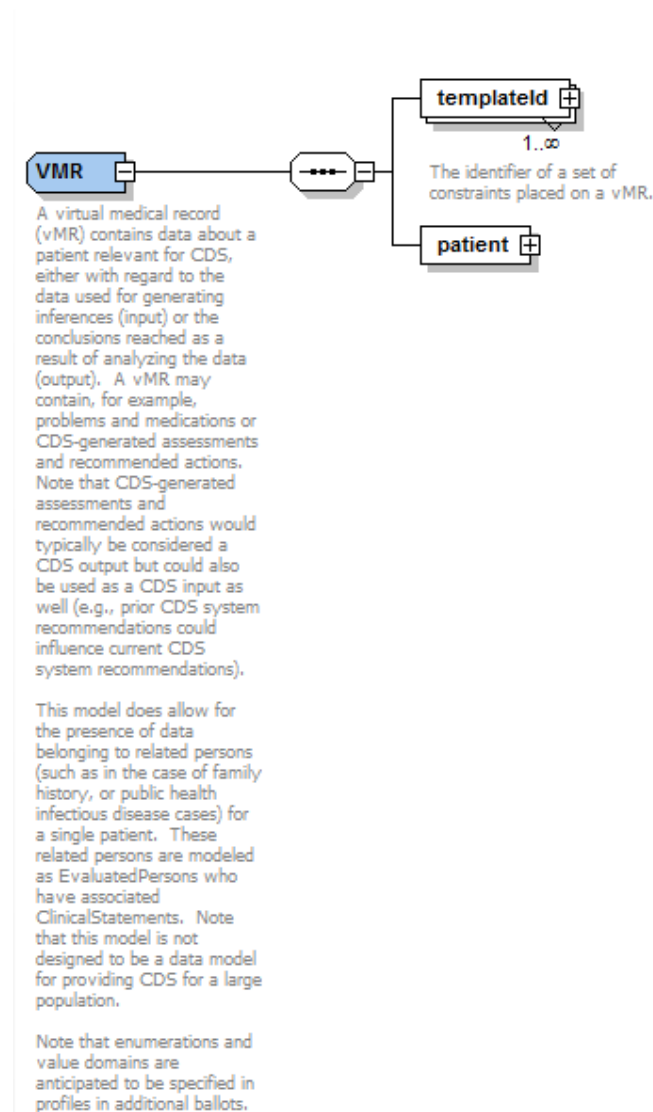

Figure 2 - The VMR complex type

Person (extension)

EvaluatedPerson

A person who is the subject of evaluation by a CDS system. May be the focal patient or some other relevant person (e.g., a relative or a sexual contact). Includes demographic attributes, clinical statements, and related entities.

age

The person's age at the time of CDS evaluation. May potentially be provided instead of birthTime when birthTime is not available. E.g., 3.5 months, 63 years.

ageAtDeath

The age at which the person died.

Included to support family history-based inferencing.

birthTime

The date on which the person was born.

ethnicity

0..∞

The person's ethnicity. An ethnicity or ethnic group is a group of people whose members identify with each other through a common heritage. E.g., Hispanic.

gender

The person's gender. E.g., male, female. Typically will consist of administrative gender, with clinical gender noted using ObservationEvents.

isDeceased

Whether the person is deceased.

Included to support family history-based inferencing.

preferredLanguage

The person's language of preference. E.g., English.

race

0..∞

The person's race. Race is a classification of humans into large groups by various factors, such as heritable phenotypic characteristics or geographic ancestry. E.g., White, Asian.

clinicalStatement

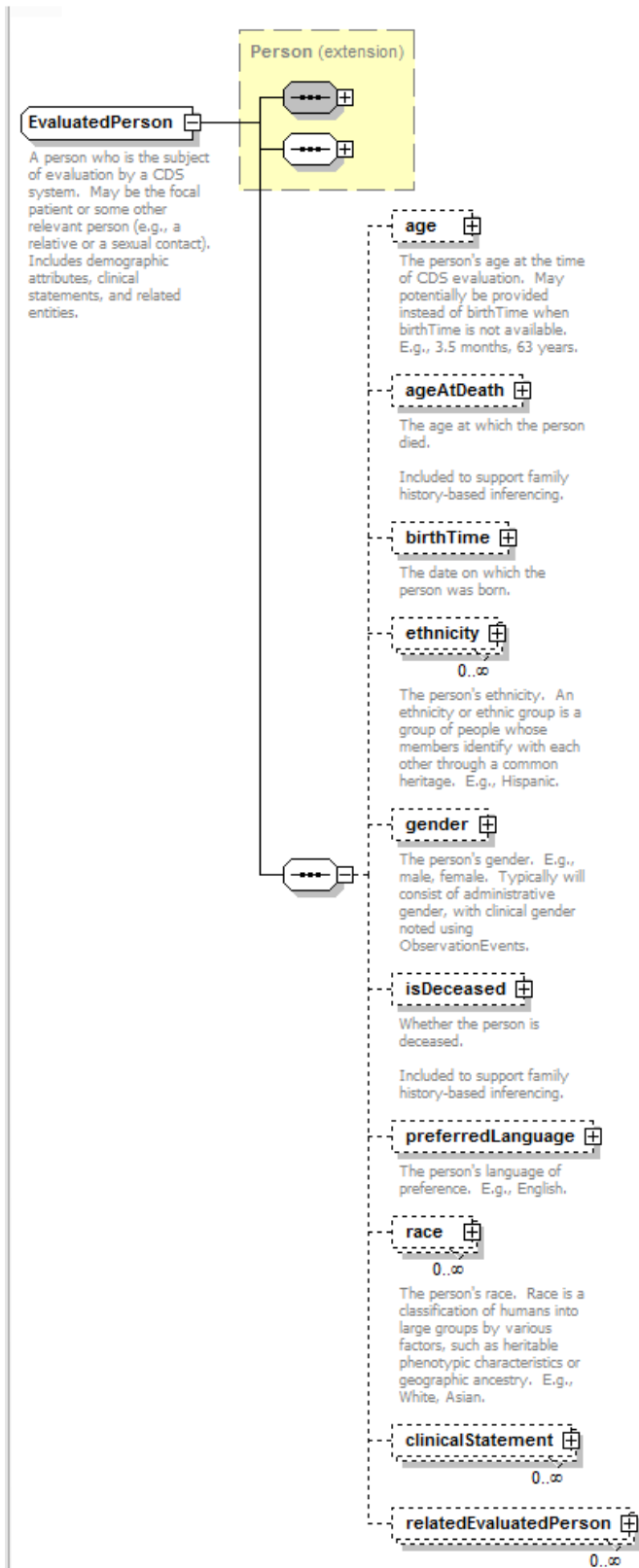0..∞

relatedEvaluatedPerson
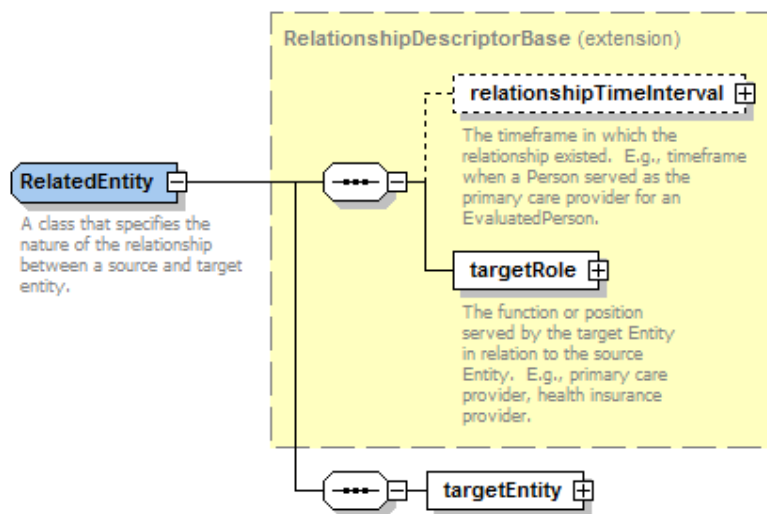
0..∞

Figure 3 - EvaluatedPerson

Figure 4 - RelatedEntity relates a target entity to a source entity or clinical statement

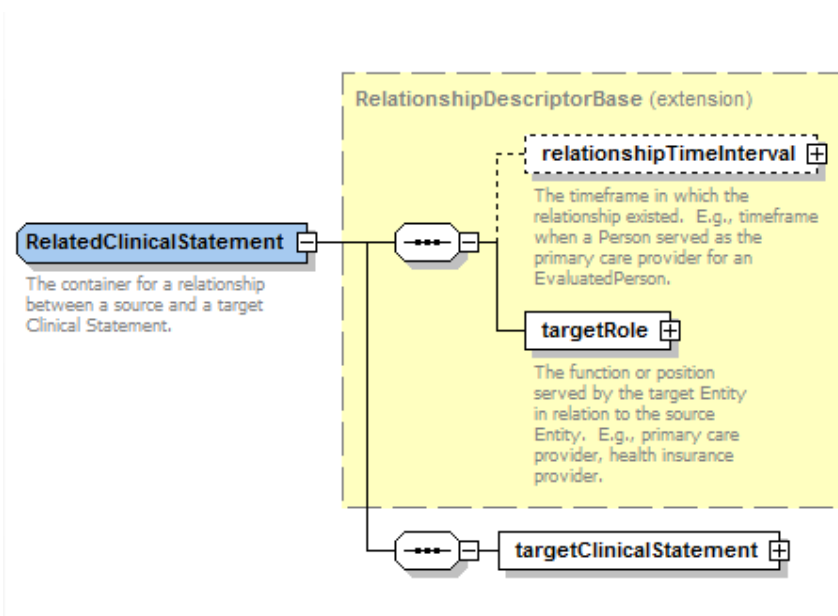Figure 5 - RelatedClinicalStatement relates a target clinical statement to a source clinical statement
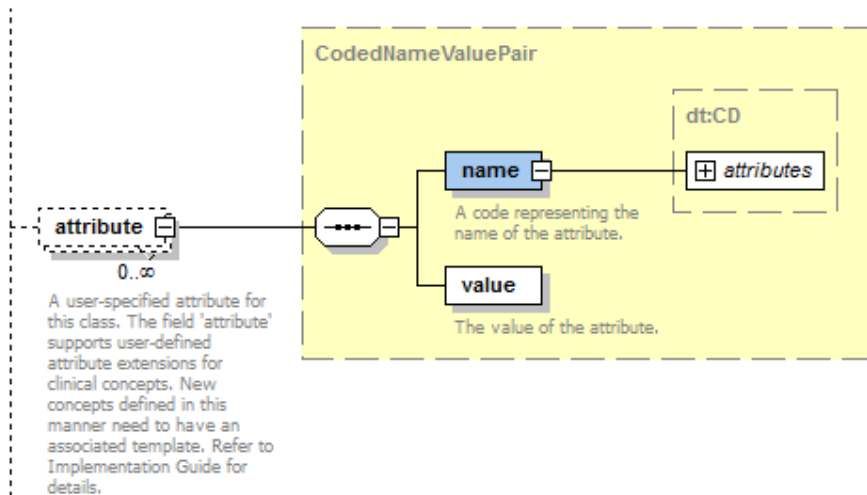
2.4 cdsInput.xsd

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.

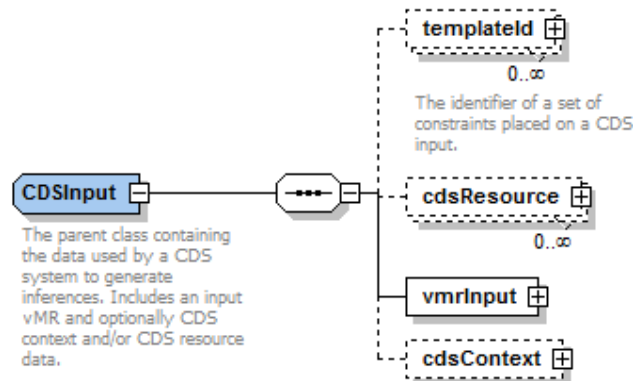## 2.5 cdsInputSpecification.xsd

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.
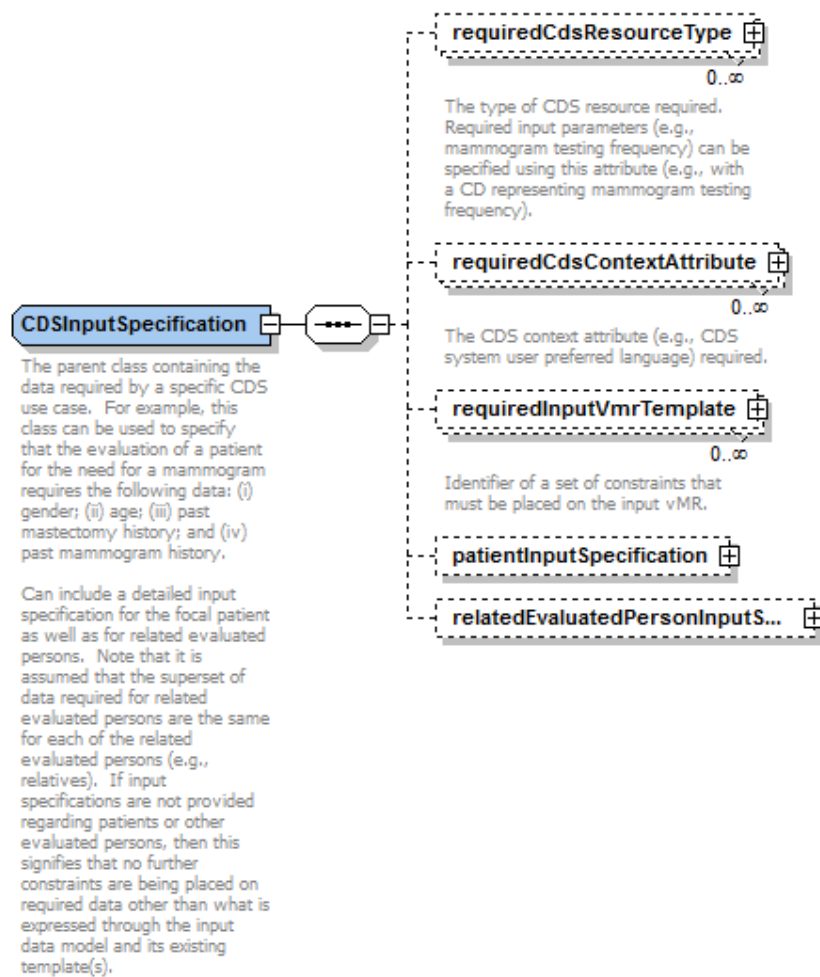
The type of CDS resource required.
Required input parameters (e.g.,
mammogram testing frequency) can be
specified using this attribute (e.g., with
a CD representing mammogram testing
frequency).

The CDS context attribute (e.g., CDS
system user preferred language) required.

Identifier of a set of constraints that
must be placed on the input vMR.

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).

Figure 8 – CDSInputSpecification complex type

2.6 cdsOutput.xsd

This schema specifies output data generated by CDS systems. The base CDSOutput is an
abstract element that is instantiated as a concrete extension. Extensions defined
within this specification include a CDSOutputAsVMR element that contains a vMR
output and a CDSOutputAsDataType element that contains an outputElement of ANY
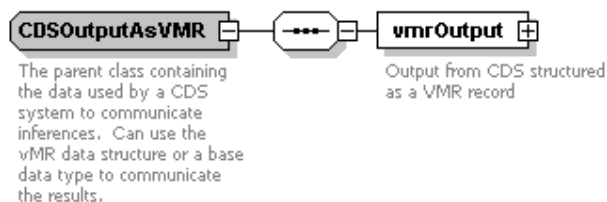data type. Please refer to the schema for the actual specification.

The parent class containing
the data used by a CDS
system to communicate
inferences. Can use the
vMR data structure or a base
data type to communicate
the results.

Output from CDS structured
as a VMR record

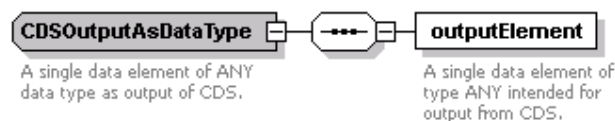Figure 9 – CDSOutputAsVMR complex type

Figure 10 – CDSOutputAsDataType complex type

2.1 cdsOutputSpecification.xsd

This schema specifies the specific CDS output data to be provided by a specific CDS use case. The main components of the cdsOutputSpecification.xsd schema are shown below. Please refer to the schema for the actual specification.
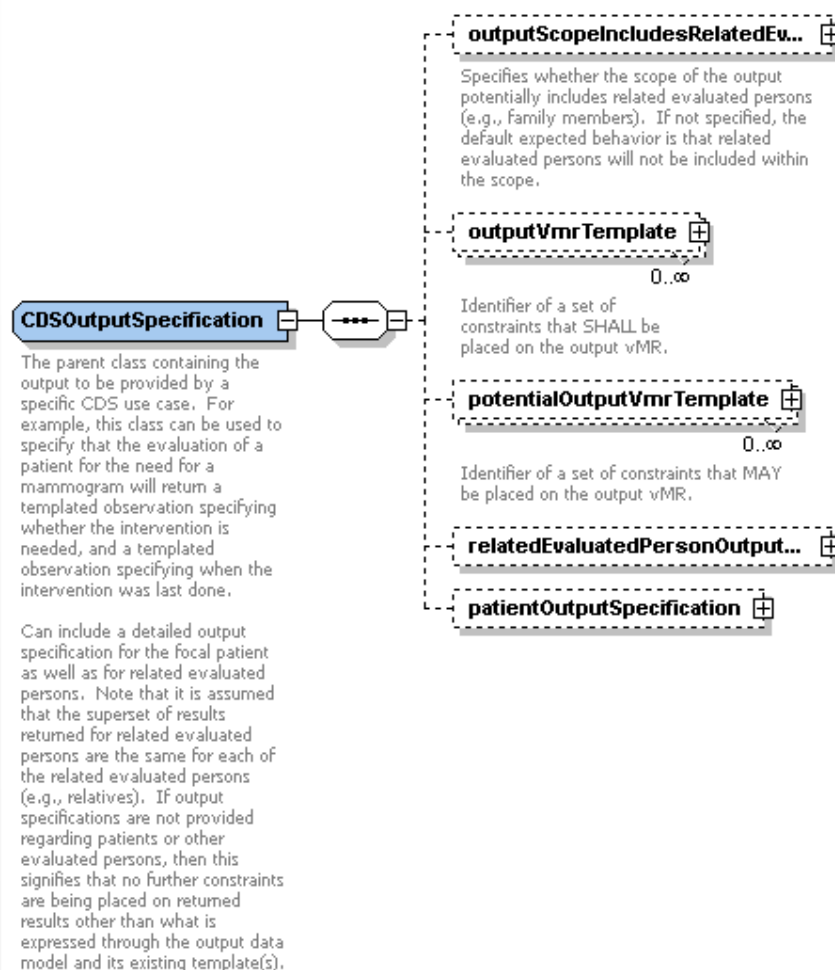

Figure 11 – CDSOutputSpecification complex type

2.2 Examples

An *informative* vMR is provided in the supplemental files.