HL7 Virtual Medical Record for Clinical Decision Support (vMR-CDS) Logical Model, Release 3

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Note Regarding Specification Name:
This specification was referred to as a Domain Analysis Model until the previous release. It is now referred to as a logical model because the model defined in this specification is in fact a logical model.

Table of Contents

Executive Summary

A **Virtual Medical Record (vMR) for Clinical Decision Support (CDS)** is a data model for representing clinical data relevant to CDS, which entails providing clinicians or patients with clinical knowledge and patient-related information, intelligently filtered or presented at appropriate times, to enhance patient care.[1] 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). For the sake of brevity, the **vMR for CDS** will be simply referred to as the **vMR** in the remainder of this document. However, it is important to note that the scope of this vMR is specifically CDS.

The term vMR has historically been used in the CDS community to refer to a **simplified representation** of the clinical record that is suitable and safe for a knowledge engineer to directly manipulate in order to derive patient-specific assessments and recommendations. Historically, the challenge has been that different organizations used different vMRs. As a consequence, CDS resources (e.g., decision rules) written against one vMR could not be directly re-used by a different organization. This has been a significant problem, because the development of CDS resources is oftentimes an expensive and time-consuming endeavor.

Due to the intended use of the vMR, a primary goal is **simple and intuitive representation** of data that is **easy and safe for a typical knowledge engineer to understand, use, and implement**. Because most knowledge engineers in most organizations have little or no previous knowledge of HL7 version 3 concepts and conventions such as null flavors, mood codes, and negation indicators, a primary purpose of the vMR is to take the rich semantic content of the HL7 version 3 body of work and to express it in a format that is more approachable for a typical knowledge engineer. A driving principle for this work has been that if a typical knowledge engineer may make an error with potential patient safety implications due to complexity, such complexity should be simplified to the greatest extent possible.

In order to achieve this goal of **ensuring patient safety and clinical quality**, the vMR does the following:

- Uses a **simplified version of the HL7 version 3 data types release 2**
- Uses a **simplified representation of clinical data that may be mappable to HL7 version 3 semantics**

Also, because one important intended use of the vMR is its **use within CDS rules engines**, and because such rules engines require a **stable underlying data model**, the vMR uses the **80-20 rule** for the underlying model, wherein frequently used and common data elements and attributes are directly represented in the model, whereas data elements and attributes anticipated to be less commonly needed for CDS are represented using generic model extension mechanisms such as related clinical statements and related entities.

This specification represents a logical model for the vMR, and includes the following:

- A specification of the vMR
- A specification of a constrained version of the HL7 version 3 Release 2 data types for use in the vMR
- Structural specifications for CDS engines' inputs and outputs, which are composed primarily of vMR data
- A structural specification for identifying input and output data requirements for specific CDS use cases
- Examples for clinical data represented using a vMR structure
- Guidance on how to represent common patterns of clinical information using the vMR
- An example of how a Consolidated Clinical Document Architecture (CCDA) would be represented as a vMR

[1] Osheroff et al., Improving Outcomes with Clinical Decision Support: An Implementer's Guide, HIMSS, 2005.

Note that the underlying data models are intended to serve several related roles: (i) the **underlying data model for use in inference engines**; (ii) a potential **payload format for representing the inputs and outputs** from such inference engines; and (iii) the core **components of CDS knowledge artifacts** such as order sets and documentation templates.

Several resources needed for fully leveraging the vMR are being defined in additional specifications. These resources include the following:

- Templates that constrain the vMR and its components for specific interoperability settings.
- Implementation technology specifications for platform-specific implementation approaches for the vMR, including in particular XML.

This specification includes an example of how a CCDA would be represented as a vMR. There are ongoing efforts to develop open-source tooling to map between HL7 balloted information structures and the vMR. Of note, the HL7 vMR project team plans on continuing the development of these types of mapping resources and to contribute them through HL7 and through other dissemination channels.

Of note, until the previous release, this specification was referred to as a Domain Analysis Model (DAM). It is now referred to as a logical model to be more accurate in its characterization.

Revision History

1. Revisions of Release 2 Specification Compared to Release 1 Specification

Compared to Release 1, Release 2 of the specification includes the following revisions:

- Additional classes and attributes incorporated, especially with regard to orders and proposals
- Added capability for clinical statements and entities to be extended through the use of coded name-value pairs in addition to the use of clinical statement relationships and entity relationships
- CDS output specification added, to parallel the existing CDS input specification

2. Revisions of Release 3 Specification Compared to Release 2 Specification

Compared to Release 2, Release 3 of the specification includes the following revisions:

- Converted name from Domain Analysis Model to logical model
- Clarified purpose and intent of the vMR
- Converted data types to become a formal subset of the HL7 version 3 data types release 2
- Added an example instantiation of a CCDA as a vMR
- Modified CDS output to be an abstract class
- Modified CDS context to contain additional attributes
- Added a grouping clinical statement to enable clinical statements to be grouped (e.g., a group of clinical statement proposals, at least one of which should be performed)

vMR Logical Model Specification

1. vMR Goal and General Approach

The primary goal of this specification is to provide a **simple and intuitive representation** of clinical data that is **easy and safe for a typical knowledge engineer to understand, use, and implement**. Another important goal is to define a **stable underlying data model for CDS rules engines.** Here, we describe the general approach taken to achieve these goals and provide examples to illustrate why the approach was taken to achieve the goals of the effort.

In order to achieve the goal of **ensuring patient safety and clinical quality**, the vMR does the following:

- Uses a **simplified version of the HL7 version 3 data types release 2**, through constraining away (i) a number of optional elements and attributes from the full model and (ii) data types that are not referenced in the vMR.
    - In particular, the optional **null flavor** attribute has been constrained away from the ANY base data type, for the following reasons.
        - The concept of a null flavor is not typically understood by a typical knowledge engineer, and therefore may lead to safety issues if the concept is included.
        - A null flavor indicates that valid data is not available, and provides the reason why the valid data is not available. While potentially important for documentation purposes or for human consumption purposes, for the purposes of automated CDS, the reason why valid data is not available is immaterial – invalid data simply cannot be considered and should not be submitted.
    - There are a number of other optional elements and attributes within the HL7 version 3 data types which may be important for the purposes of documentation or human consumption but are not needed for automated CDS. For example, the ConceptDescriptor (CD) data type in the full data type specification contains a codingRationale that specifies the reason a particular code has been provided. However, such an attribute is not required for automated CDS. By constraining out such elements and attributes that may be useful for other purposes but not for automated CDS, we reduce the complexity of the data types and thereby make it less likely that knowledge engineers will make mistakes due to an incomplete or inaccurate understanding of the data types.
- Uses a **simplified representation of clinical content that may be mappable to HL7 version 3 semantics**, in particular the CCDA.
    - A primary aspect of simplification is **reducing the deep level of nesting** that exists in many HL7 version 3 models
        - For example, in the vMR, most problem attributes such as problem status are represented as a direct attribute of the problem class rather than as a deeply nested related observation

In the CCDA, for example, specifying that a patient has had asthma since 1950 may be represented as follows (example adapted from example at http://bluebuttonplus.org/healthrecords.html#problemlist):

```
<entry
    typeCode="DRIV">
    <act classCode="ACT" moodCode="EVN">
       <!-- Problem act template -->
       <templateId root="2.16.840.1.113883.10.20.22.4.3"/>
       <id root="ec8a6ff8-ed4b-4f7e-82c3-e98e58b45de7"/>
       <code code="CONC" codeSystem="2.16.840.1.113883.5.6"
          displayName="Concern"/>
       <statusCode code="completed"/>
       <effectiveTime><low value="20070103"/></effectiveTime>
       <entryRelationship typeCode="SUBJ">
          <observation classCode="OBS" moodCode="EVN">
             <!-- Problem observation template -->
             <templateId root="2.16.840.1.113883.10.20.22.4.4"/>
             <id root="ab1791b0-5c71-11db-b0de-0800200c9a66"/>
             <code code="409586006" codeSystem="2.16.840.1.113883.6.96"
                displayName="Complaint"/>
             <statusCode code="completed"/>
             <effectiveTime><low value="19500101"/></effectiveTime>
             <value xsi:type="CD" code="195967001"
                codeSystem="2.16.840.1.113883.6.96" displayName="Asthma"/>
             <entryRelationship typeCode="REFR">
                <observation classCode="OBS" moodCode="EVN">
                   <!-- Status observation template -->
                   <templateId root="2.16.840.1.113883.10.20.22.4.6"/>
                   <code xsi:type="CE" code="33999-4"
                      codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC"
                      displayName="Status"/>
                   <statusCode code="completed"/>
                   <value xsi:type="CD" code="55561003"
                      codeSystem="2.16.840.1.113883.6.96"
                      codeSystemName="SNOMED CT" displayName="Active"/>
                </observation>
             </entryRelationship>
          </observation>
       </entryRelationship>
    </act>
 </entry>
```

Sample CCDA Representation that Patient has Had Asthma Since 1950

In order to just express a CDS condition that a “patient currently has active asthma” using this model, for example, a knowledge engineer would need to specify something like the following:

```
entry[typeCode="DRIV" and
  act[classCode="ACT" and
    moodCode="EVN" and
    /templateId[root="2.16.840.1.113883.10.20.22.4.3"] and
    /code[codeSystem="2.16.840.1.113883.5.6" and code="CONC"] and
    /statusCode[code="completed"] and
    /entryRelationship[typeCode="SUBJ" and
                        /observation[classCode="OBS" and moodCode="EVN" and
                                     /templateId[root="2.16.840.1.113883.10.20.22.4.4"] and
                                     /code[codeSystem="2.16.840.1.113883.6.96" and
code="409586006"] and
                                     /statusCode[code="completed"] and
                                     /effectiveTime[/low[value<="20130814"]] and
                                     /value[xsi:type="CD" and codeSystem="2.16.840.1.113883.6.96"
and code="95967001"] and
                                     /entryRelationship[typeCode="REFR" and
                                     /observation[classCode="OBS" and moodCode="EVN" and

/templateId[root="2.16.840.1.113883.10.20.22.4.6"] and
                                                  /code[xsi:type="CE" and
                                                        codeSystem="2.16.840.1.113883.6.1" and
                                                        code="33999-4"
                                                        ] and
                                                  /statusCode[code="completed"] and
                                                  /value [xsi:type="CD" and
                                                          codeSystem="2.16.840.1.113883.6.96" and
                                                          code="55561003"
                                                          ]
                                                  ]
                                        ]

                                     ]
    ]
  ]
```

Sample CDS Expression that “Patient Currently Has Active Asthma” Using CCDA Data Model

In an XML implementation of the vMR, the same clinical information above would be represented as something like the following:

```
<clinicalStatement xsi:type="vmr:Problem">
    <templateId root="2.16.840.1.113883.3.1829.11.7.2.5"/>
    <problemCode codeSystem="2.16.840.1.113883.6.96" code="195967001"><displayName
value="Asthma"/></problemCode>
    <problemEffectiveTime><low value="19500101"/><problemEffectiveTime>
    <problemStatus codeSystem="2.16.840.1.113883.6.96" code="55561003"><displayName
value="Active"/></problemStatus>
</clinicalStatement>
```

Sample vMR Representation that Patient has Had Asthma Since 1950

Using this vMR model, to express a CDS condition that a "patient currently has active asthma" using this model, a knowledge engineer would simply need to specify something like the following:

```
clinicalstatement[xsi:type="vmr:Problem" and
    /templateId[root="2.16.840.1.113883.3.1829.11.7.2.5"] and
    /problemCode[codeSystem="2.16.840.1.113883.6.96" and code="195967001"] and
    /problemEffectiveTime[/low[value<="20130814"]] and
    /problemStatus[codeSystem="2.16.840.1.113883.6.96" and code="55561003"]
    ]
```

Sample CDS Expression that "Patient Currently Has Active Asthma" Using vMR Data Model

- In addition to reducing deep nesting, another primary aspect of simplification in the vMR is the **intentional omission of elements that may be needed for the purposes of documentation, but not needed for the purposes of automated CDS**
  - For example, informants and custodians of data are not explicitly modeled in the vMR (although they could be expressed if needed using related entities)
  - The only exception to this general rule is the inclusion of human-directed content (e.g., comment fields) for clinical statement proposals and orders, which may be needed in CDS knowledge artifacts such as order sets.
- A final primary aspect of simplification is the utilization of alternate, more **intuitive representations of certain HL7 version 3 concepts**
  - Specifically, we use **alternate methods to express** the following concepts: **mood code, negation indicator, and inversion indicator**
  - The notion of mood is explicitly represented by class names. For example, moods for Encounter are represented explicitly through classes named AppointmentProposal, AppointmentRequest, ScheduledAppointment, and EncounterEvent.
  - The notion of negation indicator is also explicitly represented by class names. For example, the MissedAppointment class indicates an encounter event did not occur, rather than using an EncounterEvent with a negation indicator of true.
  - These approaches are needed for patient safety reasons. For example, if the vMR were to include a negation indicator, and a knowledge engineer was not familiar with the term, he or she may write the rule "Give Medication X if Problem Y exists," which may result in medication X being recommended when Problem Y does not exist, because Problem Y has a negation indicator of true, and the knowledge engineer did not know to write the rule as "Give Medication X if Problem Y exists and Problem Y has a negation indicator of false."

In addition to **simplification**, because one important intended use of the vMR is its use within CDS rules engines, and because such rules engines require a **stable underlying data model**, the vMR does the following:

- Uses the **80-20 rule** for the underlying model, wherein frequently used and common data elements and attributes are directly represented in the model, whereas data elements and attributes anticipated to be less commonly needed for CDS are represented using generic model extension mechanisms.
    - These extension mechanisms include the use of **related clinical statements**, **related entities**, and extensible **attributes**. Please see the model specification below for further information on these extension mechanisms.
    - This approach is taken so that the base vMR model can remain relatively stable over time.
- Please note that the use of the 80-20 rule means that **a number of data elements and attributes defined in HL7 version 3 models are intentionally omitted** from the base data model, with the intention for such data elements and attributes to be represented through the vMR extension mechanisms above if needed.
    - In essence, unless a data element or attribute is anticipated to be **needed for common CDS use cases**, they are intentionally omitted from the model.

2. Specification History

Release 1 of this specification was initially balloted in May 2010 as an informative specification. Following the incorporation of ballot input and implementations of the candidate specification in efforts such as OpenCDS (www.opencds.org), Release 1 was re-balloted in September 2011 as an informative specification and published. Release 2 was balloted in May 2013 and passed as an informative specification. This specification represents the third release of this specification and is the culmination of input from a variety of groups and stakeholders.

3. Resources Consulted

Specification of the vMR has been informed by a number of relevant efforts. In particular, initial development of the vMR was heavily influenced by a goal of representing the semantics of the HL7 Continuity of Care Document (CCD) relevant to CDS. Additional data model standards that have been considered in the development of the vMR include the following.

- HITSP C32, C80, C83, and C154 specifications.
- HL7 Clinical Statement Pattern, Release 1
- HL7 Pedigree model, Release 1
- HL7 Immunization model, Release 2
- HL7 Pharmacy model, Release 1
- HL7 Observations model, Release 1

In addition to reviewing existing standards, the vMR project team conducted a multi-institutional analysis of CDS data needs encompassing 20 CDS systems from 4 nations, which included both large-scale home-grown CDS systems (e.g., CDS systems of the Veterans Health Administration, Intermountain Healthcare, and Partners Healthcare) as well as a number of commercial CDS systems (Siemens Soarian, Eclipsys Sunrise, Medical-Objects CDS, Altos OncoEMR, Hughes riskApps, Wolters Kluwer Health Infobutton API, and Medi-Span). This analysis identified the use of 131 atomic data elements across the 20 CDS systems. A manuscript summarizing the findings from this study is available at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3041317/. The vMR was designed to enable the explicit representation of the data elements identified as being commonly used by production-level CDS systems in this study.

Similar to the analysis just described, for proposals and orders, the information required for inclusion in the vMR was determined through an analysis of actual proposals and orders included within the order sets of hundreds of hospitals within the United States.

4. Specification Contents

This specification includes the following content:

- A detailed specification of how the HL7 version 3 release 2 data types have been constrained, for the reasons outlined above (Section 5)
- An explanation of how common CDS constructs are to be represented using the vMR (Section 6)
- The vMR logical model (Section 7). Please note that the documentation in this section is auto-generated from the vMR UML model.
- A separate file archive that accompanies this document contains the following artifacts:
    - The Enterprise Architect UML model (.EAP) containing the vMR logical model.
    - An XMI UML file (.xmi) exported from Enterprise Architect
    - An example CCDA, an example vMR representation of the same content (as it relates to CDS), and a document specifying how the mapping was conducted **[TBD]**

Separate implementation guides are provided in other specifications for implementing the vMR using specific implementation technologies, such as XML and GELLO.

5. Constraints on HL7 Version 3 Release 2 Data Types for Use in vMR

The logical model includes a constrained version of the HL7 version 3 release 2 data types. The guiding principles and methodologies for this constraining process were as follows:

- Keep the original elements and attributes, except where elements and attributes are optional and not necessary for CDS purposes
- Explicitly identify the optional elements and attributes that have been constrained out

With regard to the **UML** model of the data types included in this specification, the following are additional differences compared to the UML representation of the HL7 version 3 release 2 data types.

- Where a collection is used as an attribute (e.g., where CD.translation is Set(CD)), the attribute was represented using a repeating version of the foundational element (e.g., CD[0..*]). This was done because collection types are not otherwise used within the vMR.
- Interfaces and methods defined in the HL7 version 3 release 2 data types are not carried forward into the vMR, as the vMR in general does not define interfaces and methods for its classes.

Of note, the above differences in the UML model do NOT carry over to the **XML** model, because the HL7 XML Implementation Technology Specification for the HL7 version 3 release 2 data types also use the same convention (representation of collections as repeating foundational elements and no inclusion of interfaces and methods). Thus, **at the XML instance level as defined in the HL7 vMR-CDS XML Implementation Technology Specification, the data types used in the vMR are designed to validate using the more comprehensive XML schema defined in the HL7 Version 3 Standard: Implementation Technology Specification R2 -- ISO Harmonized Dataypes, R1** (http://www.hl7.org/implement/standards/product_brief.cfm?product_id=48).

Specified in the table below is the cataloging of all HL7 version 3 release 2 data types used in the vMR, along with a specification of what constraints, if any, have been placed on the data type. Of note, if a base data type (e.g., ANY) has been constrained, data types that extend the base data type automatically inherit those constraints. Such inherited constraints are not separately identified in this table.

HL7 Version 3 Release 2 Data Type used in vMR	Constraints Placed on Data Type (Empty = No Constraints)	Comments
AD	constrained out useablePeriod, since vMR is a snapshot at a period in time constrained out isNotOrdered	
AddressPartType		
ADXP		
ANY	constrained to remove all optional elements	
BL		
CD	constrained out codeSystemVersion constrained out valueSet constrained out valueSetVersion constrained out codingRationale constrained out source	
CO		
Code		
CS		
Decimal		
ED	constrained out thumbnail constrained out translation	

HL7 Version 3 Release 2 Data Type used in vMR	Constraints Placed on Data Type (Empty = No Constraints)	Comments
EN		
EntityNamePartQualifier		
EntityNamePartType		
EntityNameUse		
ENXP		
II	root is 1..1 instead of 0..1 due to constraint on ANY to constrain out nullFlavor constrained out displayable, scope, and reliability	
INT	value is 1..1 instead of 0..1 due to constraint on ANY to constrain out nullFlavor and constaint on QTY to constrain out expression	
IntegrityCheckAlgorithm		
IVL_CO	constrained out width and any	
IVL_INT	constrained out width and any	
IVL_PQ	constrained out width and any	
IVL_QTY	constrained out width and any	
IVL_REAL	constrained out width and any	
IVL_TS	constrained out width and any	
PostalAddressUse		
PQ	Constrained out codingRationale and translation. Constrained value and unit to be 1..1 instead of 0..1 due to constraint on ANY to constrain out nullFlavor	
QTY	Constrained out uncertaintyType, expression, uncertainty, and uncertaintyRange.	The HL7 data type UML specifies that the ED used within PQ can only contain plain text. However, the XML ITS does not include this constraint in the schema. At the vMR UML level, such a constraint is not placed. A vMR template will be defined to place this constraint.
REAL	Constrained value to be 1..1 instead of 0..1 due to constraint on ANY to constrain out nullFlavor and on QTY to constrain out expression.	
RTO	Constrained numerator and denominator to be 1..1 instead of 0..1 due to constraint on ANY to constrain out nullFlavor and on QTY to constrain out expression.	
set_EntityNamePartQualifier	same	
set_EntityNameUse	same	
set_PostalAddressUse	same	

HL7 Version 3 Release 2 Data Type used in vMR	Constraints Placed on Data Type (Empty = No Constraints)	Comments
set_TelecommunicationAddressUse	same	
set_TelecommunicationCapability	same	
ST	Constrained out language and translation. Constrained value to be 1..1 instead of 0..1 due to constraint on ANY to constrain out nullFlavor.	
TEL	Constrained out useablePeriod. Constrained value to be 1..1 instead of 0..1 due to constraint on ANY to constrain out nullFlavor.	
TelecommunicationAddressUse	same	
TelecommunicationCapability	same	
TS	Constrained value to be 1..1 instead of 0..1 due to constraint on ANY to constrain out nullFlavor. Uses a simple type of TimeStamp rather than string so that the constraints verbally specified in the data model are expressed in a machine-computable format.	
Uid	same	
Uri	same	Enterprise Architect does support the URI data type natively. In XML Schema, need to change xs:string to xs:anyURI.
XP	Constrained out nullFlavor, code, codeSystem, codeSystemVersion, and language. Constrained value to 1..1 from 0..1 due to nullFlavor being constrained out.	

6. vMR Representation of Common Data Needed for CDS

[TBD]

7. vMR Logical Model

Details of the vMR Domain Analysis Model are provided below.

7.1 modelParent

Type: **Package**
Package: Model

The modelParent package is the parent package containing the following subsidiary model packages:

- cdsInput: specifies the data input used by CDS systems. A CDS system is considered to be an information system that provides clinicians, staff, patients or other individuals with knowledge and person-specific information, intelligently filtered or presented at appropriate times, to enhance health and health care. A CDS system user is an individual who makes use of such a CDS system for the purposes of enhancing health and health care.

- cdsOutput: specifies the data output generated by CDS systems.

- cdsInputSpecification: specifies the specific CDS input data required for a specific CDS input use case.

- cdsOutputSpecification: specifies the specific CDS output which will be created for a specific CDS output use case.

- vmr: specifies data about a patient relevant for CDS.

- dataTypes: specifies data types used. The data types are a simplified/constrained version of the HL7 version 3 datatypes specification, release 2, which is itself based on the implementable specification of ISO 21090 data types.

Note that this is a platform-independent, logical data model from which platform-specific data models can be derived.

7.1.1 vmr

Type: **Package «XSDschema»**
Package: modelParent

Specifies data about a patient relevant for CDS.

vmr - *(Class diagram)*

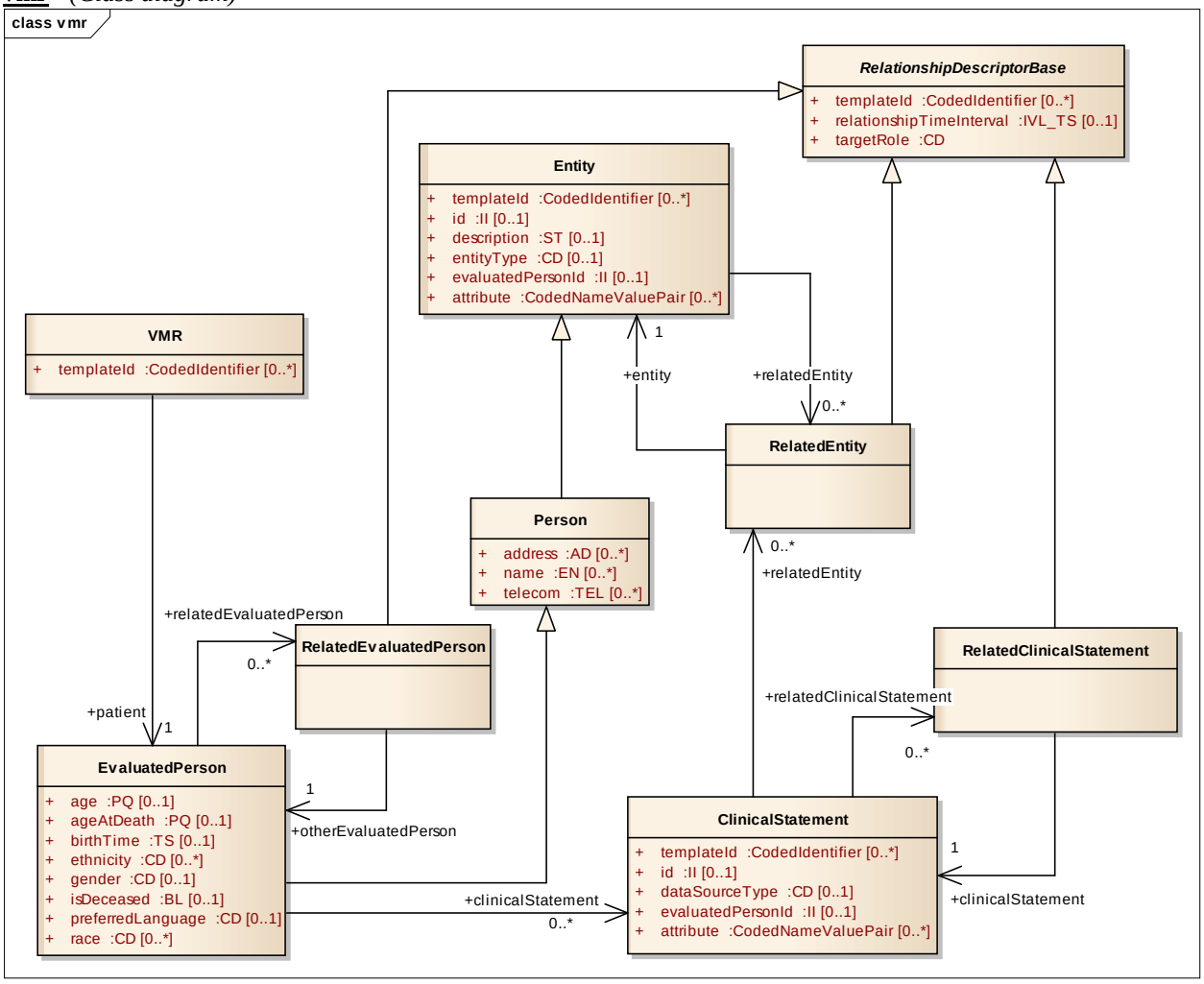

Figure: 1

extendedvMRTypes - *(Class diagram)*

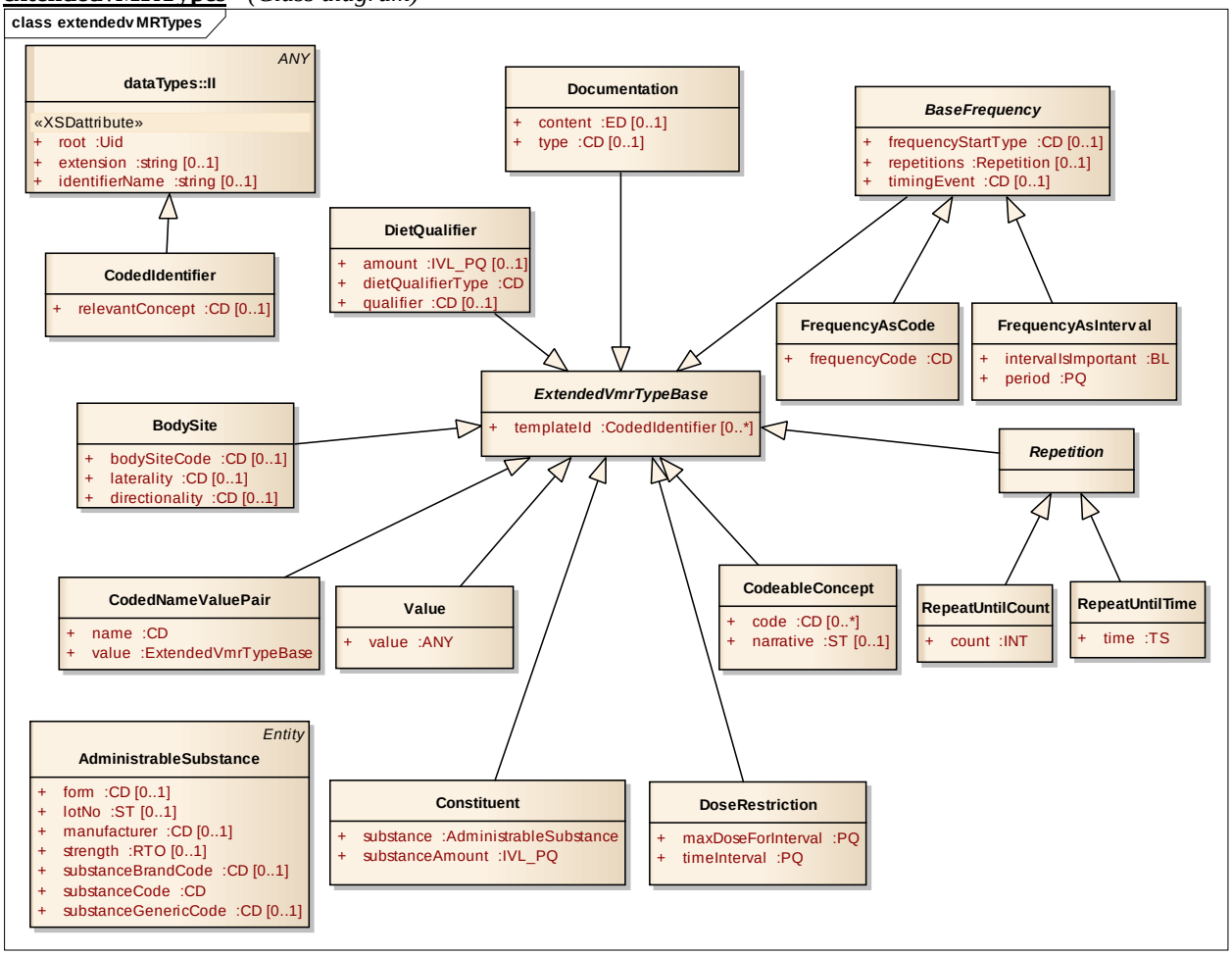

Figure: 2

entity - *(Class diagram)*

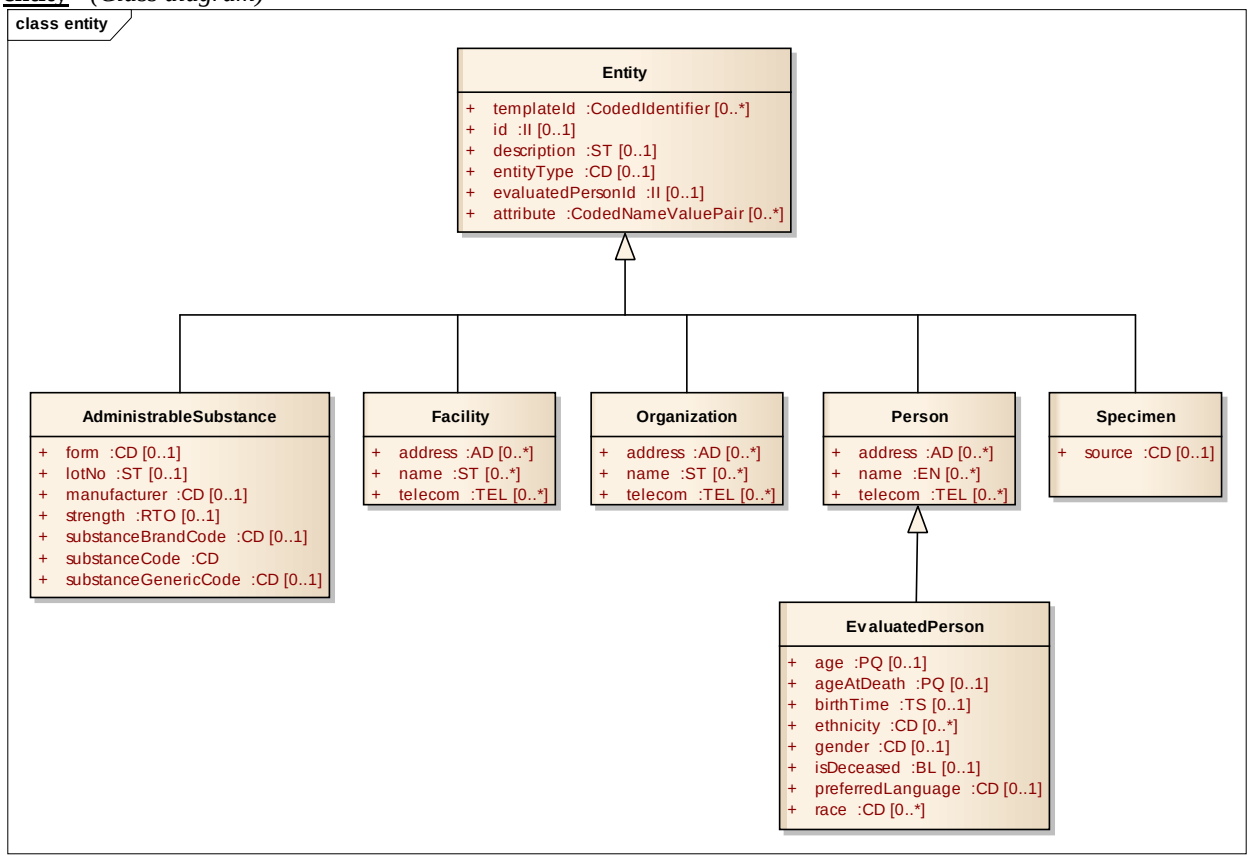

Figure: 3

clinicalStatement - *(Class diagram)*

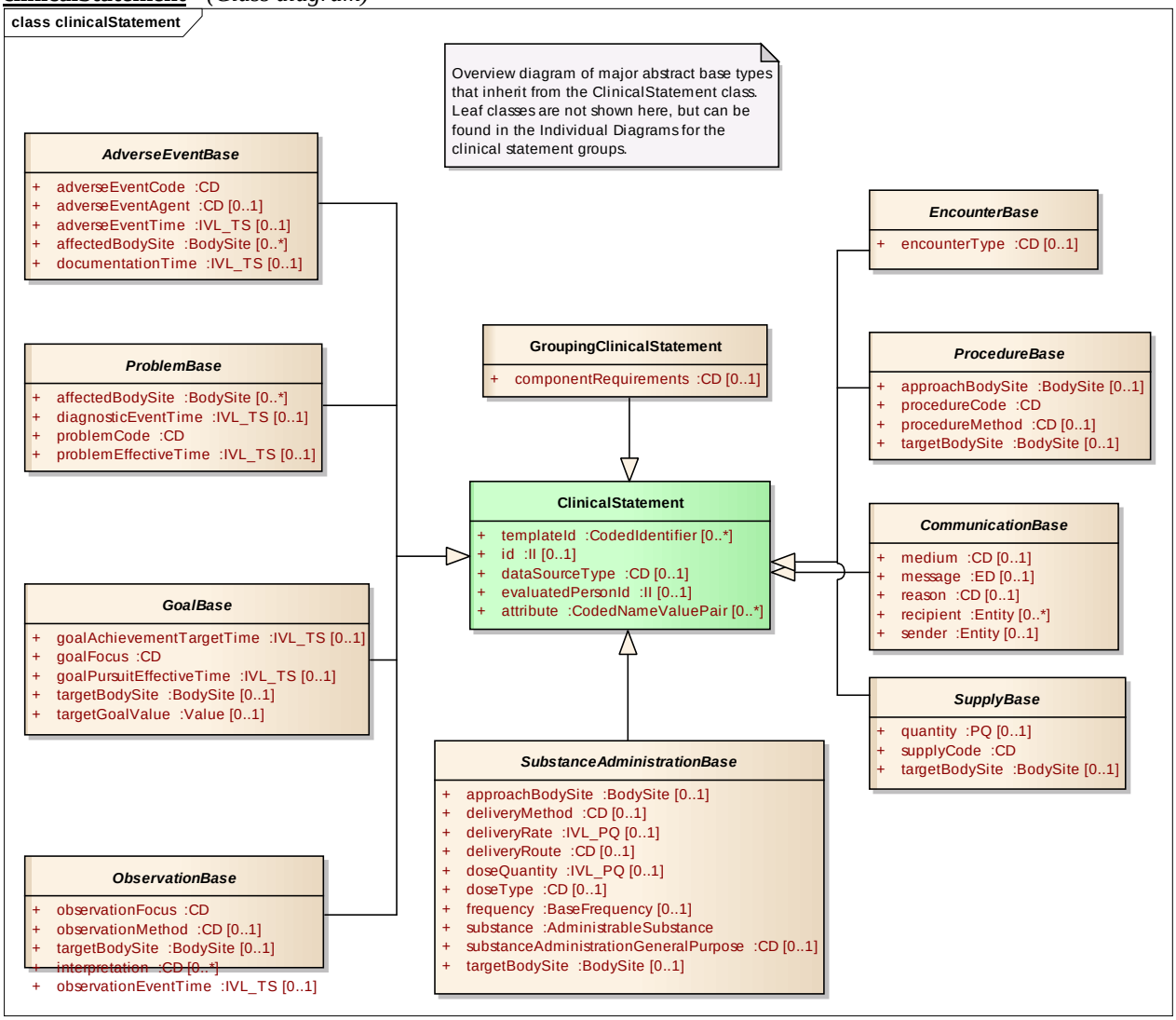

Figure: 4

adverseEvent - *(Class diagram)*

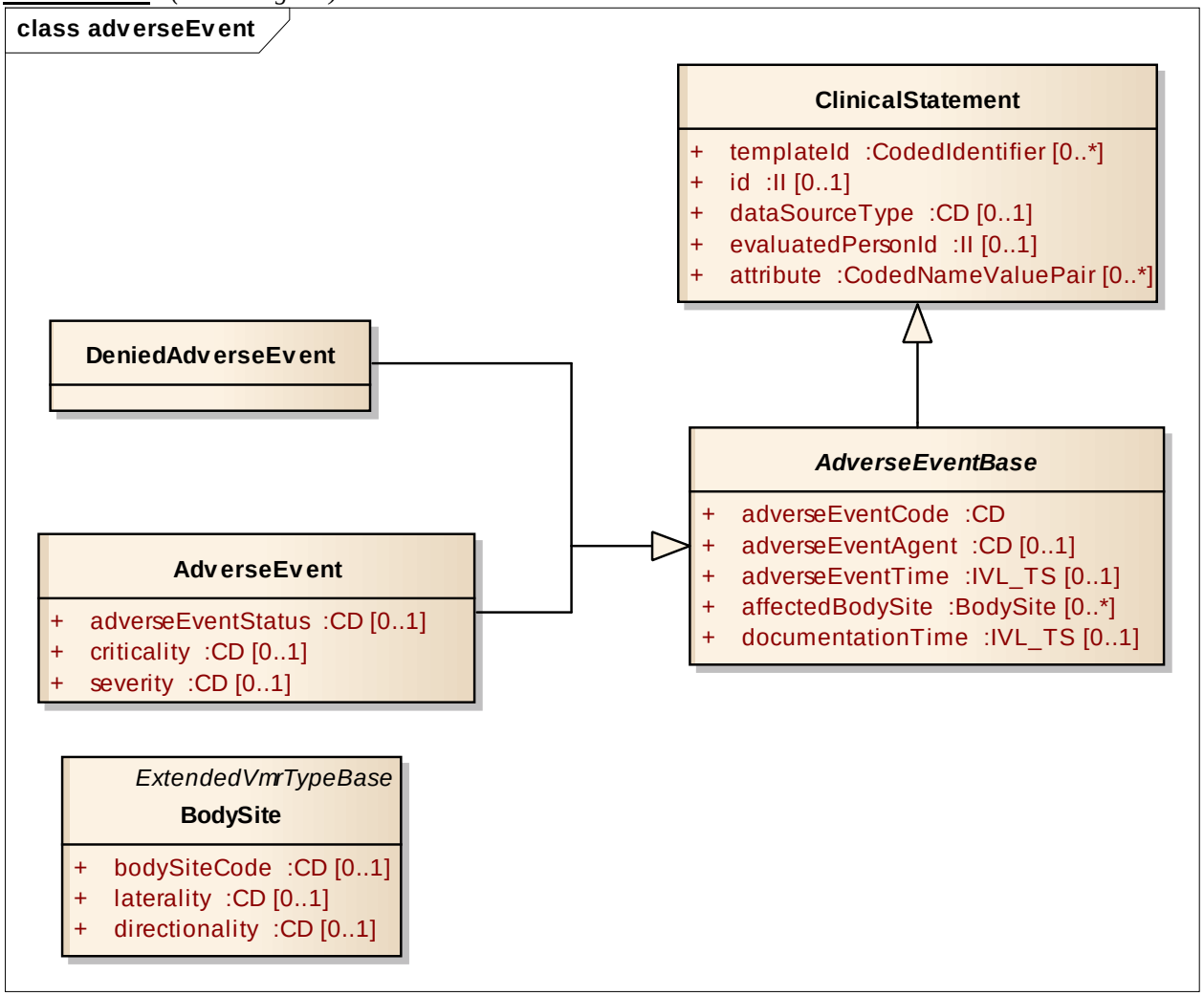

Figure: 5

communication - *(Class diagram)*

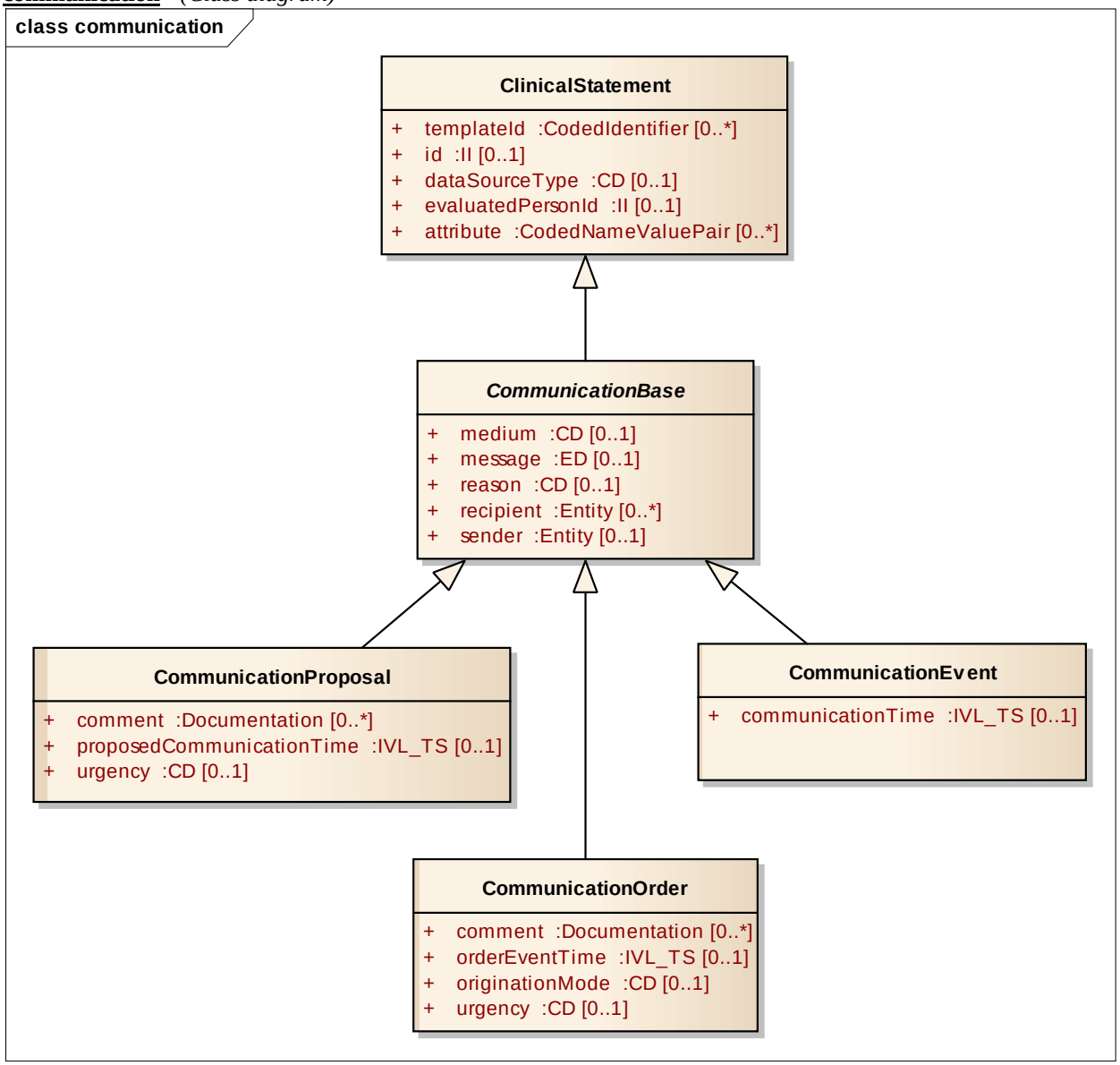

Figure: 6

encounter - *(Class diagram)*

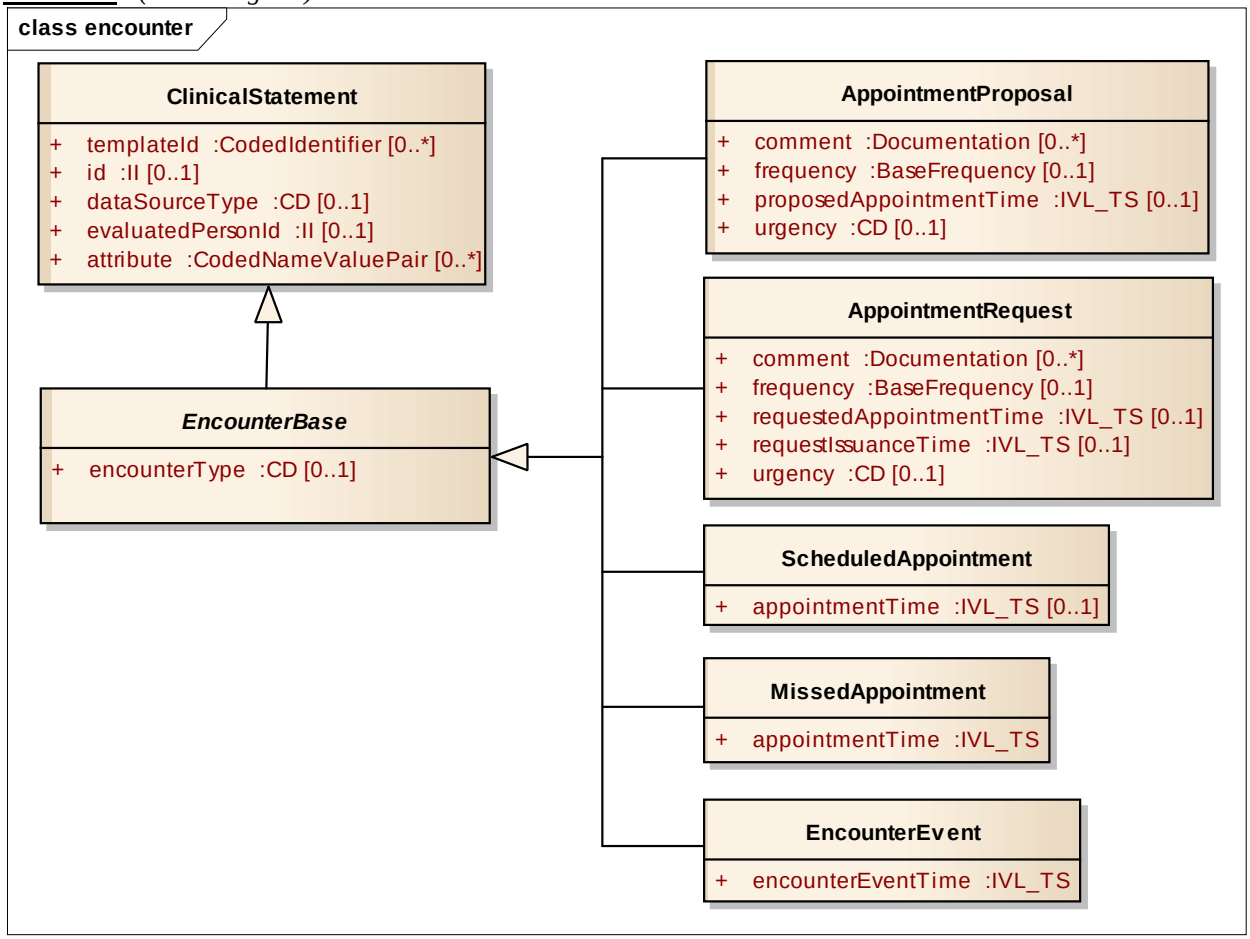

Figure: 7

goal - *(Class diagram)*

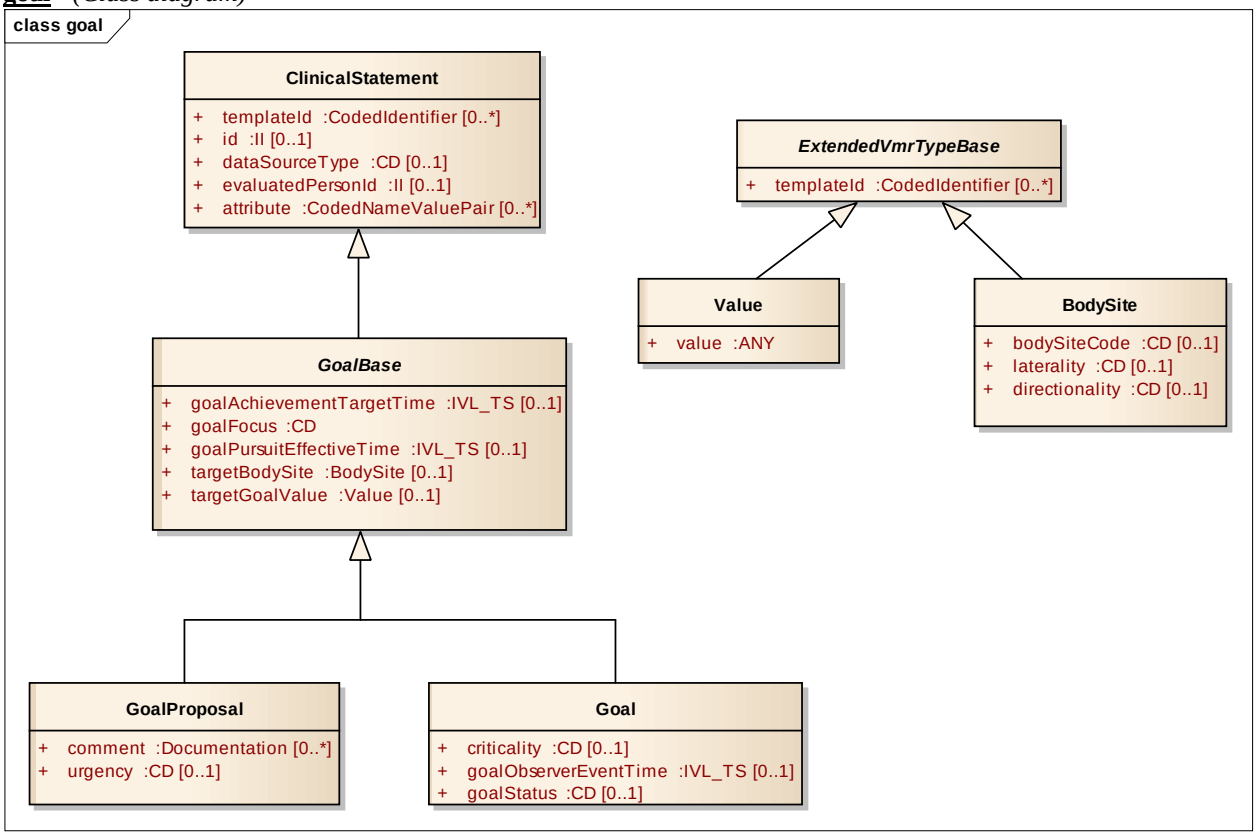

Figure: 8

observation - *(Class diagram)*

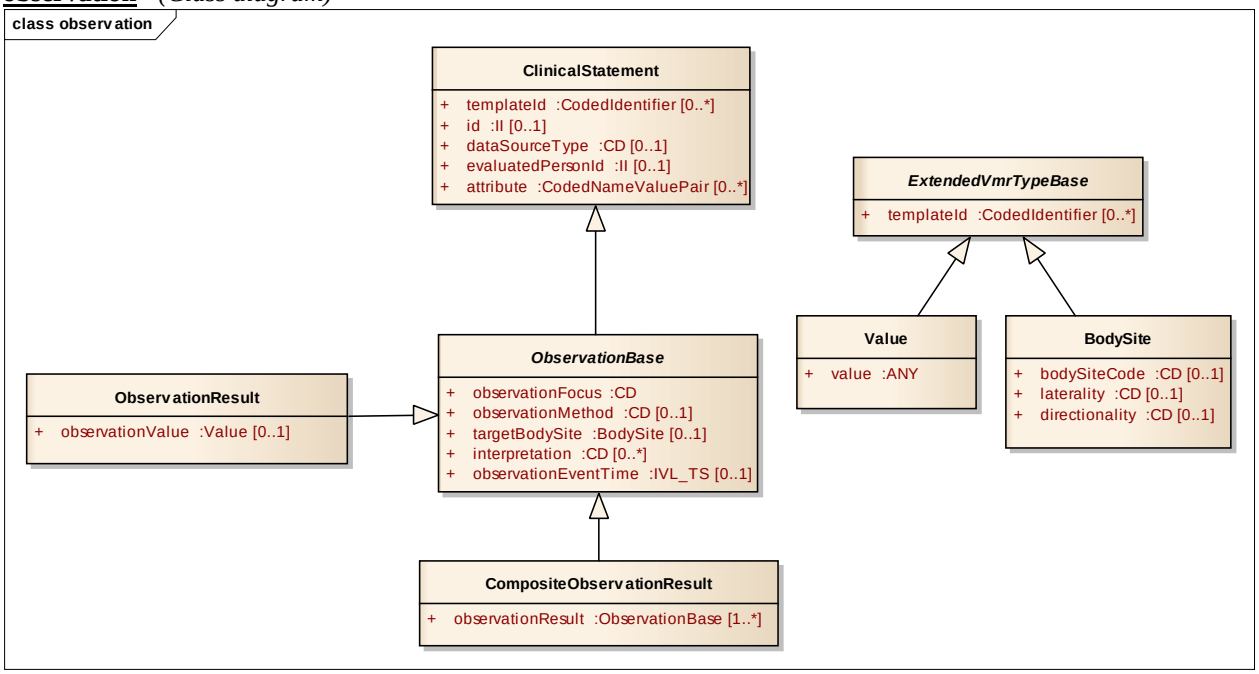

Figure: 9

problem - *(Class diagram)*

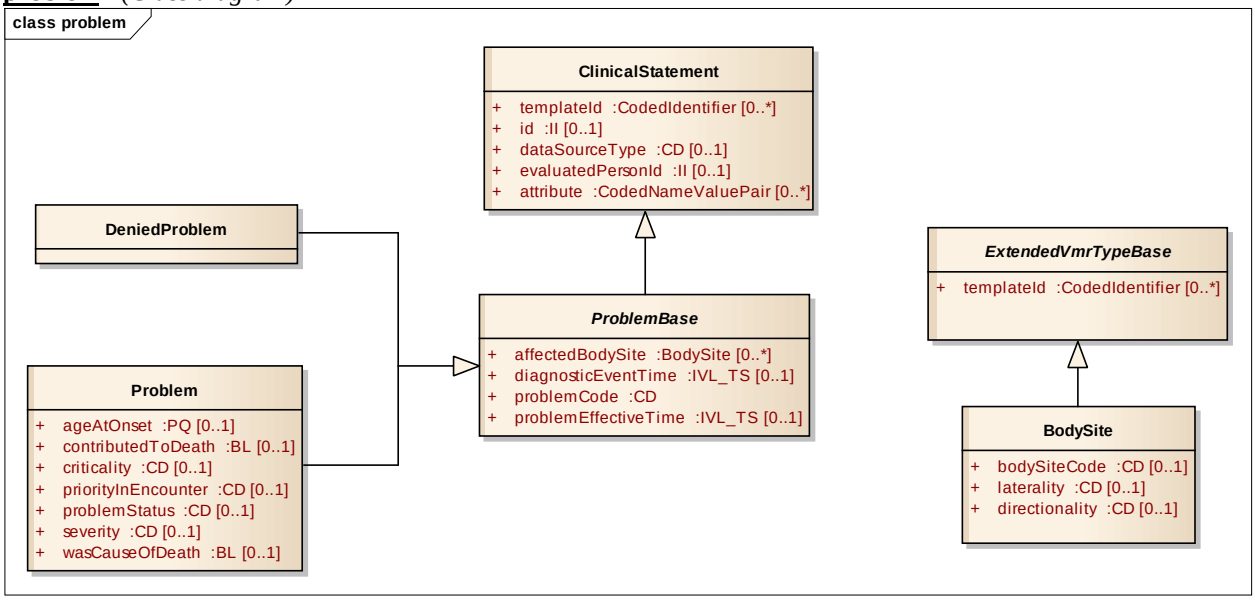

Figure: 10

procedure - *(Class diagram)*

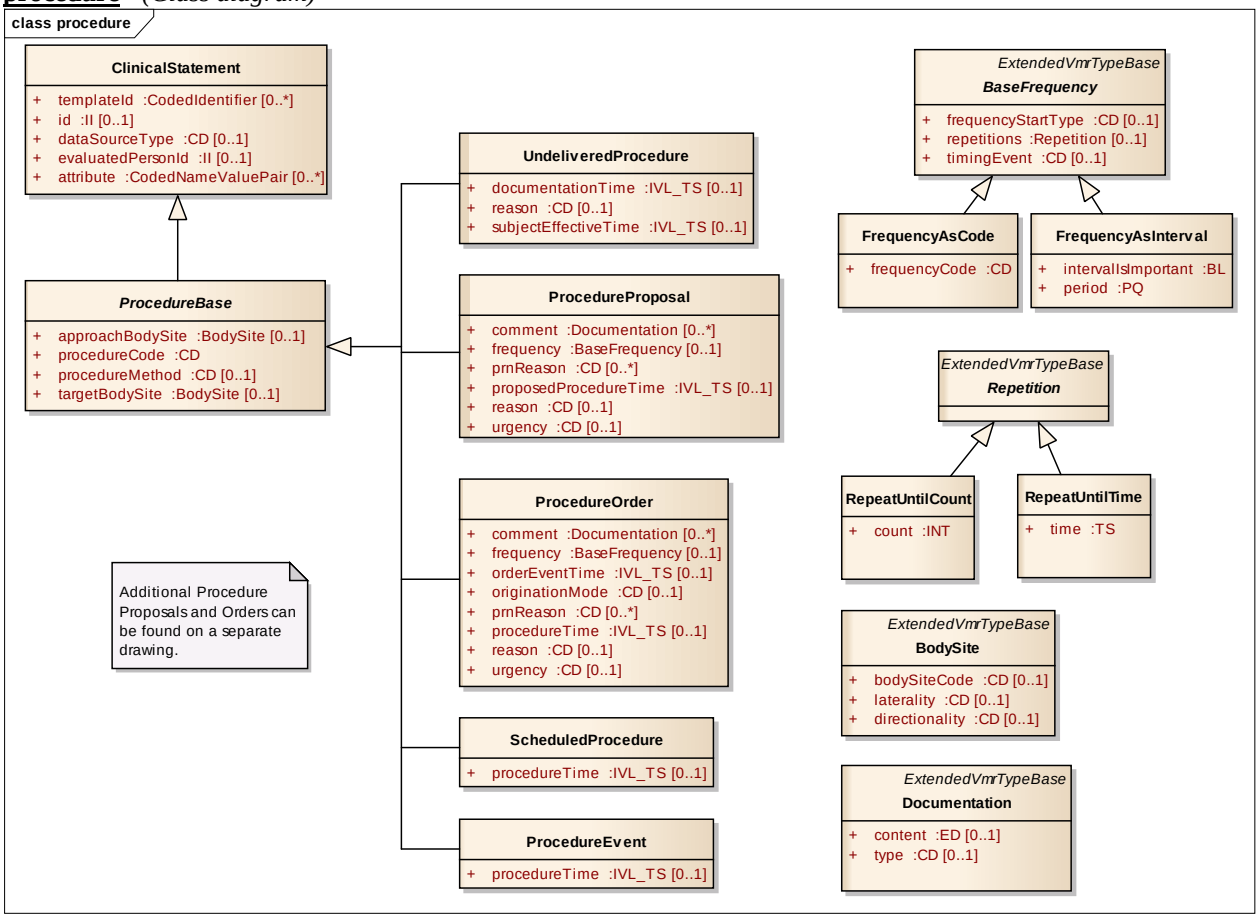

Figure: 11

procedureExtensions - *(Class diagram)*

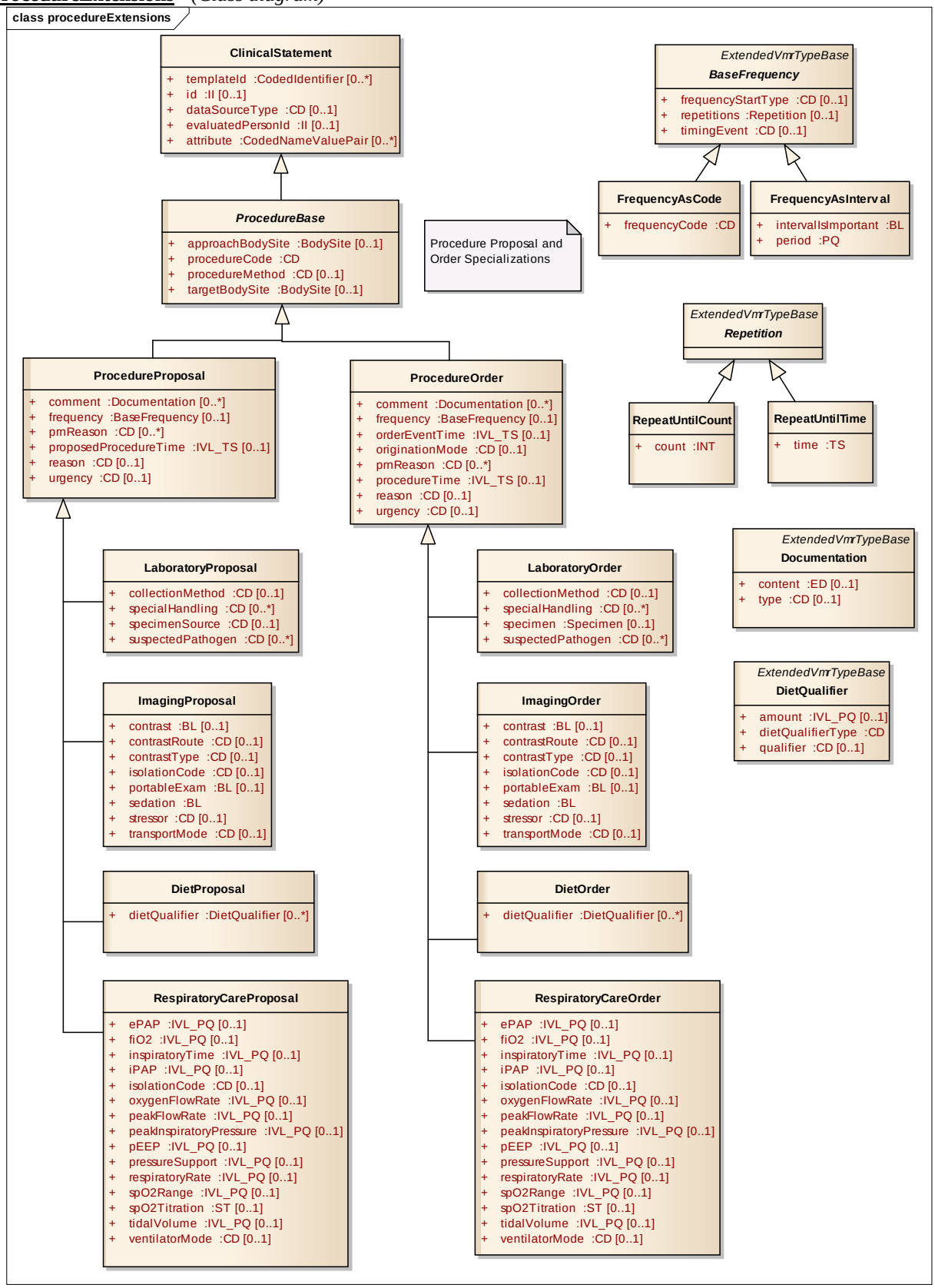

Figure: 12

substanceAdministration - *(Class diagram)*

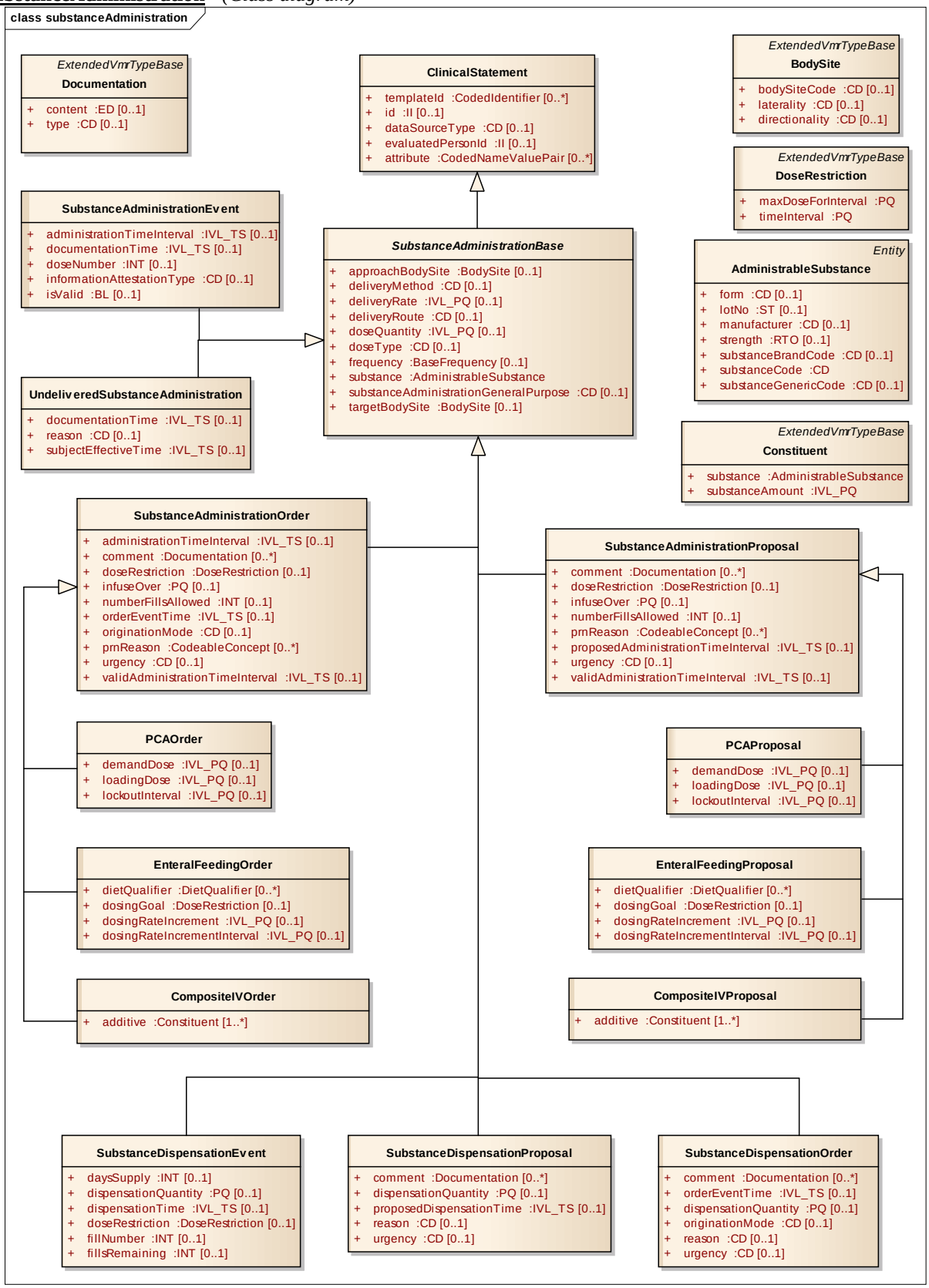

Figure: 13

supply - *(Class diagram)*

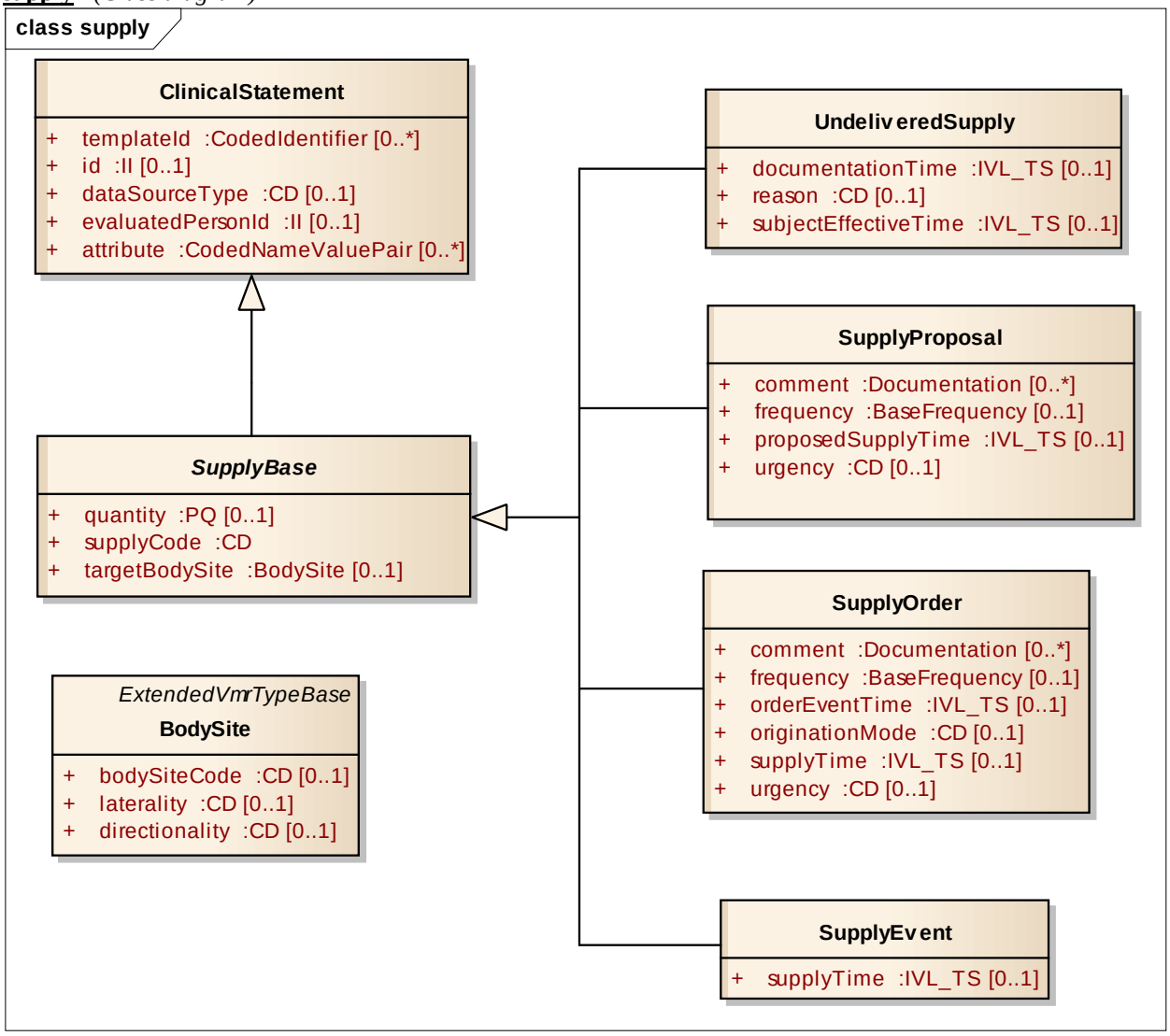

Figure: 14

7.1.1.1 AdministrableSubstance

Type: **Class** **Entity**
Package: vmr

A material of a particular constitution that can be given to a person to enable a clinical effect. It can have component administrable substances.

Attributes

Attribute	Notes
form CD [0..1]	The physical form of the substance as presented to the subject. E.g., tablet, patch, injectable, inhalant.
lotNo ST [0..1]	The number assigned by the manufacturer to the batch of manufactured substances in which this substance instance belongs. Used for quality control purposes.
manufacturer CD [0..1]	The organization that produces the substance. This is a CD and not an II because there are managed code systems for manufacturers.
strength RTO [0..1]	The concentration of the substance. E.g., 250 mg per 5 ml.
substanceBrandCode CD [0..1]	A code describing the product as a branded or trademarked entity from a controlled vocabulary.
substanceCode CD	The code that identifies the substance with as much specificity as appropriate, or as required by a template. E.g., aspirin, lisinopril. May be either a generic or brand code, unless otherwise restricted by a template.
substanceGenericCode CD [0..1]	A code describing the product as a substance produced and distributed without patent protection.

7.1.1.2 AdverseEvent

Type: **Class** **AdverseEventBase**
Package: vmr

Unfavorable healthcare event (e.g., death, rash, difficulty breathing) that is thought to have been caused by some agent (e.g., a medication, immunization, food, or environmental agent).

Attributes

Attribute	Notes
adverseEventStatus CD [0..1]	The state of the effects of this adverse event. E.g., active, inactive, resolved.
criticality CD [0..1]	Criticality: Applies to things about a patient - problems, observations, etc. (does not apply to actions) Characterizes impact on life, or durable impact on physiological function or on quality of life. Includes concepts such as life-threatening, or potential loss of function or capacity. E.g., Life threatening, potentially requires hospitalization, self-resolving. Different from severity in that a moderate subarachnoid hemorrhage is likely to be highly important, whereas a moderate headache is not.

Attribute	Notes
severity CD [0..1]	Severity: Applies to things about a patient - problems, observations, etc. (does not apply to actions) Characterizes the intensity of the manifestation of the problem or observation or an adverse event. Includes concepts such as mild, moderate, severe. If the adverseEventCode is rash and severity is moderate, it means that the adverse event was a moderate rash.

7.1.1.3 AdverseEventBase

Type: **Class** **ClinicalStatement**
Package: vmr

Abstract base class for adverse events, which are unfavorable healthcare events (e.g., death, rash, difficulty breathing) that are thought to have been caused by some agent (e.g., a medication, immunization, food, or environmental agent). If a given agent is thought to cause multiple reactions, these reactions should be represented using multiple adverse events.

Attributes

Attribute	Notes
adverseEventCode CD	Coded nature of the effects of the adverse event; maps to the "value" of an adverse event observation. For an adverse event due to an identified agent, this is the reaction code. E.g., hives, difficulty breathing.
adverseEventAgent CD [0..1]	The causative agent of the adverse event, identified with as much specificity as available, or as required by a template. E.g., penicillin, peanuts.
adverseEventTime IVL_TS [0..1]	The time that reflects when the subject experienced the adverse event (in the case of AdverseEvent) or when the subject *did not* experience the adverse event (in the case of DeniedAdverseEvent).
affectedBodySite BodySite [0..*]	A body site affected by the adverse event.
documentationTime IVL_TS [0..1]	The time when the adverse event was documented (e.g., entered into an electronic health record system by a care provider).

7.1.1.4 AppointmentProposal

Type: **Class** **EncounterBase**
Package: vmr

Proposal, e.g., by a CDS system, for an Encounter to take place.

Attributes

Attribute	Notes
comment Documentation [0..*]	A comment, instruction, or note associated with the proposal. The type specifies the type of comment (e.g., 'Provider Instruction', 'Patient Instruction', 'Reason for Procedure', 'Consult Note', etc...) and the value of the comment represents the free text value.

Attribute	Notes
frequency BaseFrequency [0..1]	How often the proposed appointments must take place.
proposedAppointmentTime IVL_TS [0..1]	Proposed time for appointment. Optional, as the proposer (e.g., a CDS system) may wish to simply propose an appointment of a type (e.g., encounter with eye professional) without specifying a specific appointment time interval. If RepeatUntilCount.count >= 2, then specifies proposed period within which the appointments should take place. In these cases, it is assumed that the appointments should be evenly distributed within the timeframe. E.g., if proposed time is 1/1/2011 to 12/31/2011, and RepeatUntilCount.count is 3, ideal appointment times would be 1/1/2011, 12/31/2011, and in the middle of the year.
urgency CD [0..1]	Urgency: Applies to actions - orders or proposals (does not apply to problems, observations) Characterizes how quickly an action must be initiated Includes concepts such as stat, urgent, routine

7.1.1.5 AppointmentRequest

Type: **Class** **EncounterBase**
Package: vmr

A request by a provider to schedule an appointment.

Attributes

Attribute	Notes
comment Documentation [0..*]	A comment, instruction, or note associated with the proposal. The type specifies the type of comment (e.g., 'Provider Instruction', 'Patient Instruction', 'Reason for Procedure', 'Consult Note', etc...) and the value of the comment represents the free text value.
frequency BaseFrequency [0..1]	How often the requested appointments must take place.
requestedAppointmentTime IVL_TS [0..1]	Requested time for appointment. If RepeatUntilCount.count >= 2, then specifies requested period within which the appointments should take place. In these cases, it is assumed that the appointments should be evenly distributed within the timeframe. E.g., if requested time is 1/1/2011 to 12/31/2011, and RepeatUntilCount.count is 3, ideal appointment times would be 1/1/2011, 12/31/2011, and in the middle of the year.
requestIssuanceTime IVL_TS [0..1]	Time when the encounter appointment was requested by the provider, as opposed to the time it was requested for.
urgency CD [0..1]	Urgency: Applies to actions - orders or proposals (does not apply to problems, observations) Characterizes how quickly an action must be initiated Includes concepts such as stat, urgent, routine

7.1.1.6 BaseFrequency

Type: **Class** **ExtendedVmrTypeBase**
Package: vmr

Specification of the periodicity of recurring events, with both regular and irregular time intervals. The preferred approach to specifying a frequency is to use the FrequencyAsCode class. When a code is not available that meets the needs of the case, only then should the FrequencyAsInterval element be used.

Attributes

Attribute	Notes
frequencyStartType CD [0..1]	Characterization of when to begin a specified cycle of frequencies; can be on a rolling or scheduled basis. With a “rolling” frequency, the first repetition occurs relative to an event (e.g., immediately after an order is processed). With a “scheduled” frequency, the first repetition occurs according to a predefined timetable (e.g., a hospital nursing unit might define “every 12 hours” to be 8:00 AM and 8:00 PM so after an order is processed, the first occurrence will not happen until the next instance in the timetable)
repetitions Repetition [0..1]	The total number of times the procedure is requested. For instance, "CPK every 8 hours x 3" is a request for a CPK level to be obtained now and again in 8 and 16 hours for a total of 3 CPK measurements
timingEvent CD [0..1]	Events in a patient's life that may be used to trigger a clinical action. Examples: https://www.oasis-open.org/committees/ubl/lcsc/doc/qateam/Comment%20work%20from%20HL7/datatypes.html#section-Properties-of-Event-Related-Periodic-Interval-of-Time-(EIVL) Table 46: Domain TimingEven (partial)t: code name definition AC before meal (from lat. ante cibus) ACD before lunch (from lat. ante cibus diurnus) ACM before breakfast (from lat. ante cibus matutinus) ACV before dinner (from lat. ante cibus vespertinus) HS the hour of sleep (e.g., H18-22) IC between meals (from lat. inter cibus) ICD between lunch and dinner ICM between breakfast and lunch ICV between dinner and the hour of sleep PC after meal (from lat. post cibus) PCD after lunch (from lat. post cibus diurnus) PCM after breakfast (from lat. post cibus matutinus) PCV after dinner (from lat. post cibus vespertinus)

7.1.1.7 BodySite

Type: **Class** **ExtendedVmrTypeBase**
Package: vmr

A location on an EvaluatedPerson's body. E.g., left breast, heart.

Attributes

Attribute	Notes
bodySiteCode CD [0..1]	A location on an EvaluatedPerson's body. May or may not encompass laterality. E.g., lung, left lung.
laterality CD [0..1]	The side of the body, from the EvaluatedPerson's perspective. E.g., left, right, bilateral.
directionality CD [0..1]	This is further specification of the body part by adding directionality, such as "upper", "lower", "frontal", "medial", etc.

7.1.1.8 ClinicalStatement

Type: **Class**
Package: vmr

A record of something of clinical relevance that is being done, has been done, can be done, or is intended or requested to be done. A class that serves as the basis for other more specific clinical statements, such as ObservationEvent and ProcedureProposal. It is a concrete class that can be used as is or specialized as needed.

Naming and modeling conventions:

- in general, **attribute names** end in 'Code' if and only if the name of the attribute overlaps with the name of the parent class
- **times** are named as follows: **Time** is the default suffix for these attributes. **EventTime** is used to distinguish the time an order is placed vs. when the ordered act should take place. **EffectiveTime** and **TimeInterval** are used when there is a desire to emphasize that a prolonged time interval (e.g., > 1 day) can be used rather than a point in time or a short time interval. Note that regardless of the naming convention, **IVL_TS** attributes allow time intervals of any length.
- **subjectEffectiveTime** is the time that is primarily related to the subject's experience of disease or treatment events (or durations), rather than when those events were reported or recorded by the performer
- **performerEventTime** is the event time that is primarily related to the performer, rather than the subject.
- the **state between ordering and the ordered event occurring** is modeled only in cases of procedures and encounters, due to the substantial rate at which orders do not result in events.

Approaches to representing specific statements:

- No known allergies --> DeniedAdverseEvent with adverseEventAgentCode that is the generic root-level code for substances and adverseEventCode that is the generic root-level code for adverse events.
- No known drug allergies --> DeniedAdverseEvent with adverseEventAgentCode that is the root-level code for medications and adverseEventCode that is the generic root-level code for adverse events.
- No known food allergies --> DeniedAdverseEvent with adverseEventAgentCode that is the root-level code for food and adverseEventCode that is the generic root-level code for adverse events.
- No known medications --> UndeliveredSubstanceAdministration with substance that is the root-level code for medications.
- No known problems --> DeniedProblem with problemCode that is the root-level code for problems or conditions.
- Patient takes an unknown drug --> SubstanceAdministrationEvent where code for substance represents "unknown medication".

Attributes

Attribute	Notes
templateId CodedIdentifier [0..*]	The identifier of a set of constraints placed on a clinical statement. If there are multiple templates specified for the element, then the element must satisfy ALL constraints defined in ANY template at that level.
id II [0..1]	A unique ID of this clinical statement for reference purposes. It must be provided if user wants it returned as part of any output, otherwise it will be auto-generated, if needed, by CDS system. Does not need to be the actual ID of the source system.
dataSourceType CD [0..1]	A categorization of the type of information source making the clinical statement. Can be used, for example, to provide relevant information regarding the reliability of input data or to mark specific pieces of data as having been generated by a CDS system. E.g., administrative system, clinical system, patient or family member, external CDS system, this CDS system. Optional in the base vMR, but should consider providing when available.
evaluatedPersonId II [0..1]	The 'owner' of this clinical statement.
attribute CodedNameValuePair [0..*]	A user-specified attribute for this class. The field 'attribute' supports user-defined attribute extensions for clinical concepts. New concepts defined in this manner need to have an associated template. Refer to Implementation Guide for details.

7.1.1.9 CodeableConcept

Type: **Class** **ExtendedVmrTypeBase**
Package: vmr

A concept that can be expressed as one or more codes or in human narrative form.

Attributes

Attribute	Notes
code CD [0..*]	A term from a controlled terminology that semantically defines this concept.
narrative ST [0..1]	A human-readable description of the concept.

7.1.1.10 CodedIdentifier

Type: **Class** **II**
Package: vmr

An II with an additional code to represent the associated concept. This is relevant for templates that are associated with a particular concept such as Barium Enema for instance.

Attributes

Attribute	Notes
relevantConcept CD [0..1]	Code specifying the concept represented by this identifier.

7.1.1.11 CodedNameValuePair

Type: **Class** **ExtendedVmrTypeBase**
Package: vmr

Class that represents a generic Name-Value-Pair object where the name may be controlled by a terminology and the value may be any type deriving from ANY and/or defined by a template.

Attributes

Attribute	Notes
name CD	A code representing the name of the attribute.
value ExtendedVmrTypeBase	The value of the attribute.

7.1.1.12 CommunicationBase

Type: **Class** **ClinicalStatement**
Package: vmr

A communication is a message sent between a sender and a recipient for a purpose and about a topic.

The specific type of entity (e.g., Attending Physician or Public Health Agency) is identified by the entityType of the sender or recipient.

There maybe a related clinical statement that identifies the topic of the communication in greater detail.

Attributes

Attribute	Notes
medium CD [0..1]	The communication medium, e.g., email, fax
message ED [0..1]	Text and other information to be communicated to the recipient
reason CD [0..1]	An indication, purpose or reason for why this action is being proposed., e.g., notify, alert, remind.
recipient Entity [0..*]	The entity (e.g., person, organization, clinical information system, or device) which is the intended target of the communication.
sender Entity [0..1]	The entity (e.g., person, organization, clinical information system, or device) which is the source of the communication.

7.1.1.13 CommunicationEvent

Type: **Class** **CommunicationBase**
Package: vmr

A communication event that is occurring or has occurred. E.g., an alert that was sent, a Direct message that was sent.

Attributes

Attribute	Notes
communicationTime IVL_TS [0..1]	Time when the communication was conducted.

7.1.1.14 CommunicationOrder

Type: **Class** **CommunicationBase**
Package: vmr

An order to communicate. E.g., a physician requests to be notified when a lab result is available.

Attributes

Attribute	Notes
comment Documentation [0..*]	A comment, instruction, or note associated with the proposal. The type specifies the type of comment (e.g., 'Provider Instruction', 'Patient Instruction', 'Reason for Procedure', 'Consult Note', etc...) and the value of the comment represents the free text value.
orderEventTime IVL_TS [0..1]	The time when the order was made.
originationMode CD [0..1]	The mode the order was received (such as by telephone, electronic, verbal, written). This describes 'how' the communication was done as opposed to dataSourceType which specifies the 'where' and 'from'.
urgency CD [0..1]	Urgency: Applies to actions - orders or proposals (does not apply to problems, observations) Characterizes how quickly an action must be initiated Includes concepts such as stat, urgent, routine

7.1.1.15 CommunicationProposal

Type: **Class** **CommunicationBase**
Package: vmr

A proposal to communicate. E.g., the CDS system proposes that an alert be sent to a responsible provider, the CDS system proposes that the public health agency be notified about a reportable condition.

Attributes

Attribute	Notes
comment Documentation [0..*]	A comment, instruction, or note associated with the proposal. The type specifies the type of comment (e.g., 'Provider Instruction', 'Patient Instruction', 'Reason for Procedure', 'Consult Note', etc...) and the value of the comment represents the free text value.
proposedCommunicationTime IVL_TS [0..1]	The time interval in which the communication is proposed to be sent

Attribute	Notes
urgency CD [0..1]	Urgency: Applies to actions - orders or proposals (does not apply to problems, observations) Characterizes how quickly an action must be initiated Includes concepts such as stat, urgent, routine

7.1.1.16 CompositeIVOrder

Type: **Class** **SubstanceAdministrationOrder**
Package: vmr

A class representing IV fluid orders that may consist of one or more additives mixed into a diluent (as represented by the substance attribute).

Attributes

Attribute	Notes
additive Constituent [1..*]	A substance that is mixed with a diluent which enables intravenous delivery to a patient; the additive is an active ingredient

7.1.1.17 CompositeIVProposal

Type: **Class** **SubstanceAdministrationProposal**
Package: vmr

A class representing IV fluid proposals that may consist of one or more additives mixed into a diluent (as represented by the substance attribute).

Attributes

Attribute	Notes
additive Constituent [1..*]	A substance that is mixed with a diluent which enables intravenous delivery to a patient; the additive is an active ingredient

7.1.1.18 CompositeObservationResult

Type: **Class** **ObservationBase**
Package: vmr

The findings from an observation represented as a composition of child observation results. CompositeObservationResult may consist of two or more ObservationResults, one or more CompositeObservationResults, or two or more of a combination of ObservationResult and CompositeObservationResult. E.g., Complete Blood Count, Basic Chemistry Panel. A

Attributes

Attribute	Notes
observationResult ObservationBase [1..*]	Component observation. May be either a simple ObservationResult or a CompositeObservationResult. E.g., Hematocrit in a Complete Blood Count.

7.1.1.19 Constituent

Type: **Class** **ExtendedVmrTypeBase**
Package: vmr

A component of a multi-component substance administration. May be an additive in a composite IV.

Attributes

Attribute	Notes
substance AdministrableSubstance	Generally the ingredient of the constituent (e.g., dopamine) such as an additive in a composite IV.
substanceAmount IVL_PQ	The amount of the constituent that makes up the whole.

7.1.1.20 DeniedAdverseEvent

Type: **Class** **AdverseEventBase**
Package: vmr

A denial that the subject has or had the specified adverse event. E.g., if adverseEventCode is hives, adverse event agent is penicillin, and documentation time is 2011-05-01, an assertion was made on 2011-05-01 that the subject does not get hives as a reaction to penicillin.

Common denials of adverse events to a class of agents can be expressed as follows:

- No known allergies --> DeniedAdverseEvent with adverseEventAgentCode that is the generic root-level code for substances and adverseEventCode that is the generic root-level code for adverse events.
- No known drug allergies --> DeniedAdverseEvent with adverseEventAgentCode that is the root-level code for medications and adverseEventCode that is the generic root-level code for adverse events.
- No known food allergies --> DeniedAdverseEvent with adverseEventAgentCode that is the root-level code for food and adverseEventCode that is the generic root-level code for adverse events.

7.1.1.21 DeniedProblem

Type: **Class** **ProblemBase**
Package: vmr

An assertion that the subject did not have the problem specified. For example, if problemCode is diabetes and diagnosticEventTime is 2011-05-01, then an assertion was made on 2011-05-01 that the subject does not have diabetes.

To assert that the subject has no known problems, a DeniedProblem can be asserted with a problemCode that is the root-level code for problems or conditions. E.g., if for a DeniedProblem, problemCode is the root-level code for problems or conditionsand diagnosticEventTime is 2011-05-01, then an assertion was made on 2011-05-01 that the subject has no known problems as of that date.

7.1.1.22 DietOrder

Type: **Class** **ProcedureOrder**
Package: vmr

A class representing a wide variety of allowable types of meals and/or specification of meal and/or nutrient restrictions for an individual patient, based on the patient's clinical condition

Attributes

Attribute	Notes
dietQualifier DietQualifier [0..*]	Diet proposals may be fully precoordinated in a terminology or specified by type only and allowing the nutrients (eg, specification of calories, carbohydrates, protein, fat, sodium, potassium, etc.) to be post-coordinated.

7.1.1.23 DietProposal

Type: **Class** **ProcedureProposal**
Package: vmr

A class representing a wide variety of allowable types of meals and/or specification of meal and/or nutrient restrictions for an individual patient, based on the patient's clinical condition

Attributes

Attribute	Notes
dietQualifier DietQualifier [0..*]	Diet proposals may be fully precoordinated in a terminology or specified by type only and allowing the nutrients (eg, specification of calories, carbohydrates, protein, fat, sodium, potassium, etc.) to be post-coordinated.

7.1.1.24 DietQualifier

Type: **Class** **ExtendedVmrTypeBase**
Package: vmr

"Diet qualifier allows the post-coordination of diets in cases where such post-coordination is required. Diets can vary greatly in how they are represented in terminologies. The most common use case for DietQualifier is to represent a nutrient that can be either stated as a quantity, a range, or as a code (e.g., 'Low Protein').

DietQualifier consists of the dietQualifierType (e.g., Sodium), the amount in the diet (e.g., 20-30g), and/or a qualifier such as 'Low Sodium'. Note that dietQualifierType is required and of type CD. Amount is optional and of type IVL_PQ. qualifier is optional and of type CD. Either amount or qualifier is required and both may not be empty.

Attributes

Attribute	Notes
amount IVL_PQ [0..1]	The quantity of nutrient or bound to consider for this diet. For instance, 40mg, <40mg, 30mg<x<60mg, etc...

Attribute	Notes
dietQualifierType CD	The type of nutrient that this diet contains. Nutrient types include: carbohydrates, lipids and fats, salts such as Sodium or Potassium, fibers, and also fluids.
qualifier CD [0..1]	Not all nutrients will be given using physical quantities. A fat may be specified as 'Low Fat', 'No Animal Fat', etc... Other examples include: 'Ketogenic 3:1 Ratio', 'Consistent Carb Low (1200-1500 Kcal'), etc... Note that fluid consistencies may also be specified as the qualifier of a Nutrient whose type is 'Fluid'. E.g., Honey Thick Liquids, Nectar Thick Liquids, Pudding Thick Liquids, Other

7.1.1.25 Documentation

Type: **Class** **ExtendedVmrTypeBase**
Package: vmr

This type may be used to represent documentation that is either free text or richer in format (e.g., XML or HTML) where provenance is not relevant. The type of the documentation is determined by a code that represents the type of documentation ("e.g., a consult note, a provider instruction, a patient instruction, etc...). It is intended to represent comment fields and notes such as those associated with order entry forms. Either freeTextValue or content must be specified.

Attributes

Attribute	Notes
content ED [0..1]	This element may be used to capture both the free text expression of the content, and/or the content of this document in encapsulated data format such as XML, XHTML or PDF.
type CD [0..1]	• Code that specifies the type of document represented: E.g., 'Instructions to Provider', 'Patient Instructions', 'Special Handling', etc...

7.1.1.26 DoseRestriction

Type: **Class** **ExtendedVmrTypeBase**
Package: vmr

Referred to in CDA release 2 as maxDoseQuantity. Specifies the maximum dose that can be given in a specified time interval.

Attributes

Attribute	Notes
maxDoseForInterval PQ	Maximum amount of substance that can be given within the specified time interval.
timeInterval PQ	The time interval during which the dose specified is the maximum amount that should be administered.

7.1.1.27 EncounterBase

Type: **Class** **ClinicalStatement**
Package: vmr

The abstract base class for an encounter of an EvaluatedPerson with the healthcare system. If an encounter or appointment has been canceled, it should simply not be provided using this model. This allows the encounter and appointment classes to be used without an explicit encounter status check.

Attributes

Attribute	Notes
encounterType CD [0..1]	Identifies the setting of the encounter with as much specificity as available, or as required by a template. E.g., outpatient encounter, inpatient encounter.

7.1.1.28 EncounterEvent

Type: **Class** **EncounterBase**
Package: vmr

EncounterEvent is the record of an interaction between an EvaluatedPerson and the healthcare system. It can be used to group observations and interventions performed during that interaction, through the use of relatedClinicalStatements.

Attributes

Attribute	Notes
encounterEventTime IVL_TS	The time of the encounter.

7.1.1.29 EnteralFeedingOrder

Type: **Class** **SubstanceAdministrationOrder**
Package: vmr

A class representing enteral nutrition orders for the delivery of enteral-fed substances (eg, Nutren, Ensure, RenalCal) for patients who are unable to consume diets orally; enteral feedings can be delivered to the stomach or varying parts of the small intestines using a variety of tube placement methods, depending on the clinical scenario. For instance, Nutren via nasogastric tube, 20 ml/hour, increase by 20 ml every 4 hours, goal of 75 ml/hour, water flushes 125 ml every shift.

Attributes

Attribute	Notes
dietQualifier DietQualifier [0..*]	Diet proposals may be fully precoordinated in a terminology or specified by type only and allowing the nutrients (eg, specification of calories, carbohydrates, protein, fat, sodium, potassium, etc.) to be post-coordinated.
dosingGoal DoseRestriction [0..1]	Target tube feeding rate. E.g., 75ml/hour.
dosingRateIncrement IVL_PQ [0..1]	Change in the dosing rate; usually an increase for a patient who is initiating tube feeding. E.g., 20 mL.

Attribute	Notes
dosingRateIncrementInterval IVL_PQ [0..1]	Period of time after which the dosingRateIncrement should be attempted. E.g., 4 hours.

7.1.1.30 EnteralFeedingProposal

Type: **Class** **SubstanceAdministrationProposal**
Package: vmr

A class representing enteral nutrition proposals for the delivery of enteral-fed substances (eg, Nutren, Ensure, RenalCal) for patients who are unable to consume diets orally; enteral feedings can be delivered to the stomach or varying parts of the small intestines using a variety of tube placement methods, depending on the clinical scenario. For instance, Nutren via nasogastric tube, 20 ml/hour, increase by 20 ml every 4 hours, goal of 75 ml/hour, water flushes 125 ml every shift.

Attributes

Attribute	Notes
dietQualifier DietQualifier [0..*]	Diet proposals may be fully precoordinated in a terminology or specified by type only and allowing the nutrients (eg, specification of calories, carbohydrates, protein, fat, sodium, potassium, etc.) to be post-coordinated.
dosingGoal DoseRestriction [0..1]	Target tube feeding rate. E.g., 75ml/hour.
dosingRateIncrement IVL_PQ [0..1]	Change in the dosing rate; usually an increase for a patient who is initiating tube feeding. E.g., 20 mL.
dosingRateIncrementInterval IVL_PQ [0..1]	Period of time after which the dosingRateIncrement should be attempted. E.g., 4 hours.

7.1.1.31 Entity

Type: **Class**
Package: vmr

A physical thing, group of physical things or an organization. It is a concrete class that can be used as is or specialized as needed.

Attributes

Attribute	Notes
templateId CodedIdentifier [0..*]	The identifier of a set of constraints placed on an Entity. If there are multiple templates specified for the element, then the element must satisfy ALL constraints defined in ANY template at that level.
id II [0..1]	The entity's unique identifier. Used for internal tracking purposes. It must be provided if user wants it returned as part of any output, otherwise it will be auto-generated, if needed, by CDS system. Does not need to be the entity's "real" identifier.
description ST [0..1]	Human narrative for display purposes.
entityType CD [0..1]	The specific type of entity. E.g., healthcare organization, medical facility, pacemaker.

Attribute	Notes
evaluatedPersonId II [0..1]	The ID of the evaluated person that this entity has a direct relationship to, generally the patient, but may be a different evaluatedPersonId when family history data is included, or related data pertinent to the patient but directly belonging to another evaluated person is present. This element is not normally needed when all relevant patient data is included in a single structured vMR, but may be essential when pieces of the vMR are furnished or referenced as separate structures in CDS inputs or outputs.
attribute CodedNameValuePair [0..*]	A user-specified attribute for this class. The field 'attribute' supports user-defined attribute extensions for entities. New concepts defined in this manner need to have an associated template. Refer to Implementation Guide for details.

7.1.1.32 EvaluatedPerson

Type: **Class** **Person**
Package: vmr

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.

Attributes

Attribute	Notes
age PQ [0..1]	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 PQ [0..1]	The age at which the person died. Included to support family history-based inferencing.
birthTime TS [0..1]	The date on which the person was born.
ethnicity CD [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 CD [0..1]	The person's gender. E.g., male, female. Typically will consist of administrative gender, with clinical gender noted using ObservationEvents.
isDeceased BL [0..1]	Whether the person is deceased. Included to support family history-based inferencing.
preferredLanguage CD [0..1]	The person's language of preference. E.g., English.
race CD [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.

7.1.1.33 ExtendedVmrTypeBase

Type: **Class**
Package: vmr

Abstract base class for extended vMR types.

Attributes

Attribute	Notes
templateId CodedIdentifier [0..*]	The identifier of a set of constraints placed on an extended vMR data type. If there are multiple templates specified for the element, then the element must satisfy ALL constraints defined in ANY template at that level.

7.1.1.34 Facility

Type: **Class** **Entity**
Package: vmr

A property such as a building that has been established to enable the performance of specific activities, typically by organizations. E.g., a hospital or clinic.

Attributes

Attribute	Notes
address AD [0..*]	The place or the name of the place where a facility is located or may be reached.
name ST [0..*]	A word or a combination of words by which a facility is known.
telecom TEL [0..*]	A locatable resource of a facility that is identified by a URI, such as a web page, a telephone number (voice, fax or some other resource mediated by telecommunication equipment), an e-mail address, or any other locatable resource that can be specified by a URL.

7.1.1.35 FrequencyAsCode

Type: **Class** **BaseFrequency**
Package: vmr

The interval in between events represented as a code such as TID, BID, q8h, etc.

Attributes

Attribute	Notes
frequencyCode CD	The interval in between events specified as a code originating in a standard terminology. For instance, TID, BID, q8h, etc.

7.1.1.36 FrequencyAsInterval

Type: **Class** **BaseFrequency**
Package: vmr

A computable frequency representation that specifies the time span between events.

Attributes

Attribute	Notes
intervalIsImportant BL	Together with dosingPeriod, identifies the frequency of substance administration. dosingPeriod identifies the periodicity of doses within a 24 hour timeframe, whereas dosingPeriodIntervalIsImportant identifies whether doses should be equally spaced within that 24 hour period. E.g., a dosingPeriod of 8 hr would signify q8h if dosingPeriodIntervalIsImportant is true, and TID if dosingPeriodIntervalIsImportant is false.
period PQ	Together with dosingPeriodIntervalIsImportant, identifies the frequency of substance administration. dosingPeriod identifies the periodicity of doses within a specified timeframe, which is often 24 hours (but may be different for some uses). E.g., a dosingPeriod of 3 times every 24 hrs would signify q8h if dosingPeriodIntervalIsImportant is true, and TID if dosingPeriodIntervalIsImportant is false. Other possibilities include 20 minutes every 2 hours for an infusion, or 30 minutes every 2 days for a medicated compress, etc.

7.1.1.37 Goal

Type: **Class** **GoalBase**
Package: vmr

A clinical end or aim towards which effort is directed.

Attributes

Attribute	Notes
criticality CD [0..1]	Criticality: Applies to things about a patient - problems, observations, etc. (does not apply to actions) Characterizes impact on life, or durable impact on physiological function or on quality of life. Includes concepts such as life-threatening, or potential loss of function or capacity. E.g., Life threatening, potentially requires hospitalization, self-resolving. Different from severity in that a moderate subarachnoid hemorrhage is likely to be highly important, whereas a moderate headache is not.
goalObserverEventTime IVL_TS [0..1]	The time that the observer made a note of the goal. It is primarily related to the creator or observer of the goal, rather than the subject.
goalStatus CD [0..1]	State of the attempt to reach this goal. E.g., active, inactive.

7.1.1.38 GoalBase

Type: **Class** **ClinicalStatement**
Package: vmr

Abstract base class for a goal, which is a clinical end or aim towards which effort is directed.

Attributes

Attribute	Notes
goalAchievementTargetTime IVL_TS [0..1]	The time that is targeted for the goal to be attained. For example, there may be a goal to reach a weight of X pounds by a particular date.
goalFocus CD	This is the code that identifies the metric that is the clinical subject of the goal with as much specificity as available, or as required by a template. Typically a measurable clinical attribute of the subject. E.g., weight, blood pressure, hemoglobin A1c level.
goalPursuitEffectiveTime IVL_TS [0..1]	The time in which the subject pursues the goal. This includes pursuing maintenance of a goal that has already been achieved. The end time of the interval may be "open" or not stated, if the goal is being indefinitely pursued. This time is optional, as, for example, a CDS system may simply wish to propose weight loss without specifying a pursuit effective time.
targetBodySite BodySite [0..1]	The body site that serves as the target of the goal. E.g., waist.
targetGoalValue Value [0..1]	The metric whose achievement would signify the fulfillment of the goal. E.g., 150 pounds, 7.0%.

7.1.1.39 GoalProposal

Type: **Class** **GoalBase**
Package: vmr

Proposal, e.g., by a CDS system, for establishing the goal specified.

Attributes

Attribute	Notes
comment Documentation [0..*]	A comment, instruction, or note associated with the proposal. The type specifies the type of comment (e.g., 'Provider Instruction', 'Patient Instruction', 'Reason for Procedure', 'Consult Note', etc...) and the value of the comment represents the free text value.
urgency CD [0..1]	Urgency: Applies to actions - orders or proposals (does not apply to problems, observations) Characterizes how quickly an action must be initiated Includes concepts such as stat, urgent, routine

7.1.1.40 GroupingClinicalStatement

Type: **Class** **ClinicalStatement**
Package: vmr

A clinical statement which serves to group other clinical statements. For example, a grouping clinical statement could contain an intervention proposal and a substance administration proposal, one of which should be completed.

Attributes

Attribute	Notes
componentRequirements CD [0..1]	The requirements for the contained components. E.g., do at least one, do all.

7.1.1.41 ImagingOrder

Type: **Class** **ProcedureOrder**
Package: vmr

An order to perform an Imaging study. For instance, Chest Radiograph - PA and Lateral.

Attributes

Attribute	Notes
contrast BL [0..1]	Specification of whether contrast should be administered as part of the imaging study (e.g., Yes, No, Per Radiology)
contrastRoute CD [0..1]	Specification of the route of contrast (e.g., Oral, IV, Per Radiology) to be given as part of an imaging proposal
contrastType CD [0..1]	Specification of the kind of contrast (e.g., Barium, Gastrograffin) to be given as part of an imaging proposal. For example, Barium, Gastrograffin.
isolationCode CD [0..1]	Specification for type of precautions that should be taken when in proximity to the patient. For instance, Airborne Precautions, Contact Precautions, Droplet Precautions, Standard Precautions.
portableExam BL [0..1]	Designation of whether or not the imaging procedure should be performed at the patient's bedside (Yes) or if the procedure can be conducted in the location of the performing department (No)
sedation BL	'true' if patient will require sedation for this procedure.
stressor CD [0..1]	Type of physiologic or pharmacologic stress that will be subjected to the patient during the imaging procedure. For example, Adenosine, Dipyrdomole, Persantine, Thallium, Cardiolite, Dobutamine, Treadmill.
transportMode CD [0..1]	Specification of how a patient will be moved from their hospital room to the performing department

7.1.1.42 ImagingProposal

Type: **Class** **ProcedureProposal**
Package: vmr

A proposal for an Imaging Order. For instance, Chest Radiograph - PA and Lateral.

Attributes

Attribute	Notes
contrast BL [0..1]	Specification of whether contrast should be administered as part of the imaging study (e.g., Yes, No, Per Radiology)
contrastRoute CD [0..1]	Specification of the route of contrast (e.g., Oral, IV, Per Radiology) to be given as part of an imaging proposal
contrastType CD [0..1]	Specification of the kind of contrast (e.g., Barium, Gastrograffin) to be given as part of an imaging proposal. For example, Barium, Gastrograffin.
isolationCode CD [0..1]	Specification for type of precautions that should be taken when in proximity to the patient. For instance, Airborne Precautions, Contact Precautions, Droplet Precautions, Standard Precautions.
portableExam BL [0..1]	Designation of whether or not the imaging procedure should be performed at the patient's bedside (Yes) or if the procedure can be conducted in the location of the performing department (No)
sedation BL	'true' if patient will require sedation for this procedure.
stressor CD [0..1]	Type of physiologic or pharmacologic stress that will be subjected to the patient during the imaging procedure. For example, Adenosine, Dipyrdomole, Persantine, Thallium, Cardiolite, Dobutamine, Treadmill.
transportMode CD [0..1]	Specification of how a patient will be moved from their hospital room to the performing department

7.1.1.43 LaboratoryOrder

Type: **Class** **ProcedureOrder**
Package: vmr

An order for a laboratory test.

Attributes

Attribute	Notes
collectionMethod CD [0..1]	Specification of how the laboratory specimen should be obtained
specialHandling CD [0..*]	Special instructions on how to handle a laboratory specimen. For example, 'Keep on ice'.
specimen Specimen [0..1]	The source of the laboratory specimen to be collected.
suspectedPathogen CD [0..*]	The pathogen or pathogens that are felt to be the most likely cause of the patient's condition that led to the laboratory procedure proposal. For instance, Staphylococcus, Streptococcus, Pseudomonas, Neisseria.

7.1.1.44 LaboratoryProposal

Type: **Class** **ProcedureProposal**
Package: vmr

A proposal for a laboratory test.

Attributes

Attribute	Notes
collectionMethod CD [0..1]	Specification of how the laboratory specimen should be obtained
specialHandling CD [0..*]	Special instructions on how to handle a laboratory specimen. For example, 'Keep on ice'.
specimenSource CD [0..1]	The source of the laboratory specimen to be collected.
suspectedPathogen CD [0..*]	The pathogen or pathogens that are felt to be the most likely cause of the patient's condition that led to the laboratory procedure proposal. For instance, Staphylococcus, Streptococcus, Pseudomonas, Neisseria.

7.1.1.45 MissedAppointment

Type: **Class** **EncounterBase**
Package: vmr

An appointment that was (i) scheduled, (ii) not rescheduled or canceled, and (iii) for which the EvaluatedPerson did not show up.

Attributes

Attribute	Notes
appointmentTime IVL_TS	The time of the scheduled appointment that was missed.

7.1.1.46 ObservationBase

Type: **Class** **ClinicalStatement**
Package: vmr

The abstract base class for an observation, which is the act of recognizing and noting a fact.

Attributes

Attribute	Notes
observationFocus CD	This is the code that identifies the focus of the observation with as much specificity as available, or as required by a template. E.g., serum potassium level, hemoglobin A1c level, smoking status.
observationMethod CD [0..1]	The approach used to make the observation. E.g., direct measurement, indirect calculation, Enzyme-Linked Immunosorbent Assay.
targetBodySite BodySite [0..1]	The body site where the observation is being made. E.g., left lung.

Attribute	Notes
interpretation CD [0..*]	Explanation of the results (e.g., fracture seen on x-ray), including an indication of the deviation of the result value from the reference range for the observation (e.g., high, low, within normal limits).
observationEventTime IVL_TS [0..1]	Time for the completion of the observation, including the interpretation.

7.1.1.47 ObservationResult

Type: **Class** **ObservationBase**
Package: vmr

The findings from an observation.

Attributes

Attribute	Notes
observationValue Value [0..1]	Actual observed results. E.g., 6.5 mg/dL, 5.7%.

7.1.1.48 Organization

Type: **Class** **Entity**
Package: vmr

An Entity representing a formalized group of persons or other organizations with a common purpose and the infrastructure to carry out that purpose. E.g., a healthcare delivery organization.

Attributes

Attribute	Notes
address AD [0..*]	The place or the name of the place where an organization is located or may be reached.
name ST [0..*]	A word or a combination of words by which an organization is known.
telecom TEL [0..*]	A locatable resource of an organization that is identified by a URI, such as a web page, a telephone number (voice, fax or some other resource mediated by telecommunication equipment), an e-mail address, or any other locatable resource that can be specified by a URL.

7.1.1.49 PCAOrder

Type: **Class** **SubstanceAdministrationOrder**
Package: vmr

Order represents a Patient Controlled Analgesic. For instance, morphine PCA, 5 mg loading dose, followed by 10 mg/hr basal rate, 1 mg demand dose, lockout interval 10 min.

Attributes

Attribute	Notes
demandDose IVL_PQ [0..1]	A dose of an analgesic given in addition to the specified basal rate; usually delivered in response to an action such as a patient pressing a button that communicates with a PCA pump
loadingDose IVL_PQ [0..1]	The initial amount of an analgesic to be administered at one time.
lockoutInterval IVL_PQ [0..1]	The amount of time that must elapse after a PCA demand dose is administered before the next PCA demand dose can be delivered. For example, 10 minutes

7.1.1.50 PCAProposal

Type: **Class** **SubstanceAdministrationProposal**
Package: vmr

Order proposal represents a Patient Controlled Analgesic. For instance, morphine PCA, 5 mg loading dose, followed by 10 mg/hr basal rate, 1 mg demand dose, lockout interval 10 min.

Attributes

Attribute	Notes
demandDose IVL_PQ [0..1]	A dose of an analgesic given in addition to the specified basal rate; usually delivered in response to an action such as a patient pressing a button that communicates with a PCA pump
loadingDose IVL_PQ [0..1]	The initial amount of an analgesic to be administered at one time.
lockoutInterval IVL_PQ [0..1]	The amount of time that must elapse after a PCA demand dose is administered before the next PCA demand dose can be delivered. For example, 10 minutes

7.1.1.51 Person

Type: **Class** **Entity**
Package: vmr

A human being.

Attributes

Attribute	Notes
address AD [0..*]	The place or the name of the place where a person is located or may be reached.
name EN [0..*]	A word or a combination of words by which a person is known.
telecom TEL [0..*]	A locatable resource of a person that is identified by a URI, such as a web page, a telephone number (voice, fax or some other resource mediated by telecommunication equipment), an e-mail address, or any other locatable resource that can be specified by a URL.

7.1.1.52 Problem

Type: **Class** **ProblemBase**
Package: vmr

An assertion regarding a clinical condition of the subject that needs to be treated or managed.

Attributes

Attribute	Notes
ageAtOnset PQ [0..1]	The subject's age when the problem began.
contributedToDeath BL [0..1]	Whether the problem contributed to the subject's death.
criticality CD [0..1]	Criticality: Applies to things about a patient - problems, observations, etc. (does not apply to actions) Characterizes impact on life, or durable impact on physiological function or on quality of life. Includes concepts such as life-threatening, or potential loss of function or capacity. E.g., Life threatening, potentially requires hospitalization, self-resolving. Different from severity in that a moderate subarachnoid hemorrhage is likely to be highly important, whereas a moderate headache is not.
priorityInEncounter CD [0..1]	Specification of whether a diagnosis is a “primary” diagnosis or a “secondary” diagnosis. The “primary” diagnosis is the main reason for an encounter (eg, hospitalization or a visit to an outpatient clinic, urgent care, ED, etc.), is the main focus of diagnosis/treatment/evaluation for that encounter, and would likely determine how the encounter is billed. A “secondary” diagnosis could be a diagnosis that may or may not relate to the primary diagnosis, may or may not have been addressed during the encounter, and likely would not impact billing. An encounter would typically have a single primary diagnosis and either zero, one, or many secondary diagnoses.
problemStatus CD [0..1]	State of the problem. E.g., active, inactive, resolved.
severity CD [0..1]	Severity: Applies to things about a patient - problems, observations, etc. (does not apply to actions) Characterizes the intensity of the manifestation of the problem or observation or an adverse event Includes concepts such as mild, moderate, severe
wasCauseOfDeath BL [0..1]	Whether the problem was the cause of the subject's death.

7.1.1.53 ProblemBase

Type: **Class** **ClinicalStatement**
Package: vmr

Abstract base class for problems, which are clinical conditions that need to be treated or managed.

Attributes

Attribute	Notes
affectedBodySite BodySite [0..*]	A body site affected by the problem (in the case of Problem) or not affected by the problem (in the case of DeniedProblem).
diagnosticEventTime IVL_TS [0..1]	The time when the evaluator identified the subject as having the condition (in the case of Problem) or as not having the condition (in the case of DeniedProblem).
problemCode CD	This is the code that identifies the problem or condition with as much specificity as available, or as required by a template. It might be an ICD9, ICD10, or SNOMED code, or whatever vocabularies are appropriate to describe the problem or condition. E.g., diabetes mellitus, congestive heart failure.
problemEffectiveTime IVL_TS [0..1]	The time that is primarily related to the subject's experience of the disease or condition, rather than when those events were reported or recorded by the evaluator.

7.1.1.54 ProcedureBase

Type: **Class** **ClinicalStatement**
Package: vmr

Abstract base class for a procedure, which is a series of steps taken on a subject to accomplish a clinical goal. Procedures include diagnostic testing, consultations, referrals, nursing procedures, making observations, and other clinical interventions excluding substance administrations.

Attributes

Attribute	Notes
approachBodySite BodySite [0..1]	The body site used for gaining access to the target body site. E.g., femoral artery for a coronary angiography.
procedureCode CD	This is the code that identifies the procedure with as much specificity as available, or as required by a template. E.g., appendectomy, coronary artery bypass graft surgery.
procedureMethod CD [0..1]	Describes the method used for the procedure and can vary depending on the procedure. For example, a surgical procedure method might be laparoscopic surgery or robotic surgery; an imaging procedure such as a chest radiograph might have methods that represent the views such as PA and lateral; a laboratory procedure like urinalysis might have a method of clean catch; a respiratory care procedure such as supplemental oxygen might have a method of nasal cannula, hood, face mask, or non-rebreather mask.
targetBodySite BodySite [0..1]	The body site where the procedure takes place. E.g., coronary blood vessels for coronary angiography.

7.1.1.55 ProcedureEvent

Type: **Class** **ProcedureBase**
Package: vmr

The actual event of performing a procedure.

Attributes

Attribute	Notes
procedureTime IVL_TS [0..1]	Time when procedure was done.

7.1.1.56 ProcedureOrder

Type: **Class** **ProcedureBase**
Package: vmr

An order for procedure to be done. Orders for making an observation (e.g., Pneumonia Severity Index, blood pressure, or PHQ-9 Depression Assessment) are also included in the scope of ProcedureOrder.

Attributes

Attribute	Notes
comment Documentation [0..*]	A comment, instruction, or note associated with the proposal. The type specifies the type of comment (e.g., 'Provider Instruction', 'Patient Instruction', 'Reason for Procedure', 'Consult Note', etc...) and the value of the comment represents the free text value.
frequency BaseFrequency [0..1]	The interval in between procedures. For instance, 'Every 8 hours', TID, BID, q8h, etc... Frequency may be represented as either a code or as an interval.
orderEventTime IVL_TS [0..1]	The time when the order was made.
originationMode CD [0..1]	The mode the order was received (such as by telephone, electronic, verbal, written). This describes 'how' the communication was done as opposed to dataSourceType which specifies the 'where' and 'from'.
prnReason CD [0..*]	Indication for the procedure such as shortness of breath; Reasons such as "SpO2 less than x%" should be addressed as a PRN Instruction rather than a PRN Reason as it is unlikely that a value set can be identified for such range of possible observations. For example, Pain, Shortness of Breath, Insomnia, Nausea.
procedureTime IVL_TS [0..1]	Ordered time for procedure. If RepeatUntilCount.count >= 2, then specifies period within which the procedures should take place. In these cases, it is assumed that the procedures should be evenly distributed within the timeframe. E.g., if ordered time is 1/1/2011 to 12/31/2011, and RepeatUntilCount.count is 3, ideal procedure times would be 1/1/2011, 12/31/2011, and in the middle of the year.
reason CD [0..1]	An indication, purpose or reason for why this action is being proposed.
urgency CD [0..1]	Urgency: Applies to actions - orders or proposals (does not apply to problems, observations) Characterizes how quickly an action must be initiated Includes concepts such as stat, urgent, routine

7.1.1.57 ProcedureProposal

Type: **Class** **ProcedureBase**
Package: vmr

Proposals for a procedure to take place, e.g., generated by a CDS system or by a consulting clinician. Proposals for making an observation (e.g., Pneumonia Severity Index, blood pressure, or PHQ-9 Depression Assessment) are also included in the scope of ProcedureProposal.

Attributes

Attribute	Notes
comment Documentation [0..*]	A comment, instruction, or note associated with the proposal. The type specifies the type of comment (e.g., 'Provider Instruction', 'Patient Instruction', 'Reason for Procedure', 'Consult Note', etc...) and the value of the comment represents the free text value.
frequency BaseFrequency [0..1]	The interval in between procedures. For instance, 'Every 8 hours', TID, BID, q8h, etc... Frequency may be represented as either a code or as an interval.
prnReason CD [0..*]	Indication for the proposed procedure such as shortness of breath; Reasons such as "SpO2 less than x%" should be addressed as a PRN Instruction rather than a PRN Reason as it is unlikely that a value set can be identified for such range of possible observations. For example, Pain, Shortness of Breath, Insomnia, Nausea.
proposedProcedureTime IVL_TS [0..1]	Requested time for procedure. If RepeatUntilCount.count >= 2, then specifies requested period within which the procedures should take place. In these cases, it is assumed that the procedures should be evenly distributed within the timeframe. E.g., if requested time is 1/1/2011 to 12/31/2011, and RepeatUntilCount.count is 3, ideal procedure times would be 1/1/2011, 12/31/2011, and in the middle of the year.
reason CD [0..1]	An indication, purpose or reason for why this action is being proposed.
urgency CD [0..1]	Urgency: Applies to actions - orders or proposals (does not apply to problems, observations) Characterizes how quickly an action must be initiated Includes concepts such as stat, urgent, routine

7.1.1.58 RelatedClinicalStatement

Type: **Class** **RelationshipDescriptorBase**
Package: vmr

The container for a relationship between a source and a target Clinical Statement.

7.1.1.59 RelatedEntity

Type: **Class** **RelationshipDescriptorBase**
Package: vmr

A class that specifies the nature of the relationship between a *source* and *target* entity.

7.1.1.60 RelatedEvaluatedPerson

Type: **Class** **RelationshipDescriptorBase**
Package: vmr

Person who has a clinical relationship to the patient and whose clinical data is relevant to that patient. This can include a relative, or sexual partner, etc...

Notes to implementers: Do not use RelatedEntity to describe persons related to the patient. Use this related person instead.

7.1.1.61 RelationshipDescriptorBase

Type: **Class**
Package: vmr

The relationship between one class and another.

Attributes

Attribute	Notes
templateId CodedIdentifier [0..*]	The identifier of a set of constraints placed on a relationship. If there are multiple templates specified for the element, then the element must satisfy ALL constraints defined in ANY template at that level.
relationshipTimeInterval IVL_TS [0..1]	The timeframe in which the relationship existed. E.g., timeframe when a Person served as the primary care provider for an EvaluatedPerson.
targetRole CD	The function or position served by the target Entity in relation to the source Entity. E.g., primary care provider, health insurance provider.

7.1.1.62 RepeatUntilCount

Type: **Class** **Repetition**
Package: vmr

The total number of times the clinical action should be performed. For instance, "CPK every 8 hours x 3" is a request for a CPK level to be obtained now and again in 8 and 16 hours for a total of 3 CPK measurements.

Attributes

Attribute	Notes
count INT	The total number of times the clinical action should be performed.

7.1.1.63 RepeatUntilTime

Type: **Class** **Repetition**
Package: vmr

The action should be repeated until the specified time. For instance, do X every 4 hours until Thursday at noon.

Attributes

Attribute	Notes
time TS	The action should be repeated until the specified time.

7.1.1.64 Repetition

Type: **Class** **ExtendedVmrTypeBase**
Package: vmr

Specification of the endpoint of a repetitive action. Must be extended by either RepeatUntilCount or RepeatUntilTime.

7.1.1.65 RespiratoryCareOrder

Type: **Class** **ProcedureOrder**
Package: vmr

Orders that encompass supplemental oxygen (eg, nasal cannula, face mask), BiPAP/CPAP, and mechanical ventilation. While these are vastly different respiratory care concepts, the associated data elements can be constrained through templates.

Attributes

Attribute	Notes
ePAP IVL_PQ [0..1]	Expiratory positive airway pressure, often expressed in cmH20 in the United States. Example: 5 cmH2O
fiO2 IVL_PQ [0..1]	Fraction of inspired oxygen, expressed as a percentage. For example, 100%.
inspiratoryTime IVL_PQ [0..1]	Specification of the duration of the positive airway pressume applied by a mechanical ventilator. For example, 1 second.
iPAP IVL_PQ [0..1]	Inspiratory positive airway pressure, often expressed in cmH20 in the United States. For example, 10 cmH2O
isolationCode CD [0..1]	Describes the kinds of precautions that should be taken for the patient. Values include: Airborne Precautions, Contact Precautions, Droplet Precautions, Standard Precautions, Neutropenic (Reverse) Precautions
oxygenFlowRate IVL_PQ [0..1]	The rate at which oxygen is administered to the patient; generally in liters per minute
peakFlowRate IVL_PQ [0..1]	Specification of the maximum allowable rate of airflow delivered by a mechanical ventilator. For example, 60 L/min.
peakInspiratoryPressure IVL_PQ [0..1]	Specification of the maximum airway pressure allowed to be delivered by the ventilator in order to prevent barotrauma, applies to volume-controlled ventilation modes. For example, 35 cmH2O.
pEEP IVL_PQ [0..1]	Positive end expiratory pressure, the alveolar pressure above atmospheric pressure that exists at the end of expiration, often expressed in cmH20 in the United States. For example, 5 cmH2O.
pressureSupport IVL_PQ [0..1]	Specification of the additional amount of pressure that is added to a mechanical ventilation mode, often CPAP mode. Not to be confused with pressure control ventilation mode. For example, 500 mL
respiratoryRate IVL_PQ [0..1]	Number of machine-delivered breaths per minute, in the context of mechanical ventilation, expressed as breaths/minute. For example, 14 breaths/minute.
spO2Range IVL_PQ [0..1]	Target oxygen saturation, expressed as a percentage. For instance, 95-100%
spO2Titration ST [0..1]	Titration instructions to achieve target oxygen saturation. An example might include: "Titrate oxygen to maintain SpO2 > 93%"

Attribute	Notes
tidalVolume IVL_PQ [0..1]	Volume of air delivered with each machine-delivered breath, often expressed in mL in the United States. For example, 500 mL.
ventilatorMode CD [0..1]	Primary setting on a mechanical ventilator that specifies how machine breaths will be delivered to a patient. Examples:Assist Control (AC), Synchronized Intermittent Mandatory Ventilation (SIMV), Pressure Support Ventilation (PS or PSV), Pressure-Regulated Volume Control (PRVC)

7.1.1.66 RespiratoryCareProposal

Type: **Class** **ProcedureProposal**
Package: vmr

Order proposals that encompass supplemental oxygen (eg, nasal cannula, face mask), BiPAP/CPAP, and mechanical ventilation. While these are vastly different respiratory care concepts, the associated data elements can be constrained through templates.

Attributes

Attribute	Notes
ePAP IVL_PQ [0..1]	Expiratory positive airway pressure, often expressed in cmH20 in the United States. Example: 5 cmH2O
fiO2 IVL_PQ [0..1]	Fraction of inspired oxygen, expressed as a percentage. For example, 100%.
inspiratoryTime IVL_PQ [0..1]	Specification of the duration of the positive airway pressume applied by a mechanical ventilator. For example, 1 second.
iPAP IVL_PQ [0..1]	Inspiratory positive airway pressure, often expressed in cmH20 in the United States. For example, 10 cmH2O
isolationCode CD [0..1]	Describes the kinds of precautions that should be taken for the patient. Values include: Airborne Precautions, Contact Precautions, Droplet Precautions, Standard Precautions, Neutropenic (Reverse) Precautions
oxygenFlowRate IVL_PQ [0..1]	The rate at which oxygen is administered to the patient; generally in liters per minute
peakFlowRate IVL_PQ [0..1]	Specification of the maximum allowable rate of airflow delivered by a mechanical ventilator. For example, 60 L/min.
peakInspiratoryPressure IVL_PQ [0..1]	Specification of the maximum airway pressure allowed to be delivered by the ventilator in order to prevent barotrauma, applies to volume-controlled ventilation modes. For example, 35 cmH2O.
pEEP IVL_PQ [0..1]	Positive end expiratory pressure, the alveolar pressure above atmospheric pressure that exists at the end of expiration, often expressed in cmH20 in the United States. For example, 5 cmH2O.
pressureSupport IVL_PQ [0..1]	Specification of the additional amount of pressure that is added to a mechanical ventilation mode, often CPAP mode. Not to be confused with pressure control ventilation mode. For example, 500 mL
respiratoryRate IVL_PQ [0..1]	Number of machine-delivered breaths per minute, in the context of mechanical ventilation, expressed as breaths/minute. For example, 14 breaths/minute.
spO2Range IVL_PQ [0..1]	Target oxygen saturation, expressed as a percentage. For instance, 95-100%
spO2Titration ST [0..1]	Titration instructions to achieve target oxygen saturation. An example might include: "Titrate oxygen to maintain SpO2 > 93%"

Attribute	Notes
tidalVolume IVL_PQ [0..1]	Volume of air delivered with each machine-delivered breath, often expressed in mL in the United States. For example, 500 mL.
ventilatorMode CD [0..1]	Primary setting on a mechanical ventilator that specifies how machine breaths will be delivered to a patient. Examples:Assist Control (AC), Synchronized Intermittent Mandatory Ventilation (SIMV), Pressure Support Ventilation (PS or PSV), Pressure-Regulated Volume Control (PRVC)

7.1.1.67 ScheduledAppointment

Type: **Class** **EncounterBase**
Package: vmr

A clinical appointment that has been scheduled. If rescheduled, the appointmentTime may change.

Attributes

Attribute	Notes
appointmentTime IVL_TS [0..1]	The time of the scheduled appointment.

7.1.1.68 ScheduledProcedure

Type: **Class** **ProcedureBase**
Package: vmr

A procedure that has been scheduled to take place.

Attributes

Attribute	Notes
procedureTime IVL_TS [0..1]	The time of the scheduled procedure.

7.1.1.69 Specimen

Type: **Class** **Entity**
Package: vmr

A sample of tissue, blood, urine, water, air, etc., taken for the purposes of diagnostic examination or evaluation.

Attributes

Attribute	Notes
source CD [0..1]	The specimen source. E.g., sputum, urine, blood, stool

7.1.1.70 SubstanceAdministrationBase

Type: **Class** **ClinicalStatement**
Package: vmr

Abstract base class for giving a material of a particular constitution to a person to enable a clinical effect.

Attributes

Attribute	Notes
approachBodySite BodySite [0..1]	The body site used for gaining access to the target body site for the purposes of the substance administration.
deliveryMethod CD [0..1]	Methodology used to administer the substance. E.g., gastric feeding tube, gastrostomy, drip
deliveryRate IVL_PQ [0..1]	Rate of substance administration. E.g., 1000 mL/hr.
deliveryRoute CD [0..1]	The physical route through which the substance is administered. E.g., IV, PO.
doseQuantity IVL_PQ [0..1]	The amount of substance. E.g., 1 tab, 325 mg, 1-2 tabs.
doseType CD [0..1]	The type of dose. E.g., initial, maintenance, loading.
frequency BaseFrequency [0..1]	The interval in between substance administrations. For instance, 'Every 8 hours', TID, BID, q8h, etc... Frequency may be represented as either a code or as an interval.
substance AdministrableSubstance	A material of a particular constitution that can be given to a person to enable a clinical effect.
substanceAdministrationGeneralPurpose CD [0..1]	The general purpose for the substance administration. E.g., medication, immunization.
targetBodySite BodySite [0..1]	The body site where the substance is delivered.

7.1.1.71 SubstanceAdministrationEvent

Type: **Class** **SubstanceAdministrationBase**
Package: vmr

The actual administration of the substance.

Handling of entries in "current medication list" with no other data than current medications could be as follows:
- SubstanceAdministrationEvent with documentationTime = time when snapshot was taken of current medication list, administrationEventTime = null if no data provided on when medication was started or stopped, administrationTime with specified Low but null High if data only provided on when medication was started.

To specify "patient takes an unknown drug", use a code for substance that represents "unknown medication".

Attributes

Attribute	Notes
administrationTimeInterval IVL_TS [0..1]	The time when the substance is administered. An unspecified high time interval signifies that the administration is ongoing. Left optional to allow use for a medication list that does not have this data.

Attribute	Notes
documentationTime IVL_TS [0..1]	The time when the substance administration is documented.
doseNumber INT [0..1]	Identifies which dose this substance administration represents within a series of doses. Most commonly used for immunizations.
informationAttestationType CD [0..1]	How the substance administration was claimed or verified. E.g., patient-reported, observed by care provider, performed by care provider. Can be used as a gauge of reliability, or when verified substance administration (e.g., for tuberculosis treatment) is required.
isValid BL [0..1]	Primarily designed to support analysis of previous immunizations.

7.1.1.72 SubstanceAdministrationOrder

Type: **Class** **SubstanceAdministrationBase**
Package: vmr

A clinical order for a substance administration. Includes medication prescriptions.

Attributes

Attribute	Notes
administrationTimeInterval IVL_TS [0..1]	Ordered time for administering the substance.
comment Documentation [0..*]	A comment, instruction, or note associated with the proposal. The type specifies the type of comment (e.g., 'Provider Instruction', 'Patient Instruction', 'Reason for Procedure', 'Consult Note', etc...) and the value of the comment represents the free text value.
doseRestriction DoseRestriction [0..1]	Specifies the maximum dose that can be given in a specified time interval.
infuseOver PQ [0..1]	Represents the actual time the medication is infused. Note the difference between infuseOver and duration. An orderable may call for infusing a patient TID for an hour each time over a duration of 5 days.
numberFillsAllowed INT [0..1]	The number of fills allowed. Must be 1 or greater.
orderEventTime IVL_TS [0..1]	Time when order was made.
originationMode CD [0..1]	The mode the order was received (such as by telephone, electronic, verbal, written). This describes 'how' the communication was done as opposed to dataSourceType which specifies the 'where' and 'from'.
prnReason CodeableConcept [0..*]	Indication for the proposed procedure such as shortness of breath; Reasons such as "SpO2 less than x%" should be addressed as a PRN Instruction rather than a PRN Reason as it is unlikely that a value set can be identified for such range of possible observations. For example, Pain, Shortness of Breath, Insomnia, Nausea.
urgency CD [0..1]	Urgency: Applies to actions - orders or proposals (does not apply to problems, observations) Characterizes how quickly an action must be initiated Includes concepts such as stat, urgent, routine
validAdministrationTimeInterval IVL_TS [0..1]	Acceptable time for administering the substance. Distinct from proposedAdministrationTimeInterval that this time includes acceptable but suboptimal administration times. This is an important aspect of immunizations, which have recommended and acceptable/valid timeframes for administration that can differ.

7.1.1.73 SubstanceAdministrationProposal

Type: **Class** **SubstanceAdministrationBase**
Package: vmr

Proposal for a substance administration. Used, for example, when a CDS system proposes that a medication or vaccination be given.

Attributes

Attribute	Notes
comment Documentation [0..*]	A comment, instruction, or note associated with the proposal. The type specifies the type of comment (e.g., 'Provider Instruction', 'Patient Instruction', 'Reason for Procedure', 'Consult Note', etc...) and the value of the comment represents the free text value.
doseRestriction DoseRestriction [0..1]	Specifies the maximum dose that can be given in a specified time interval.
infuseOver PQ [0..1]	Represents the actual time the medication is infused. Note the difference between infuseOver and duration. An orderable may call for infusing a patient TID for an hour each time over a duration of 5 days.
numberFillsAllowed INT [0..1]	The number of fills allowed. Must be 1 or greater.
prnReason CodeableConcept [0..*]	Indication for the proposed procedure such as shortness of breath; Reasons such as "SpO2 less than x%" should be addressed as a PRN Instruction rather than a PRN Reason as it is unlikely that a value set can be identified for such range of possible observations. For example, Pain, Shortness of Breath, Insomnia, Nausea.
proposedAdministrationTimeInterval IVL_TS [0..1]	Proposed time for administering the substance.
urgency CD [0..1]	Urgency: Applies to actions - orders or proposals (does not apply to problems, observations) Characterizes how quickly an action must be initiated Includes concepts such as stat, urgent, routine
validAdministrationTimeInterval IVL_TS [0..1]	Acceptable time for administering the substance. Distinct from proposedAdministrationTimeInterval that this time includes acceptable but suboptimal administration times. This is an important aspect of immunizations, which have recommended and acceptable/valid timeframes for administration that can differ.

7.1.1.74 SubstanceDispensationEvent

Type: **Class** **SubstanceAdministrationBase**
Package: vmr

This is the Event of a pharmacy filling a prescription.

Attributes

Attribute	Notes
daysSupply INT [0..1]	The number of days this dispensation should last.

Attribute	Notes
dispensationQuantity PQ [0..1]	The amount of substance provided.
dispensationTime IVL_TS [0..1]	Time when substance was dispensed.
doseRestriction DoseRestriction [0..1]	Specifies the maximum dose that can be given in a specified time interval.
fillNumber INT [0..1]	The current fill number. 1 if it is the first fill on this prescription, 2 if it is the second, etc. Must be 1 or greater.
fillsRemaining INT [0..1]	The number of fills remaining on prescription.

7.1.1.75 SubstanceDispensationOrder

Type: **Class** **SubstanceAdministrationBase**
Package: vmr

A clinical order for a substance dispensation. That is the substance is to be dispensed but not administered.

Attributes

Attribute	Notes
comment Documentation [0..*]	A comment, instruction, or note associated with the proposal. The type specifies the type of comment (e.g., 'Provider Instruction', 'Patient Instruction', 'Reason for Procedure', 'Consult Note', etc...) and the value of the comment represents the free text value.
orderEventTime IVL_TS [0..1]	Time when order was made.
dispensationQuantity PQ [0..1]	The amount of substance provided.
originationMode CD [0..1]	The mode the order was received (such as by telephone, electronic, verbal, written). This describes 'how' the communication was done as opposed to dataSourceType which specifies the 'where' and 'from'.
reason CD [0..1]	An indication, purpose or reason for why this action is being proposed.
urgency CD [0..1]	Urgency of the substance administration. Coding system values indicating the urgency of a requested or proposed observation (e.g., please give Vitamin K STAT).

7.1.1.76 SubstanceDispensationProposal

Type: **Class** **SubstanceAdministrationBase**
Package: vmr

Specifies that a substance needs to be dispensed but not administered to a patient (eg, “naloxone at bedside”).

Constrain all attributes out from SubstanceAdministrationBase except substance.

Attributes

Attribute	Notes
comment Documentation [0..*]	A comment, instruction, or note associated with the proposal. The type specifies the type of comment (e.g., 'Provider Instruction', 'Patient Instruction', 'Reason for Procedure', 'Consult Note', etc...) and the value of the comment represents the free text value.
dispensationQuantity PQ [0..1]	The amount of substance to be provided.
proposedDispensationTime IVL_TS [0..1]	Proposed time for dispensing the substance.
reason CD [0..1]	An indication, purpose or reason for why this action is being proposed.
urgency CD [0..1]	Urgency of the substance administration. Coding system values indicating the urgency of a requested or proposed observation (e.g., please give Vitamin K STAT).

7.1.1.77 SupplyBase

Type: **Class** **ClinicalStatement**
Package: vmr

Abstract base class for the provision of some clinical material or equipment to the subject, such as a wheelchair.

Attributes

Attribute	Notes
quantity PQ [0..1]	Amount of material described by the supplyCode.
supplyCode CD	This is the code that identifies the material supplied with as much specificity as available, or as required by a template. E.g., wheelchair, bandages.
targetBodySite BodySite [0..1]	Body site where supply is to be used.

7.1.1.78 SupplyEvent

Type: **Class** **SupplyBase**
Package: vmr

The provision of some clinical material or equipment to the subject, such as a wheelchair.

Attributes

Attribute	Notes
supplyTime IVL_TS [0..1]	When the supply was delivered.

7.1.1.79 SupplyOrder

Type: **Class** **SupplyBase**
Package: vmr

A provider's order to deliver the supply.

Attributes

Attribute	Notes
comment Documentation [0..*]	A comment, instruction, or note associated with the proposal. The type specifies the type of comment (e.g., 'Provider Instruction', 'Patient Instruction', 'Reason for Procedure', 'Consult Note', etc...) and the value of the comment represents the free text value.
frequency BaseFrequency [0..1]	The interval in between supply orders. For instance, 'Every 8 hours', TID, BID, q8h, etc... Frequency may be represented as either a code or as an interval.
orderEventTime IVL_TS [0..1]	The time when the supply was ordered.
originationMode CD [0..1]	The mode the order was received (such as by telephone, electronic, verbal, written). This describes 'how' the communication was done as opposed to dataSourceType which specifies the 'where' and 'from'.
supplyTime IVL_TS [0..1]	Ordered time for supply. If RepeatUntilCount.count >= 2, then specifies period within which the supplies should take place. In these cases, it is assumed that the supplies should be evenly distributed within the timeframe. E.g., if ordered time is 1/1/2011 to 12/31/2011, and RepeatUntilCount.count is 3, ideal supply times would be 1/1/2011, 12/31/2011, and in the middle of the year.
urgency CD [0..1]	Urgency: Applies to actions - orders or proposals (does not apply to problems, observations) Characterizes how quickly an action must be initiated Includes concepts such as stat, urgent, routine

7.1.1.80 SupplyProposal

Type: **Class** **SupplyBase**
Package: vmr

Proposal, e.g., by a CDS system, for a Supply to be delivered.

Attributes

Attribute	Notes
comment Documentation [0..*]	A comment, instruction, or note associated with the proposal. The type specifies the type of comment (e.g., 'Provider Instruction', 'Patient Instruction', 'Reason for Procedure', 'Consult Note', etc...) and the value of the comment represents the free text value.
frequency BaseFrequency [0..1]	The interval in between supply orders. For instance, 'Every 8 hours', TID, BID, q8h, etc... Frequency may be represented as either a code or as an interval.

Attribute	Notes
proposedSupplyTime IVL_TS [0..1]	Requested time for supply. If RepeatUntilCount.count >= 2, then specifies requested period within which the supplies should take place. In these cases, it is assumed that the supplies should be evenly distributed within the timeframe. E.g., if requested time is 1/1/2011 to 12/31/2011, and RepeatUntilCount.count is 3, ideal supply times would be 1/1/2011, 12/31/2011, and in the middle of the year.
urgency CD [0..1]	Urgency: Applies to actions - orders or proposals (does not apply to problems, observations) Characterizes how quickly an action must be initiated Includes concepts such as stat, urgent, routine

7.1.1.81 UndeliveredProcedure

Type: **Class** **ProcedureBase**
Package: vmr

Documentation that a procedure was not delivered. E.g., documentation that a surgery was not performed because the patient refused.

Attributes

Attribute	Notes
documentationTime IVL_TS [0..1]	Time when the non-delivery of the procedure was documented.
reason CD [0..1]	The reason the procedure was not performed. E.g., patient refused, inadequate time.
subjectEffectiveTime IVL_TS [0..1]	Time when procedure might have been done, but was not. Optional, as may simply want to note that a procedure was never done.

7.1.1.82 UndeliveredSubstanceAdministration

Type: **Class** **SubstanceAdministrationBase**
Package: vmr

Documents the non-delivery of a substance. E.g., documents that an influenza immunization was not given because the patient refused or had an adverse reaction to a previous flu vaccine.

Attributes

Attribute	Notes
documentationTime IVL_TS [0..1]	Time when the non-delivery of the substance was documented.
reason CD [0..1]	Reason why the substance was not administered.
subjectEffectiveTime IVL_TS [0..1]	Time interval when subject did not receive substance. Optional, as may simply want to note that a particular substance was never administered.

7.1.1.83 UndeliveredSupply

Type: **Class** **SupplyBase**
Package: vmr

Documentation that the indicated material was not provided to the subject.

Attributes

Attribute	Notes
documentationTime IVL_TS [0..1]	Time when the non-delivery of the supply was documented.
reason CD [0..1]	The reason the supply was not provided. E.g., patient refused, inadequate time.
subjectEffectiveTime IVL_TS [0..1]	Time when the supply should have been delivered, but was not. Optional, as may simply want to note that a supply was never done.

7.1.1.84 VMR

Type: **Class**
Package: vmr

A virtual medical record (vMR) contains data about a patient relevant for CDS, either with regard to the data used for generating inferences (input) or the conclusions reached as a result of analyzing the data (output). A vMR may contain, for example, problems and medications or CDS-generated assessments and recommended actions. Note that CDS-generated assessments and recommended actions would typically be considered a CDS output but could also be used as a CDS input as well (e.g., prior CDS system recommendations could influence current CDS system recommendations).

This model does allow for the presence of data belonging to related persons (such as in the case of family history, or public health infectious disease cases) for a single patient. These related persons are modeled as EvaluatedPersons who have associated ClinicalStatements. Note that this model is not designed to be a data model for providing CDS for a large population.

Note that enumerations and value domains are anticipated to be specified in profiles in additional ballots.

Attributes

Attribute	Notes
templateId CodedIdentifier [0..*]	The identifier of a set of constraints placed on a vMR. If there are multiple templates specified for the element, then the element must satisfy ALL constraints defined in ANY template at that level.

7.1.1.85 Value

Type: **Class** **ExtendedVmrTypeBase**
Package: vmr

Class that represents a generic value which may be of any type deriving from ANY.

Attributes

Attribute	Notes
value ANY	The value of the attribute.

7.1.1.86 extendedvMRTypes

Type: **UMLDiagram**
Package: vmr

7.1.2 dataTypes

Type: **Package «XSDschema»**
Package: modelParent

Specifies data types used. The data types are a simplified/constrained version of the HL7 version 3 datatypes specification, release 2, which is itself based on the implementable specification of ISO 21090 data types.

dataTypes - *(Class diagram)*

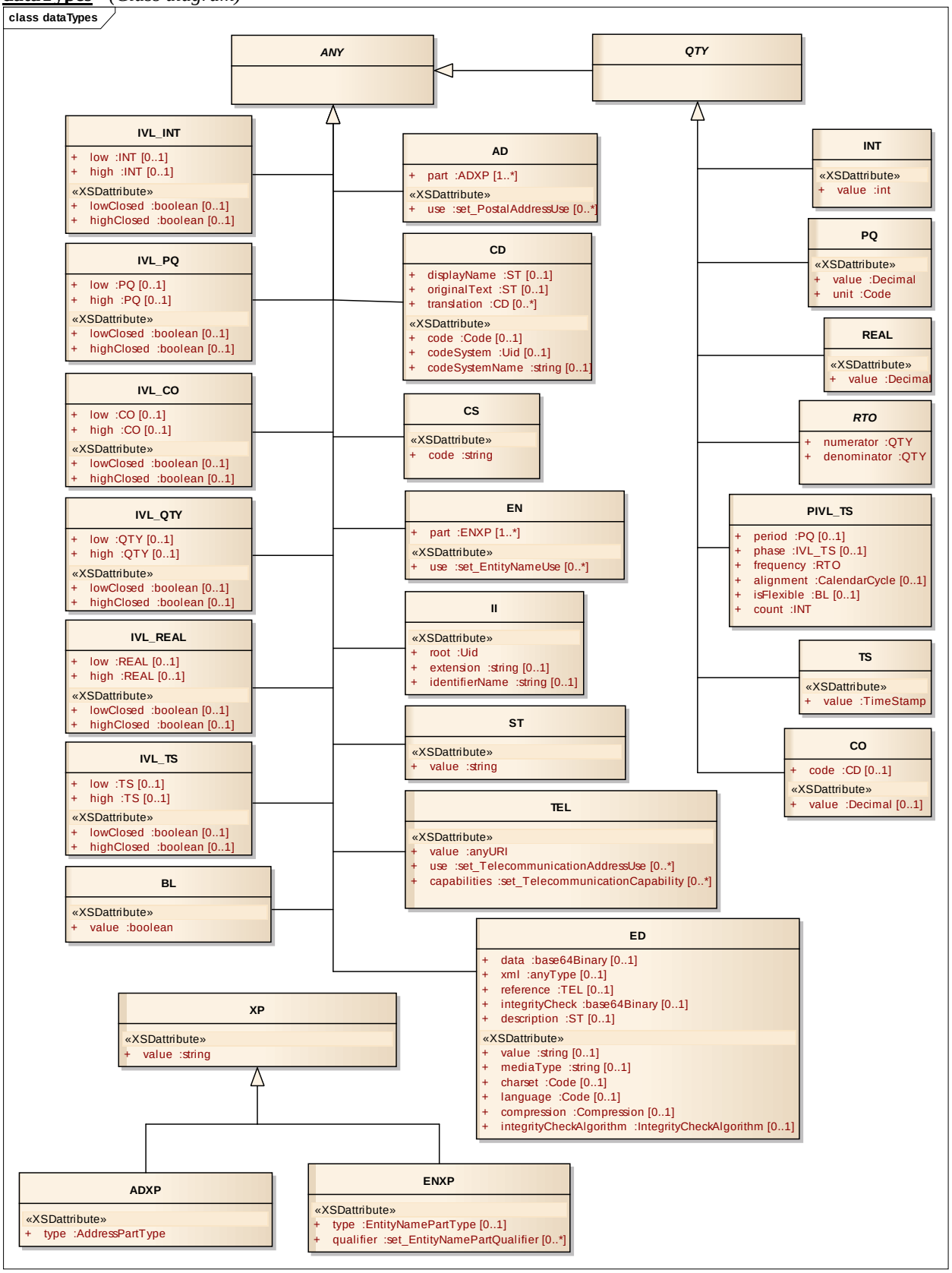

Figure: 15

simpleTypesAndEnums - *(Class diagram)*

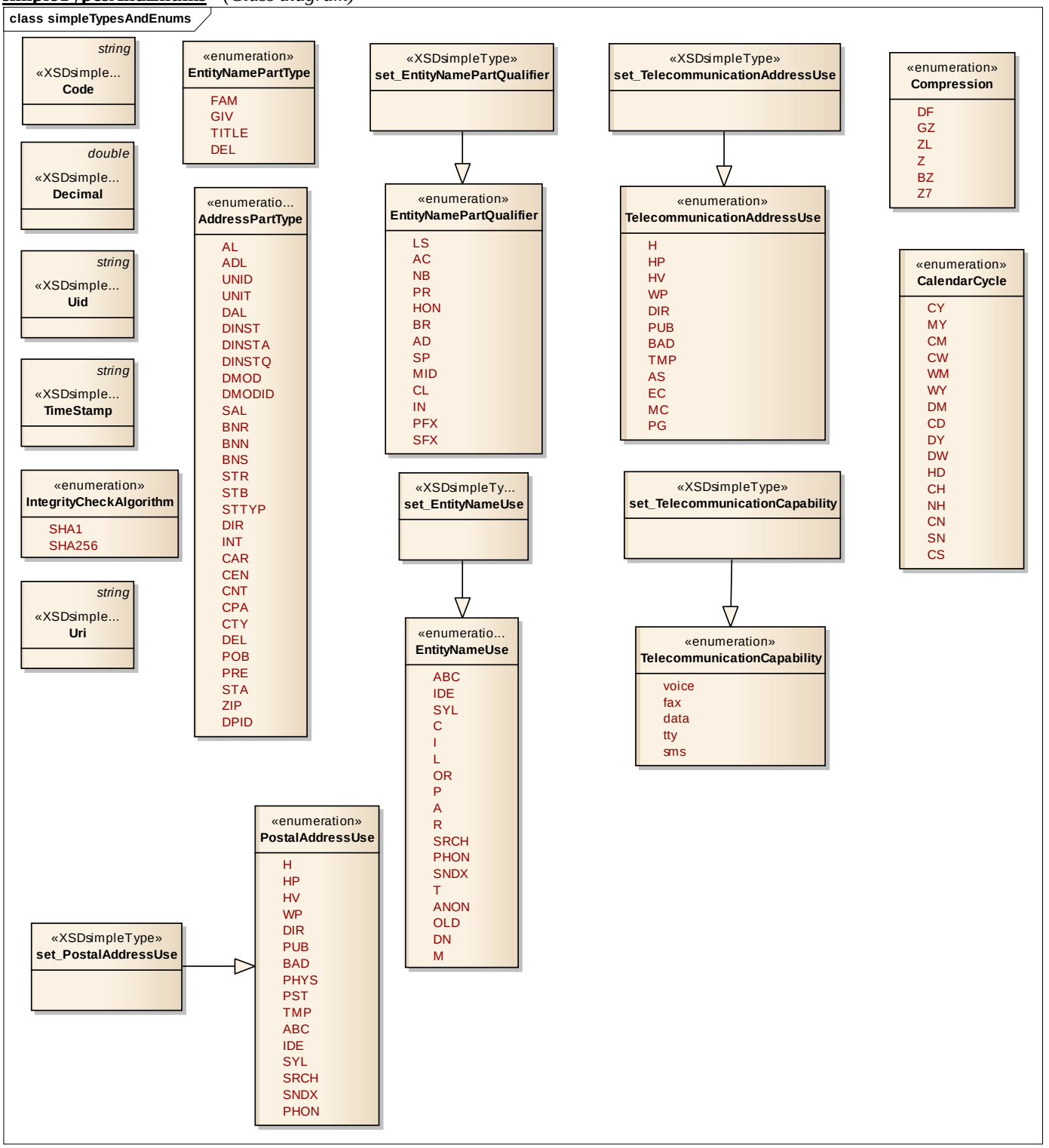

Figure: 16

7.1.2.1 AD

Type: **Class** **ANY**
Package: dataTypes

Mailing and home or office addresses.

AD is primarily used to communicate data that will allow printing mail labels, or that will allow a person to physically visit that address. The postal address datatype is not supposed to be a container for additional information that might be useful for finding geographic locations (e.g., GPS coordinates) or for performing epidemiological studies. Such additional information should be captured by other, more appropriate data structures.

Addresses are essentially sequences of address parts, but add a "use" code and a valid time range for information about if and when the address can be used for a given purpose.

Attributes

Attribute	Notes
use set_PostalAddressUse [0..*]	A set of codes advising a system or user which address in a set of like addresses to select for a given purpose. An address without specific use code might be a default address useful for any purpose, but an address with a specific use code would be preferred for that respective purpose. If populated, the values contained in this attribute SHALL be taken from the HL7 PostalAddressUse code system.
part ADXP [1..*]	A sequence of address parts, such as street or post office Box, city, postal code, country, etc.

7.1.2.2 ADXP

Type: **Class** **XP**
Package: dataTypes

A part with a type-tag signifying its role in the address. Typical parts that exist in about every address are street, house number, or post box, postal code, city, country but other roles may be defined regionally, nationally, or on an enterprise level (e.g. in military addresses).

Attributes

Attribute	Notes
type AddressPartType	Whether an address part names the street, city, country, postal code, post box, address line 1, etc. The value of this attribute SHALL be taken from the HL7 AddressPartType code system.

7.1.2.3 ANY

Type: **Class**
Package: dataTypes

Defines the basic properties of every data value. This is conceptually an abstract type, meaning that no proper value can be just a data value without belonging to any concrete type. Every public concrete type is a specialization of this general abstract DataValue type.

This class is maintained despite the lack of attributes to maintain compatibility with the ISO 21090 data structure.

7.1.2.4 AddressPartType

Type: **Enumeration**
Package: dataTypes

Specifies whether an address part names the street, city, country, postal code, post box, etc. If the type is NULL the address part is unclassified.

Concept Domain AddressPartType. ValueSet OID: 2.16.840.1.113883.11.10642. CodeSystem "AddressPartType", OID: 2.16.840.1.113883.5.16, Owner: HL7

Attributes

Attribute	Notes
AL	Address Line: An address line is for either an additional locator, a delivery address or a street address. An address generally has only a delivery address line or a street address line, but not both.
ADL	Additional Locator: This can be a unit designator, such as apartment number, suite number, or floor. There may be several unit designators in an address (e.g., "3rd floor, Appt. 342".) This can also be a designator pointing away from the location (e.g. Across the street from).
UNID	Unit Identifier: The number or name of a specific unit contained within a building or complex, as assigned by that building or complex.
UNIT	Unit Designator: Indicates the type of specific unit contained within a building or complex. E.g. Appartment, Floor
DAL	Delivery Address Line: A delivery address line is frequently used instead of breaking out delivery mode, delivery installation, etc. An address generally has only a delivery address line or a street address line, but not both.
DINST	Delivery Installation Type: Indicates the type of delivery installation (the facility to which the mail will be delivered prior to final shipping via the delivery mode.) Example: post office, letter carrier depot, community mail center, station, etc.
DINSTA	Delivery Installation Area: The location of the delivery installation, usually a town or city, and is only required if the area is different from the municipality. Area to which mail delivery service is provided from any postal facility or service such as an individual letter carrier, rural route, or postal route.
DINSTQ	Delivery Installation Qualifier: A number, letter or name identifying a delivery installation. E.g., for Station A, the delivery installation qualifier would be 'A'.

Attribute	Notes
DMOD	Delivery Mode: Indicates the type of service offered, method of delivery. For example: post office box, rural route, general delivery, etc.
DMODID	Delivery Mode Identifier: Represents the routing information such as a letter carrier route number. It is the identifying number of the designator (the box number or rural route number).
SAL	Street Address Line: A street address line is frequently used instead of breaking out build number, street name, street type, etc. An address generally has only a delivery address line or a street address line, but not both.
BNR	Building Number: The number of a building, house or lot alongside the street. Also known as "primary street number". This does not number the street but rather the building.
BNN	Building Number Numeric: The numeric portion of a building number
BNS	Building Number Suffix: Any alphabetic character, fraction or other text that may appear after the numeric portion of a building number
STR	Street Name: The name of the street, including the type
STB	Street Name Base: The base name of a roadway or artery recognized by a municipality (excluding street type and direction)
STTYP	Street Type: The designation given to the street. (e.g. Street, Avenue, Crescent, etc.)
DIR	Direction (e.g., N, S, W, E)
INT	Intersection: An intersection denotes that the actual address is located at or close to the intersection of two or more streets
CAR	Care Of: The name of the party who will take receipt at the specified address, and will take on responsibility for ensuring delivery to the target recipient
CEN	Census Tract: A geographic sub-unit delineated for demographic purposes.
CNT	Country
CPA	County or Parish: A sub-unit of a state or province. (49 of the United States of America use the term "county;" Louisiana uses the term "parish".)
CTY	Municipality: The name of the city, town, village, or other community or delivery center
DEL	Delimiter: Delimiters are printed without framing white space. If no value component is provided, the delimiter appears as a line break.
POB	Post Box: A numbered box located in a post station.
PRE	Precinct: A subsection of a municipality
STA	State or Province: A sub-unit of a country with limited sovereignty in a federally organized country.
ZIP	Postal Code: A postal code designating a region defined by the postal service.
DPID	A value that uniquely identifies the postal address. (Often used in barcodes).

7.1.2.5 BL

Type: **Class** **ANY**
Package: dataTypes

BL stands for the values of two-valued logic. A BL value can be either true or false.

Attributes

Attribute	Notes
value boolean	The value of the BL.

7.1.2.6 CD

Type: **Class** **ANY**
Package: dataTypes

A CD is a reference to a concept defined in an external code system, terminology, or ontology.

A CD may also contain an original text or phrase that served as the basis of the coding.

Attributes

Attribute	Notes
code Code [0..1]	The plain code symbol defined by the code system, or an expression in a syntax defined by the code system which describes the concept. Code SHALL be an exact match to a plain code symbol or expression defined by the code system. If the code system defines a code or expression that includes whitespace, the code SHALL include the whitespace. An expression can only be used where the codeSystem either defines an expression syntax, or there is a generally accepted syntax for the codeSystem. A code system may be defined that only defines an expression syntax with bindings to other code Systems for the elements of the expression. It is at the discretion of the interpreting system whether to check for an expression instead of a simple code and evaluate the expression instead of treating the expression as a code. In some cases, it may be unclear or ambiguous whether the code represents a single symbol or an expression. This usually arises where the code system defines an expression language and then defines pre-coordinated concepts with symbols which match their expression, e.g. UCUM. In other cases, it is safe to treat the expression as a symbol. There is no guarantee that this is always safe: the definitions of the codeSystem should always be consulted to determine how to handle potential expressions.
codeSystem Uid [0..1]	The code system that defines the code, or if no code was found, the codeSystem in which no code was found. Code systems SHALL be referred to by a UID, which allows unambiguous reference to standard code systems and other local codesystems. Where either ISO or HL7 have assigned UID to code Systems, then these UIDs SHALL be used. Otherwise implementations SHALL use an appropriate ISO Object Identifier (OID) or UUID to construct a globally unique local coding system identifier.

Attribute	Notes
codeSystemName string [0..1]	The common name of the coding system. The code system name has no computational value. codeSystemName can never modify the meaning of codeSystem and cannot exist without codeSystem. Information Processing Entities claiming direct or indirect conformance SHALL NOT functionally rely on codeSystemName. In addition, they MAY choose not to implement codeSystemName; but SHALL NOT reject instances because codeSystemName is present. Note: The purpose of a code system name is to assist an unaided human interpreter of a code value to interpret codeSystem.
displayName ST [0..1]	A name, title, or representation for the code or expression as it exists in the code system. If populated, the displayName SHALL be a valid human readable representation of the concept as defined by the code system at the time of data entry. The displayName SHALL conform to any rules defined by the codingSystem; if the codeSystem does not define a human representation for the code or expression, then none can be provided. displayName is included both as a courtesy to an unaided human interpreter of a code value and as a documentation of the name used to display the concept to the user. The display name has no functional meaning; it SHALL never exist without a code; and it SHALL never modify the meaning of the code. A display name may not be present if the code is an expression for which no display name has been assigned or can be derived. Information Processing Entities claiming direct or indirect conformance MAY choose not to implement displayName but SHALL NOT reject instances because displayName is present. Display names SHALL not alter the meaning of the code value. Therefore, display names SHOULD NOT be presented to the user on a receiving application system without ascertaining that the display name adequately represents the concept referred to by the code value. Communication SHALL NOT simply rely on the display name. The display name's main purpose is to support implementation debugging.
originalText ST [0..1]	The text as seen and/or selected by the user who entered the data which represents the intended meaning of the user. Note: Local implementations may influence what is required to represent that original text. Original text can be used in a structured user interface to capture what the user saw as a representation of the code on the data input screen, or in a situation where the user dictates or directly enters text, it is the text entered or uttered by the user. It is valid to use the CD datatype to store only the text that the user entered or uttered. In this situation, original text will exist without a code. In a situation where the code is assigned sometime after the text was entered, originalText is the text or phrase used as the basis for assigning the code. The original text SHALL be an excerpt of the relevant information in the original sources, rather than a pointer or exact reproduction. Thus

Attribute	Notes
	the original text SHALL be represented in plain text form. In specific circumstances, when clearly descirbed the context of use, the originalText may be a reference to some other text artefact for which the resolution scope is clearly described. Values of type CD MAY have a original text despite not having a code. Any CD value with no code signifies a coding exception. In this case, originalText is a name or description of the concept that was not coded.
translation CD [0..*]	Translation of the base code / codeSystem to other codeSystems.

7.1.2.7 CO

Type: **Class** **QTY**
Package: dataTypes

Represents data where coded values are associated with a specific order.

Note: CO may be used for things that model rankings and scores, e.g. likert scales, pain, Apgar values, etc, where there is a) implied ordering, b) no implication that the distance between each value is constant, and c) the total number of values is finite. CO may also be used in the context of an ordered code system. In this case, it may not be appropriate or even possible to use the value attribute, but CO may still be used so that models that make use of such code systems may introduce model elements that involve statements about the order of the terms in a domain.

The relative order of values in a code system need not be independently obvious in the literal representation of the CO. It these circumstances, is expected that an application will look up the ordering of these values from some definition of the code system.

Some of the code systems will directly assign numerical value to the concepts that are suitable for some mathemetical operations.

Though it would generally make sense, applications SHOULD not assume that the translations of the code, if provided, will have the same ordering as the CO. Translations SHALL not be considered when the ordering of the code system is determined.

Attributes

Attribute	Notes
value Decimal [0..1]	A numerical value associated with the coded ordinal value. The value may be constrained to an integer in some contexts of use. If code is nonNull, value SHALL only be nonNull if the code system explicitly assigns a value to the concept.
code CD [0..1]	A code representing the definition of the ordinal item

7.1.2.8 CS

Type: **Class** **ANY**
Package: dataTypes

Coded data in its simplest form, where only the code is not predetermined.

The code system and code system version are implied and fixed by the context in which the CS value occurs.

Due to its highly restricted functionality, CS SHALL only be used for simple structural attributes with highly controlled and stable terminologies where:
- all codes come from a single code system
- codes are not reused if their concept is deprecated
- the publication and extensibility properties of the code system are well described and understood

Attributes

Attribute	Notes
code string	The plain code symbol defined by the code system. If the code value is empty or null, then there is no code in the code system that represents the concept. Code SHALL only contain characters that are either a letter, a digit, or one of '.', '-', '_' or ':'. Code systems that are used with CS SHALL NOT define code symbols or expression syntaxes that contain whitespace or any other characters not in this list.

7.1.2.9 CalendarCycle

Type: **Enumeration**
Package: dataTypes

Attributes

Attribute	Notes
CY	year
MY	month of the year
CM	month (continuous)
CW	week (continuous)
WM	week of the month
WY	week of the year
DM	day of the month
CD	day (continuous)
DY	day of the year

Attribute	Notes
DW	day of the week (begins with monday)
HD	hour of the day
CH	hour (continuous)
NH	minute of the hour
CN	minute (continuous)
SN	second of the minute
CS	second (continuous)

7.1.2.10 Code

Type: **Class** **string**
Package: dataTypes

A code representing the string data. For example, the string data may be a user-message out of a message-catalog where the code represents the identifier of the message in the message catalog.

7.1.2.11 Compression

Type: **Enumeration**
Package: dataTypes

The compression algorithm, specified in the HL7 CompressionAlgorithm code system.

Attributes

Attribute	Notes
DF	Deflate : The deflate compressed data format as specified in IETF RFC 1951.
GZ	GZIP : A compressed data format that is compatible with the widely used GZIP utility as specified in IETF RFC 1952(uses the deflate algorithm).
ZL	ZLIB : A compressed data format that also uses the deflate algorithm. Specified as IETF RFC 1950.
Z	Compress : Original UNIX compress algorithm and file format using the LZC algorithm (a variant of LZW). Patent encumbered and less efficient than deflate.
BZ	BZIP : bzip-2 compression format. See [http://www.bzip.org/] for more information.
Z7	Z7 : 7z compression file format. See [http://www.7-zip.org/7z.html] for more information.

7.1.2.12 Decimal

Type: **Class** **double**
Package: dataTypes

A number that is not restricted to an integer, and may contain fractional values between two integers.

7.1.2.13 ED

Type: **Class** **ANY**
Package: dataTypes

Data that is primarily intended for human interpretation or for further machine processing outside the scope of this specification. This includes unformatted or formatted written language, multimedia data, or structured information as defined by a different standard (e.g., XML-signatures.)
Encapsulated data can be present in two forms, inline or by reference. The content is the same whether it is located inline or remote. Inline data is communicated or moved as part of the encapsulated data value, whereas by-reference data may reside at a different location: a URL/URI that provides reference to the information required to locate the data. Inline data may be provided in one of 3 different ways:

1) as a plain sequence of characters (value)
2) as a binary (a sequence of bytes) (data
3) as xml content (xml)

Content SHALL be provided if the ED has no nullFlavor. The content may be provided in-line (using only one of value, data or xml), or it may be provided as a reference.Content may be provided in-line and a reference also may be given; in these cases, it is expected that the content of the reference will be exactly the same as the in-line content. Information Processing Entities are not required to check this, but may regard it as an error condition if the content does not match

Attributes

Attribute	Notes
data base64Binary [0..1]	A simple sequence of byte values that contains the content. (Base64 Encoded String).
xml anyType [0..1]	The content represented in plain XML form. A direct representation is provided for XML. This is because this specification includes an XML serialization of the data, and this xml attribute is handled specially in the serialisation form. The xml data is not different in any semantic sense to the same data if represented in the value or data attributes.
reference TEL [0..1]	A URL the target of which provides the binary content. The semantic value of an encapsulated data value is the same, regardless whether the content is present as inline content or just by reference. However, an encapsulated data value without inline content behaves differently, since any attempt to examine the content requires the data to be downloaded from the reference. An encapsulated data value may have both inline content and a reference. If data is provded in the value, data or xml attributes, the reference SHALL point to the same data. It is an error if the data resolved through the reference does not match either the integrity check, data as provided,

Attribute	Notes
	or data that had earlier been retrieved through the reference and then cached. The mediatype of the ED SHALL match the type returned by accessing the reference. The reference may contain a usablePeriod to indicate that the data may only be available for a limited period of time. Whether the reference is limited by a usablePeriod or not, the content of the reference SHALL be fixed for all time. Any application using the reference SHALL always receive the same data, or an error. The reference cannot be reused to send a different version of the same data, or different data
integrityCheck base64Binary [0..1]	A checksum calculated over the binary data The purpose of this property, when communicated with a reference is for anyone to validate later whether the reference still resolved to the same content that the reference resolved to when the encapsulated data value with reference was created. If the attribute is null, there is no integrityCheck. It is an error if the data resolved through the reference does not match the integrity check. The integrity check is calculated according to the integrityCheckAlgorithm. By default, the Secure Hash Algorithm-1 (SHA-1) shall be used. The integrity check is binary encoded according to the rules of the integrity check algorithm. The integrity check is calculated over the raw binary data that is contained in the data component, or that is accessible through the reference. No transformations are made before the integrity check is calculated. If the data is compressed, the Integrity Check is calculated over the compressed data.
description ST [0..1]	An alternative description of the media where the media is not able to be rendered. E.g. Short text description of an image or sound clip, etc. This attribute is not intended to be a complete substitute for the original. For complete substitutes, use the "translation" property. The intent of this property is to allow compliance with disability requirements such as those expressed in American's with Disability Act (also known as "Section 508"), where there is a requirement to provide a short text description of included media in some form that can be read by a screen reader. This is similar to a very short thumbnail with mediaType = text/plain.
value string [0..1]	A simple sequence of characters that contains the content. If value is used, the mediatype is fixed to text/plain and the charset must be consistent with the String Character Set. Refer to section 6.7.5 for more details
mediaType string [0..1]	Identifies the type of the encapsulated data and can be used to determine a method to interpret or render the content. The IANA defined domain of media types is established by the IETF RFCs 2045 and 2046. mediaType has a default value of text/plain and cannot be null. If the media type is different to text/plain, the <i>mediaType</i> attribute SHALL be populated.

Attribute	Notes
	If the content is compressed using a specified compression algorithm, the mediaType SHALL refer the mediaType of the uncompressed data, whether the data is accessed by reference or not.
charset Code [0..1]	An Internet Assigned Numbers Authority (IANA) Charset Registered character set and character encoding for character-based encoding types. Whenever the content of the ED is character type data in any form, the charset property needs to be known. If the content is provided directly in the value attribute, then the charset SHALL be a known character set consistent with the String Character Set. Refer to section 6.7.5 for more details. If the content is provided as a reference, and the access method does not provide the charset for the content (such as by a mime header), then the charset SHALL be conveyed as part of the ED
language Code [0..1]	The human language of the content. Valid codes are taken from the IETF RFC 3066. If this attribute is null, the language may be inferred from elsewhere, either from the context or from unicode language tags, for example. Conformance profiles SHOULD define defaulting rules for language for a given usage environment of this specification. Note: While language attribute usually alters the interpretation of the text, the language attribute does not alter the meaning of the characters in the text.
compression Compression [0..1]	The compression algorithm, if any, used on the raw byte data. If the attribute is null, the data is not compressed. Compression only applies to the binary form of the content. If populated, the value of this attribute SHALL be taken from the HL7 CompressionAlgorithm code system. Some compression formats allow multiple archive files to be embedded within a single compressed volume. Applications SHALL ensure that the decompressed form of the data conforms to the stated media type.
integrityCheckAlgorithm IntegrityCheckAlgorithm [0..1]	The algorithm used to compute the integrityCheck value. If populated, the value of this attribute SHALL be taken from the HL7 IntegrityCheckAlgorithm code system.

7.1.2.14 EN

Type: **Class** **ANY**
Package: dataTypes

A name for a person, organization, place or thing.

Examples: Jim Bob Walton, Jr., Health Level Seven, Inc., Lake Tahoe, etc. An entity name may be as simple as a character string or may consist of several entity name parts, such as, Jim, Bob, Walton, and Jr., Health Level Seven, and Inc.

Entity names are essentially sequences of entity name parts, but add a "use" code.

Attributes

Attribute	Notes
part ENXP [1..*]	A sequence of name parts, such as given name or family name, prefix, suffix, etc.
use set_EntityNameUse [0..*]	A set of codes advising a system or user which name in a set of names to select for a given purpose. A name without specific use code might be a default name useful for any purpose, but a name with a specific use code would be preferred for that respective purpose. Names SHOULD not be collected without at least one use code, but names MAY exist without use code, particularly for legacy data. If populated, the values contained in this attribute SHALL be taken from the HL7 EntityNameUse2 code system.

7.1.2.15 ENXP

Type: **Class** **XP**
Package: dataTypes

A part with a type code signifying the role of the part in the whole entity name, and qualifier codes for more detail about the name part type. (Typical name parts for person names are given names, and family names, titles, etc.).

Attributes

Attribute	Notes
type EntityNamePartType [0..1]	Indicates whether the name part is a given name, family name, prefix, suffix, etc. The value of this attribute SHALL be taken from the HL7 EntityNamePartType2 code system.
qualifier set_EntityNamePartQualifier [0..*]	The qualifier is a set of codes each of which specifies a certain subcategory of the name part in addition to the main name part type. For example, a given name may be flagged as a nickname (CL), a family name may be a name acquired by marriage (SP) or a name from birth (BR). If populated, the values contained in this attribute SHALL be taken from the HL7 EntityNamePartQualifier2 code system.

7.1.2.16 EntityNamePartQualifier

Type: **Enumeration**
Package: dataTypes

The qualifier is a set of codes each of which specifies a certain subcategory of the name part in addition to the main name part type. For example, a given name may be flagged as a nickname, a family name may be a pseudonym or a name of public records.

ValueSet OID: [TBD], CodeSystem "EntityNamePartTypeQualifier", OID: 2.16.840.1.113883.5.43. CodeSystem "EntityNamePartTypeQualifierR2", OID: 2.16.840.1.113883.5.1122, Owner: HL7

Attributes

Attribute	Notes
LS	Legal Status
AC	Academic
NB	Nobility
PR	Professional
HON	Honorific
BR	Birth
AD	Acquired
SP	Spouse
MID	Middle Name
CL	Call Me
IN	Initial
PFX	Prefix
SFX	Suffix

7.1.2.17 EntityNamePartType

Type: **Enumeration**
Package: dataTypes

Indicates whether the name part is a given name, family name, prefix, suffix, etc.

ValueSet OID: [TBD], CodeSystem "EntityNamePartType", OID: 2.16.840.1.113883.5.43. CodeSystem "EntityNamePartTypeR2", OID: 2.16.840.1.113883.5.1122, Owner: HL7

Attributes

Attribute	Notes
FAM	Family Name
GIV	Given Name
TITLE	Title
DEL	Delimiter: Delimiters are printed without framing white space. If no value component is provided, the delimiter appears as a line break.

7.1.2.18 EntityNameUse

Type: **Enumeration**
Package: dataTypes

A set of codes advising a system or user which name in a set of names to select for a given purpose.

ValueSet OID: [TBD], CodeSystem "EntityNameUse", OID: 2.16.840.1.113883.5.45. CodeSystem "EntityNameUseR2", OID: 2.16.840.1.113883.5.1120, Owner: HL7

Attributes

Attribute	Notes
ABC	Alphabetic: Alphabetic transcription of name (Japanese: romaji)
IDE	Ideographic: Ideographic representation of name (e.g., Japanese kanji, Chinese characters)
SYL	Syllabic: Syllabic transcription of name (e.g., Japanese kana, Korean hangul)
C	License: As recorded on a license, record, certificate, etc. (only if different from legal name)
I	Indigenous/Tribal: e.g. Chief Red Cloud
L	Known as/conventional/the one you use
OR	official registry: The formal name as registered in an official (government) registry, but which name might not be commonly used. Particularly used in countries with a law system based on Napoleonic law.
P	Pseudonym: A self asserted name that the person is using or has used.
A	Artist/Stage: Includes writer's pseudonym, stage name, etc
R	Religious: e.g. Sister Mary Francis, Brother John
SRCH	Search Type Uses: A name intended for use in searching or matching.
PHON	Phonetic: The address as understood by the data enterer, i.e. a close approximation of a phonetic spelling of the address, not based on a phonetic algorithm.
SNDX	A name spelled according to the SoundEx algorithm.
T	Obsolete, meaning not known
ANON	Anonymized name, designed to hide the actual identify of a person. (Obsolete, use ASGN instead)
OLD	Obsolete name, no longer in use
DN	Obsolete, meaning not known
M	Married name (obsolete, use "C" for name as recorded on a certificate or license)

7.1.2.19 II

Type: **Class** **ANY**
Package: dataTypes

An identifier that uniquely identifies a thing or object.

Examples are object identifier for HL7 RIM objects, medical record number, order id, service catalog item id, Vehicle Identification Number (VIN), etc. Instance identifiers are usually defined based on ISO object identifiers.

An identifier allows someone to select one record, object or thing from a set of candidates. Usually an identifier alone without any context is not usable. Identifiers are distinguished from concept descriptors as concept descriptors never identify an individual thing, although there may sometimes be an individual record or object that represents the concept.

Information Processing Entities claiming direct or indirect conformance SHALL never assume that receiving applications can infer the identity of issuing authority or the type of the identifier from the identifier or components thereof.

Attributes

Attribute	Notes
root Uid	A unique identifier that guarantees the global uniqueness of the instance identifier. If root is populated, and there is no extension, then the root is a globally unique identifier in its own right. In the presence of a non-null extension, the root is the unique identifier for the "namespace" of the identifier in the extension. Note that this does NOT necessarily correlate with the organization that manages the issuing of the identifiers. A given organization may manage multiple identifier namespaces, and control over a given namespace may transfer from organization to organization over time while the root remains the same. This field can be either a DCE UUID, an Object Identifier (OID), or a special identifier taken from lists that may be published by ISO or HL7. Comparison of root values is always case sensitive. UUID's SHALL be represented in upper case, so UUID case should always be preserved. The root SHALL not be used to carry semantic meaning - all it does is ensure global computational uniqueness.
extension string [0..1]	A character string as a unique identifier within the scope of the identifier root. The root and extension scheme means that the concatenation of root and extension SHALL be a globally unique identifier for the item that this II value identifies. Some identifier schemes define certain style options to their code values. For example, the U.S. Social Security Number (SSN) is normally written with dashes that group the digits into a pattern "123-12-1234". However, the dashes are not meaningful and a SSN can also be represented as "123121234" without the dashes. In the case where identifier schemes provide for multiple representations, HL7 or ISO may make a ruling about which is the preferred form and document that ruling where that respective external identifier scheme is recognized. If no *extension* attribute is provided in a non-null *II*, then the root is the complete unique identifier.
identifierName string [0..1]	A human readable description for this identifier.

7.1.2.20 INT

Type: **Class** **QTY**
Package: dataTypes

Integer numbers (-1,0,1,2, 100, 3398129, etc.) are precise numbers that are results of counting and enumerating. Integer numbers are discrete, the set of integers is infinite but countable. No arbitrary limit is imposed on the range of integer numbers.

Attributes

Attribute	Notes
value int	The value of the INT. Note that this specification imposes no limitations on the size of integer, but most implementations will map this to a 32 or 64 bit integer.

7.1.2.21 IVL_CO

Type: **Class** **ANY**
Package: dataTypes

A set of consecutive values of an ordered base datatype.

Any ordered type can be the basis of an IVL; it does not matter whether the base type is discrete or continuous. If the base datatype is only partially ordered, all elements of the IVL must be elements of a totally ordered subset of the partially ordered datatype. For example, PQ is considered ordered. However the ordering of PQs is only partial; a total order is only defined among comparable quantities (quantities of the same physical dimension). While IVLs between 2 and 4 meter exists, there is no IVL between 2 meters and 4 seconds

Attributes

Attribute	Notes
low CO [0..1]	This is the low limit. If the low limit is not known, it may be null. The low limit SHALL NOT be positive infinity.
high CO [0..1]	This is the high limit. If the high limit is not known, it may be null. The high limit SHALL NOT be negative infinity, and SHALL be higher than the low limit if one exists.
lowClosed boolean [0..1]	This attribute is called lowIsClosed in the ISO 21090 specification and lowClosed in the HL7 Data Types R2 specification. Whether low is included in the IVL (is closed) or excluded from the IVL (is open).
highClosed boolean [0..1]	This attribute is called highIsClosed in the ISO 21090 specification and highClosed in the HL7 Data Types R2 specification. Whether high is included in the IVL (is closed) or excluded from the IVL (is open).

7.1.2.22 IVL_INT

Type: **Class** **ANY**
Package: dataTypes

A set of consecutive values of an ordered base datatype.

Any ordered type can be the basis of an IVL; it does not matter whether the base type is discrete or continuous. If the base datatype is only partially ordered, all elements of the IVL must be elements of a totally ordered subset of the partially ordered datatype. For example, PQ is considered ordered. However the ordering of PQs is only partial; a total order is only defined among comparable quantities (quantities of the same physical dimension). While IVLs between 2 and 4 meter exists, there is no IVL between 2 meters and 4 seconds.

Attributes

Attribute	Notes
low INT [0..1]	This is the low limit. If the low limit is not known, it may be null. The low limit SHALL NOT be positive infinity.
high INT [0..1]	This is the high limit. If the high limit is not known, it may be null. The high limit SHALL NOT be negative infinity, and SHALL be higher than the low limit if one exists.
lowClosed boolean [0..1]	This attribute is called lowIsClosed in the ISO 21090 specification and lowClosed in the HL7 Data Types R2 specification. Whether low is included in the IVL (is closed) or excluded from the IVL (is open).
highClosed boolean [0..1]	This attribute is called highIsClosed in the ISO 21090 specification and highClosed in the HL7 Data Types R2 specification. Whether high is included in the IVL (is closed) or excluded from the IVL (is open).

7.1.2.23 IVL_PQ

Type: **Class** **ANY**
Package: dataTypes

A set of consecutive values of an ordered base datatype.

Any ordered type can be the basis of an IVL; it does not matter whether the base type is discrete or continuous. If the base datatype is only partially ordered, all elements of the IVL must be elements of a totally ordered subset of the partially ordered datatype. For example, PQ is considered ordered. However the ordering of PQs is only partial; a total order is only defined among comparable quantities (quantities of the same physical dimension). While IVLs between 2 and 4 meter exists, there is no IVL between 2 meters and 4 seconds.

Attributes

Attribute	Notes
low PQ [0..1]	This is the low limit. If the low limit is not known, it may be null. The low limit SHALL NOT be positive infinity.
high PQ [0..1]	This is the high limit. If the high limit is not known, it may be null. The high limit SHALL NOT be negative infinity, and SHALL be higher than the low limit if one exists.

Attribute	Notes
lowClosed boolean [0..1]	This attribute is called lowIsClosed in the ISO 21090 specification and lowClosed in the HL7 Data Types R2 specification. Whether low is included in the IVL (is closed) or excluded from the IVL (is open).
highClosed boolean [0..1]	Whether high is included in the IVL (is closed) or excluded from the IVL (is open).

7.1.2.24 IVL_QTY

Type: **Class** **ANY**
Package: dataTypes

A set of consecutive values of an ordered base datatype.

Any ordered type can be the basis of an IVL; it does not matter whether the base type is discrete or continuous. If the base datatype is only partially ordered, all elements of the IVL must be elements of a totally ordered subset of the partially ordered datatype. For example, PQ is considered ordered. However the ordering of PQs is only partial; a total order is only defined among comparable quantities (quantities of the same physical dimension). While IVLs between 2 and 4 meter exists, there is no IVL between 2 meters and 4 seconds.

Attributes

Attribute	Notes
low QTY [0..1]	This is the low limit. If the low limit is not known, it may be null. The low limit SHALL NOT be positive infinity.
high QTY [0..1]	This is the high limit. If the high limit is not known, it may be null. The high limit SHALL NOT be negative infinity, and SHALL be higher than the low limit if one exists.
lowClosed boolean [0..1]	This attribute is called lowIsClosed in the ISO 21090 specification and lowClosed in the HL7 Data Types R2 specification. Whether low is included in the IVL (is closed) or excluded from the IVL (is open).
highClosed boolean [0..1]	This attribute is called highIsClosed in the ISO 21090 specification and highClosed in the HL7 Data Types R2 specification. Whether high is included in the IVL (is closed) or excluded from the IVL (is open).

7.1.2.25 IVL_REAL

Type: **Class** **ANY**
Package: dataTypes

A set of consecutive values of an ordered base datatype.

Any ordered type can be the basis of an IVL; it does not matter whether the base type is discrete or continuous. If the base datatype is only partially ordered, all elements of the IVL must be elements of a totally ordered subset of the partially ordered datatype. For example, PQ is considered ordered. However the ordering of PQs is only partial; a total order is only defined among comparable quantities (quantities of the same physical dimension). While IVLs between 2 and 4 meter exists, there is no IVL between 2 meters and 4 seconds.

Attributes

Attribute	Notes
low REAL [0..1]	This is the low limit. If the low limit is not known, it may be null. The low limit SHALL NOT be positive infinity.
high REAL [0..1]	This is the high limit. If the high limit is not known, it may be null. The high limit SHALL NOT be negative infinity, and SHALL be higher than the low limit if one exists.
lowClosed boolean [0..1]	This attribute is called lowIsClosed in the ISO 21090 specification and lowClosed in the HL7 Data Types R2 specification. Whether low is included in the IVL (is closed) or excluded from the IVL (is open).
highClosed boolean [0..1]	This attribute is called highIsClosed in the ISO 21090 specification and highClosed in the HL7 Data Types R2 specification. Whether high is included in the IVL (is closed) or excluded from the IVL (is open).

7.1.2.26 IVL_TS

Type: **Class** **ANY**
Package: dataTypes

A set of consecutive values of an ordered base datatype.

Any ordered type can be the basis of an IVL; it does not matter whether the base type is discrete or continuous. If the base datatype is only partially ordered, all elements of the IVL must be elements of a totally ordered subset of the partially ordered datatype. For example, PQ is considered ordered. However the ordering of PQs is only partial; a total order is only defined among comparable quantities (quantities of the same physical dimension). While IVLs between 2 and 4 meter exists, there is no IVL between 2 meters and 4 seconds.

Attributes

Attribute	Notes
low TS [0..1]	This is the low limit. If the low limit is not known, it may be null. The low limit SHALL NOT be positive infinity.
high TS [0..1]	This is the high limit. If the high limit is not known, it may be null. The high limit SHALL NOT be negative infinity, and SHALL be higher than the low limit if one exists.
lowClosed boolean [0..1]	This attribute is called lowIsClosed in the ISO 21090 specification and lowClosed in the HL7 Data Types R2 specification. Whether low is included in the IVL (is closed) or excluded from the IVL (is open).

Attribute	Notes
highClosed boolean [0..1]	This attribute is called highIsClosed in the ISO 21090 specification and highClosed in the HL7 Data Types R2 specification. Whether high is included in the IVL (is closed) or excluded from the IVL (is open).

7.1.2.27 IntegrityCheckAlgorithm

Type: **Enumeration**
Package: dataTypes

The algorithm used to compute the integrityCheck value.

Attributes

Attribute	Notes
SHA1	secure hash algorithm - 1 This algorithm is defined in FIPS PUB 180-1: Secure Hash Standard. As of April 17, 1995.
SHA256	secure hash algorithm - 256 This algorithm is defined in FIPS PUB 180-2: Secure Hash Standard.

7.1.2.28 PIVL_TS

Type: **Class** **QTY**
Package: dataTypes

An interval of time that recurs periodically. PIVL has two properties, phase and period/frequency. phase specifies the "interval prototype" that is repeated on the period/frequency.

Attributes

Attribute	Notes
period PQ [0..1]	A time duration specified as a reciprocal measure of the frequency at which the PIVL repeats.
phase IVL_TS [0..1]	A prototype of the repeating interval, specifying the duration of each occurrence and anchors the PIVL sequence at a certain point in time. phase also marks the anchor point in time for the entire series of periodically recurring intervals. If count is null or nullFlavored, the recurrence of a PIVL has no beginning or ending, but is infinite in both future and past. The width of the phase SHALL be less than or equal to the period
frequency RTO	The number of times the PIVL repeats (numerator) within a specified time-period (denominator). The numerator is an integer, and the denominator is a PQ.TIME. Only one of period and frequency should be specified. The form chosen should be the form that most naturally conveys the idea to humans. i.e. Every 10 mins (period) or twice a day (frequency).

Attribute	Notes
alignment CalendarCycle [0..1]	
isFlexible BL [0..1]	Indicates whether the exact timing is up to the party executing the schedule e.g., to distinguish "every 8 hours" from "3 times a day". Note: this is sometimes referred to as "institution specified timing".
count INT	The number of times the period repeats in total. If count is null, then the period repeats indefinitely both before and after the anchor implicit in the phase.

7.1.2.29 PQ

Type: **Class** **QTY**
Package: dataTypes

A dimensioned quantity expressing the result of measuring.

Attributes

Attribute	Notes
value Decimal	The number which is multiplied by the unit to make the PQ.
unit Code	The unit of measure specified in the Unified Code for Units of Measure (UCUM). UCUM defines two forms of expression, case sensitive and case insensitive. *PQ* uses the case sensitive codes. The codeSystem OID for the case sensitive form is 2.16.840.1.113883.6.8. The default value for unit is the UCUM code "1" (unity). Equality of physical quantities does not require the values and units to be equal independently. Value and unit is only how we represent physical quantities. For example, 1 m equals 100 cm. Although the units are different and the values are different, the physical quantities are equal. Therefore one should never expect a particular unit for a physical quantity but instead allow for automated conversion between different comparable units. The unit SHALL come from UCUM, which only specifies unambiguous measurement units. Sometimes it is not clear how some measurements in healthcare map to UCUM codes. Note: The general pattern for a measurement is *value* unit of **Thing**. In this scheme, the PQ represents the *value* and the unit, and the **Thing** is described by some coded concept that is linked to the PQ by the context of use. This maps obviously to some measurements, such as **Patient Body Temperature** of *37* Celsius, and *250* mg/day of **Salicylate**. However for some measurements that arise in healthcare, the scheme is not so obvious. Two classic examples are 5 Drinks of Beer, and 3 Acetaminophen tablets. At first glance it is tempting to classify these measurements like this: *5* drinks of **Beer** and *3* **Acetaminophen** tablets. The problem with this is that UCUM does not support units of "beer", "tablets" or "scoops". The reason for this is that neither tablets or scoops are proper units. What kind of tablets? How big is the glass? In these kinds of cases, the concept that appears to be a unit needs to further specified before interoperability is established. If a correct amount is required, then it is generally appropriate to specify an exact measurement with an appropriate UCUM unit. If this is not possible, then the concept is not part of the measurement. UCUM provides a unit called unity for use in these cases. The proper way to understand these measurements as *3* 1 **Acetaminophen** tablets, where 1 is the UCUM unit for unity, and the **Thing** has a qualifier. The context of use will need to provide the extra qualifying information.

7.1.2.30 PostalAddressUse

Type: **Enumeration**
Package: dataTypes

A set of codes advising a system or user which address in a set of like addresses to select for a given purpose.

ValueSet OID: 2.16.840.1.113883.11.190. CodeSystem "PostalAddressUse", OID: 2.16.840.1.113883.5.1012, Owner: HL7

Attributes

Attribute	Notes
H	Home Address: A communication address at a home, attempted contacts for business purposes might intrude privacy and chances are one will contact family or other household members instead of the person one wishes to call. Typically used with urgent cases, or if no other contacts are available.
HP	Primary Home: The primary home, to reach a person after business hours.
HV	Vacation Home: A vacation home, to reach a person while on vacation.
WP	Work Place: An office address. First choice for business related contacts during business hours.
DIR	Direct: Indicates a work place address or telecommunication address that reaches the individual or organization directly without intermediaries. For phones, often referred to as a 'private line'.
PUB	Public: Indicates a work place address or telecommunication address that is a 'standard' address which may reach a reception service, mail-room, or other intermediary prior to the target entity.
BAD	Bad Address: A flag indicating that the address is bad, in fact, useless.
PHYS	Physical Visit Address: Used primarily to visit an address.
PST	Postal Address: Used to send mail.
TMP	Temporary Address: A temporary address, may be good for visit or mailing. Note that an address history can provide more detailed information.
ABC	Alphabetic: Alphabetic transcription of name (Japanese: romaji)
IDE	Ideographic: Ideographic representation of name (e.g., Japanese kanji, Chinese characters)
SYL	Syllabic: Syllabic transcription of name (e.g., Japanese kana, Korean hangul)
SRCH	Search Type Uses: A name intended for use in searching or matching.
SNDX	Soundex: An address spelled according to the SoundEx algorithm.
PHON	phonetic: The address as understood by the data enterer, i.e. a close approximation of a phonetic spelling of the address, not based on a phonetic algorithm.

7.1.2.31 QTY

Type: **Class** **ANY**
Package: dataTypes

The quantity datatype is an abstract generalization for all datatypes whose domain values has an order relation (less-or-equal) and where difference is defined in all of the datatype's totally ordered value subsets.

7.1.2.32 REAL

Type: **Class** **QTY**
Package: dataTypes

Fractional numbers. Typically used whenever quantities are measured, estimated, or computed from other real numbers. The typical representation is decimal, where the number of significant decimal digits is known as the precision.

Attributes

Attribute	Notes
value Decimal	The value of the REAL.

7.1.2.33 RTO

Type: **Class** **QTY**
Package: dataTypes

A quantity constructed as the quotient of a numerator quantity divided by a denominator quantity.
Common factors in the numerator and denominator are not automatically cancelled out.
The RTO datatype supports titers (e.g., "1:128") and other quantities produced by laboratories that truly represent ratios. Ratios are not simply "structured numerics", particularly blood pressure measurements (e.g. "120/60") are not ratios.
Notes:
1. Ratios are different from rational numbers, i.e., in ratios common factors in the numerator and denominator never cancel out. A ratio of two real or integer numbers is not automatically reduced to a real number. This datatype is not defined to generally represent rational numbers. It is used only if common factors in numerator and denominator are not supposed to cancel out. This is only rarely the case. For observation values, ratios occur almost exclusively with titers. In most other cases, REAL should be used instead of the RTO.
2. Since many implementation technologies expect generics to be collections, or only have one parameter, RTO is not implemented as a generic in this specification. Constraints at the point where the RTO is used will define which form of QTY are used.

Attributes

Attribute	Notes
numerator QTY	The quantity that is being divided in the ratio
denominator QTY	The quantity that divides the numerator in the ratio. The denominator SHALL not be zero.

7.1.2.34 ST

Type: **Class ANY**
Package: dataTypes

The character string datatype stands for text data, primarily intended for machine processing (e.g., sorting, querying, indexing, etc.) or direct display. Used for names, symbols, presentation and formal expressions.

A ST SHALL have at least one character or else be null.

Attributes

Attribute	Notes
value string	The actual content of the string.

7.1.2.35 TEL

Type: **Class ANY**
Package: dataTypes

A locatable resource that is identified by a URI, such as a web page, a telephone number (voice, fax or some other resource mediated by telecommunication equipment), an e-mail address, or any other locatable resource that can be specified by a URL.

The address is specified as a Universal Resource Locator (URL) qualified by time specification and use codes that help in deciding which address to use for a given time and purpose.

The value attribute is constrained to be a uniform resource locator specified according to IETF RFCs 1738 and 2806 when used in this datatype.

Note: The intent of this datatype is to be a locator, not an identifier; this datatype is used to refer to a locatable resource using a URL, and knowing the URL allows one to locate the object. However some use cases have arisen where a URI is used to refer to a locatable resource. Though this datatype allows for URIs to be used, the resource identified SHOULD always be locatable. A common use of locatable URIs is to refer to SOAP attachments.

Attributes

Attribute	Notes
value anyURI	A uniform resource identifier specified according to IETF RFC 2396. The URI specifies the protocol and the contact point defined by that protocol for the resource. Examples: Notable uses of the telecommunication address datatype are for telephone and telefax numbers, e-mail addresses, Hypertext references, FTP references, etc.
use set_TelecommunicationAddressUse [0..*]	One or more codes advising system or user which telecommunication address in a set of like addresses to select for a given telecommunication need. The telecommunication use code is not a complete classification for equipment types or locations. Its main purpose is to suggest or discourage the use of a particular telecommunication address. There are no easily defined rules that govern the selection of a telecommunication address. Conformance statements may clarify what rules may apply or

Attribute	Notes
	how additional rules are applied. If populated, the values contained in this attribute SHALL be taken from the HL7 TelecommunicationAddressUse code system
capabilities set_TelecommunicationCapability [0..*]	One or more codes advising a system or user what telecommunication capabilities are known to be associated with the telecommunication address. If populated, the values contained in this attribute SHALL be taken from the HL7 TelecommunicationCapability code system

7.1.2.36 TS

Type: **Class** **QTY**
Package: dataTypes

A quantity specifying a point on the axis of natural time. A point in time is most often represented as a calendar expression.

Attributes

Attribute	Notes
value TimeStamp	The value of the TS. value is a string with the format "YYYY[MM[DD[HH[MM[SS[.U[U[U[U]]]]]]]]][+|-ZZzz]" that conforms to the constrained ISO 8601 defined in ISO 8824 (ASN.1) under clause 32 (generalized time). The format should be used to the degree of precision that is appropriate.

7.1.2.37 TelecommunicationAddressUse

Type: **Enumeration**
Package: dataTypes

One or more codes advising a system or user which telecommunication address in a set of like addresses to select for a given telecommunication need.

ValueSet OID: 2.16.840.1.113883.11.201. CodeSystem "TelecommunicationAddressUse", OID: 2.16.840.1.113883.5.1011, Owner: HL7

Attributes

Attribute	Notes
H	Home Address: A communication address at a home, attempted contacts for business purposes might intrude privacy and chances are one will contact family or other household members instead of the person one wishes to call.
HP	Primary Home: The primary home, to reach a person after business hours.
HV	Vacation Home: vacation home, to reach a person while on vacation.
WP	Work Place: An office address. First choice for business related contacts during business hours.

Attribute	Notes
DIR	Direct: Indicates a work place address or telecommunication address that reaches the individual or organization directly without intermediaries. For phones, often referred to as a 'private line'.
PUB	Public: Indicates a work place address or telecommunication address that is a 'standard' address which may reach a reception service, mail-room, or other intermediary prior to the target entity.
BAD	Bad Address: A flag indicating that the address is bad, in fact, useless.
TMP	Temporary Address: A temporary address, may be good for visit or mailing. Note that an address history can provide more detailed information.
AS	Answering Service: An automated answering machine used for less urgent cases and if the main purpose of contact is to leave a message or access an automated announcement.
EC	Emergency Contact: A contact specifically designated to be used for emergencies. This is the first choice in emergencies, independent of any other use codes.
MC	Mobile Contact: A telecommunication device that moves and stays with its owner. May have characteristics of all other use codes, suitable for urgent matters, not the first choice for routine business.
PG	Pager: A paging device suitable to solicit a callback or to leave a very short message.

7.1.2.38 TelecommunicationCapability

Type: **Enumeration**
Package: dataTypes

One or more codes advising a system or user what telecommunication capabilities are known to be associated with the telecommunication address.

ValueSet OID: [to be assigned]. CodeSystem "TelecommunicationCapabilities", OID: 2.16.840.1.113883.5.1118, Owner: HL7

Attributes

Attribute	Notes
voice	Voice This device can receive voice calls (i.e. talking to another person, or a recording device, or a voice activated computer)
fax	Fax This device can receive faxes.
data	Data This device can receive data calls (i.e. modem)
tty	Text This device is a text telephone.
sms	SMS This device can receive SMS messages.

7.1.2.39 TimeStamp

Type: **Class** **string**
Package: dataTypes

Represents a timestamp such as 20101127235417.123+0930

7.1.2.40 Uid

Type: **Class** **string**
Package: dataTypes

A unique identifier string is a character string which identifies an object in a globally unique and timeless manner. The allowable formats and values and procedures of this data type are strictly controlled by HL7. At this time, user-assigned identifiers SHALL only be certain character representations of ISO Object Identifiers (OID) and DCE Universally Unique Identifiers (UUID). In addition, HL7 reserves the right to assign other forms of UIDs (RUID), such as mnemonic identifiers for code systems.
The sole purpose of UID is to be a globally and timelessly unique identifier. The form of UID, whether it is an OID, a UUID or a RUID, is entirely irrelevant. As far as HL7 is concerned, the only thing one can do with a UID is denote to the object for which it stands. Comparison of UIDs is literal, i.e. if two UIDs are literally identical, they are assumed to denote to the same object. If two UIDs are not literally identical they may not denote to the same object. Note that this comparison is case sensitive; (OID)s do not have letters subject to case, (UUID)s are fixed to uppercase, and (RUID)s have a fixed case.
protected type UniqueIdentifierString alias UID specializes ST.SIMPLE;
No difference in semantics is recognized between the different allowed forms of UID. The different forms are not distinguished by a component within or aside from the identifier string itself.
Even though this specification recognizes no semantic difference between the different forms of the unique identifier forms, there are differences of how these identifiers are built and managed, which is the sole reason to define subtypes of UID for each of the variants.

7.1.2.41 Uri

Type: **Class** **string**
Package: dataTypes

Universal Resource Identifier

7.1.2.42 XP

Type: **Class**
Package: dataTypes

A part of a name or address. Each part is a character string.

Attributes

Attribute	Notes
value string	The actual string value of the part.

7.1.2.43 set_EntityNamePartQualifier

Type: **Class** **EntityNamePartQualifier**
Package: dataTypes

7.1.2.44 set_EntityNameUse

Type: **Class** **EntityNameUse**
Package: dataTypes

7.1.2.45 set_PostalAddressUse

Type: **Class** **PostalAddressUse**
Package: dataTypes

7.1.2.46 set_TelecommunicationAddressUse

Type: **Class** **TelecommunicationAddressUse**
Package: dataTypes

7.1.2.47 set_TelecommunicationCapability

Type: **Class** **TelecommunicationCapability**
Package: dataTypes

7.1.3 cdsInput

Type: **Package «XSDschema»**
Package: modelParent

Specifies input data used by CDS systems.

cdsInput - *(Class diagram)*

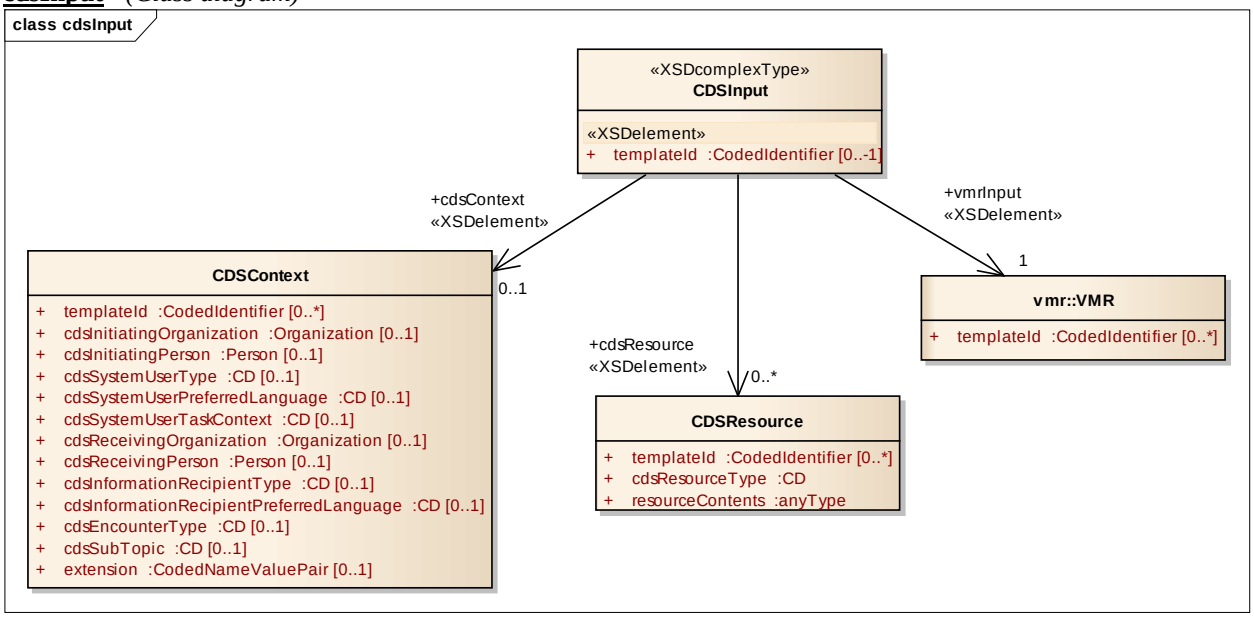

Figure: 17

7.1.3.1 CDSContext

Type: **Class**
Package: cdsInput

The situation or context within which a CDS evaluation is made. Included in CDS inputs for HL7 Context-Aware Knowledge Retrieval (Infobutton) Knowledge Request standard. Used, for example, to generate human-readable care guidance in the end-user's preferred language.

Attributes

Attribute	Notes
templateId CodedIdentifier [0..*]	The identifier of a set of constraints placed on the CDS context. If there are multiple templates specified for the element, then the element must satisfy ALL constraints defined in ANY template at that level.
cdsInitiatingOrganization Organization [0..1]	Organization that initiated the CDS request.
cdsInitiatingPerson Person [0..1]	Person in the initiating organization who initiated the CDS request.
cdsSystemUserType CD [0..1]	The type of individual using the CDS system. E.g., patient, healthcare provider, or specific type of healthcare provider (physician, nurse, etc.).

Attribute	Notes
cdsSystemUserPreferredLanguage CD [0..1]	Preferred language of the person who is using the system. Used, for example, to indicate the language in which the user interface should be rendered. E.g., English, Spanish.
cdsSystemUserTaskContext CD [0..1]	The task that a CDS system user is performing. E.g., laboratory results review, medication list review. Can be used to tailor CDS outputs, such as recommended information resources.
cdsReceivingOrganization Organization [0..1]	Organization that the response will be directed towards.
cdsReceivingPerson Person [0..1]	Person in the receiving organization that the response will be directed towards.
cdsInformationRecipientType CD [0..1]	The type of individual who consumes the CDS content. May be different from CDS system user type (e.g., if clinician is getting disease management guidance for provision to a patient). E.g., patient, healthcare provider, or specific type of healthcare provider (physician, nurse, etc.).
cdsInformationRecipientPreferredLanguage CD [0..1]	Preferred language of the person who will consume the CDS content. Used, for example, to indicate the language in which the content should be written. E.g., English, Spanish.
cdsEncounterType CD [0..1]	The type of patient encounter (e.g., inpatient, outpatient) in which the knowledge request takes place. Encounter type (Value set: ActEncounterCode [2.16.840.1.113883.1.11.13955])
cdsSubTopic CD [0..1]	Narrows down the knowledge request by specifying a subdomain of interest (e.g., indications, contraindications, dose).
extension CodedNameValuePair [0..1]	Section for user-defined CDSContext attributes.

7.1.3.2 CDSInput

Type: **Class**
Package: cdsInput

The parent class containing the data used by a CDS system to generate inferences. Includes an input vMR and optionally CDS context and/or CDS resource data.

Attributes

Attribute	Notes
templateId CodedIdentifier [0..-1]	The identifier of a set of constraints placed on a CDS input. If there are multiple templates specified for the element, then the element must satisfy ALL constraints defined in ANY template at that level.

7.1.3.3 CDSResource

Type: **Class**
Package: cdsInput

A resource independent of individual patients, provided to a CDS engine to facilitate patient evaluation. Includes, for example, local antibiogram data (local susceptibility profile of microbes to different antimicrobial agents), local formulary restrictions, or CDS system user preference on which guidelines to use for health maintenance (e.g., HEDIS vs. USPSTF).

Attributes

Attribute	Notes
templateId CodedIdentifier [0..*]	The identifier of a set of constraints placed on a CDS resource. If there are multiple templates specified for the element, then the element must satisfy ALL constraints defined in ANY template at that level.
cdsResourceType CD	The type of CDS resource, as defined by a coded taxonomy. A resource independent of individual patients, provided to a CDS engine to facilitate patient evaluation. E.g., local antibiogram, local formulary restrictions, CDS system user preference on which guidelines to use for health maintenance (e.g., HEDIS vs. USPSTF). The specified data structure used to convey the related resourceContents must be identifiable from the cdsResourceType.
resourceContents anyType	The data structure of the resource depends on the CDS resource type. E.g., local antibiogram data, local formulary restrictions, CDS system user preference on which guidelines to use for health maintenance (e.g., HEDIS vs. USPSTF).

7.1.4 cdsInputSpecification

Type: **Package «XSDschema»**
Package: modelParent

Specifies the specific CDS input data required for a specific CDS use case.

cdsInputSpecification - *(Class diagram)*

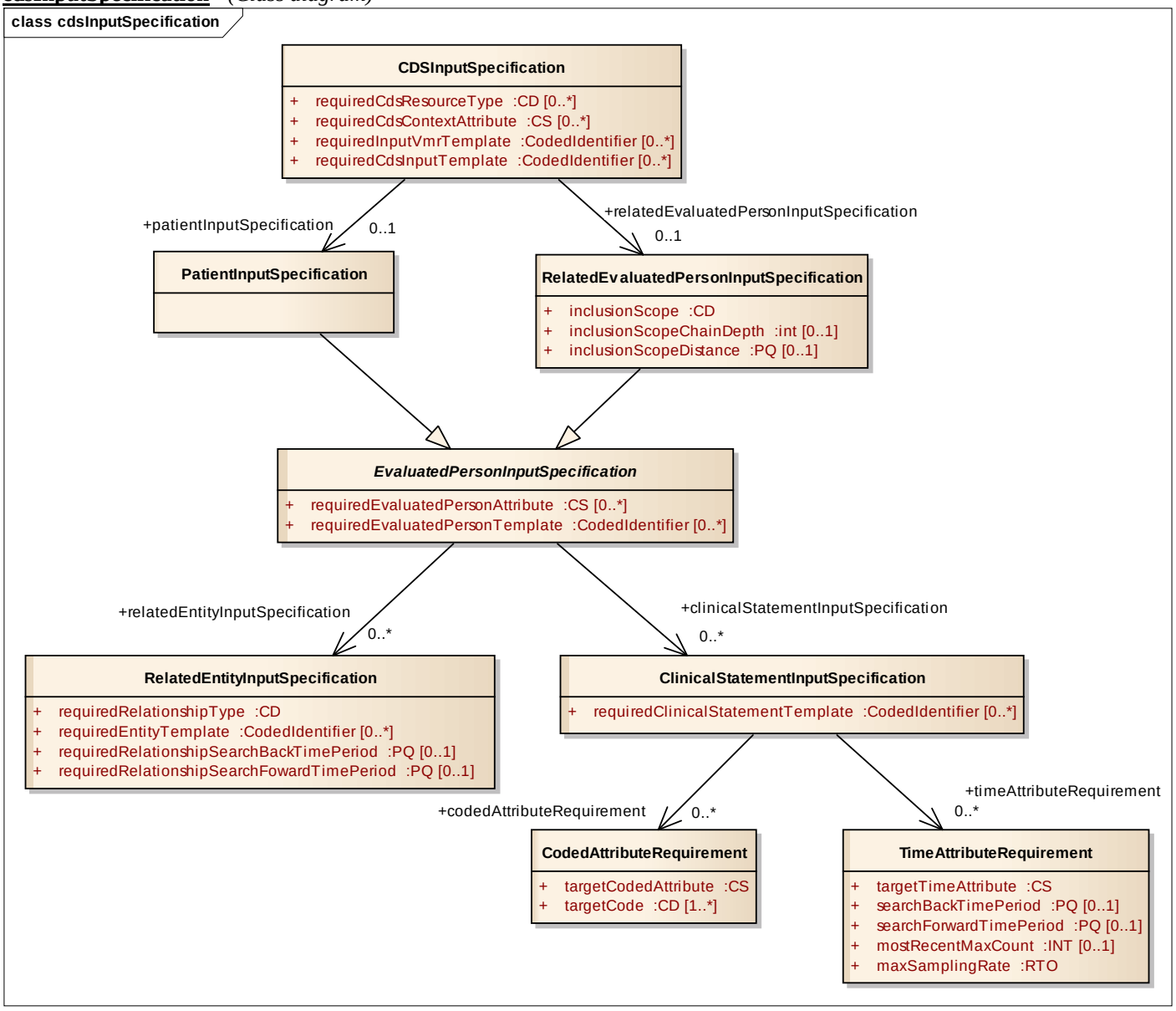

Figure: 18

7.1.4.1 CDSInputSpecification

Type: **Class**
Package: 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).

Attributes

Attribute	Notes
requiredCdsResourceType CD [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 CS [0..*]	The CDS context attribute (e.g., CDS system user preferred language) required.
requiredInputVmrTemplate CodedIdentifier [0..*]	Identifier of a set of constraints that must be placed on the CDS input.
requiredCdsInputTemplate CodedIdentifier [0..*]	Identifier of a set of constraints that must be placed on the input vMR.

7.1.4.2 ClinicalStatementInputSpecification

Type: **Class**
Package: cdsInputSpecification

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.

Attributes

Attribute	Notes
requiredClinicalStatementTemplate CodedIdentifier [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.

7.1.4.3 CodedAttributeRequirement

Type: **Class**

Package: cdsInputSpecification

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.

Attributes

Attribute	Notes
targetCodedAttribute CS	The clinical statement's coded attribute that is the subject of restriction. E.g., problem code, problem status.
targetCode CD [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.

7.1.4.4 EvaluatedPersonInputSpecification

Type: **Class**
Package: cdsInputSpecification

Specifies the data required for an evaluated person. Can include (i) a specification of the person attributes (e.g., gender) required; (ii) a specification of the templates that must be applied; (iii) a specification of the data required for related entities; and (iv) a specification of the clinical statements required.

Attributes

Attribute	Notes
requiredEvaluatedPersonAttribute CS [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.
requiredEvaluatedPersonTemplate CodedIdentifier [0..*]	Identifier of a set of constraints that must be placed on the EvaluatedPerson.

7.1.4.5 PatientInputSpecification

Type: **Class** **EvaluatedPersonInputSpecification**
Package: cdsInputSpecification

The data required for the patient. Is a specialization of the EvaluatedPersonInputSpecification class.

7.1.4.6 RelatedEntityInputSpecification

Type: **Class**
Package: cdsInputSpecification

Specifies the data required regarding entities related to the evaluated person of interest.

Attributes

Attribute	Notes
requiredRelationshipType CD	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 CodedIdentifier [0..*]	Identifier of a set of constraints that must be placed on the related Entity.
requiredRelationshipSearchBackTimePeriod PQ [0..1]	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.
requiredRelationshipSearchFowardTimePeriod PQ [0..1]	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.

7.1.4.7 RelatedEvaluatedPersonInputSpecification

Type: **Class** **EvaluatedPersonInputSpecification**
Package: cdsInputSpecification

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.

Attributes

Attribute	Notes
inclusionScope CD	The scope of evaluated persons to include. E.g., relative, sexual contacts, persons living in affected geographic zone.
inclusionScopeChainDepth int [0..1]	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,

Attribute	Notes
	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 PQ [0..1]	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.

7.1.4.8 TimeAttributeRequirement

Type: **Class**
Package: cdsInputSpecification

A requirement for a time attribute of a clinical statement. Specified in terms of the target time attribute and the required time interval for that attribute in relationship to the index evaluation time. A searchBackTimePeriod and/or a searchForwardTimePeriod must be provided.

Attributes

Attribute	Notes
targetTimeAttribute CS	The time attribute targeted for restriction. E.g., procedure time, substance dispensation time.
searchBackTimePeriod PQ [0..1]	The time attribute requirement is met if the target time attribute overlaps with the time interval that starts at (index evaluation time - searchBackTimePeriod) 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 searchBackTimePeriod is 1 year, then the time attribute requirement is met if the targetTimeAttribute has overlaps with anytime after 4pm on 7/1/2010 and up to and including 7/1/2011 at 4pm.
searchForwardTimePeriod PQ [0..1]	The time attribute requirement is met if the target time attribute overlaps with the time interval that starts at (index evaluation time) and ends at (index evaluation time + searchForwardTimePeriod). 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 searchForwardTimePeriod is 1 year, then the time attribute requirement is met if the targetTimeAttribute has overlaps with anytime after 4pm on 7/1/2011 and up to and including 7/1/2012 at 4pm.
mostRecentMaxCount INT [0..1]	The maximum number of most recent clinical statements to return.
maxSamplingRate RTO	In the case where there are large number of available clinical statements, it may be useful to specify a sampling rate to reduce the number to be evaluated. For example, when there have been large numbers of vital signs taken by automated equipment, it may be useful to evaluate a subset of the entire group.

7.1.5 cdsOutput

Type: **Package «XSDschema»**
Package: modelParent

Specifies output data generated by CDS systems.

cdsOutput - *(Class diagram)*

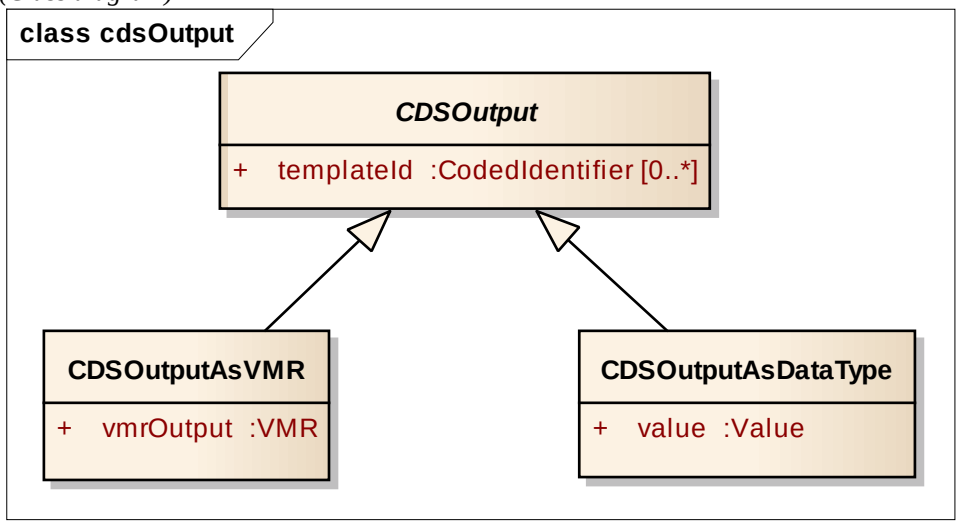

Figure: 19

7.1.5.1 CDSOutput

Type: **Class**
Package: cdsOutput

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.

Attributes

Attribute	Notes
templateId CodedIdentifier [0..*]	The identifier of a set of constraints placed on a CDS output. If there are multiple templates specified for the element, then the element must satisfy ALL constraints defined in ANY template at that level.

7.1.5.2 CDSOutputAsDataType

Type: **Class CDSOutput**
Package: cdsOutput

A single data element of ANY data type as output of CDS.

Attributes

Attribute	Notes
value Value	The value of the CDS output.

7.1.5.3 CDSOutputAsVMR

Type: **Class CDSOutput**
Package: cdsOutput

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.

Attributes

Attribute	Notes
vmrOutput VMR	Output from CDS structured as a VMR record

7.1.6 cdsOutputSpecification

Type: **Package «XSDschema»**
Package: modelParent

Specifies the specific CDS output data produced for a specific CDS use case.

cdsOutputSpecification - *(Class diagram)*

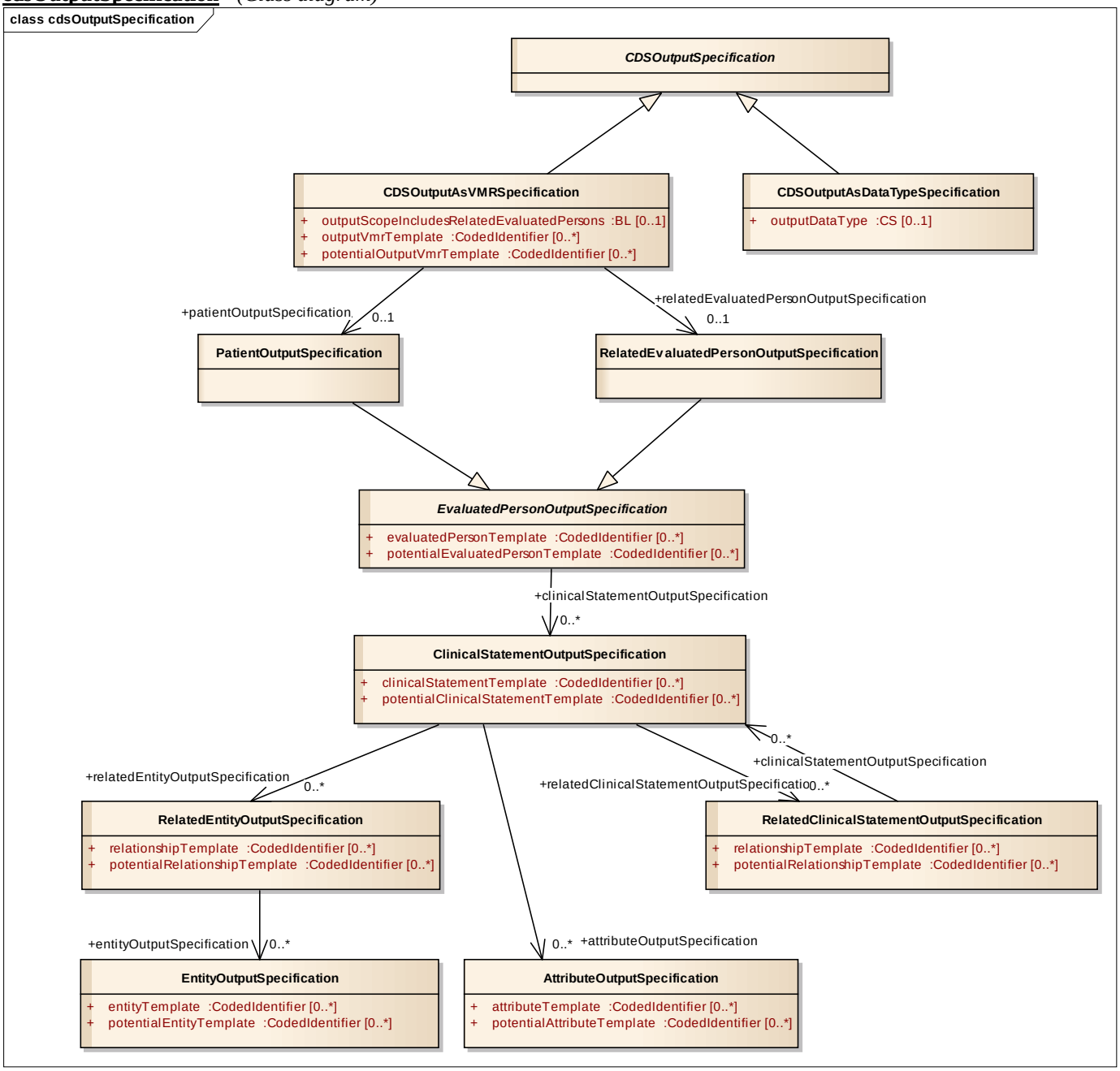

Figure: 20

7.1.6.1 AttributeOutputSpecification

Type: **Class**
Package: cdsOutputSpecification

Specifies the attributes contained in the source clinical statement regarding the evaluated person of interest.

Attributes

Attribute	Notes
attributeTemplate CodedIdentifier [0..*]	Identifier of constrained attribute that SHALL be provided as a part of the parent clinical statement.
potentialAttributeTemplate CodedIdentifier [0..*]	Identifier of constrained attribute that MAY be provided as a part of the parent clinical statement.

7.1.6.2 CDSOutputAsDataTypeSpecification

Type: **Class** **CDSOutputSpecification**
Package: cdsOutputSpecification

The parent class specifying the data type output to be provided by a specific CDS use case.

Attributes

Attribute	Notes
outputDataType CS [0..1]	Specifies the data type to be used in the output, e.g., BL, CD, etc.

7.1.6.3 CDSOutputAsVMRSpecification

Type: **Class** **CDSOutputSpecification**
Package: cdsOutputSpecification

The parent class specifying the vMR output to be provided 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 will return a templated observation specifying whether the intervention is needed, and a templated observation specifying when the intervention was last done.

Can include a detailed output specification for the focal patient as well as for related evaluated persons. Note that it is assumed that the superset of results returned for related evaluated persons are the same for each of the related evaluated persons (e.g., relatives). If output specifications are not provided regarding patients or other evaluated persons, then this signifies that no further constraints are being placed on returned results other than what is expressed through the output data model and its existing template(s).

Attributes

Attribute	Notes
outputScopeIncludesRelatedEvaluatedPersons BL [0..1]	Specifies whether the scope of the output potentially includes related evaluated persons (e.g., family members). If not specified, the default expected behavior is that related evaluated persons will not be included within the scope.
outputVmrTemplate CodedIdentifier [0..*]	Identifier of a set of constraints that SHALL be placed on the output vMR.

Attribute	Notes
potentialOutputVmrTemplate CodedIdentifier [0..*]	Identifier of a set of constraints that MAY be placed on the output vMR.

7.1.6.4 CDSOutputSpecification

Type: **Class**
Package: cdsOutputSpecification

Abstract base class specifying the output to be provided by a specific CDS use case.

7.1.6.5 ClinicalStatementOutputSpecification

Type: **Class**
Package: cdsOutputSpecification

Specifies the output clinical statements regarding the evaluated person of interest.

Attributes

Attribute	Notes
clinicalStatementTemplate CodedIdentifier [0..*]	Identifier of constrained clinical statement that SHALL be provided as a part of the evaluation result.
potentialClinicalStatementTemplate CodedIdentifier [0..*]	Identifier of constrained clinical statement that MAY be provided as a part of the evaluation result.

7.1.6.6 EntityOutputSpecification

Type: **Class**
Package: cdsOutputSpecification

Specifies the entities to be provided as a part of the output.

Attributes

Attribute	Notes
entityTemplate CodedIdentifier [0..*]	Identifier of constrained entity that SHALL be provided as a part of the entity relationship.
potentialEntityTemplate CodedIdentifier [0..*]	Identifier of constrained entity that MAY be provided as a part of the entity relationship.

7.1.6.7 EvaluatedPersonOutputSpecification

Type: **Class**
Package: cdsOutputSpecification

Specifies the evaluation results to be provided for an evaluated person. Specifies the templates that SHALL or MAY be applied.

Attributes

Attribute	Notes
evaluatedPersonTemplate CodedIdentifier [0..*]	Identifier of a set of constraints that SHALL be placed on the EvaluatedPerson.
potentialEvaluatedPersonTemplate CodedIdentifier [0..*]	Identifier of a set of constraints that MAY be placed on the EvaluatedPerson.

7.1.6.8 PatientOutputSpecification

Type: **Class** **EvaluatedPersonOutputSpecification**
Package: cdsOutputSpecification

The evaluation results to be returned for the patient. Is a specialization of the EvaluatedPersonOutputSpecification class.

7.1.6.9 RelatedClinicalStatementOutputSpecification

Type: **Class**
Package: cdsOutputSpecification

Specifies the clinical statements related to the source clinical statement regarding the evaluated person of interest.

Attributes

Attribute	Notes
relationshipTemplate CodedIdentifier [0..*]	Identifier of constrained clinical statement relationship that SHALL be provided as a part of the parent clinical statement.
potentialRelationshipTemplate CodedIdentifier [0..*]	Identifier of constrained clinical statement relationship that MAY be provided as a part of the parent clinical statement.

7.1.6.10 RelatedEntityOutputSpecification

Type: **Class**
Package: cdsOutputSpecification

Specifies the entities related to the source clinical statement regarding the evaluated person of interest.

Attributes

Attribute	Notes
relationshipTemplate CodedIdentifier [0..*]	Identifier of constrained entity relationship that SHALL be provided as a part of the parent clinical statement.
potentialRelationshipTemplate CodedIdentifier [0..*]	Identifier of constrained entity relationship that MAY be provided as a part of the parent clinical statement.

7.1.6.11 RelatedEvaluatedPersonOutputSpecification

Type: **Class** **EvaluatedPersonOutputSpecification**
Package: cdsOutputSpecification

The results that will be provided for evaluated persons related to the patient. Is a specialization of the EvaluatedPersonOutputSpecification class.