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HL7 Virtual Medical Record for Clinical Decision Support (vMR-CDS) Logical Model, Release 2

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HL7 DSTU Specification

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Note Regarding Changes since Last Version:
Please refer to the 'Revision History' below for information on updates to the model since the last version.

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.

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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 the 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 CDS artifact authors and implementers 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 typical CDS artifact authors and implementers to understand, author, use, and implement**. Because most CDS artifact authors and implementers 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 CDS artifact implementer. For instance, mood codes such as PRP, EVN, or GOL are represented as explicit classes such as ProcedureProposal, Goal, or SubstanceAdministrationEvent rather than as coded attributes within the corresponding concept. Similarly, the vMR handles negation indicator through explicit classes such as DeniedProblem or UndeliveredProcedure. Note that in these cases the V3 concepts expressed in this fashion can be fairly easily transformed into their V3 counterpart as no information loss occurs. For instance, a SubstanceAdministrationEvent can be mapped to classCode ACT and moodCode EVN, and a DeniedProblem may be mapped to a V3 concept representation of a Problem with a negation indicator of 'true'. A driving principle for this work has been that if a typical CDS artifact author or implementer 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.** While sample mappings have been conducted manually between HL7 V3 artifacts and the vMR, exhaustive or automatic mapping has not been attempted to date.

The vMR intends to model and capture 100% of the clinical concepts and attributes that are relevant for CDS. However, 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

- the 80% of common and stable clinical elements and attributes are directly represented in the model,
- while the 20% less common and less stable data elements and attributes are represented using generic model extension mechanisms such as coded extension attributes, related clinical statements and related entities coupled with templates.

This base specification is intended to be further constrained for specific CDS interoperability scenarios. vMR templates are the vehicles for specifying such contraints.

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

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
- Guidance on how to represent common patterns of clinical information using the vMR
- An example of how relevant content from a Consolidated Clinical Document Architecture (CCDA) instance can be represented as a vMR instance. CCDA is a set of implementation guides for the CDA. The actual specification for CCDA is "HL7 Implementation Guide for CDA® Release 2: IHE Health Story Consolidation, DSTU Release 1.1".

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.
- 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. 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.

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 DAM Release 2, Version 1.0 Specification Compared to DAM Release 1 Specification

Compared to the DAM Release 1 specification, the DAM Release 2 Version 1.0 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 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 Logical Model Release 2, Version 2.0 Specification Compared to DAM Release 2, Version 1.0 Specification

Compared to the DAM Release 2 Version 1.0 specification, the Logical Model Release 2 Version 2.0 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 constrained 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)
- Added an explicit AllergyOrIntolerance class

3. Revisions of Logical Model Release 2, Version 3.0 Specification Compared to Logical Model Release 2, Version 2.0 Specification

Compared to the DAM Release 2 Version 2.0 specification, the Logical Model Release 2 Version 3.0 specification includes the following revisions:

- Made updates to the model to align more closely with FHIR and other relevant HL7 models
- Aligned examples with underlying model
- Made a number of clarifying updates to the documentation

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 CDS artifact author and implementer to understand, author, 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 CDS Artifact Author, 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 generally immaterial. In cases where one needs to specify the reason why valid data is not available, such information can be conveyed using explicit model elements, such as an Observation noting data is not available, along with a related observation of why the data is not available.
    - 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 a CDS artifact author or implementer 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 Release 1.1.
    - 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 Release 1.1, for example, specifying that a patient has had asthma since 1950 may be represented as follows (example adapted from CCDA sample 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 Release 1.1 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 CDS Artifact Author 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 Release 1.1 Data Model

Of note, the CCDA has many fixed values within templates. If one were to take advantage of this aspect of the CCDA, an expression with the equivalent semantics could be written in a much more concise form as shown in the figure below.

However, this approach does have the limitation of needing to consult an external template definition to make sense of the logical expression. Moreover, the verbosity of the CCDA may present performance challenges in real-time applications.

```
//cda:observation[@negationInd != "true"
     and templateId/@root  = "2.16.840.1.113883.10.20.22.4.4"
     and effectiveTime/low[@value<="20130814"]
     and value[@code="195967001"]
     and entryRelationship/observation[
          templateId/@root="2.16.840.1.113883.10.20.22.4.6"
          and value/@code="55561003"
     ]
]
```

Sample CDS Expression that "Patient Currently Has Active Asthma" Using CCDA Release 1.1 Data Model and Leveraging Semantics of CCDA Templates

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"/>
    <conditionCode codeSystem="2.16.840.1.113883.6.96" code="195967001"><displayName
value="Asthma"/></conditionCode>
    <conditionEffectiveTime><low value="19500101"/><conditionEffectiveTime>
    <conditionStatus codeSystem="2.16.840.1.113883.6.96" code="55561003"><displayName
value="Active"/></conditionStatus>
</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 CDS Artifact Implementer 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
    conditionCode[@codeSystem="2.16.840.1.113883.6.96" and @code="195967001"] and
    conditionEffectiveTime[low[@value<="20130814"]] and
    conditionStatus[@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 CDS artifact implementer 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 CDS Artifact Author 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

The vMR DAM Release 1 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), the vMR DAM Release 1 was re-balloted in September 2011 as an informative specification and published. The vMR DAM Release 2 Version 1.0 was balloted in May 2013 and passed as an informative specification. The vMR Logical Model Release 2 Version 2.0 was balloted in September 2013 and passed as an informative specification. The vMR Logical Model Release 2 Version 3.0 was balloted in January 2014 and passed as a Daft Standard for Trial Use (DSTU).

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
- HL7 Fast Healthcare Interoperability Resources (FHIR)
- HL7 Version 3 Domain Analysis Model: Diet and Nutrition Orders, Release 2
- HL7 Allergy model from Patient Care Work Group

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 these CDS systems.

Furthermore, 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.

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 clinical concepts are represented using the vMR (Section **Error! eference source not found.**)
- 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 and an example vMR representation of the same content (as it relates to CDS)

Separate HL7 documents provide 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 vMR logical model includes a constrained version of the HL7 version 3 release 2 data types from the 2012 Normative Edition of HL7. 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.
- The Uri type is replaced with the XML anyURI type for TEL.value
- The XML type is replaced with the XML anyType type for ED.xml
- The Binary type is replaced with the XML base64Binary

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 conventions (representation of collections as repeating foundational elements; no inclusion of interfaces and methods; use of anyURI for TEL.value; use of anyType for ED.xml). Thus, **at the XML instance level as defined in the HL7 vMR-CDS XML 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 and enumerations 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)
AD	- constrained out useablePeriod - constrained out isNotOrdered
ADXP	- type attribute constrained from 0..1 to 1..1
ANY	- constrained to remove all optional elements
BL	- value attribute constrained from 0..1 to 1..1
CD	- constrained out codingRationale - constrained out source
CO	
Code	
CS	
Decimal	
ED	- constrained out thumbnail - constrained out translation
EN	

HL7 Version 3 Release 2 Data Type used in vMR	Constraints Placed on Data Type (Empty = No Constraints)
ENXP	
HXIT	- constrained to remove all optional elements
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
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
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
QSET	- constrained to remove all optional elements
QTY	- constrained to remove all optional elements
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.
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.
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	
XP	- constrained out nullFlavor, code, codeSystem, codeSystemVersion, and language - constrained value to 1..1 from 0..1 due to nullFlavor being constrained out.

HL7 Version 3 Release 2 Enumerations and Sets used in vMR	Constraints Placed on Enumerations (Empty = No Constraints)
AddressPartType	
EntityNamePartQualifier	
EntityNamePartType	
EntityNameUse	
IntegrityCheckAlgorithm	

HL7 Version 3 Release 2 Enumerations and Sets used in vMR	Constraints Placed on Enumerations (Empty = No Constraints)
PostalAddressUse	
set_EntityNamePartQualifier	
set_EntityNameUse	
set_PostalAddressUse	
set_TelecommunicationAddressUse	
set_TelecommunicationCapability	
TelecommunicationAddressUse	
TelecommunicationCapability	

Of note, we anticipate that future releases of the vMR logical model may specify alternate data type profiles, such as a data type profile that uses the full HL7 version 3 release 2 data types or a data type profile that places fewer or more constraints on the HL7 version 3 release 2 data types.

6. Modeling Common Clinical Concepts Using the vMR

The following section is non-normative and is intended to illustrate the use of vMR to model common clinical concepts.

The vMR can be used to model and structure a variety of common clinical concepts useful for CDS. This document aims to illustrate how some of these concepts map to vMR classes and provides some high-level guidance on how to perform such mappings. Note that this document is not intended to act as a comprehensive guide on how to perform such mappings or to provide a comprehensive list of all clinical concepts and categories found in a patient record. Rather, it is intended to provide general guidance on the most common concepts facing clinicians at the point of care.

Many concepts in vMR have a coded attribute to describe the semantics of the instance of a class. For instance, procedure concepts such as ImagingOrder or LabOrder inherit a procedureCode (CD) attribute from ProcedureBase. In addition to such semantic attributes, other attributes are often provided to represent specific characteristics of a concept. For instance, ProcedureBase defines a procedureMethod which provides additional information about how the procedure is to be performed. Similarly, LaboratoryOrder specifies a specimen attribute. Yet, many terminologies often precoordinate some of these characteristics directly into the semantic code. Attributes such as method, and specimen are often embedded in the test name (e.g., blood culture, Chest X-ray). In such cases, artifact developers may chose to ignore those characteristics of a concept already precoordinated in the concept's semantic code as such attributes are generally optional in nature. However, terminologies may not be entirely consistent in their degree of precoordination, and as such, an artifact author may need to resort to some post-coordination in order to properly describe the concept. Furthermore, in some cases, the Artifact Author may wish to provide more specific semantics than what is specified by the base semantic term (e.g., blood taken from the R antecubital fossa). In some cases, an artifact author may also choose to provide a post-coordinated version of the concept even though the semantic code for the concept is precoordinated in order to facilitate computability of the term. Precoordinated terms pose a significant parsing challenge without the aid of terminology services and, in cases where no such service exist, an artifact author may choose to specify specific characteristics of the concept even if these are already precoordinated in the term itself.

The source of information that is typically used to model the patient record for CDS purposes may come from both structured and unstructured sources. Examples of structured or semi-structured sources might include (i) a patient record persisted in or generated from an EHR system in a format such as the CCDA or (ii) other structured content in electronic form that may be emitted from a clinical system (e.g., lab results, medication orders).

Unstructured sources of content often include information in narrative form such as:

- Physician progress notes such as physician SOAP notes
- Nursing notes
- Consult notes
- Discharge summaries
- Procedure notes (invasive and non-invasive)
- Notes of radiologists' interpretations of imaging studies or other clinicians' interpretations of diagnostic test results
- Patient history and physical examination notes (H&P notes)

Structured content may in some cases be convertible into the vMR using one or more automated transformation steps. In other cases, some manual processing may be required to ensure a semantically accurate conversion (e.g., to properly map between terminologies with different levels of granularity).

Similarly, unstructured content must first be converted into a structured form if it is to be actionable by a CDS system. This conversion may be done manually by a clinician or may benefit from the application of

sophisticated technologies such as Natural Language Processing (NLP) and entity extraction and alignment.

Once captured, the following clinical concepts may be modeled using the vMR as described in the following sections.

Clinical Findings

Clinical findings about a patient may be documented as part of an assessment performed during a patient visit, based on the result of a test or diagnostic procedure, or based on a patient interview. The following table describes how these findings are typically captured in the vMR. An individual measurement or observation is typically represented in the vMR as an ObservationResult with the concept to be measured being captured under ObservationResult.observationFocus and the measurement (or other value type) captured in the ObservationResult.value attribute. The value specified for the observation can be any of the vMR-constrained ISO 21090 data types. For instance, it may be a physical quantity or a coded field. Observation also supports a field to represent the clinical interpretation of the observation, the time the observation was made, or the body site relevant to this observation.

A panel or any grouping of related observations such as those resulting from vital signs measurements, on the other hand, may be captured as a CompositeObservationResult that can support arbitrary levels of nesting based on subgrouping needs. Note that for a CompositeObservationResult, observationFocus generally describes the type of observation grouping in question.

Observation results and panels can be related to the procedures that generated them via the use of the *relatedClinicalStatement*. For instance, a laboratory panel may be associated to a ProcedureEvent using a related Clinical Statement relationship that indicates that the procedure was the source of the panel. It is important to note that the action that produces the observation results is generally a procedure. For instance, the action of measuring vital signs is a procedure. A blood pressure measurement collected through the act of measuring vital signs is an observation result.

Laboratory Results

Example Concepts: Blood panels such as CBC with differential, liver panel, etc...

Relevant vMR Classes: Use ObservationResult to capture an individual measurement. Use CompositeObservationResult to describe a panel of results.

How to model: “CBC Results - WBC =7.2 thousands of wbc/mcL, …”

A CBC Panel is modeled as a CompositeObservationResult consisting of individual ObservationResults or other CompositeObservationResults for each component of the panel: WBC, RBC, HCT, Hgb, etc.

The CompositeObservationResult.observationFocus may be a “Complete blood count (hemogram) panel" [LOINC: 58410-2].

An individual component is modeled using the ObservationResult class. For instance, WBC may be modeled as follows:

ObservationResult.observationFocus = "Leukocytes [#/volume] in Blood by Automated count” [LOINC: 6690-2].
ObservationResult.value – A PQ data type that represents the actual measurement: 7,200 white blood cells/mcL.

Similarly, a hemoglobin measurement may be modeled as follow:

ObservationResult.observationFocus = “Hemoglobin [Mass/volume] in Blood” [LOINC: 718-7].
ObservationResult.value – A PQ representing the measurement of 19 g/dL.
ObservationResult.interpretation may be a code specifying ‘Elevated’.

Imaging Study Findings

Example Concepts: CT scans, MRI, plain radiographs, ultrasounds

Relevant vMR Classes: Use ObservationResult to capture an individual measurement. Use CompositeObservationResult to describe a composite result.

How to model: “Patient has pulmonary edema”

Similar to a blood panel above, the vMR supports the grouping of related observations obtained during a review of an imaging procedure using a CompositeObservationResult. The observationFocus may be a code for the ‘interpretation of MRI’ for instance. This group consists of a number of ObservationResults such as, for instance, an observation that the patient has Pulmonary Edema.

In this case, ObservationResult.observationFocus is the code “Imaging interpretation (observable entity)” [SNOMED CT 282290005] with a value of “Pulmonary edema (disorder)” [SNOMED CT 19242006].

Upon examining the results of an imaging procedure, a physician may conclude that the patient has congestive heart failure and relate the Imaging ProcedureEvent via a related clinical statement to an instance of the Problem class that captures this new diagnosis and the set of observations associated with this procedure.

Diagnostic Test Results

Example Concepts: EKG, pulmonary function test, EEG

Relevant vMR Classes: Use ObservationResult to capture an individual measurement. Use CompositeObservationResult to describe a composite result.

How to model: “Patient has ST-segment elevation”

ObservationResult.observationFocus = “ST-T segment by EKG” [LOINC: 8620-7]
ObservationResult.observationResult = “ST segment elevation (finding)” [SNOMED: 76388001]

How to model: “Patient has ST amplitude readings of X from the various leads"

These readings can be modeled as a CompositeObservationResult with each reading being a child ObservationResult.

CompositeObservationResult.observationFocus = a code indicating the collection of such measurements

As for the individual readings they may have an ObservationResult.observationValue of type PQ for the amplitude of the segment and the ObservationResult.observationFocus could be any one of the LOINC codes listed below:

18548-8, ST amplitude.J point+20 ms Lead II
18549-6, ST amplitude.J point+20 ms Lead III
18550-4, ST amplitude.J point+20 ms Lead V1

18551-2, ST amplitude.J point+20 ms Lead V2
18552-0, ST amplitude.J point+20 ms Lead V3
18553-8, ST amplitude.J point+20 ms Lead V4
18554-6, ST amplitude.J point+20 ms Lead V5
18555-3, ST amplitude.J point+20 ms Lead V6
18556-1, ST amplitude.J point+60 ms Lead AVF
18557-9, ST amplitude.J point+60 ms Lead AVL

Vital Signs

Example Concepts: Temperature, blood pressure, heart rate, respiratory rate

Relevant vMR Classes: Use ObservationResult to capture an individual measurement. Use CompositeObservationResult to describe a composite result.

How to model: "Vital sign measurements including (among other measurements) body temperature of 101.3 deg F"

CompositeObservationResult.observationFocus = “Vital signs measurements” [LOINC: 29274-8]
ObservationResult.observationFocus = “Body temperature” [LOINC: 8310-5]
ObservationResult.value = 101.3 deg F expressed as a PQ

Other Physical Exam Findings

Example Concepts: Auscultation findings

Relevant vMR Classes: Use ObservationResult to capture an individual measurement. Use CompositeObservationResult to describe a composite result.

How to model: "Auscultation reveals inpiratory crackles"

ObservationResult.observationFocus = “Breath sound qualifier by Auscultation” [LOINC: 33424-3].
ObservationResult.value = "Inspiratory crackles (finding)" [SNOMED: 75252003]

Pulmonary Artery Catheter Readings

Example Concepts: Pulmonary artery pressure

Relevant vMR Classes: Use ObservationResult to capture an individual measurement. Use CompositeObservationResult to describe a composite result.

How to model: "Pulmonary artery pressure of 7 mm Hg"

ObservationResult.observationFocus = “Pulmonary artery wedge mean blood pressure” [LOINC: 8587-8]
ObservationResult.value = 7 mm Hg expressed as a PQ

Patient Problems, Allergies and Adverse Events

Patient diagnoses and traits are captured in the vMR using the Problem and DeniedProblem classes. Allergies and substance intolerances are captured by the vMR classes AllergyOrIntolerance and DeniedAllergyOrIntolerance. This includes such patient traits as drug or food allergies. Note that the vMR captures the denial of a problem or allergy as a concrete class. (AdverseEvent and

DeniedAdverseEvent follow a similar pattern.) For instance, an allergy to Penicillin may be captured as either an AllergyOrIntolerance or DeniedAllergyOrIntolerance depending on the semantics as shown below:

Class: AllergyOrIntolerance
conditionCode: “Drug Allergy” [SNOMED Code: 91936005]
agent: Penicillin
Semantics: Patient has an allergy to penicillin

Class: DeniedAllergyOrIntolerance
conditionCode: “Drug Allergy” [SNOMED Code: 91936005]
agent: Penicillin
Semantics: Patient ***does not have*** an allergy to penicillin

While the Problem and AllergyOrIntolerance classes indicate the documentation of the presence of a clinical condition in the patient’s record, the DeniedProblem or DeniedAllergyOrIntolerance indicates the documentation of a patient’s (or physician’s) denial that such a problem exists.

AdverseEvent and DeniedAdverseEvent, on the other hand, document the occurrence of an adverse event *at some point in time*. It is often after the occurrence of an adverse reaction to a substance for instance that an AllergyOrIntolerance may be documented.

Please note: Allergies are represented as special types of conditions embodied in the AllergyOrIntolerance class, whereas individual adverse events are represented as adverse events.

Also note that a problem resulting from an adverse event should not be confused with the adverse event. A fall is an adverse event whereas the fracture resulting from the fall is a problem. In general, as a rule of thumb, if something can naturally be represented as a problem, it should probably be represented as a problem.

Iatrogenic issues should generally be represented as both an adverse event and problem where feasible. These may include hospital-acquired pneumonia, central-line infections, or deep-venous thrombosis occurring during a hospitalization.

In some cases, the iatrogenic event will be distinct from the resulting problem. For example, an inadvertent liver laceration during surgery is an adverse event whereas the resulting liver bleeding is the problem.

Note that 'Never-Events' are adverse events while the resulting conditions from these events are problems.

Allergy

Example Concepts: Food or drug allergies

Relevant vMR Classes: AllergyOrIntolerance, DeniedAllergyOrIntolerance

How to model: “Patient is allergic to Penicillin”

AllergyOrIntolerance.conditionCode = “Drug allergy (disorder)” [SNOMED Code: 416098002]
AllergyOrIntolerance.agent = “Penicillin” [RxNorm: 70618] (TTY=IN)
AllergyOrIntolerance.criticality = “Life threatening severity (qualifier value)” [SNOMED: 442452003]

Clinical Diagnosis

Example Concepts: Diabetes, congestive heart failure

Relevant vMR Classes: Problem, DeniedProblem

How to model: “Patient has had diabetes since 1990”

Problem.conditionCode = ”Diabetes mellitus (disorder)” [SNOMED: 73211009]
Problem.conditionEffectiveTime.low = 19900617

Adverse Event or Adverse Reaction

Example Concepts: Adverse reaction to an agent, falls, adverse surgical events, hospital infections

Relevant vMR Classes: AdverseEvent, DeniedAdverseEvent

How to model: “Patient had an anaphylaxis reaction to peanuts”

AdverseEvent.adverseEventCode = “Anaphylaxis (disorder)” [SNOMED: 39579001]
AdverseEvent.adverseEventAgent = “Peanut - dietary (substance)” [SNOMED: 256349002]
AdverseEvent.severity = “Symptom moderate (finding)” [SNOMED: 162469005]
AdverseEvent.criticality = “Life threatening severity (qualifier value)” [SNOMED: 442452003]

Patient History

The vMR also supports the capture of a patient’s medical history through a variety of mechanisms listed below.

Chief Complaint

Example Concepts: Cough, pain, fever, fatigue

Relevant vMR Classes: ObservationResult

How to model: “Patient complains of cough”

ObservationResult.observationFocus = “Chief complaint (nominal scale)” [LOINC: 8661-1]
ObservationResult.observationValue = “Complaining of cough (finding)” [SNOMED: 272039006]

Past Surgical History

Example Concepts: Appendectomy, hernia repair

Relevant vMR Classes: ProcedureEvent

How to model: “Patient has undergone Total Knee Replacement Surgery on Right Knee”

ProcedureEvent.procedureCode = “Total replacement of right knee joint (procedure)” [SNOMED: 443682009]
ProcedureEvent.procedureTime = A valid date for the procedure.

Past Medical History

Example Concepts: Diabetes, congestive heart failure

Relevant vMR Classes: Problem

How to model: *See Patient Problems and Adverse Events Section*

MAR (Medication Administration Record)

Example Concepts: Warfarin 5mg PO administered on 12/10/2013 at 3pm

Relevant vMR Classes: SubstanceAdministrationEvent

How to model:

SubstanceAdministrationEvent.substance.substanceCode = “aspirin” [RxNorm: 435504] (TTY=SCD)
SubstanceAdministrationEvent.administrationTimeInterval = date when medication was administered.

Home Meds

Example Concepts: “Warfarin 5mg, 30 day supply, dispensed on 12/01/2013”

Relevant vMR Classes: SubstanceDispenseEvent

How to model:

SubstanceDispenseEvent.substance.substanceCode = “aspirin” [RxNorm: 435504] (TTY=SCD)
SubstanceDispenseEvent.dispenseTime = date medication was dispensed.

Social History

Example Concepts: Sexual behavior, smoking status, alcohol intake, illicit drug use

Relevant vMR Classes: ObservationResult

How to model: “Patient smokes 1 pack per day”

ObservationResult.observationFocus = “Tobacco smoking consumption (observable entity)” [SNOMED: 266918002]
ObservationResult.value (CD) = “Moderate cigarette smoker (10-19 cigs/day)” [SNOMED: 230062009]
Additional data, such as pack-years or exact quantity of cigarettes smoked per day, may also need to be specified.

Family History

Example Concepts: Mother has diabetes

Relevant vMR Classes: Patient.relatedEvaluatedPerson.otherEvaluatedPerson.clinicalStatement

How to model: “Mother has diabetes”

relatedEvaluatedPerson.targetRole = “Mother (person)” [SNOMED: 72705000]
relatedEvaluatedPerson.clinicalStatement[type:Problem].conditionCode = “Diabetes mellitus (disorder)” [SNOMED: 73211009]

Signs & Symptoms (e.g., from a review of systems - ROS)

Example Concepts: Pain, fever

Relevant vMR Classes: ObservationResult

How to model: “Patient has pain”

See Clinical Findings section above.

Suggested Physician Orders

The following section of a patient record enumerates proposed clinical actions for the given patient. These are modeled using the various vMR proposal classes. The following text lists examples of proposed orders for a given patient.

Typically, a plan is produced as a result of an assessment. Hence, a planned procedure or substance administration/dispense may be related to one or more patient problems using a related clinical statement.

Proposal for a Laboratory Test

Example Concepts: A blood panel, a stool analysis

Relevant vMR Classes: LaboratoryProposal

How to model: “Hemoglobin A1c test”

LaboratoryProposal.procedureCode = “Hemoglobin A1c/Hemoglobin.total in Blood” [LOINC: 4548-4]

Proposal for an Imaging Procedure

Example Concepts: CT scan, MRI, X-Rays

Relevant vMR Classes: ImagingProposal

How to model: “Head CT with contrast”

ImagingProposal.procedureCode = “Computed tomography of entire head (procedure)” [SNOMED: 408754009]
ImagingProposal.contrast = true

Proposed Diet Order

Example Concepts: An oral diet order

Relevant vMR Classes: OralDietProposal

How to model: "Consistent carbohydrate diet"

OralDietProposal.dietType = “Consistent carbohydrate diet (regime/therapy)” [SNOMED US Extension Concept ID: 435651000124106]

Proposed Respiratory Care Order

Example Concepts: Oxygen delivery

Relevant vMR Classes: RespiratoryCareProposal

How to model: “Oxygen by nasal cannula”

RespiratoryCareProposal.procedureCode = “Oxygen administration by nasal cannula (procedure)” [SNOMED: 371907003]

Proposed Medications

Example Concepts: Aspirin, Lisinopril

Relevant vMR Classes: SubstanceAdministrationProposal, PCAProposal, EnteralFeedingProposal, CompositeIVProposal

How to model: “Administer to patient 488 mg Aspirin po qd”

SubstanceAdministrationProposal.substance.substanceCode = “Aspirin” [RxNorm: 435504] (TTY=SCD)
SubstanceAdministrationProposal.frequency.cycle.cycleTiming[type:CodedRecurringEvent].repeatCode = “Daily (qualifier value)” [SNOMED: 69620002]
SubstanceAdministrationProposal.dose.doseQuantity.low/high = 488 mg
SubstanceAdministrationProposal.dose.deliveryRoute = “Oral route (qualifier value)” [SNOMED: 26643006]

Proposed Supply

Example Concepts: Wheel chair

Relevant vMR Classes: SupplyProposal

How to model: “Wheel chair to bedside”

SupplyProposal.supplyCode = “Wheel chair, device (physical object)” [SNOMED: 58938008]

Interdisciplinary Care Planning

This is the component of the electronic health record that addresses interdisciplinary plans of care. It is a collection of problems, goals, and interventions to address one or more health concerns to guide resolution of acute care needs and to achieve healthy living.

Patient Problem

Example Concepts: At risk for falls, diabetes

Relevant vMR Classes: Problem

How to model: “At risk for falls”

Problem.conditionCode = “At risk for falls (finding)” [SNOMED: 129839007]

Patient Goal

Example Concepts: Reduce risk of falls, lose weight

Relevant vMR Classes: GoalProposal and Goal

How to model: "Reduce risk of falls"

Goal.goalFocus = “Falls (finding)” [SNOMED: 161898004]
Goal.targetGoalValue (Value: BL) = False

Intervention

Example Concepts: Patient assessments

Relevant vMR Classes: Procedure

How to model: “Fall risk assessment”

Procedure.procedureCode = “Fall risk assessment (procedure)” [SNOMED: 414191008]

Active Order List

This section of a patient record enumerates the list of all active orders that have not yet been fulfilled for this patient. These are modeled in the vMR using the various vMR *order* classes.

An Order for a Laboratory Test

Example Concepts: A blood panel, a stool analysis

Relevant vMR Classes: LaboratoryOrder

How to model: “Hemoglobin A1c”

LaboratoryOrder.procedureCode = “Hemoglobin A1c/Hemoglobin.total in blood” [LOINC: 4548-4]

An order for an Imaging Procedure

Example Concepts: CT Scan, MRI, X-Rays

Relevant vMR Classes: ImagingOrder

How to model: “Head CT with contrast”

ImagingOrder.procedureCode = “Computed tomography of entire head (procedure)” [SNOMED: 408754009]
ImagingOrder.contrast= true

OR

ImagingOrder.procedureCode = “Computerized axial tomography of brain with radiopaque contrast (procedure)” [SNOMED: 396207002]

A Diet Order

Example Concepts: An oral diet order

Relevant vMR Classes: OralDietOrder

How to model: "Consistent carbohydrate diet"

OralDietOrder.dietType = “Consistent carbohydrate diet (regime/therapy)” [SNOMED US Extension Concept ID: 435651000124106]

A Respiratory Care Order

Example Concepts: Oxygen delivery

Relevant vMR Classes: RespiratoryCareOrder

How to model: “Oxygen by nasal cannula”

RespiratoryCareOrder.procedureCode = “Oxygen administration by nasal cannula (procedure)” [SNOMED: 371907003]

Ordered Medications

Example Concepts: Aspirin, Warfarin

Relevant vMR Classes: SubstanceAdministrationOrder, PCAOrder, EnteralFeedingOrder, CompositeIVOrder

How to model: “Administer to patient 325 mg Aspirin po qd”

SubstanceAdministrationOrder.substance.substanceCode = “Aspirin” [RxNorm: 1191].
SubstanceAdministrationOrder.frequency.cycle.cycleTiming[type:CodedRecurringEvent].repeatCode = code for ‘QD’
SubstanceAdministrationOrder.dose.doseQuantity.low/high = 325 mg
SubstanceAdministrationOrder.dose.deliveryRoute = Code for ‘PO’

Ordered Supplies

Example Concepts: Wheel chair

Relevant vMR Classes: SupplyOrder

How to model: “Wheel chair to bedside”

SupplyOrder.supplyCode = “Wheel chair, device (physical object)” [SNOMED: 58938008]

7. vMR Logical Model

Details of the vMR Logical Model are provided below.

7.1 Model

Type: **Package**
Package:

7.1.1 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.

7.1.1.1 vmr

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

Specifies data about a patient relevant for CDS.

oralDiet - *(Class diagram)*

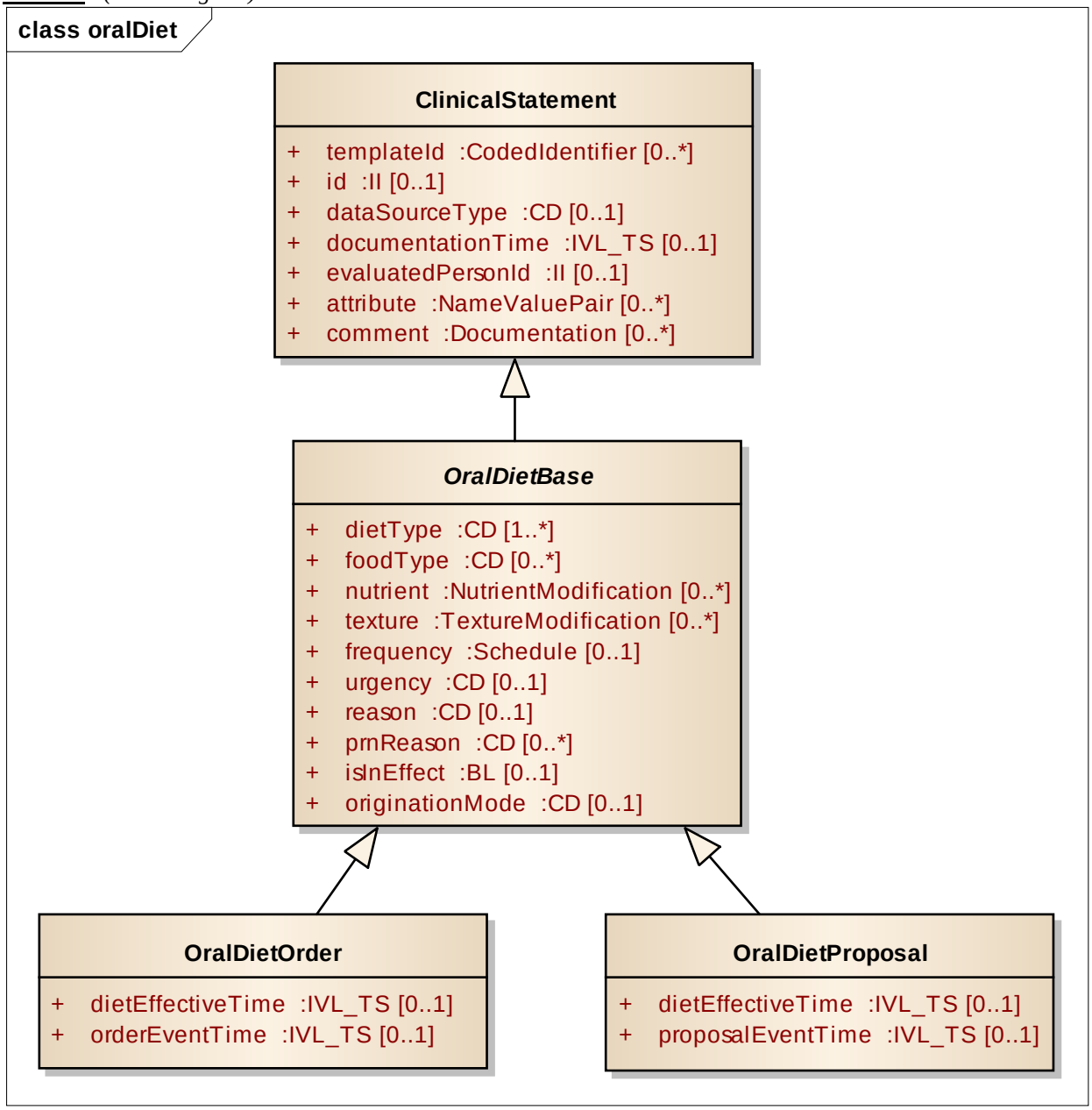

Figure: 1

vmr - *(Class diagram)*

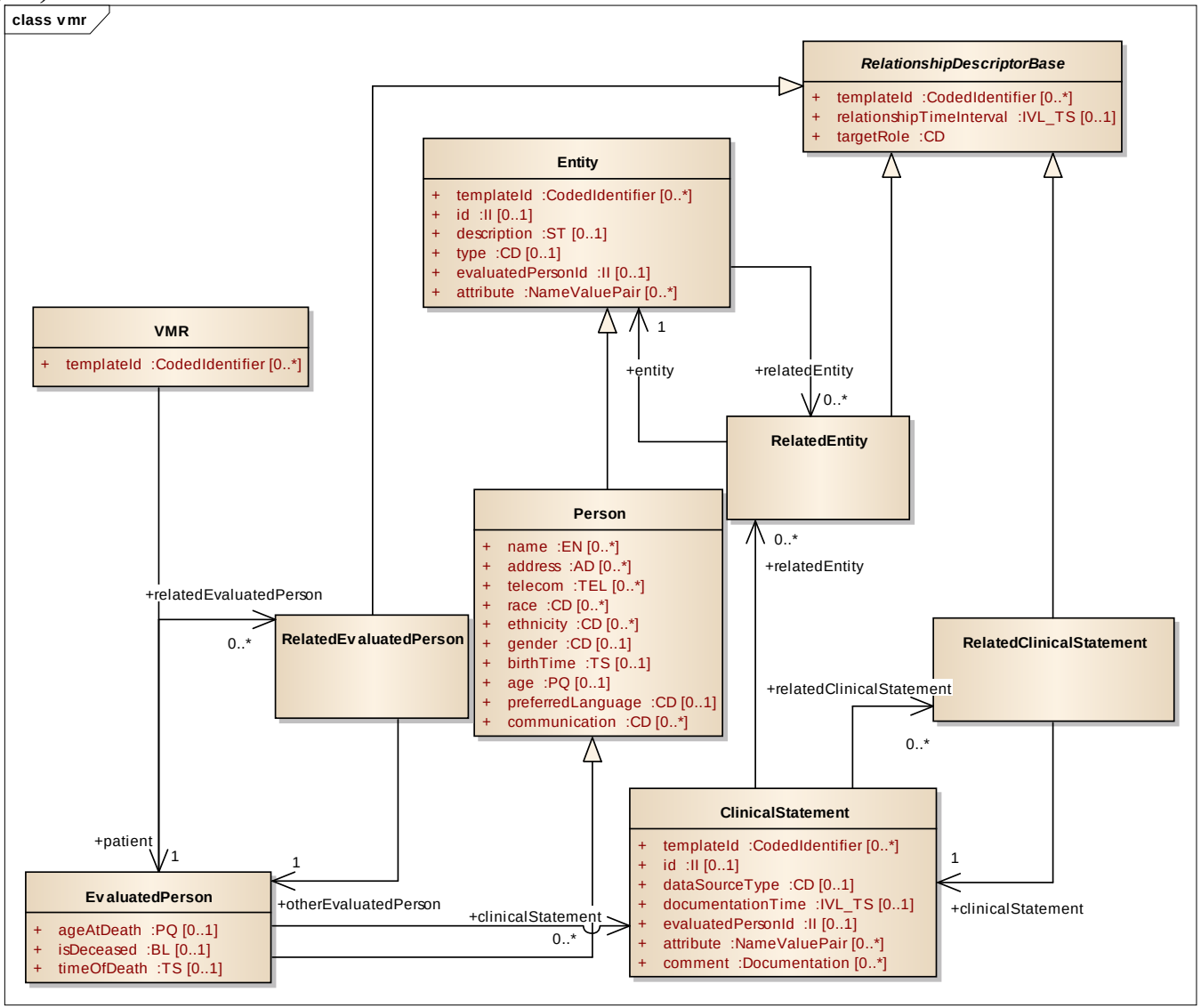

Figure: 2

extendedvMRTypes - *(Class diagram)*

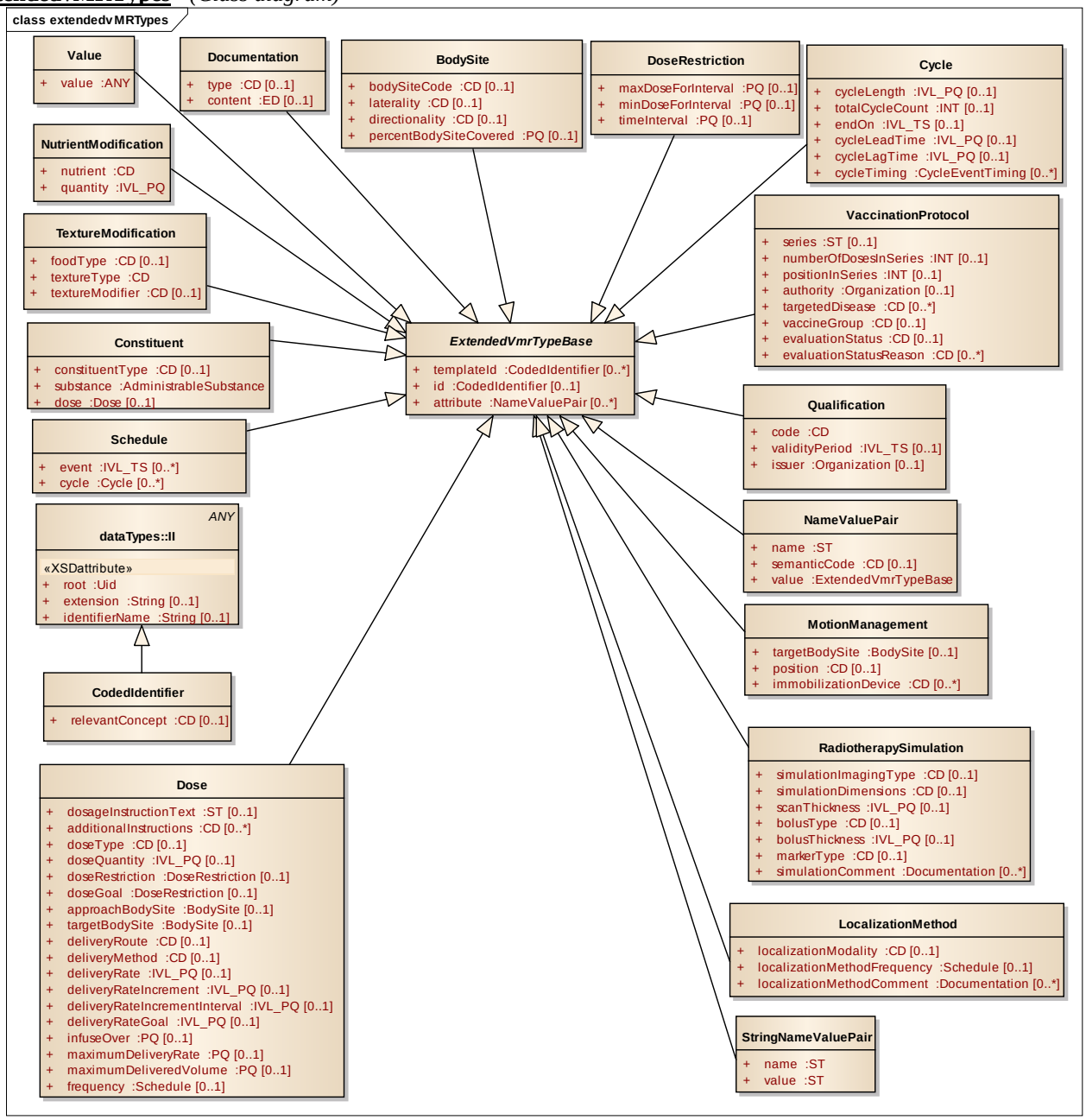

Figure: 3

schedule - *(Class diagram)*

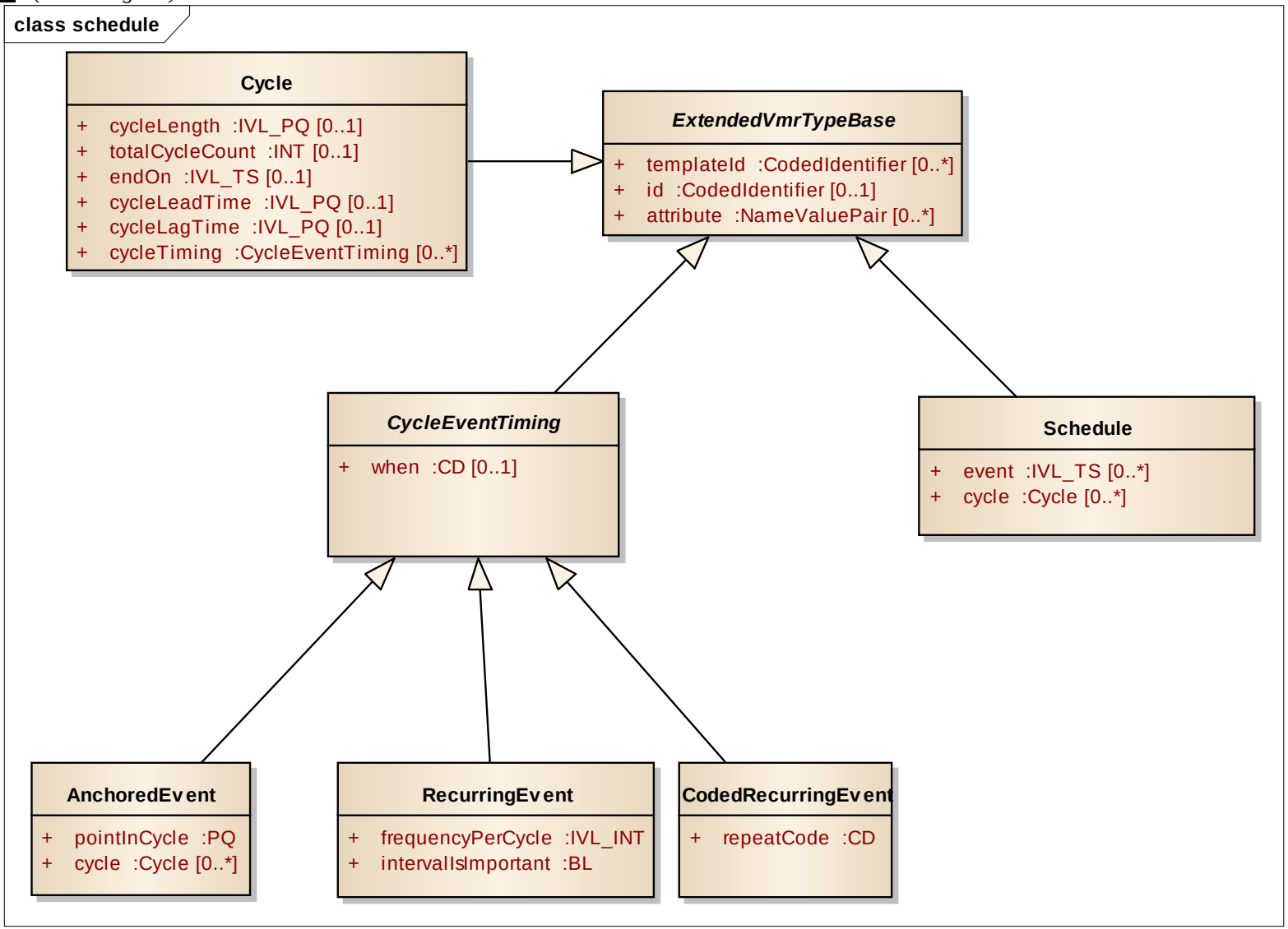

Figure: 4

entity - *(Class diagram)*

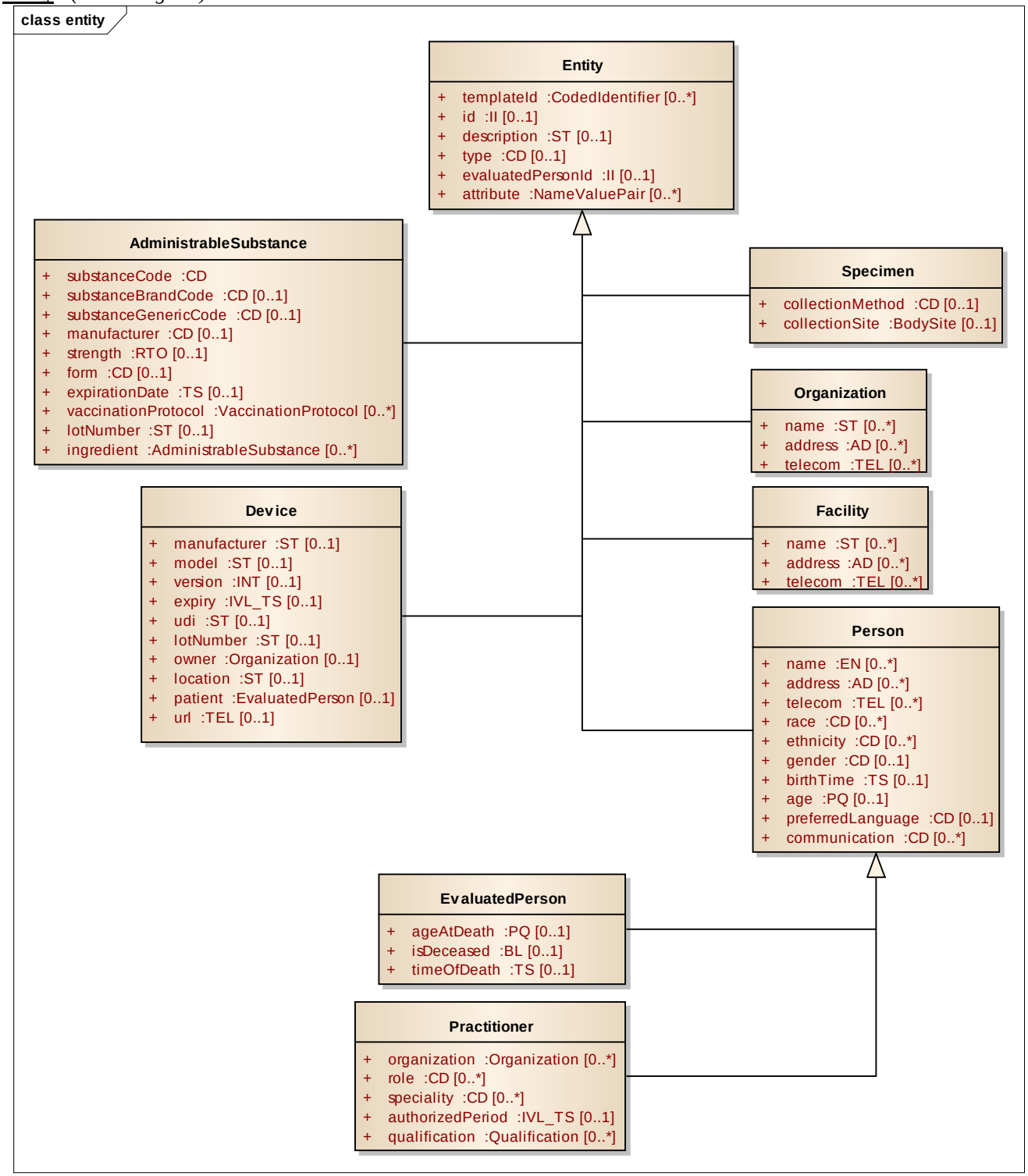

Figure: 5

clinicalStatement - *(Class diagram)*

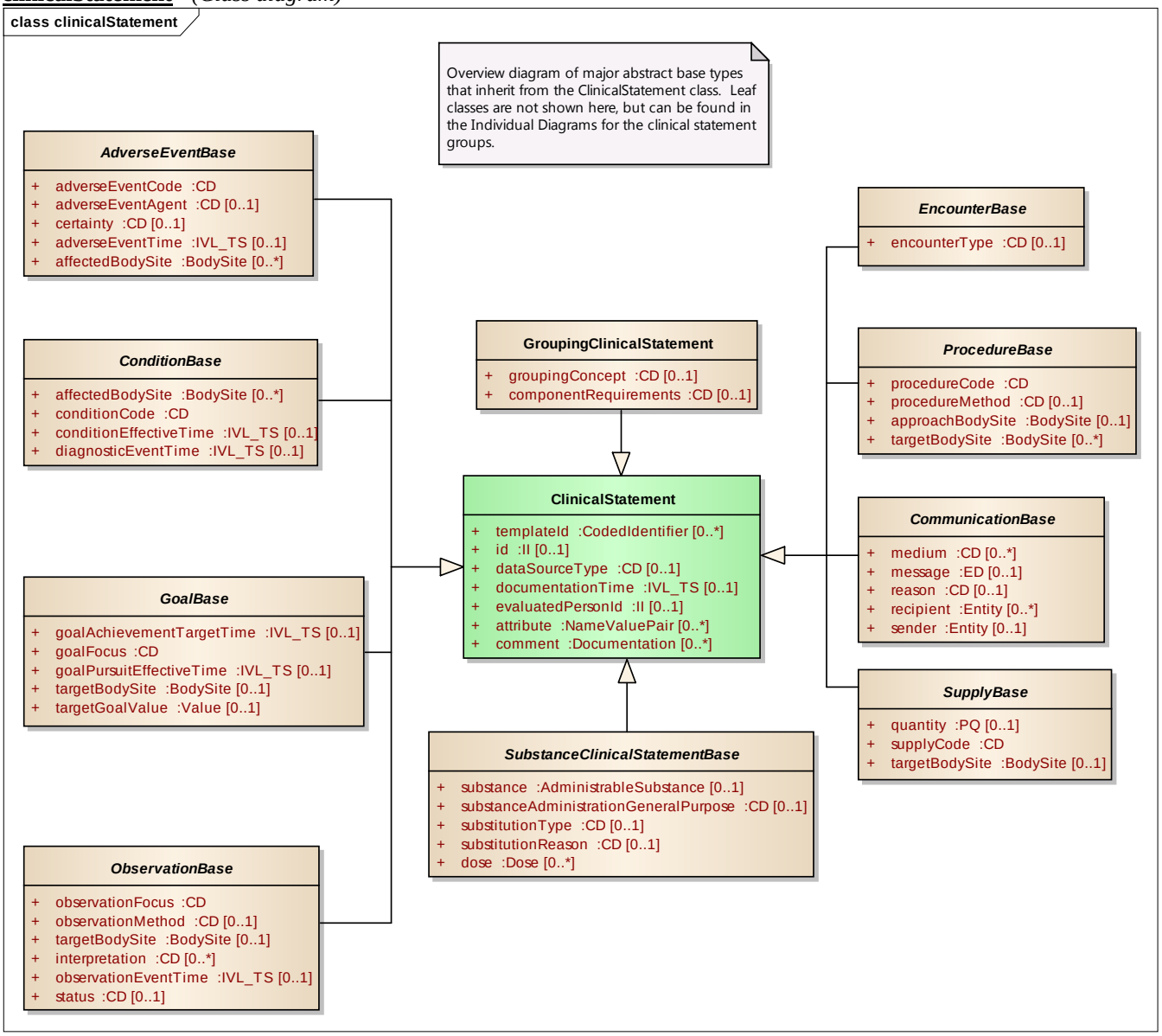

Figure: 6

communication - *(Class diagram)*

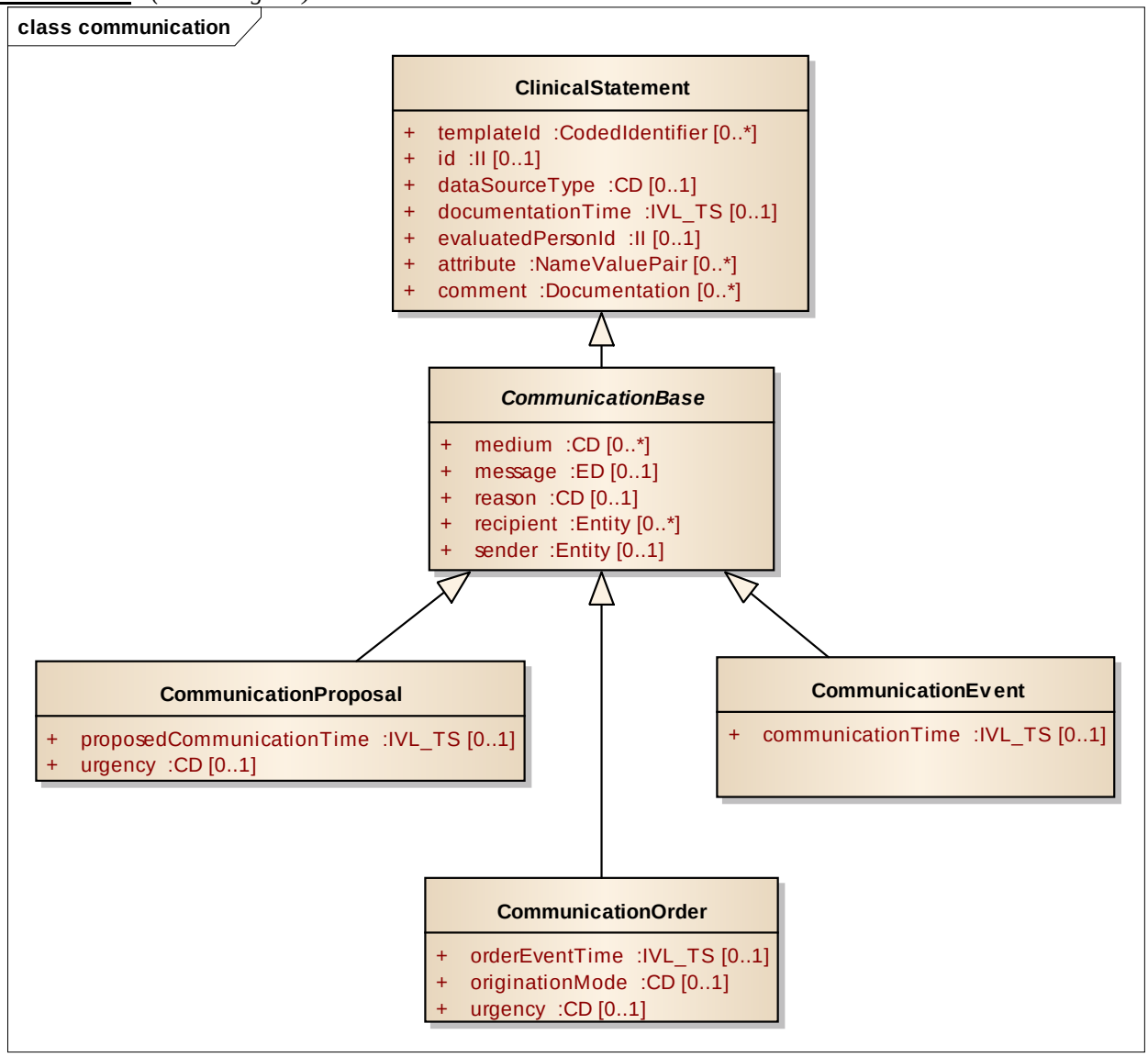

Figure: 7

encounter - *(Class diagram)*

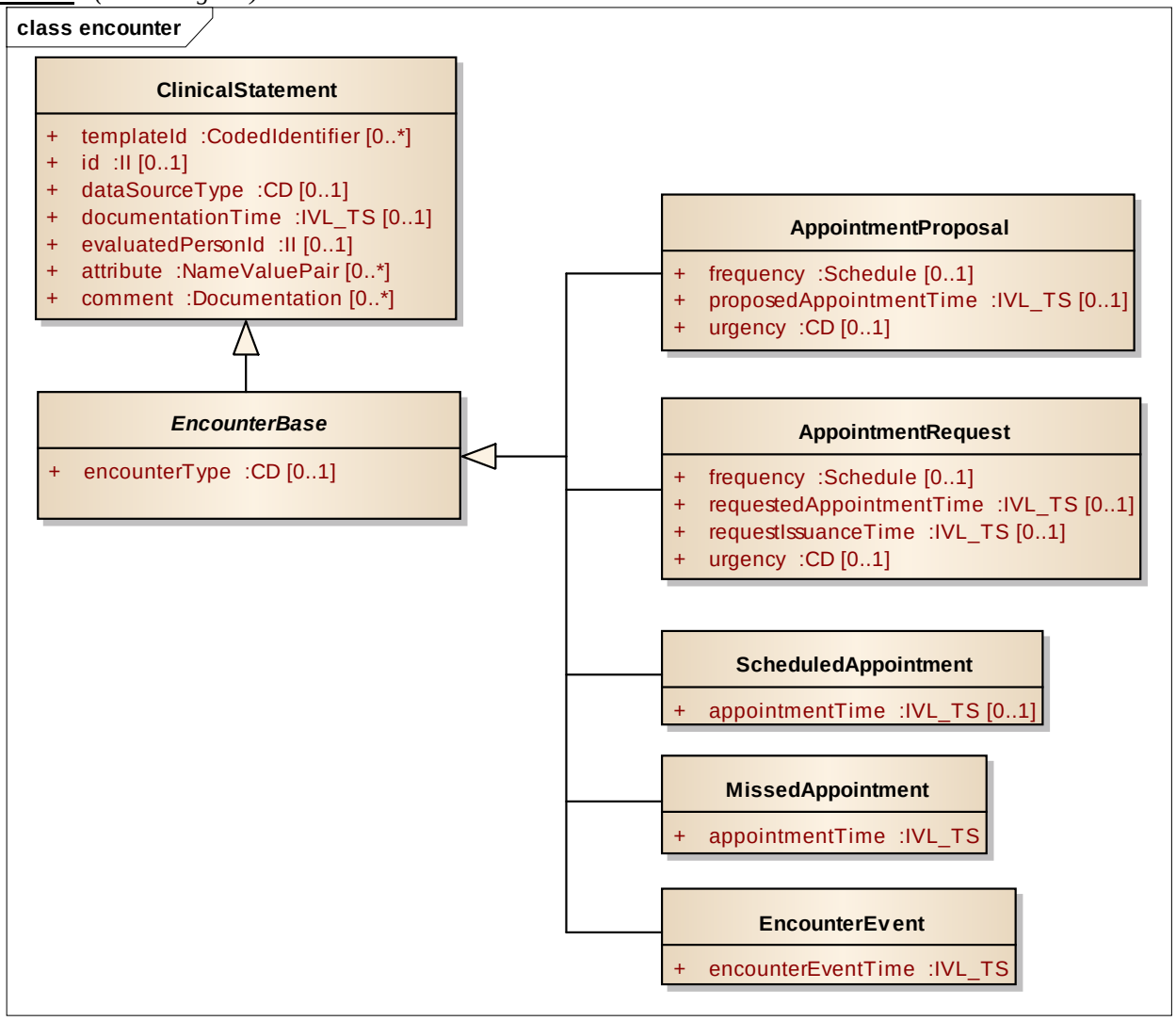

Figure: 8

goal - *(Class diagram)*

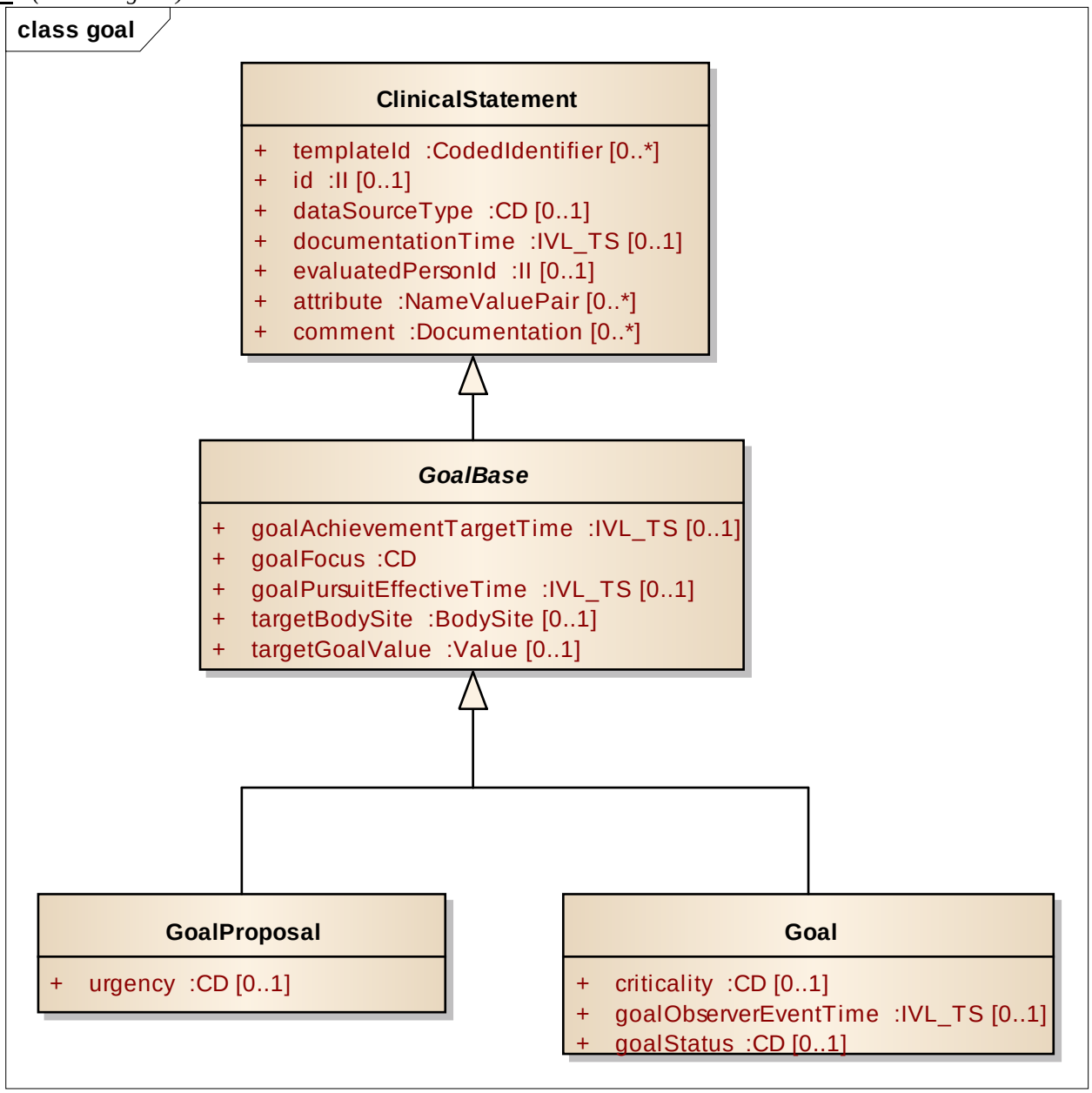

Figure: 9

observation - *(Class diagram)*

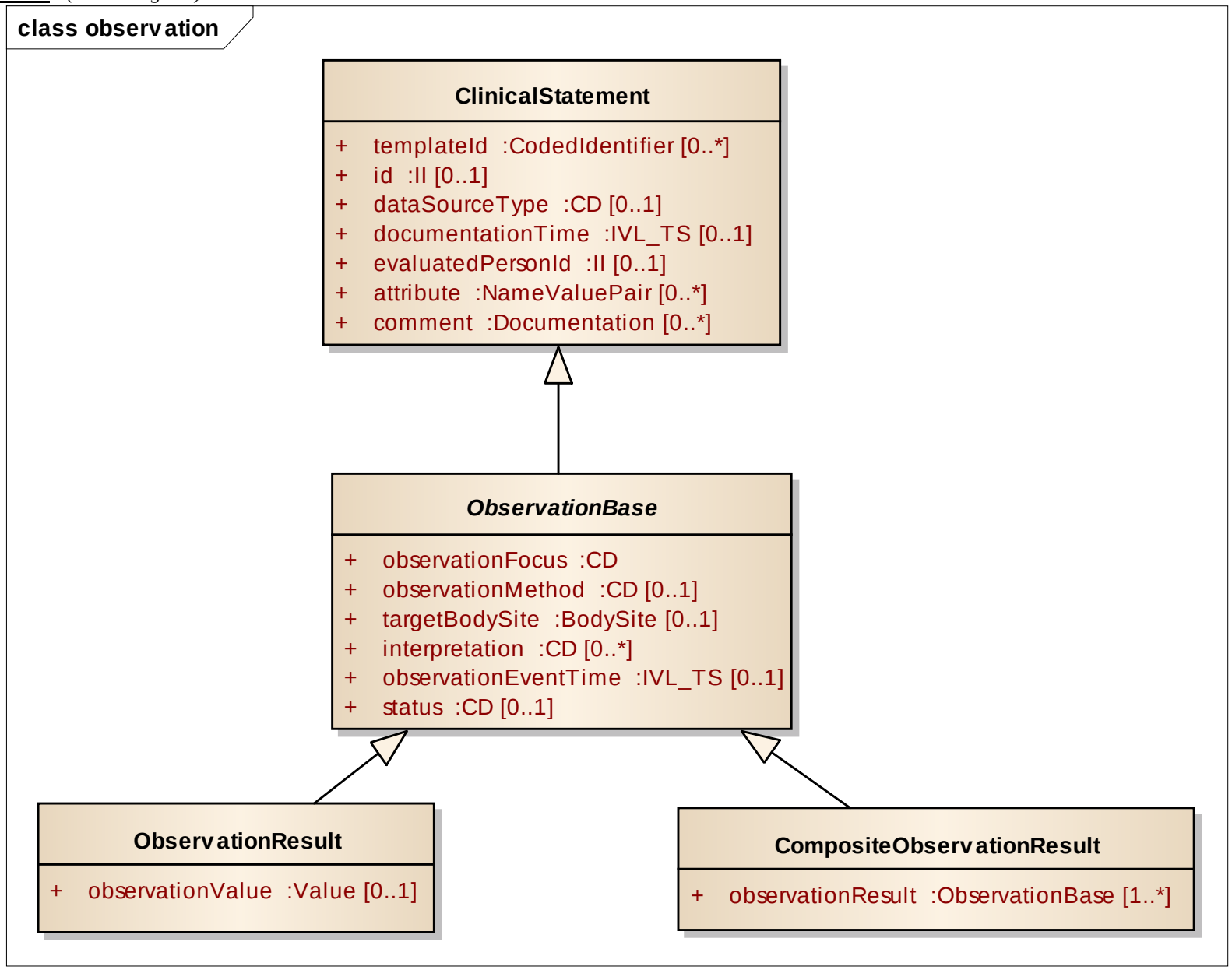

Figure: 10

adverseEvent - *(Class diagram)*

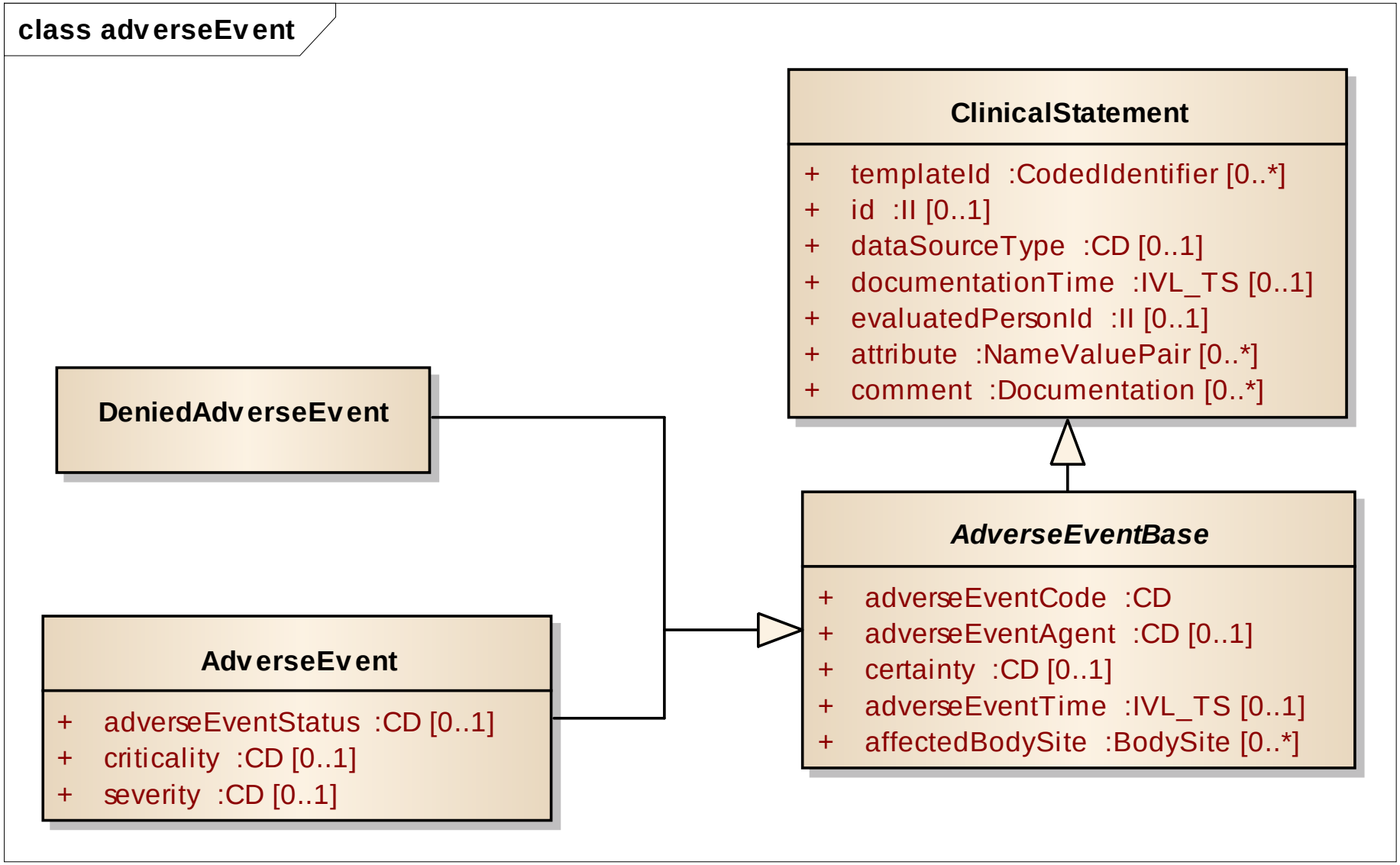

Figure: 11

problemAllergyIntolerance - *(Class diagram)*

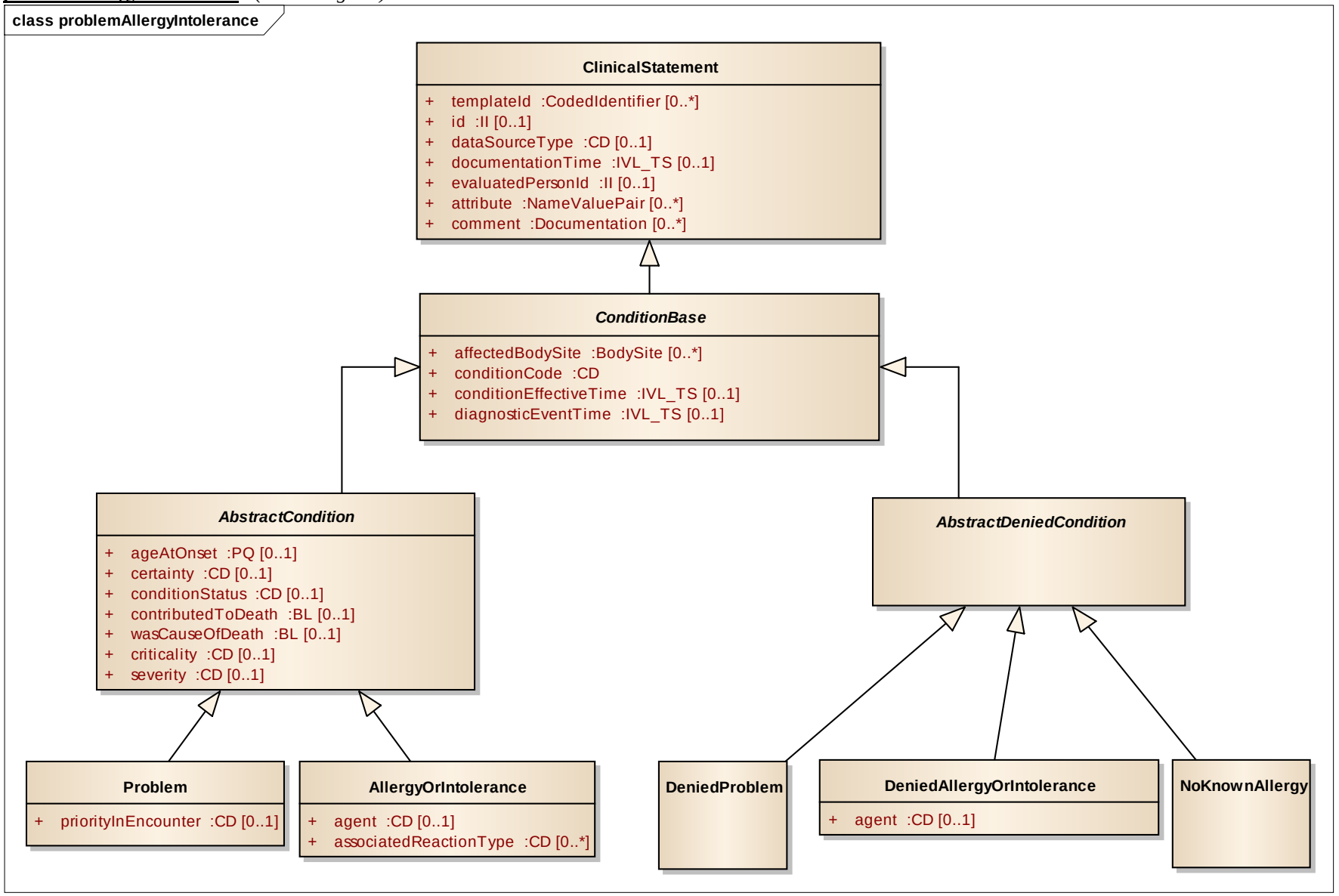

Figure: 12

procedure - *(Class diagram)*

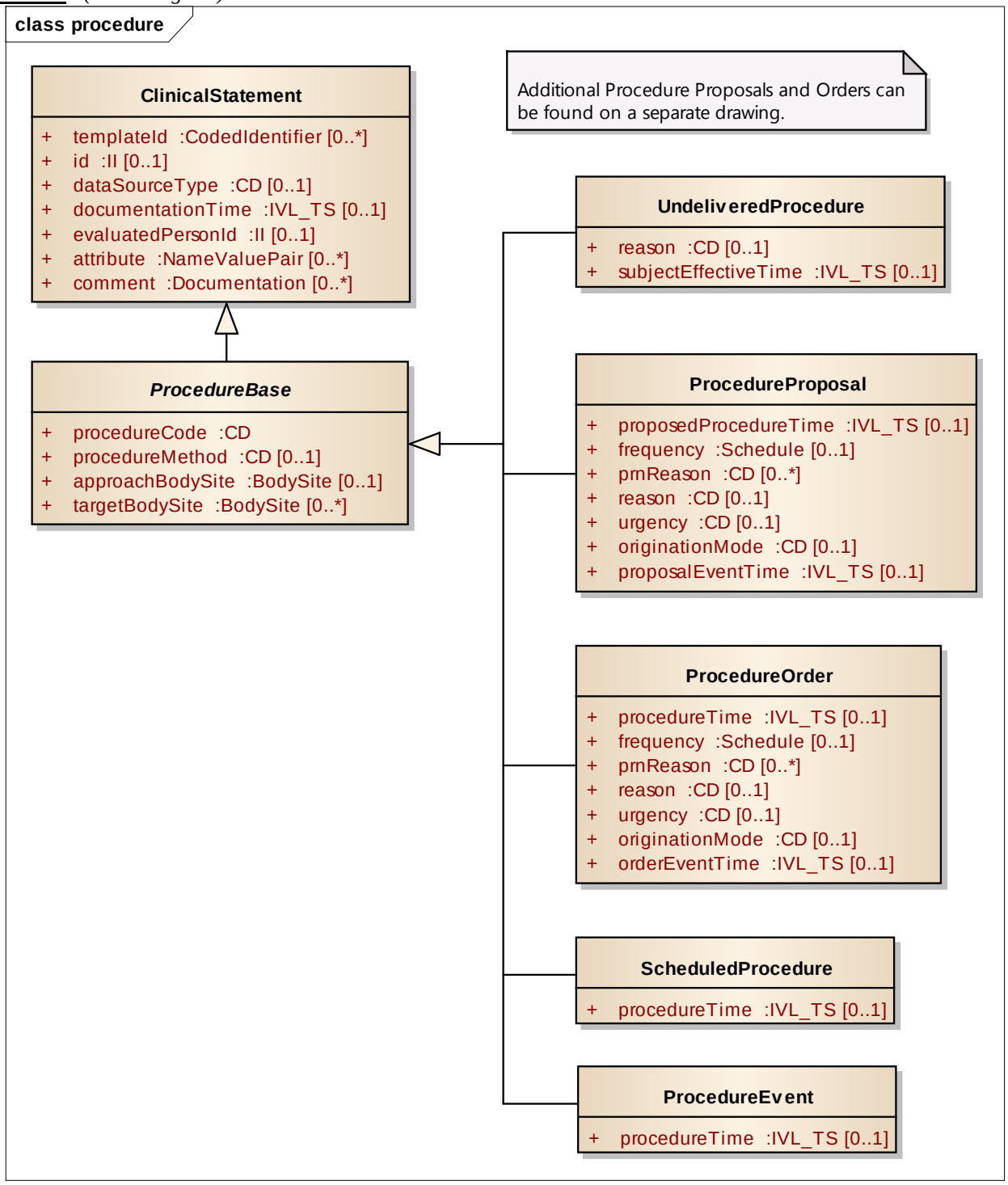

Figure: 13

procedureExtensions - *(Class diagram)*

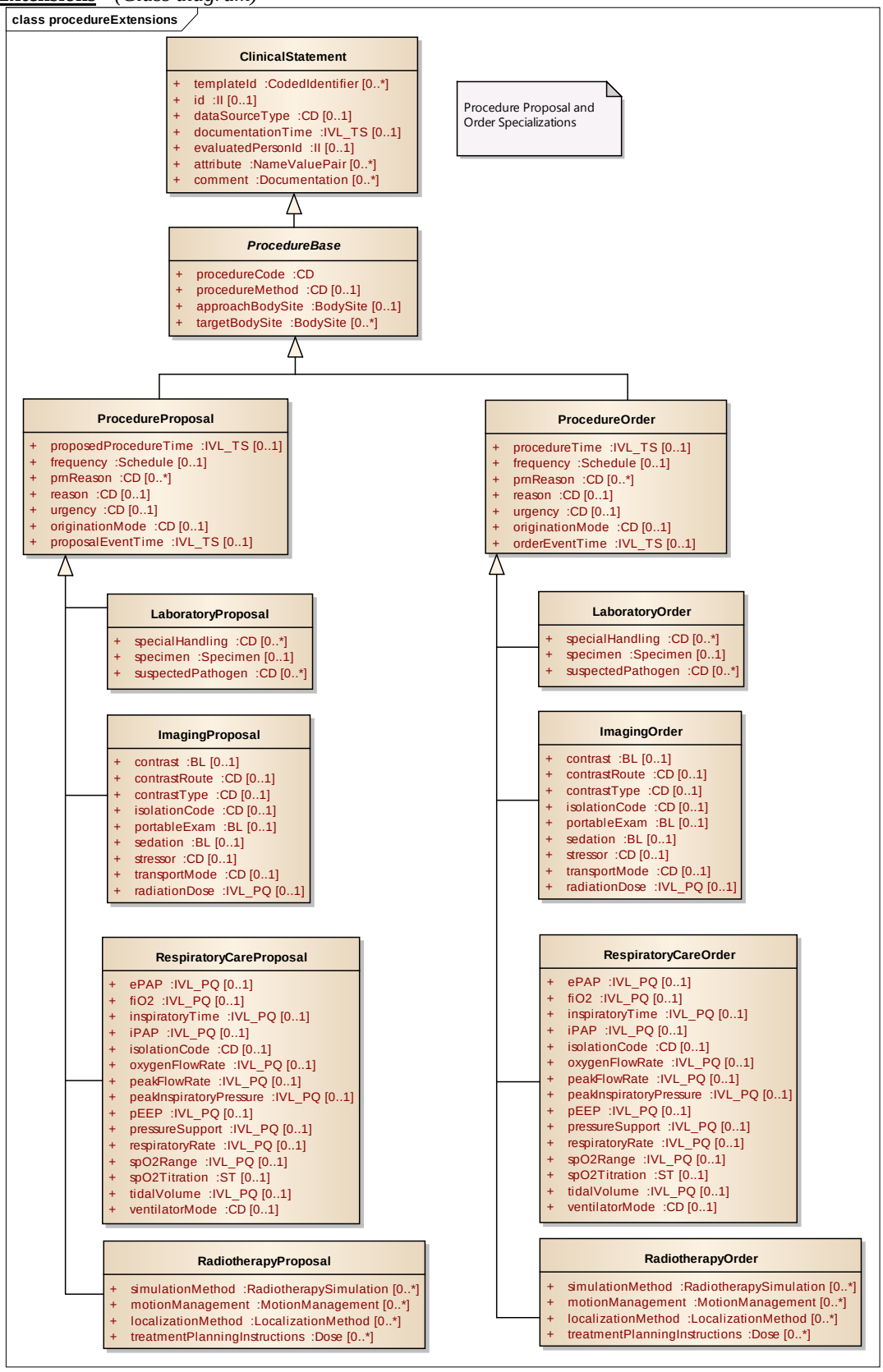

Figure: 14

substanceAdministration - *(Class diagram)*

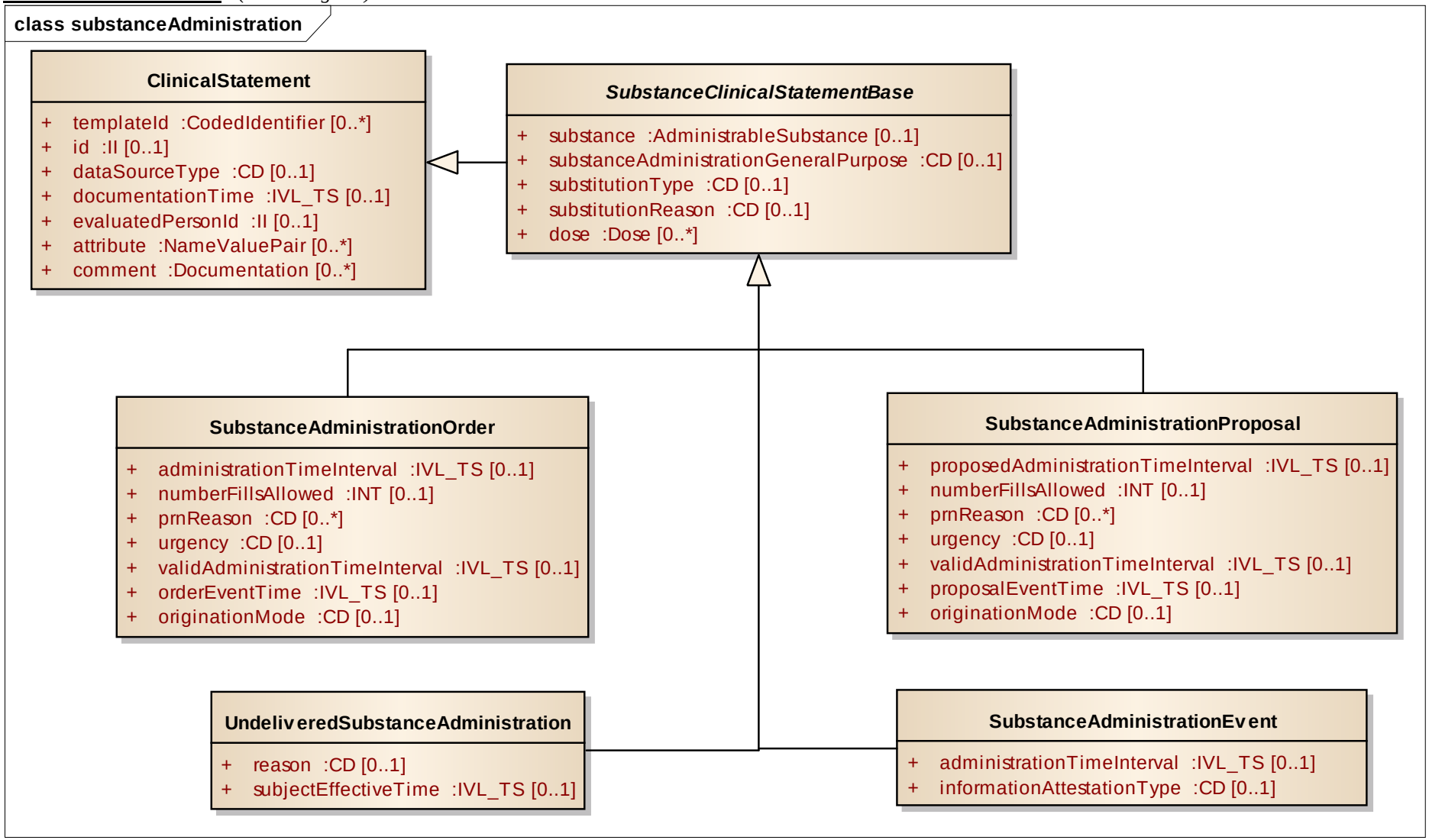

Figure: 15

substanceAdministrationExtensions - *(Class diagram)*

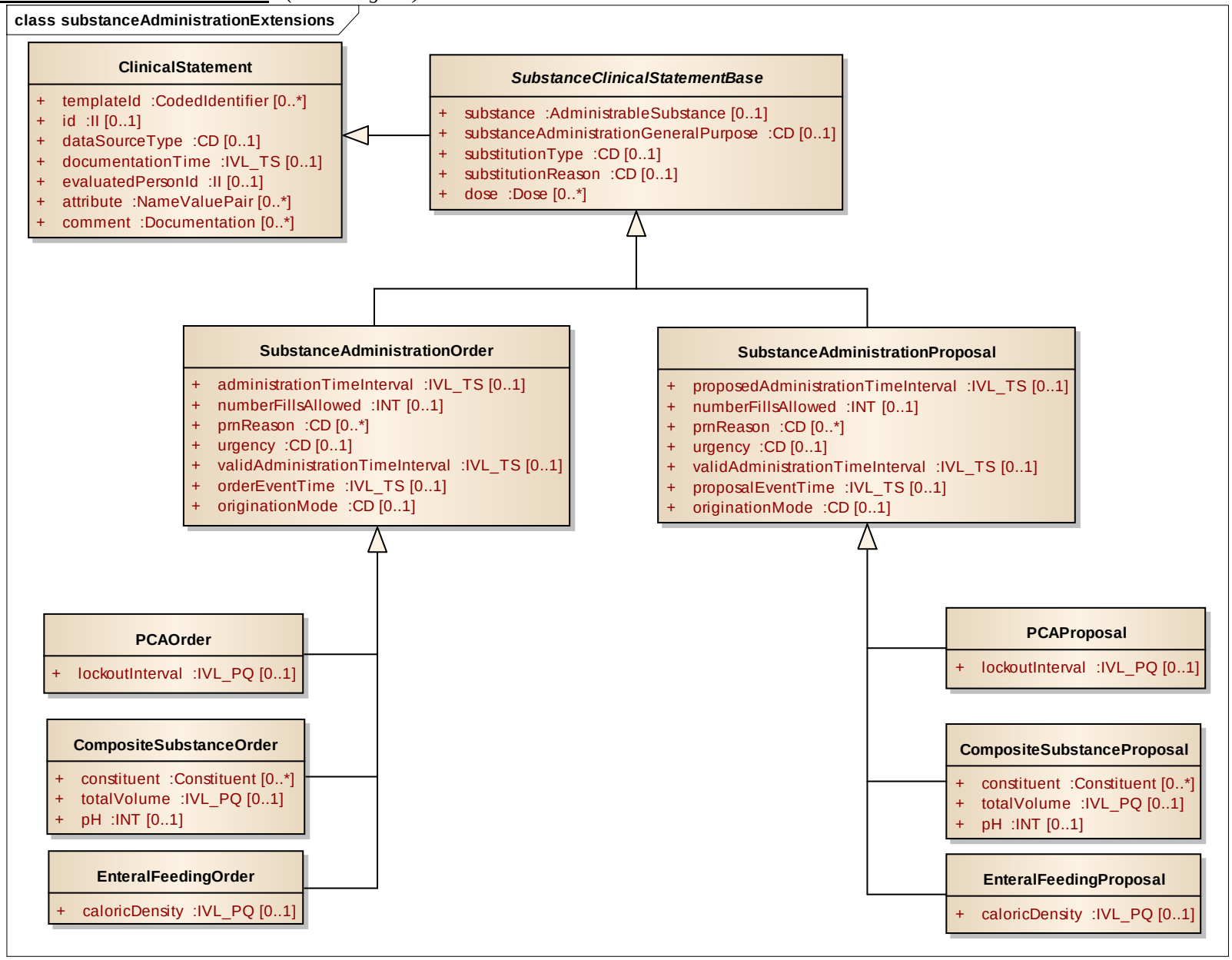

Figure: 16

substanceDispense - *(Class diagram)*

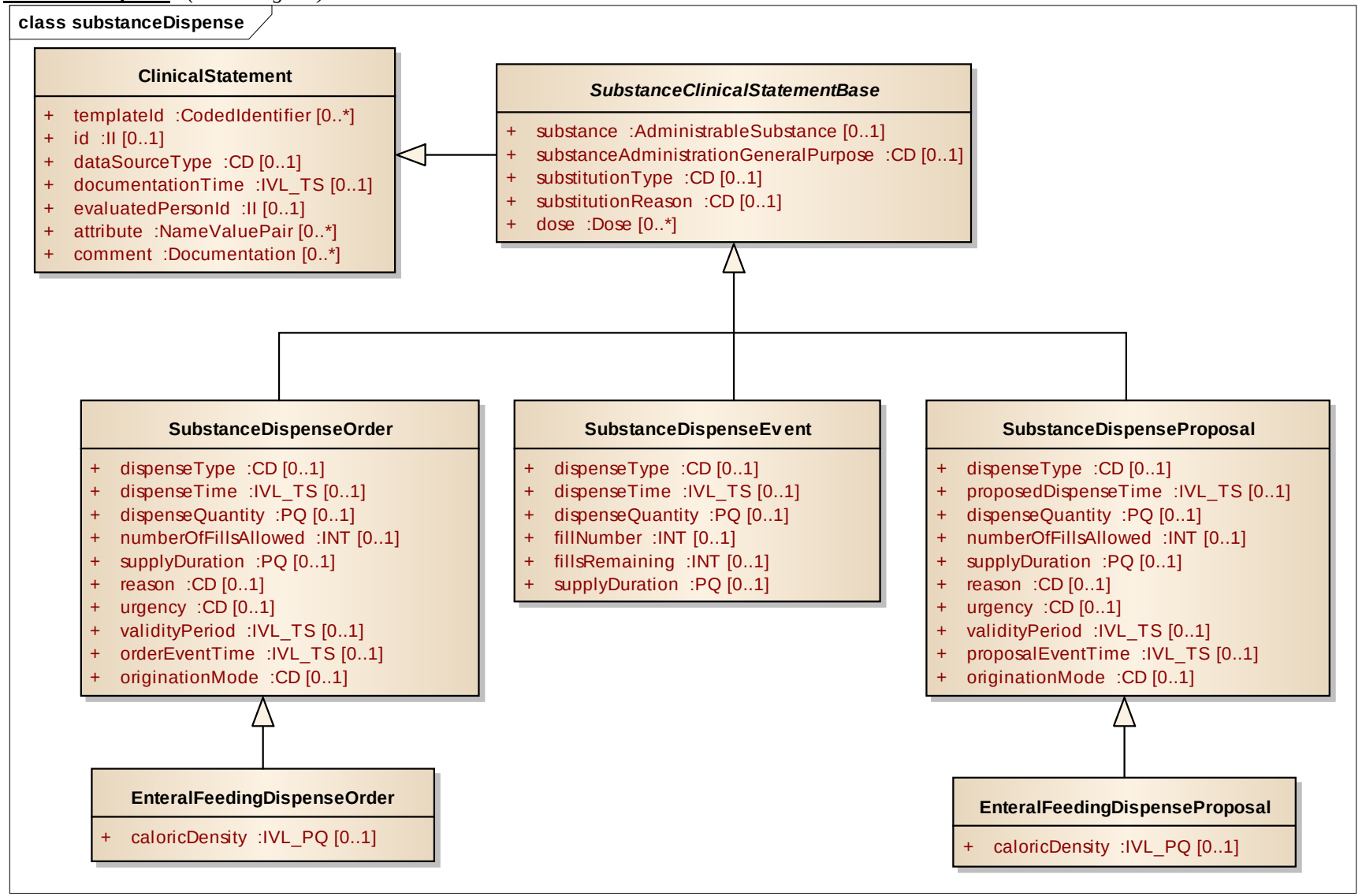

Figure: 17

supply - *(Class diagram)*

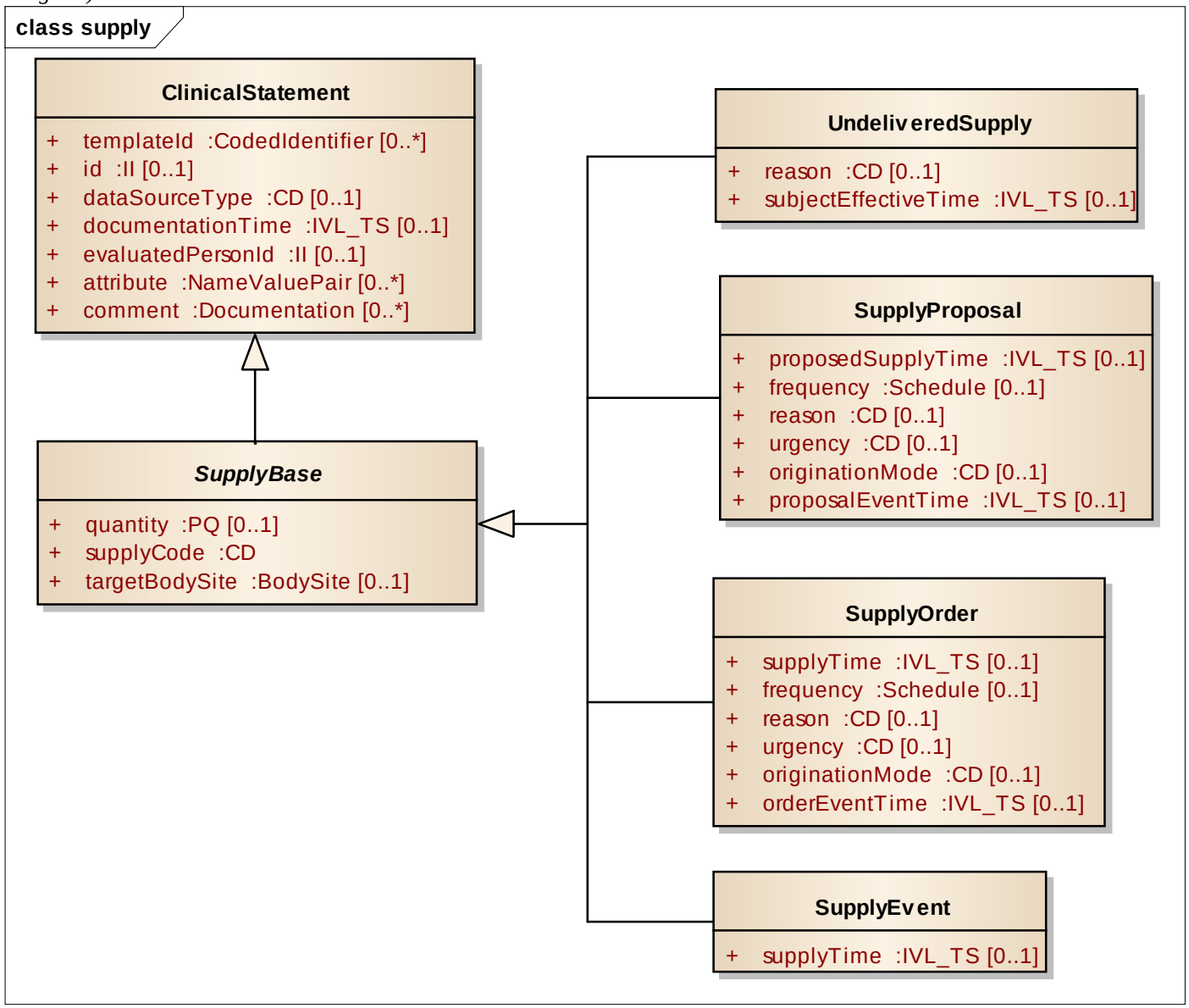

Figure: 18

7.1.1.1.1 AbstractCondition

Type: **Class** **ConditionBase**
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.
certainty CD [0..1]	Code indicating degree of certainty about the problem or allergy to an agent, such as 'Known' or 'Suspected'.
conditionStatus CD [0..1]	State of the problem. E.g., active, inactive, resolved.
contributedToDeath BL [0..1]	Whether the problem contributed to the subject's death.
wasCauseOfDeath BL [0..1]	Whether the problem was the cause of 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.
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

7.1.1.1.2 AbstractDeniedCondition

Type: **Class** **ConditionBase**
Package: vmr

A denial of the existence of a condition, problem, or allergy.

7.1.1.1.3 AdministrableSubstance

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

A material, generally but not exclusively a medication or antigen, of a particular constitution that can be given to a person to enable a clinical effect. An administrable substance may have component administrable substances.

Attributes

Attribute	Notes
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.
substanceBrandCode CD [0..1]	A code describing the product as a branded or trademarked entity from a controlled vocabulary.
substanceGenericCode CD [0..1]	A code describing the product as a substance produced and distributed without patent protection.
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 or amount of the administrable substance. E.g., 250 mg per 5 ml or 250 mg per tablet.
form CD [0..1]	The physical form of the substance as presented to the subject. E.g., tablet, patch, injectable, inhalant.
expirationDate TS [0..1]	Date substance expires. Requirement: This is useful input for an Immunization CDS engine. Expired administrations can not count and must be repeated.
vaccinationProtocol VaccinationProtocol [0..*]	Contains information about the protocol under which the vaccine was administered.
lotNumber 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.
ingredient AdministrableSubstance [0..*]	The ingredients of a composite substance. E.g., a polyvalent vaccine or a composite medication.

7.1.1.1.4 AdverseEvent

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

Unfavorable healthcare event (e.g., death, rash, difficulty breathing, a fall, or an adverse surgical event) that may or may not have been caused by some agent (e.g., a medication, immunization, food, or environmental agent).

Use AdverseEvent to model adverse reaction. An adverse reaction is type of adverse event that is characterized by an undesired or unexpected negative reaction to an agent (generally a medication or a food item).

An adverse reactions can range from a mild reaction, such as a harmless rash to a severe and life-threatening reaction. They can occur immediately or develop over time. For example, a patient may develop a rash after taking a particular medication.

In the case of adverse reactions, if a given agent is thought to cause multiple reactions, these reactions should be represented using multiple adverse events.

Note that allergies are represented as special types of conditions embodied in the AllergyOrIntolerance class, whereas individual adverse events are represented as adverse events.

Note that a problem resulting from adverse event should not be confused with the adverse event. A fall is an adverse event whereas the fracture resulting from the fall is a problem. In general, as a rule of thumb, if something can naturally be represented as a problem, it should be represented as a problem.

Iatrogenic issues should generally be represented as both an adverse event and problem where feasible. For instance, hospital-acquired pneumonia, central-line infections, or deep-venous thrombosis occurring during a hospitalization.

In some cases, the iatrogenic event will be distinct from the resulting problem. For example, an inadvertent liver laceration during surgery is an adverse event whereas the resulting liver bleeding is the problem.

Note that 'Never-Events' are adverse events while the resulting condition from these events are problems.

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.
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.

7.1.1.1.5 AdverseEventBase

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

Abstract base class for both adverse events and denied 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.
certainty CD [0..1]	Code indicating whether adverse reaction to agent is 'Known' or 'Suspected'. Note: This field is only intended to state the degree of certainty one has about an agent causing the adverse reaction. It is not intended to state the level of certainty of the adverse event statement itself.
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).

Attribute	Notes
affectedBodySite BodySite [0..*]	A body site affected by the adverse event.

7.1.1.1.6 AllergyOrIntolerance

Type: **Class** **AbstractCondition**
Package: vmr

An allergy or intolerance triggered by a known or suspected agent. Note that one class is used to represent both concepts as it is often difficult to distinguish the two.

Attributes

Attribute	Notes
agent CD [0..1]	An agent that causes or contributes to the allergy or intolerance, identified with as much specificity as available, or as required by a template. Used for allergies, intolerances, and other reactions to a known agent. E.g., penicillin, peanuts, latex.
associatedReactionType CD [0..*]	A code that indicates specific reactions that occurred. Example: Rash, Hives, immune-mediated.

7.1.1.1.7 AnchoredEvent

Type: **Class** **CycleEventTiming**
Package: vmr

Identifies the timing of a point-in-time occurrence and optionally a sub-cycle in a cycle that starts at a specific point in the cycle and may span a duration of time.

For instance give a medication on the fifth, 10th, and 18th day of a 24-day cycle for a duration of 1 day each time, three times per day.

Attributes

Attribute	Notes
pointInCycle PQ	The point within the cycle. For instance, for a cycle of 21 days, the 5th day in the cycle is equivalent to a pointInCycle = 5 day (read as Day 5).
cycle Cycle [0..*]	If the occurrence has a duration and a frequency, it should be specified as a cycle. For instance, give medication X on day 5 of a 22 day cycle, three times a day for 2 days.

7.1.1.1.8 AppointmentProposal

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

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

Attributes

Attribute	Notes
frequency Schedule [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 frequency >= 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 frequency 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

7.1.1.1.9 AppointmentRequest

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

A request by a provider to schedule an appointment.

Attributes

Attribute	Notes
frequency Schedule [0..1]	How often the requested appointments must take place.
requestedAppointmentTime IVL_TS [0..1]	Requested time for appointment. If frequency >= 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 frequency 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

7.1.1.1.10 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.
percentBodySiteCovered PQ [0..1]	Percent of the body site structured of relevance within this clinical context. For instance, this is often relevant in radiotherapy where a total dose volume applies to only a portion of the target body site (e.g., 60% of the left kidney).

7.1.1.1.11 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 --> NoKnownAllergy with conditionCode reflecting the type of 'No known allergy' statements (e.g., 'No known allergy', 'No known medication allergy', 'No known food allergy')
- No known medications --> UndeliveredSubstanceAdministration with substance that is the root-level code for medications.
- No known problems --> DeniedProblem with conditionCode 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, patient care devices, clinical system, patient or family member, external CDS system, this CDS system. Optional in the base vMR, but should consider providing when available.
documentationTime IVL_TS [0..1]	The time when the clinical statement was documented (e.g., entered into an electronic health record system by a care provider).
evaluatedPersonId II [0..1]	The 'owner' of this clinical statement.
attribute NameValuePair [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.
comment Documentation [0..*]	A comment, instruction, or note associated with the clinical statement. 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.

7.1.1.1.12 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.

7.1.1.1.13 CodedRecurringEvent

Type: **Class** **CycleEventTiming**
Package: vmr

Specification of a repetitive schedule element as a code.

Attributes

Attribute	Notes
repeatCode CD	A code indicating the frequency of the occurrence. For instance, Q8H or TID.

7.1.1.1.14 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..*]	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.

7.1.1.1.15 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.

7.1.1.1.16 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
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

7.1.1.1.17 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
proposedCommunicationTime IVL_TS [0..1]	The time interval in which the communication is proposed to be sent
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

7.1.1.1.18 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.

7.1.1.1.19 CompositeSubstanceOrder

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

A class representing an order for a composite medication such as IV fluid that may consist of one or more additives mixed into a diluent. Additives and diluents are represented as constituents with the appropriate constituentType.

Attributes

Attribute	Notes
constituent Constituent [0..*]	A substance that composes this composite medication such as an additive or diluent in a composite IV.
totalVolume IVL_PQ [0..1]	The total volume of the overall mixture such as the volume of the bag.
pH INT [0..1]	The pH of the composite IV. This field may be important for Total Parenteral Nutrition.

7.1.1.1.20 CompositeSubstanceProposal

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

A class representing a proposal for a composite medication such as IV fluid that may consist of one or more additives mixed into a diluent. Additives and diluents are represented as constituents with the appropriate constituentType.

Attributes

Attribute	Notes
constituent Constituent [0..*]	A substance that composes this composite medication such as an additive or diluent in a composite IV.
totalVolume IVL_PQ [0..1]	The total volume of the overall mixture such as the volume of the bag.
pH INT [0..1]	The pH of the composite IV. This field may be important for Total Parenteral Nutrition.

7.1.1.1.21 ConditionBase

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

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

Note that allergies are represented as a special type of conditions represented by the AllergyOrIntolerance concept, whereas individual adverse events are represented as adverse events.

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).
conditionCode 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

Attribute	Notes
	ICD9, ICD10, or SNOMED code, or whatever vocabularies are appropriate to describe the problem or condition. E.g., diabetes mellitus, congestive heart failure.
conditionEffectiveTime 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.
diagnosticEventTime IVL_TS [0..1]	The time when the evaluator identified the subject as having the condition (in the case of Problem for instance) or as not having the condition (in the case of DeniedProblem for instance). The same principles apply to AllergyOrIntolerance.

7.1.1.1.22 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
constituentType CD [0..1]	Indicates the category of the constituent. For instance, for a composite IV, the constituent may be either a 'diluent' or an 'additive'. For a TPN order, the constituent category may be a nutrient grouping such as 'electrolyte' or 'lipid', etc...
substance AdministrableSubstance	Generally the ingredient of the constituent (e.g., dopamine) such as an additive in a composite IV.
dose Dose [0..1]	The dose of the constituent that makes up the whole. E.g., 500ml 50% Dextrose solution

7.1.1.1.23 Cycle

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

Represents a predictable periodic interval where events may occur at specific points within this interval. Examples may include:

1. An event that may occur TID.
2. An event that may occur TID but at specific times such as 8am, noon, and 3pm.
3. An event that may occur three times a day but the interval is not important.
4. An event that may occur three times a day where the interval between events must be 8hrs (Q8H).

Note that cycles may be nested. For instance,
A chemotherapy regimen where a substance is administered TID on day 1,5,10 of a 10-day cycle.

Attributes

Attribute	Notes
cycleLength IVL_PQ [0..1]	The duration of the overall cycle or subcycle.

Attribute	Notes
totalCycleCount INT [0..1]	Number of times to repeat the cycle including the first one. When not specified, assumed to be 1.
endOn IVL_TS [0..1]	Point in time when the cycle should end.
cycleLeadTime IVL_PQ [0..1]	Negative offset between the end of the previous cycle and the start of the next cycle. That is, the start of the next cycle shall start before the end of the previous cycle.
cycleLagTime IVL_PQ [0..1]	Positive offset between the end of the first cycle and the start of the second one. That is, the start of the next cycle shall start after then end of the previous cycle.
cycleTiming CycleEventTiming [0..*]	Identifies a repeating pattern to the intended time periods such as the number of occurrences in a given time period, the days in a multi-day cycle, or a code representing the frequency of occurrence for a given cycle.

7.1.1.1.24 CycleEventTiming

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

Identifies a repeating pattern to the intended time periods such as the number of occurrences in a given time period, the days in a multi-day cycle, or a code representing the frequency of occurrence for a given cycle.

Attributes

Attribute	Notes
when CD [0..1]	A code that identifies the occurrence of daily life that determine timing. This is an example value set with codes taken from http://hl7.org/fhir/v3/TimingEvent: HS HS event occurs [duration] before the hour of sleep (or trying to). WAKE WAKE event occurs [duration] after waking. AC AC event occurs [duration] before a meal (from the Latin ante cibus). ACM ACM event occurs [duration] before breakfast (from the Latin ante cibus matutinus). ACD ACD event occurs [duration] before lunch (from the Latin ante cibus diurnus). ACV ACV event occurs [duration] before dinner (from the Latin ante cibus vespertinus). PC PC event occurs [duration] after a meal (from the Latin post cibus). PCM PCM event occurs [duration] after breakfast (from the Latin post cibus matutinus). PCD PCD event occurs [duration] after lunch (from the Latin post cibus diurnus). PCV PCV event occurs [duration] after dinner (from the Latin post cibus vespertinus).

7.1.1.1.25 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.

7.1.1.1.26 DeniedAllergyOrIntolerance

Type: **Class** **AbstractDeniedCondition**
Package: vmr

An statement denying the presence of an allergy or intolerance to a specific agent.

Attributes

Attribute	Notes
agent CD [0..1]	An agent that causes or contributes to the allergy or intolerance, identified with as much specificity as available, or as required by a template. Used for allergies and intolerances to a known agent. E.g., penicillin, peanuts, latex.

7.1.1.1.27 DeniedProblem

Type: **Class** **AbstractDeniedCondition**
Package: vmr

An statement denying the presence of a clinical condition.

7.1.1.1.28 Device

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

This resource identifies an instance of a manufactured thing that is used in the provision of healthcare without being substantially changed through that activity. The device may be a machine, an insert, a computer, an application, etc. This includes durable (reusable) medical equipment as well as disposable equipment used for diagnostic, treatment, and research for healthcare and public health.

Attributes

Attribute	Notes
manufacturer ST [0..1]	A name of the manufacturer.

Attribute	Notes
model ST [0..1]	The "model" - an identifier assigned by the manufacturer to identify the product by its type. This number is shared by the all devices sold as the same type.
version INT [0..1]	The version of the device, if the device has multiple releases under the same model, or if the device is software or carries firmware.
expiry IVL_TS [0..1]	Date of expiry of this device (if applicable).
udi ST [0..1]	FDA Mandated Unique Device Identifier. Use the human readable information (the content that the user sees, which is sometimes different to the exact syntax represented in the barcode) - see http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/UniqueDeviceIdentification/default.htm.
lotNumber ST [0..1]	Lot number assigned by the manufacturer.
owner Organization [0..1]	An organization that is responsible for the provision and ongoing maintenance of the device.
location ST [0..1]	The resource may be found in the specified location.
patient EvaluatedPerson [0..1]	Patient information, if the resource is affixed to a person.
url TEL [0..1]	A network address on which the device may be contacted directly.

7.1.1.1.29 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.

Attributes

Attribute	Notes
type CD [0..1]	• Code that specifies the type of document represented: E.g., 'Instructions to Provider', 'Patient Instructions', 'Special Handling', etc...
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.

7.1.1.1.30 Dose

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

How the medication is to be used by or administered to the patient.

Attributes

Attribute	Notes
dosageInstructionText ST [0..1]	Free text dosage instructions for cases where the instructions are too complex to code.
additionalInstructions CD [0..*]	Additional instructions such as "Swallow with plenty of water" which may or may not be coded.
doseType CD [0..1]	The type of dose. E.g., initial, maintenance, loading, demand.
doseQuantity IVL_PQ [0..1]	The amount of substance. E.g., 1 tab, 325 mg, 1-2 tabs, 2QY.
doseRestriction DoseRestriction [0..1]	Specifies the maximum (or, in some cases the minimum) dose that can be given in a specified time interval.
doseGoal DoseRestriction [0..1]	Target dose goal. Note that the dose goal differs from dose restriction. Typically, the dose goal will be less than the dose restriction.
approachBodySite BodySite [0..1]	The body site used for gaining access to the target body site for the purposes of the substance administration.
targetBodySite BodySite [0..1]	The body site where the substance is delivered.
deliveryRoute CD [0..1]	The physical route through which the substance is administered. E.g., IV, PO.
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.
deliveryRateIncrement IVL_PQ [0..1]	Change in the dosing rate; usually an increase for a patient who is initiating tube feeding. E.g., 20 mL/hour.
deliveryRateIncrementInterval IVL_PQ [0..1]	Period of time after which the deliveryRateIncrement should be attempted. E.g., 4 hours.
deliveryRateGoal IVL_PQ [0..1]	The target rate to reach for this infusion. Note that deliveryRateGoal is typically less than the maximum delivery rate which is the rate not to exceed. For enteral feeding orders, a target tube feeding rate of 75ml/hour may be specified.
infuseOver PQ [0..1]	Represents the actual time the medication is infused. Note the difference between infuseOver and, say, administrationTimeInterval (duration). An orderable may call for infusing a patient TID for an hour each time over a duration of 5 days.
maximumDeliveryRate PQ [0..1]	The maximum rate of substance administration. This value may be used as a stopping condition when a deliveryRateIncrement is specified without a count.
maximumDeliveredVolume PQ [0..1]	The maximum volume of fluid to administer to a patient.
frequency Schedule [0..1]	The interval in between dosings. For instance, 'Every 8 hours', TID, BID, q8h, etc... Frequency may be represented as either a code or as an interval.

7.1.1.1.31 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 [0..1]	Maximum amount of substance that can be given within the specified time interval.
minDoseForInterval PQ [0..1]	
timeInterval PQ [0..1]	The time interval during which the dose specified is the maximum or minimum amount that should be administered. Note: if the timeInterval is left out, it will be implied to be the duration of the treatment. It is preferable, however, to specify a value for timeInterval.

7.1.1.1.32 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.

7.1.1.1.33 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.

7.1.1.1.34 EnteralFeedingDispenseOrder

Type: **Class** **SubstanceDispenseOrder**
Package: vmr

A clinical order for dispensing an enteral feeding product. That is, the product is to be dispensed but not administered to the patient.

Attributes

Attribute	Notes
caloricDensity IVL_PQ [0..1]	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.

7.1.1.1.35 EnteralFeedingDispenseProposal

Type: **Class** **SubstanceDispenseProposal**
Package: vmr

A clinical proposal for dispensing an enteral feeding product. That is, the product is to be dispensed but not administered to the patient.

Attributes

Attribute	Notes
caloricDensity IVL_PQ [0..1]	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.

7.1.1.1.36 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
caloricDensity IVL_PQ [0..1]	The number of calories specified for this order. E.g., 800 cal.

7.1.1.1.37 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
caloricDensity IVL_PQ [0..1]	The number of calories specified for this proposed order. E.g., 800 cal.

7.1.1.1.38 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.
type CD [0..1]	The specific type of entity. E.g., healthcare organization, medical facility, a type of device such as a pacemaker. For specimens, this may be blood, urine, sputum, etc...
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 NameValuePair [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.

7.1.1.1.39 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
ageAtDeath PQ [0..1]	The age at which the person died. Included to support family history-based inferencing.
isDeceased BL [0..1]	Whether the person is deceased. Included to support family history-based inferencing.
timeOfDeath TS [0..1]	The time at which the person expired.

7.1.1.1.40 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.
id CodedIdentifier [0..1]	Optional unique identifier for the extended vmr type.
attribute NameValuePair [0..*]	

7.1.1.1.41 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
name ST [0..*]	A word or a combination of words by which a facility is known.
address AD [0..*]	The place or the name of the place where a facility is located or may be reached.
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.

7.1.1.1.42 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.

7.1.1.1.43 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%.

7.1.1.1.44 GoalProposal

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

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

Attributes

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

7.1.1.1.45 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
groupingConcept CD [0..1]	The clinical concept motivating the composition. E.g., Insulin Sliding Scale, Steroid Taper, etc...
componentRequirements CD [0..1]	The requirements for the contained components. E.g., do at least one, do all.

7.1.1.1.46 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.

Attribute	Notes
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 [0..1]	'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
radiationDose IVL_PQ [0..1]	The amount of radiation intended to be administered to a patient.

7.1.1.1.47 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 [0..1]	'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
radiationDose IVL_PQ [0..1]	The amount of radiation intended to be administered to a patient.

7.1.1.1.48 LaboratoryOrder

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

An order for a laboratory test.

Attributes

Attribute	Notes
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.

7.1.1.1.49 LaboratoryProposal

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

A proposal for a laboratory test.

Attributes

Attribute	Notes
specialHandling CD [0..*]	Special instructions on how to handle a laboratory specimen. For example, 'Keep on ice'.
specimen Specimen [0..1]	The type of 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.

7.1.1.1.50 LocalizationMethod

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

The imaging modality and the frequency with which it will be used to confirm that a tumor/target is in the same position at the time of treatment as it was at the time of simulation are defined. For example, an order may indicate that a cone-beam CT (CBCT)should be acquired just prior to each treatment to confirm that a lung tumor is within a target volume.

Attributes

Attribute	Notes
localizationModality CD [0..1]	Defines the imaging modality to be used to verify the positioning of a patient and/or target prior and/or during a radiation treatment. For example, a patient may have a cone-beam CT prior to treatment to verify that a lung tumor is within the targeted volume.
localizationMethodFrequency	Defines how often the localization imaging should be performed. For

Attribute	Notes
Schedule [0..1]	example, a patient may have a cone-beam CT taken only once every 5 treatments.
localizationMethodComment Documentation [0..*]	Additional comments pertaining to the localization method.

7.1.1.1.51 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.

7.1.1.1.52 MotionManagement

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

Class representing a method to control the positioning and movement of a specific area of the body. Such motion management may be conducted during a procedure.

Attributes

Attribute	Notes
targetBodySite BodySite [0..1]	The area of the body whose motion is to be managed.
position CD [0..1]	Position defines the way that a patient should be positioned for a given procedure. Examples might include: - Head: Tilted left or right, neck extended - Body: Prone, supine, on left/right side - Arms: Down by side, on chest, above head - Legs: flat, bent
immobilizationDevice CD [0..*]	Immobilization device refers to the device or devices used to maximize reproducibility of positioning and to minimize motion of a part of a body for each radiation treatment. For example, a commonly used immobilization device is a thermoplastic mask for patients being treated to the head and neck region.

7.1.1.1.53 NameValuePair

Type: **Class** **ExtendedVmrTypeBase**

Package: vmr

Class that represents a generic Name-Value-Pair object where the name is generally a token (a string without spaces), a semantic category that is controlled by a terminology and a value which may be any type deriving from ANY and/or defined by a template.

Attributes

Attribute	Notes
name ST	The name of the attribute or parameter.
semanticCode CD [0..1]	A code representing the concept embodied by this name-value pair.
value ExtendedVmrTypeBase	The value of the parameter or attribute. Can be any value extended from ExtendedVmrTypeBase, including ANY.

7.1.1.1.54 NoKnownAllergy

Type: **Class** **AbstractDeniedCondition**
Package: vmr

Use this class to model 'No known allergies' or 'No known drug allergies', or more generally, no known allergy to a class of substances.

Common denials of allergies or intolerances to a class of agents can be expressed as follows:

- No known allergies --> NoKnownAllergy with a conditionCode stating 'No known allergies'.
- No known drug allergies --> NoKnownAllergy with conditionCode stating 'No known drug allergies'.
- No known food allergies --> NoKnownAllergy with conditionCode stating 'No known food allergies'.

7.1.1.1.55 NutrientModification

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

Nutrient modifications 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 Nutrient modification is to represent a nutrient that can be either stated as a quantity or a range

NutrientModification consists of the nutrient (e.g., Sodium) and the amount in the diet (e.g., 20-30g). Note that nutrient is required and of type CD. The 'quantity' attribute is also required and can express a range.

Attributes

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

7.1.1.1.56 ObservationBase

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

The abstract base class for an observation which represents a result (e.g., a laboratory value), a clinical finding (e.g., sitting, tachypneic, rebound tenderness), or an inferred finding such as one produced by a CDS system (e.g., patient is in need of an HbA1c test).

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.
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.
status CD [0..1]	The state of the observation. E.g., preliminary, final. The status of a CompositeObservationResult should not be inconsistent with the status of individual component observation results.

7.1.1.1.57 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%. If the observationFocus is not observed, one may use an observationValue of type CD with a code indicating that the observationFocus was not observed.

7.1.1.1.58 OralDietBase

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

Concept generally representing food and/or a nutritional supplement prepared from food ingredients that is self-administered by a patient and consumed orally. Note that nutritional supplements derived from a specific product such as an Ensure shake or Metamucil should be represented using SubstanceAdministration or SubstanceDispense-related classes.

Attributes

Attribute	Notes
dietType CD [1..*]	Specifies the type of diet ordered. The dietCode may specify what kind of diet is ordered such as 'Consistent carbohydrate diet'.
foodType CD [0..*]	Indicates what type of food the diet should contain.
nutrient NutrientModification [0..*]	Consists of the nutrient (e.g., Sodium) and the amount in the diet (e.g., 20-30g).
texture TextureModification [0..*]	Specifies or modifies the texture for one or more types of food in a diet.
frequency Schedule [0..1]	The interval in between occurrences. For instance, 'Every 8 hours', TID, BID, q8h, etc... Frequency may be represented as either a code or as an interval.
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
reason CD [0..1]	An indication, purpose or reason for why this diet is being or has been proposed/ordered.
prnReason CD [0..*]	Indication that the diet is to be used only in specified circumstances. Typically, not used.
isInEffect BL [0..1]	Indicates whether the diet item is currently in effect for the patient.
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'.

7.1.1.1.59 OralDietOrder

Type: **Class** **OralDietBase**
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.

Includes diet- and nutrition-related orders for a patient/resident including orders for oral diet, either general or therapeutic (medical) nutritional supplements.

Attributes

Attribute	Notes
dietEffectiveTime IVL_TS [0..1]	Indicates when the ordered diet is to be effective. The end point of this interval is often not specified - the diet is ended when it is canceled or replaced by a new item.
orderEventTime IVL_TS [0..1]	The time when the order was made.

7.1.1.1.60 OralDietProposal

Type: **Class** **OralDietBase**
Package: vmr

A class representing a proposal for 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.

Includes diet- and nutrition-related proposals for a patient/resident including proposals for oral diet, either general or therapeutic (medical) nutritional supplements.

Attributes

Attribute	Notes
dietEffectiveTime IVL_TS [0..1]	Indicates when the proposed diet is to be effective. The end point of this interval is often not specified - the diet is ended when it is canceled or replaced by a new item.
proposalEventTime IVL_TS [0..1]	The time when the proposal was made.

7.1.1.1.61 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
name ST [0..*]	A word or a combination of words by which an organization is known.
address AD [0..*]	The place or the name of the place where an organization is located or may be reached.
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.

7.1.1.1.62 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
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

7.1.1.1.63 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
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

7.1.1.1.64 Person

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

A human being.

Attributes

Attribute	Notes
name EN [0..*]	A word or a combination of words by which a person is known.
address AD [0..*]	The place or the name of the place where a person is located or may be reached.
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.
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.
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.
birthTime TS [0..1]	The date on which the person was born.
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.

Attribute	Notes
preferredLanguage CD [0..1]	The person's language of preference. E.g., English.
communication CD [0..*]	Languages which may be used to communicate with this person.

7.1.1.1.65 Practitioner

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

A person who is directly or indirectly involved in the provisioning of healthcare.

Attributes

Attribute	Notes
organization Organization [0..*]	The organization that the practitioner represents.
role CD [0..*]	Roles which this practitioner is authorized to perform for the organization.
speciality CD [0..*]	Specific specialty of the practitioner.
authorizedPeriod IVL_TS [0..1]	The period during which the person is authorized to act as a practitioner in these role(s) for the organization.
qualification Qualification [0..*]	Qualifications obtained by training and certification.

7.1.1.1.66 Problem

Type: **Class** **AbstractCondition**
Package: vmr

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

Note, for allergies or substance intolerances including food, use the AllergyOrIntolerance class.

Attributes

Attribute	Notes
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.

7.1.1.1.67 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
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.
approachBodySite BodySite [0..1]	The body site used for gaining access to the target body site. E.g., femoral artery for a coronary angiography.
targetBodySite BodySite [0..*]	The body site where the procedure takes place. E.g., coronary blood vessels for coronary angiography.

7.1.1.1.68 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.

7.1.1.1.69 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
procedureTime	Ordered time for procedure.

Attribute	Notes
IVL_TS [0..1]	If frequency >= 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 frequency is 3, ideal procedure times would be 1/1/2011, 12/31/2011, and in the middle of the year.
frequency Schedule [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 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. If trying to further characterize the prnReason, use the available comment attribute rather than the narrative attribute of the CodeableConcept.
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
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'.
orderEventTime IVL_TS [0..1]	The time when the order was made.

7.1.1.1.70 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
proposedProcedureTime IVL_TS [0..1]	Requested time for procedure. If frequency >= 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 frequency is 3, ideal procedure times would be 1/1/2011, 12/31/2011, and in the middle of the year.

Attribute	Notes
frequency Schedule [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. If trying to further characterize the prnReason, use the available comment attribute rather than the narrative attribute of the CodeableConcept.
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
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'.
proposalEventTime IVL_TS [0..1]	The time when the order was proposed.

7.1.1.1.71 Qualification

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

Qualifications obtained by training and certification.

Attributes

Attribute	Notes
code CD	Coded representation of the qualification.
validityPeriod IVL_TS [0..1]	Period during which the qualification is valid.
issuer Organization [0..1]	Organization that regulates and issues the qualification.

7.1.1.1.72 RadiotherapyOrder

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

An order for a radiotherapy procedure.

Attributes

Attribute	Notes
simulationMethod RadiotherapySimulation [0..*]	In this part of the RadiotherapyOrder, the type of imaging and any accessories that will be used during the simulation session are defined. For example, an order might indicate that the simulation should be done using a 4-dimensional PET-CT with 5mm slices, no bolus and wire (to mark surgical scar).
motionManagement MotionManagement [0..*]	In this part of the RadiotherapyOrder, the positioning and type of immobilization for various parts of the body are defined. For example, an order might indicate that the head should be hyper-extended and immobilized in a head-support and thermoplastic mask.
localizationMethod LocalizationMethod [0..*]	In this part of the RadiotherapyOrder, the imaging modality and the frequency it will be used to confirm that a tumor/target is in the same position at the time of treatment as it was at the time of simulation are defined. For example, an order may indicate that a cone-beam CT (CBCT)should be acquired just prior to each treatment to confirm that a lung tumor is within a target volume.
treatmentPlanningInstructions Dose [0..*]	In this part of the RadiotherapyOrder, the radiation delivery techniques to be used for treatment and the physician's goals for how much radiation dose targets and normal tissues should receive are defined. For example, an order might indicate that a treatment should use intensity modulate x-ray radiation (IMXT) to deliver at least 50 Gy to 95% of a planning target volume but no more than 20 Gy to 20% of the total lung volume. Please note the following guidance vis-a-vis dose: 1. The target volume delineation is captured as the dose's targetBodySite. Values may include: GTV, ITV, CTV and PTV, for instance. 2. doseQuantity may be used to represent 'dose per fraction' - e.g., 2 GY 3. doseRestriction may be used to represent to total dose or the number of fractions for a given volume delineation. Note that this value may specify either a minimum or maximum volume - e.g., 30 GY

7.1.1.1.73 RadiotherapyProposal

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

A proposal for a radiotherapy procedure.

Attributes

Attribute	Notes
simulationMethod RadiotherapySimulation [0..*]	In this part of the RadiotherapyProposal, the type of imaging and any accessories that will be used during the simulation session are defined. For example, an order might indicate that the simulation should be done using a 4-dimensional PET-CT with 5mm slices, no bolus and wire (to mark surgical scar).
motionManagement MotionManagement [0..*]	In this part of the RadiotherapyProposal, the positioning and type of immobilization for various parts of the body are defined. For example, an order might indicate that the head should be hyper-extended and immobilized in a head-support and thermoplastic mask.
localizationMethod LocalizationMethod [0..*]	In this part of the RadiotherapyOrder, the imaging modality and the frequency it will be used to confirm that a tumor/target is in the same

Attribute	Notes
	position at the time of treatment as it was at the time of simulation are defined. For example, an order may indicate that a cone-beam CT (CBCT)should be acquired just prior to each treatment to confirm that a lung tumor is within a target volume.
treatmentPlanningInstructions Dose [0..*]	In this part of the RadiotherapyProposal, the radiation delivery techniques to be used for treatment and the physician's goals for how much radiation dose targets and normal tissues should receive are defined. For example, an order might indicate that a treatment should use intensity modulate x-ray radiation (IMXT) to deliver at least 50 Gy to 95% of a planning target volume but no more than 20 Gy to 20% of the total lung volume. Please note the following guidance vis-a-vis dose: 1. The target volume delineation is captured as the dose's targetBodySite. Values may include: GTV, ITV, CTV and PTV, for instance. 2. doseQuantity may be used to represent 'dose per fraction' - e.g., 2 GY 3. doseRestriction may be used to represent to total dose or the number of fractions for a given volume delineation. Note that this value may specify either a minimum or maximum volume - e.g., 30 GY

7.1.1.1.74 RadiotherapySimulation

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

The type of imaging and any accessories that will be used during a simulation session for radiotherapy. For example, an order might indicate that the simulation should be done using a 4-dimensional PET-CT with 5mm slices, no bolus and wire (to mark surgical scar).

Attributes

Attribute	Notes
simulationImagingType CD [0..1]	Defines the type of imaging modality to be used. E.g., PET-CT, CT alone, CT-PET, CT-MRI, MRI alone.
simulationDimensions CD [0..1]	Defines whether the imaging is volumetric (3D) and whether motion over time will be modeled (4D). E.g., 2D, 3D or 4D
scanThickness IVL_PQ [0..1]	Defines the distance between each imaging slice. E.g., 5mm between axial slices of a CT scan.
bolusType CD [0..1]	Defines the type of tissue-equivalent material that will be placed on a patient's skin at the time of treatment to minimize the skin-sparing effect of high energy photon beams. For example, paraffin wax may be used as a bolus.
bolusThickness IVL_PQ [0..1]	Defines the thickness of the bolus material to be used. E.g., 5mm thick
markerType CD [0..1]	Defines the type of marker that will be used to define the targeted area for treatment planning or localize the targeted area during treatment. For example, gold coils may be placed within a tumor for localization during treatment.
simulationComment Documentation [0..*]	Additional information pertaining to the simulation

7.1.1.1.75 RecurringEvent

Type: **Class** **CycleEventTiming**
Package: vmr

Specifies timing as a number of times the event occurs in the cycleLength and whether the time interval is important.

For instance, if the cycle length is 24 hours, the frequencyPerCycle is 3 and the intervalIsImportant is true, this is equivalent to stating that the event should occur every 8 hours (Q8H).

Attributes

Attribute	Notes
frequencyPerCycle IVL_INT	Indicates how often the event should occur. If one specifies a range for frequencyPerCycle, it shall be interpreted as a frequency which may range from Low to High.
intervalIsImportant BL	Specifies whether a fixed interval between occurrences is important when true. For instance, every 8 hours may mean: Q8H - the interval between each occurrence has to be 8 hours (intervalIsImportant = true) TID - the occurrence should happen 3 times within a 24 hour period but could occur with meals or when the patient is awake, etc... (intervalIsImportant = false)

7.1.1.1.76 RelatedClinicalStatement

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

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

7.1.1.1.77 RelatedEntity

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

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

7.1.1.1.78 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.

7.1.1.1.79 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.

7.1.1.1.80 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.

Attribute	Notes
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%"
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)

7.1.1.1.81 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.

Attribute	Notes
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%"
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)

7.1.1.1.82 Schedule

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

A schedule that specifies an event that may occur multiple times. Schedules should not be used to record when events did happen but rather when actions or events are expected or requested to occur.

A schedule can be either a list of 'calendar time' events - periods on which the event ought to occur, or a single event with repeating criteria, or just repeating criteria with no actual event as represented by the 'cycle' concept and attribute.

Attributes

Attribute	Notes
event IVL_TS [0..*]	Identifies specific time periods when the event should occur. Some schedules are just explicit lists of times.
cycle Cycle [0..*]	Identifies a repeating pattern to the intended time periods. If present, the Schedule.event indicates the time of the first occurrence.

7.1.1.1.83 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.

7.1.1.1.84 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.

7.1.1.1.85 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
collectionMethod CD [0..1]	Specification of how the laboratory specimen should be obtained
collectionSite BodySite [0..1]	Site from which the specimen was collected.

7.1.1.1.86 StringNameValuePair

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

Class that represents a generic StringName-StringValue-Pair object where the name is just an ST and the value is also an ST and defined by a template.

Attributes

Attribute	Notes
name ST	A String representing the name of the attribute.
value ST	A String representing the value of the attribute.

7.1.1.1.87 SubstanceAdministrationEvent

Type: **Class** **SubstanceClinicalStatementBase**
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, administrationTimeInterval = 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.
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.

7.1.1.1.88 SubstanceAdministrationOrder

Type: **Class** **SubstanceClinicalStatementBase**
Package: vmr

A clinical order for the administration of a substance. Describes the event of a patient being given a dose of a medication. This may be as simple as swallowing a tablet or it may be a long running infusion.

Medication prescription represents both the dispense of a medication and dosing instructions. It can be modeled using both a SubstanceAdministrationOrder and a SubstanceDispenseOrder related by a RelatedClinicalStatement or grouped under a GroupedClinicalStatement.

Attributes

Attribute	Notes
administrationTimeInterval IVL_TS [0..1]	Ordered time for administering the substance.
numberFillsAllowed INT [0..1]	The number of fills allowed. Must be 1 or greater.
prnReason CD [0..*]	Indication for the ordered 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. If this attribute is specified, it implies that the substance administration is prn (i.e., as needed).

Attribute	Notes
	If trying to further characterize the prnReason, use the available comment attribute rather than the narrative attribute of the CodeableConcept.
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 administrationTimeInterval 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.
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'.

7.1.1.1.89 SubstanceAdministrationProposal

Type: **Class** **SubstanceClinicalStatementBase**
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
proposedAdministrationTimeInterval IVL_TS [0..1]	Proposed time for administering the substance.
numberFillsAllowed INT [0..1]	The number of fills allowed. Must be 1 or greater.
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. If this attribute is specified, it implies that the substance administration is prn (i.e., as needed). If trying to further characterize the prnReason, use the available comment attribute rather than the narrative attribute of the CodeableConcept.
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	Acceptable time for administering the substance. Distinct from

Attribute	Notes
IVL_TS [0..1]	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.
proposalEventTime IVL_TS [0..1]	Time when proposal was made.
originationMode CD [0..1]	The mode the proposal 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'.

7.1.1.1.90 SubstanceClinicalStatementBase

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
substance AdministrableSubstance [0..1]	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.
substitutionType CD [0..1]	A code signifying whether a different drug was dispensed from what was prescribed. Include codes from http://hl7.org/fhir/v3/substanceAdminSubstitution where concept is-a _ActSubstanceAdminSubstitutionCode A code signifying whether a different drug should be dispensed from what was prescribed. E http://hl7.org/fhir/v3/substanceAdminSubstitution equivalent EC http://hl7.org/fhir/v3/substanceAdminSubstitution equivalent composition BC http://hl7.org/fhir/v3/substanceAdminSubstitution brand composition G http://hl7.org/fhir/v3/substanceAdminSubstitution generic composition TE http://hl7.org/fhir/v3/substanceAdminSubstitution therapeutic alternative TB http://hl7.org/fhir/v3/substanceAdminSubstitution therapeutic brand TG http://hl7.org/fhir/v3/substanceAdminSubstitution therapeutic generic F http://hl7.org/fhir/v3/substanceAdminSubstitution formulary N http://hl7.org/fhir/v3/substanceAdminSubstitution none
substitutionReason CD [0..1]	A coded concept describing the reason that a different medication should (or should not) be substituted from what was prescribed.

Attribute	Notes
	This value set (http://hl7.org/fhir/v3/vs/SubstanceAdminSubstitutionReason) is defined as part of HL7 v3. CT http://hl7.org/fhir/v3/ActReason continuing therapy FP http://hl7.org/fhir/v3/ActReason formulary policy OS http://hl7.org/fhir/v3/ActReason out of stock RR http://hl7.org/fhir/v3/ActReason regulatory requirement
dose Dose [0..*]	Indicates how the medication is to be used by the patient.

7.1.1.1.91 SubstanceDispenseEvent

Type: **Class** **SubstanceClinicalStatementBase**
Package: vmr

This is the Event of a pharmacy filling a prescription or a record of a substance being dispensed but not administered. (E.g.,, “naloxone at bedside”).

Attributes

Attribute	Notes
dispenseType CD [0..1]	Indicates the type of dispensing event that is performed. Examples include: Trial Fill, Completion of Trial, Partial Fill, Emergency Fill, Samples, etc. http://hl7.org/fhir/v3/vs/ActPharmacySupplyType Include codes from http://hl7.org/fhir/v3/ActCode where concept is-a _ActPharmacySupplyType DF http://hl7.org/fhir/v3/ActCode Daily Fill EM http://hl7.org/fhir/v3/ActCode Emergency Supply SO http://hl7.org/fhir/v3/ActCode Script Owing FF http://hl7.org/fhir/v3/ActCode First Fill FFC http://hl7.org/fhir/v3/ActCode First Fill - Complete FFCS http://hl7.org/fhir/v3/ActCode first fill complete, partial strength FFP http://hl7.org/fhir/v3/ActCode First Fill - Part Fill FFPS http://hl7.org/fhir/v3/ActCode first fill, part fill, partial strength FFSS http://hl7.org/fhir/v3/ActCode first fill, partial strength TFS http://hl7.org/fhir/v3/ActCode trial fill partial strength TF http://hl7.org/fhir/v3/ActCode Trial Fill FS http://hl7.org/fhir/v3/ActCode Floor stock MS http://hl7.org/fhir/v3/ActCode Manufacturer Sample RF http://hl7.org/fhir/v3/ActCode Refill UD http://hl7.org/fhir/v3/ActCode Unit Dose RFC http://hl7.org/fhir/v3/ActCode Refill - Complete RFCS http://hl7.org/fhir/v3/ActCode refill complete partial strength RFF http://hl7.org/fhir/v3/ActCode Refill (First fill this facility)

Attribute	Notes
	RFFS http://hl7.org/fhir/v3/ActCode refill partial strength (first fill this facility) RFP http://hl7.org/fhir/v3/ActCode Refill - Part Fill RFPS http://hl7.org/fhir/v3/ActCode refill part fill partial strength RFS http://hl7.org/fhir/v3/ActCode refill partial strength TB http://hl7.org/fhir/v3/ActCode Trial Balance TBS http://hl7.org/fhir/v3/ActCode trial balance partial strength UDE http://hl7.org/fhir/v3/ActCode unit dose equivalent
dispenseTime IVL_TS [0..1]	Time when substance was dispensed.
dispenseQuantity PQ [0..1]	The amount of substance provided.
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.
supplyDuration PQ [0..1]	The duration (generally in days) this dispensation should last.

7.1.1.1.92 SubstanceDispenseOrder

Type: **Class** **SubstanceClinicalStatementBase**
Package: vmr

A clinical order for provision of a supply of a medication generally with the intention that it is subsequently consumed by a patient (usually in response to a prescription).

An order for a substance to be dispensed but not administered. (E.g.,, “naloxone at bedside”).

Attributes

Attribute	Notes
dispenseType CD [0..1]	Indicates the type of dispensing event that is performed. Examples include: Trial Fill, Completion of Trial, Partial Fill, Emergency Fill, Samples, etc. http://hl7.org/fhir/v3/vs/ActPharmacySupplyType Include codes from http://hl7.org/fhir/v3/ActCode where concept is-a _ActPharmacySupplyType DF http://hl7.org/fhir/v3/ActCode Daily Fill EM http://hl7.org/fhir/v3/ActCode Emergency Supply SO http://hl7.org/fhir/v3/ActCode Script Owing FF http://hl7.org/fhir/v3/ActCode First Fill FFC http://hl7.org/fhir/v3/ActCode First Fill - Complete FFCS http://hl7.org/fhir/v3/ActCode first fill complete, partial strength FFP http://hl7.org/fhir/v3/ActCode First Fill - Part Fill FFPS http://hl7.org/fhir/v3/ActCode first fill, part fill, partial strength

Attribute	Notes
	FFSS http://hl7.org/fhir/v3/ActCode first fill, partial strength TFS http://hl7.org/fhir/v3/ActCode trial fill partial strength TF http://hl7.org/fhir/v3/ActCode Trial Fill FS http://hl7.org/fhir/v3/ActCode Floor stock MS http://hl7.org/fhir/v3/ActCode Manufacturer Sample RF http://hl7.org/fhir/v3/ActCode Refill UD http://hl7.org/fhir/v3/ActCode Unit Dose RFC http://hl7.org/fhir/v3/ActCode Refill - Complete RFCS http://hl7.org/fhir/v3/ActCode refill complete partial strength RFF http://hl7.org/fhir/v3/ActCode Refill (First fill this facility) RFFS http://hl7.org/fhir/v3/ActCode refill partial strength (first fill this facility) RFP http://hl7.org/fhir/v3/ActCode Refill - Part Fill RFPS http://hl7.org/fhir/v3/ActCode refill part fill partial strength RFS http://hl7.org/fhir/v3/ActCode refill partial strength TB http://hl7.org/fhir/v3/ActCode Trial Balance TBS http://hl7.org/fhir/v3/ActCode trial balance partial strength UDE http://hl7.org/fhir/v3/ActCode unit dose equivalent
dispenseTime IVL_TS [0..1]	Time for dispensing the substance.
dispenseQuantity PQ [0..1]	The amount of substance provided.
numberOfFillsAllowed INT [0..1]	An integer indicating the number of repeats of the Dispense. UsageNotes: For example, the number of times the prescribed quantity is to be supplied including the initial standard fill.
supplyDuration PQ [0..1]	The number of days this dispensation should last.
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).
validityPeriod IVL_TS [0..1]	This indicates the validity period of a prescription (stale dating the Prescription) It reflects the prescriber perspective for the validity of the prescription. Dispenses must not be made against the prescription outside of this period. The lower-bound of the Dispensing Window signifies the earliest date that the prescription can be filled for the first time. If an upper-bound is not specified then the Prescription is open-ended or will default to a stale-date based on regulations. Rationale: Indicates when the Prescription becomes valid, and when it ceases to be a dispensable Prescription.
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'.

7.1.1.1.93 SubstanceDispenseProposal

Type: **Class** **SubstanceClinicalStatementBase**
Package: vmr

A clinical proposal for provision of a supply of a medication generally with the intention that it is subsequently consumed by a patient (usually in response to a prescription).

An proposal for a substance to be dispensed but not administered. (E.g.,, “naloxone at bedside”).

Attributes

Attribute	Notes
dispenseType CD [0..1]	Indicates the type of dispensing event that is performed. Examples include: Trial Fill, Completion of Trial, Partial Fill, Emergency Fill, Samples, etc. http://hl7.org/fhir/v3/vs/ActPharmacySupplyType Include codes from http://hl7.org/fhir/v3/ActCode where concept is-a _ActPharmacySupplyType DF http://hl7.org/fhir/v3/ActCode Daily Fill EM http://hl7.org/fhir/v3/ActCode Emergency Supply SO http://hl7.org/fhir/v3/ActCode Script Owing FF http://hl7.org/fhir/v3/ActCode First Fill FFC http://hl7.org/fhir/v3/ActCode First Fill - Complete FFCS http://hl7.org/fhir/v3/ActCode first fill complete, partial strength FFP http://hl7.org/fhir/v3/ActCode First Fill - Part Fill FFPS http://hl7.org/fhir/v3/ActCode first fill, part fill, partial strength FFSS http://hl7.org/fhir/v3/ActCode first fill, partial strength TFS http://hl7.org/fhir/v3/ActCode trial fill partial strength TF http://hl7.org/fhir/v3/ActCode Trial Fill FS http://hl7.org/fhir/v3/ActCode Floor stock MS http://hl7.org/fhir/v3/ActCode Manufacturer Sample RF http://hl7.org/fhir/v3/ActCode Refill UD http://hl7.org/fhir/v3/ActCode Unit Dose RFC http://hl7.org/fhir/v3/ActCode Refill - Complete RFCS http://hl7.org/fhir/v3/ActCode refill complete partial strength RFF http://hl7.org/fhir/v3/ActCode Refill (First fill this facility) RFFS http://hl7.org/fhir/v3/ActCode refill partial strength (first fill this facility) RFP http://hl7.org/fhir/v3/ActCode Refill - Part Fill RFPS http://hl7.org/fhir/v3/ActCode refill part fill partial strength RFS http://hl7.org/fhir/v3/ActCode refill partial strength TB http://hl7.org/fhir/v3/ActCode Trial Balance TBS http://hl7.org/fhir/v3/ActCode trial balance partial strength UDE http://hl7.org/fhir/v3/ActCode unit dose equivalent
proposedDispenseTime IVL_TS [0..1]	Proposed time for dispensing the substance.
dispenseQuantity PQ [0..1]	The amount of substance to be provided.
numberOfFillsAllowed INT [0..1]	An integer indicating the number of repeats of the Dispense. UsageNotes: For example, the number of times the prescribed quantity is to be supplied including the initial standard fill.
supplyDuration	The duration (generally in days) this dispensation should last.

Attribute	Notes
PQ [0..1]	
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).
validityPeriod IVL_TS [0..1]	This indicates the validity period of a prescription (stale dating the Prescription) It reflects the prescriber perspective for the validity of the prescription. Dispenses must not be made against the prescription outside of this period. The lower-bound of the Dispensing Window signifies the earliest date that the prescription can be filled for the first time. If an upper-bound is not specified then the Prescription is open-ended or will default to a stale-date based on regulations. Rationale: Indicates when the Prescription becomes valid, and when it ceases to be a dispensable Prescription.
proposalEventTime IVL_TS [0..1]	Time when proposal was made.
originationMode CD [0..1]	The mode the proposal 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'.

7.1.1.1.94 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.

7.1.1.1.95 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.

7.1.1.1.96 SupplyOrder

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

A provider's order to deliver the supply.

Attributes

Attribute	Notes
supplyTime IVL_TS [0..1]	Ordered time for supply. If frequency >= 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 frequency is 3, ideal supply times would be 1/1/2011, 12/31/2011, and in the middle of the year.
frequency Schedule [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.
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
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'.
orderEventTime IVL_TS [0..1]	The time when the supply was ordered.

7.1.1.1.97 SupplyProposal

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

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

Attributes

Attribute	Notes
proposedSupplyTime IVL_TS [0..1]	Requested time for supply. If frequency >= 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

Attribute	Notes
	requested time is 1/1/2011 to 12/31/2011, and frequency is 3, ideal supply times would be 1/1/2011, 12/31/2011, and in the middle of the year.
frequency Schedule [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.
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
originationMode CD [0..1]	The mode the proposal 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'.
proposalEventTime IVL_TS [0..1]	The time when the supply was proposed.

7.1.1.1.98 TextureModification

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

TextureModification specifies or modifies the texture for one or more types of food in a diet.

The purpose of this use case is to notify Food & Nutrition Services of an order that relates to food texture modification such as ground, chopped, or puree, for a patient/ resident. Texture modification is part of the diet order and may have different textures ordered for different food groups, e.g., ground meat, or individual foods for one patient/resident. In addition, texture modification could include snacks and meals at different consistencies recommended by the Speech and Language Pathologist (SLP) and/or the physician which must be communicated to Food & Nutrition Services or patient/resident care staff.

Attributes

Attribute	Notes
foodType CD [0..1]	Indicates what type of food that the texture modification applies to.
textureType CD	A code that identifies any texture modifications that should be made, eg. Pureed, Easy to Chew.
textureModifier CD [0..1]	A further modification to the texture, eg. Pudding Thick.

7.1.1.1.99 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
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.

7.1.1.1.100 UndeliveredSubstanceAdministration

Type: **Class** **SubstanceClinicalStatementBase**
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
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.

7.1.1.1.101 UndeliveredSupply

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

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

Attributes

Attribute	Notes
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.

7.1.1.1.102 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.

7.1.1.1.103 VaccinationProtocol

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

Contains information about the protocol under which the vaccine was administered.

Attributes

Attribute	Notes
series ST [0..1]	One possible path to achieve presumed immunity against a disease - within the context of an authority. E.g., 3-dose Hepatitis B Series
numberOfDosesInSeries INT [0..1]	The recommended number of doses to achieve immunity.
positionInSeries INT [0..1]	Nominal position in a series.
authority Organization [0..1]	The organization that issues the vaccination protocol.
targetedDisease CD [0..*]	The targeted disease.
vaccineGroup CD [0..1]	Grouping used by immunization forecasters to indicate when patient achieves goal for immunity against disease. E.g., Hepatitis B Vaccine Group.
evaluationStatus CD [0..1]	Indicates if the immunization event should "count" against the protocol. Values may include substandard (recalled, expired), invalid, extraneous/unnecessary, valid
evaluationStatusReason CD [0..*]	Provides an explanation as to why an immunization event should or should not count against the protocol.

7.1.1.1.104 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.

7.1.1.1.105 extendedvMRTypes

Type: **UMLDiagram**
Package: vmr

7.1.1.2 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)*

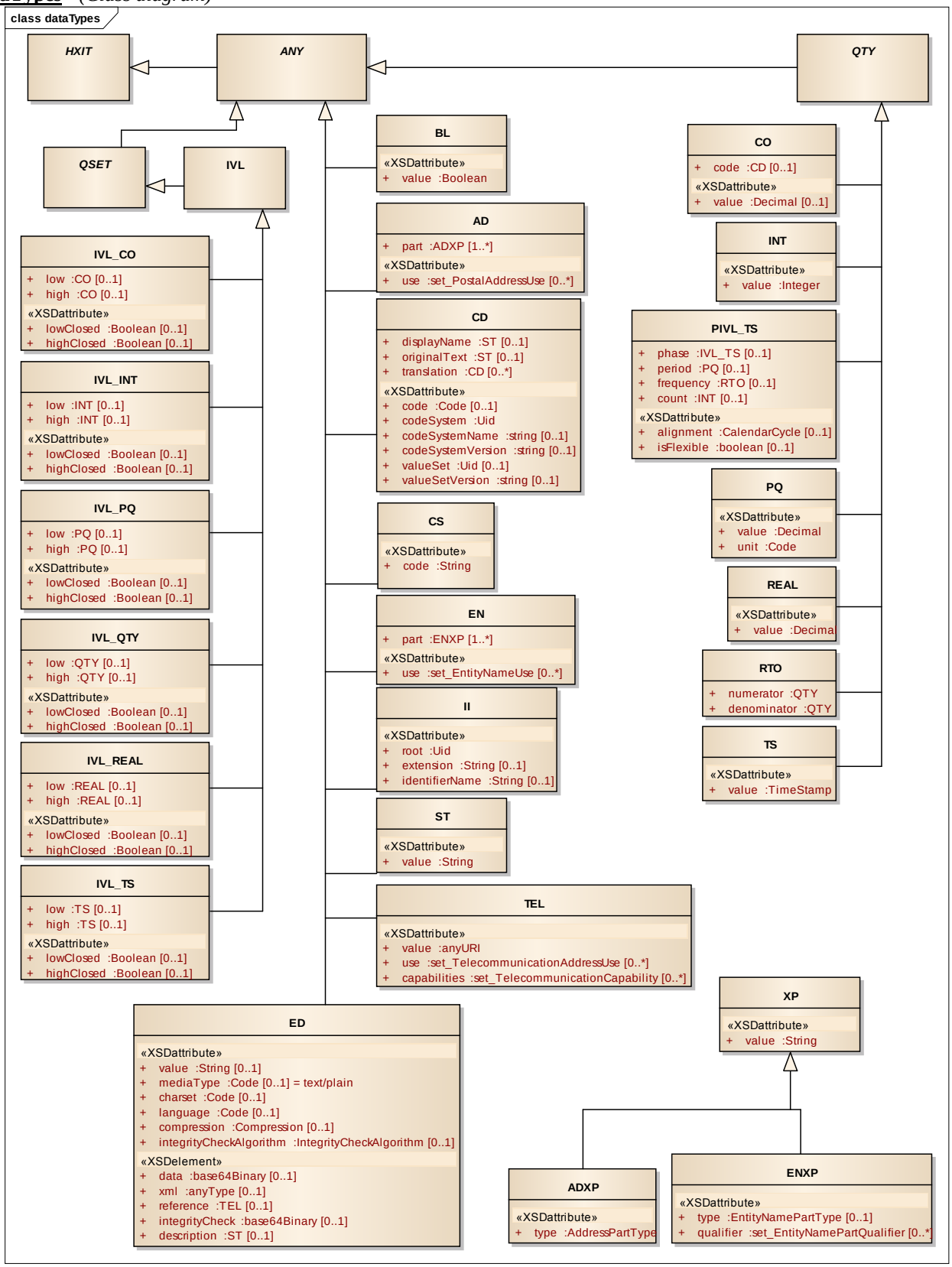

Figure: 19

simpleTypesAndEnums - *(Class diagram)*

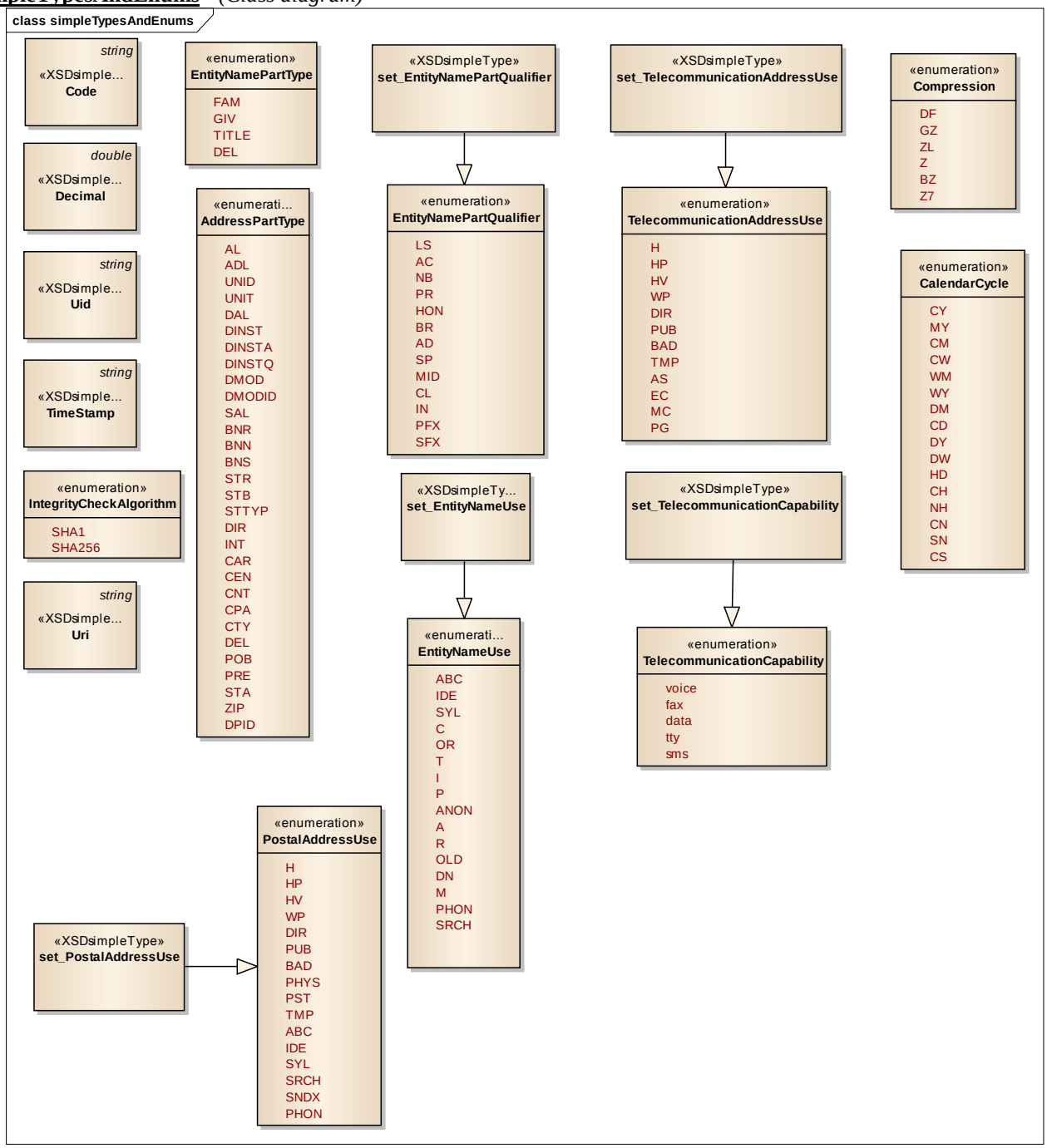

Figure: 20

7.1.1.2.1 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
part ADXP [1..*]	A sequence of address parts, such as street or post office Box, city, postal code, country, etc.
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.

7.1.1.2.2 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.

7.1.1.2.3 ANY

Type: **Class** **HXIT**
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.

However exceptional values (nullFlavored values) may be of type ANY, except for the exceptional values that imply the nullFlavor INV, since this requires a type to be meaningful. Note that not all nullFlavors may be used with the type ANY.

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

We have also made it abstract to be consistent with the lack of support for nullFlavors.

7.1.1.2.4 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.

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, rather than specifying a smaller location within some larger one (e.g., Dutch "t.o." means "opposite to" for house boats located across the street facing houses)
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. Apartment, 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'.
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).

Attribute	Notes
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	Delivery Point Identifier : A value that uniquely identifies the postal address.

7.1.1.2.5 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.

7.1.1.2.6 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	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.
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

Attribute	Notes
	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.
codeSystemVersion string [0..1]	If applicable, a version descriptor defined specifically for the given code system.
valueSet Uid [0..1]	The value set that applied when this CD was created.
valueSetVersion string [0..1]	The version of the valueSet in which the code was found.
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 the original text SHALL be represented in plain text form. In specific circumstances, when clearly descirbed the context of use, the

Attribute	Notes
	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.

7.1.1.2.7 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
code CD [0..1]	A code representing the definition of the ordinal item
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.

7.1.1.2.8 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.

7.1.1.2.9 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
DW	day of the week (begins with monday)
HD	hour of the day
CH	hour (continuous)
NH	minute of the hour

Attribute	Notes
CN	minute (continuous)
SN	second of the minute
CS	second (continuous)

7.1.1.2.10 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.

7.1.1.2.11 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.

7.1.1.2.12 Decimal

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

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

7.1.1.2.13 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
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
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, or data that had earlier been retrieved through the reference and then cached. The mediatype of the ED SHALL match the type returned by

Attribute	Notes
	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
mediaType Code [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. 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.
integrityCheck base64Binary [0..1]	A checksum calculated over the binary data

Attribute	Notes
	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.
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.
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.

7.1.1.2.14 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.

Attribute	Notes
	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.

7.1.1.2.15 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.

7.1.1.2.16 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.

CodeSystem "EntityNamePartTypeQualifierR2", OID: 2.16.840.1.113883.5.1122, Owner: HL7

Attributes

Attribute	Notes
LS	Legal Status : For organizations a suffix indicating the legal status, e.g., "Inc.", "Co.", "AG", "GmbH", "B.V." "S.A.", "Ltd." Etc.
AC	Academic : Indicates that a prefix like "Dr." or a suffix like "M.D." or "Ph.D." is an academic title

Attribute	Notes
NB	Nobility : In Europe and Asia, there are still people with nobility titles (aristocrats). German "von" is generally a nobility title, not a mere voorvoegsel. Others are "Earl of" or "His Majesty King of..." etc. Rarely used nowadays, but some systems do keep track of this
PR	Professional : Primarily in the British Imperial culture people tend to have an abbreviation of their professional organization as part of their credential suffices
HON	Honorific : A honorific such as "The Right Honourable" or "Weledelgeleerde Heer".
BR	Birth : A name that a person was given at birth or established as a consequence of adoption. Note: this is not used for temporary names assigned at birth such as "Baby of Smith" - which is just a name with a use code of "TEMP".
AD	Acquired : A name part a person acquired. The name part may be acquired by adoption, or the person may have chosen to use the name part for some other reason. Note: this differs from an Other/Psuedonym/Alias in that an acquired name part is acquired on a formal basis rather than an informal one (e.g. registered as part of the official name)
SP	Spouse : The name assumed from the partner in a marital relationship. Usually the spouse's family name. Note that no inference about gender can be made from the existence of spouse names
MID	Middle Name : Indicates that the name part is a middle name. Usage Notes: In general, the english 'middle name' concept is all of the given names after the first. This qualifier may be used to explicitly indicate which given names are considered to be middle names. The middle name qualifier may also be used with family names. This is a Scandinavian use case, matching the concept of "mellomnavn" / "mellannamn". Note that there are specific rules that indicate what names may be taken as a mellannamn in different Scandinavian countries
CL	Callme : Callme is used to indicate which of the various name parts is used when interacting with the person
IN	Initial : Indicates that a name part is just an initial. Initials do not imply a trailing period since this would not work with non-Latin scripts. Initials may consist of more than one letter, e.g., "Ph." could stand for "Philippe" or "Th." for "Thomas"
PFX	Prefix : A prefix has a strong association to the immediately following name part. A prefix has no implicit trailing white space (it has implicit leading white space though).
SFX	Suffix : A suffix has a strong association to the immediately preceding name part. A suffix has no implicit leading white space (it has implicit trailing white space though).

7.1.1.2.17 EntityNamePartType

Type: **Enumeration**
Package: dataTypes

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

CodeSystem "EntityNamePartTypeR2", OID: 2.16.840.1.113883.5.1122, Owner: HL7

Attributes

Attribute	Notes
FAM	Family : Family name, this is the name that links to the genealogy. In some cultures (e.g. Eritrea) the family name of a son is the first name of his father
GIV	Given: Given name. Note: don't call it "first name" since this given names do not always come first
TITLE	Title : Part of the name that is acquired as a title due to academic, legal, employment or nobility status etc. Note: Title name parts include name parts that come after the name such as qualifications
DEL	Delimiter : A delimiter has no meaning other than being literally printed in this name representation. A delimiter has no implicit leading and trailing white space

7.1.1.2.18 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.

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	Customary : Known as/conventional/the one you normally use
OR	Official Registry Name : the formal name as registered in an official (government) registry, but which name might not be commonly used. May correspond to the concept of legal name
T	Temporary : A temporary name. Note that a name valid time can provide more detailed information. This may also be used for temporary names assigned at birth or in emergency situations.

Attribute	Notes
I	Indigenous/Tribal: e.g. Chief Red Cloud
P	Other/Pseudonym/Alias: A non-official name by which the person is sometimes known. (This may also be used to record informal names such as a nickname)
ANON	Anonymous : Anonymous assigned name (used to protect a person's identity for privacy reasons)
A	Business Name : A name used in a Professional or Business context . Examples: Continuing to use a maiden name in a professional context, or using a stage performing name (some of these names are also pseudonyms)
R	Religious : A name assumed as part of a religious vocation. e.g. Sister Mary Francis, Brother John
OLD	No Longer in Use : This name is no longer in use (note: Names may also carry valid time ranges . This code is used to cover the situations where it is known that the name is no longer valid, but no particular time range for its use is known)
DN	Do Not Use : This name should no longer be used when interacting with the person (i.e . in addition to no longer being used, the name should not be even mentioned when interacting with the person) Note: applications are not required to compare names labeled "Do Not Use" and other names in order to eliminate name parts that are common between the other name and a name labeled "Do Not Use".
M	Maiden Name : A name used prior to marriage. Note that marriage naming customs vary greatly around the world. This name use is for use by applications that collect and store "maiden" names. Though the concept of maiden name is often gender specific, the use of this term is not gender specific. The use of this term does not imply any particular history for a person's name, nor should the maiden name be determined algorithmically
PHON	Phonetic : The name as understood by the data enterer, i.e. a close approximation of a phonetic spelling of the name, not based on a phonetic algorithm.
SRCH	Search Type Uses: A name intended for use in searching or matching

7.1.1.2.19 HXIT

Type: **Class**
Package: dataTypes

Information about the history of this value: period of validity and a reference to an identified event that established this value as valid.

Because of the way that the types are defined, a number of attributes of the datatypes have values with a type derived from HXIT. In these cases the HXIT attributes are constrained to null. The only case where the HXIT attributes are allowed within a datatype is on items in a collection (DSET, LIST, BAG, HIST).
The use of these attributes is generally subject to further constraints in the specifications that make use of these types.

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

7.1.1.2.20 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.

Attribute	Notes
identifierName String [0..1]	A human readable description for this identifier.

7.1.1.2.21 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 Integer	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.

7.1.1.2.22 IVL

Type: **Class** **QSET**
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

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

7.1.1.2.23 IVL_CO

Type: **Class** **IVL**
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).

7.1.1.2.24 IVL_INT

Type: **Class** **IVL**
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).

7.1.1.2.25 IVL_PQ

Type: **Class** **IVL**
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.
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).

7.1.1.2.26 IVL_QTY

Type: **Class** **IVL**
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.

Attribute	Notes
	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).

7.1.1.2.27 IVL_REAL

Type: **Class** **IVL**
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).

7.1.1.2.28 IVL_TS

Type: **Class** **IVL**
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).
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).

7.1.1.2.29 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

7.1.1.2.30 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
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

Attribute	Notes
	future and past. The width of the phase SHALL be less than or equal to the period
period PQ [0..1]	A time duration specified as a reciprocal measure of the frequency at which the PIVL repeats.
frequency RTO [0..1]	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).
alignment CalendarCycle [0..1]	
isFlexible boolean [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 [0..1]	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.

7.1.1.2.31 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

Attribute	Notes
	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.

7.1.1.2.32 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.

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.

Attribute	Notes
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.

7.1.1.2.33 QSET

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

Abstract; specializes ANY

Parameter: T : QTY

An unordered set of distinct values which are quantities.

Any ordered type can be the basis of an QSET; it does not matter whether the base type is discrete or continuous. If the base datatype is only partially ordered, all elements of the QSET must be elements of a totally ordered subset of the partially ordered datatype (for example, PQ is only ordered when the units are consistent. Every value in a QSET(PQ) must have the same canonical unit).

QSET is an abstract type. A working QSET is specified as an expression tree built using a combination of operator (QSI, QSD, QSU, QSP) and component types (QSC, QSS and IVL; and, for TS, PIVL and EIVL).

QSETs SHALL not contain null or nullFlavored values as members of the set.

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

7.1.1.2.34 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.

The quantity type abstraction is needed in defining certain other types, such as the interval, and probability distributions.

7.1.1.2.35 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.

7.1.1.2.36 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.

7.1.1.2.37 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.

7.1.1.2.38 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 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

7.1.1.2.39 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.

7.1.1.2.40 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.

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. 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: 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.
TMP	Temporary Address: A temporary address, may be good for visit or mailing. Note that an address history can provide more detailed information.

Attribute	Notes
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.

7.1.1.2.41 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.

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

7.1.1.2.42 TimeStamp

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

Represents a timestamp such as 20101127235417.123+0930

7.1.1.2.43 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.

7.1.1.2.44 Uri

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

Universal Resource Identifier

7.1.1.2.45 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.

7.1.1.2.46 set_EntityNamePartQualifier

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

7.1.1.2.47 set_EntityNameUse

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

7.1.1.2.48 set_PostalAddressUse

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

7.1.1.2.49 set_TelecommunicationAddressUse

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

7.1.1.2.50 set_TelecommunicationCapability

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

7.1.1.3 cdsInput

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

Specifies input data used by CDS systems.

cdsInput - *(Class diagram)*

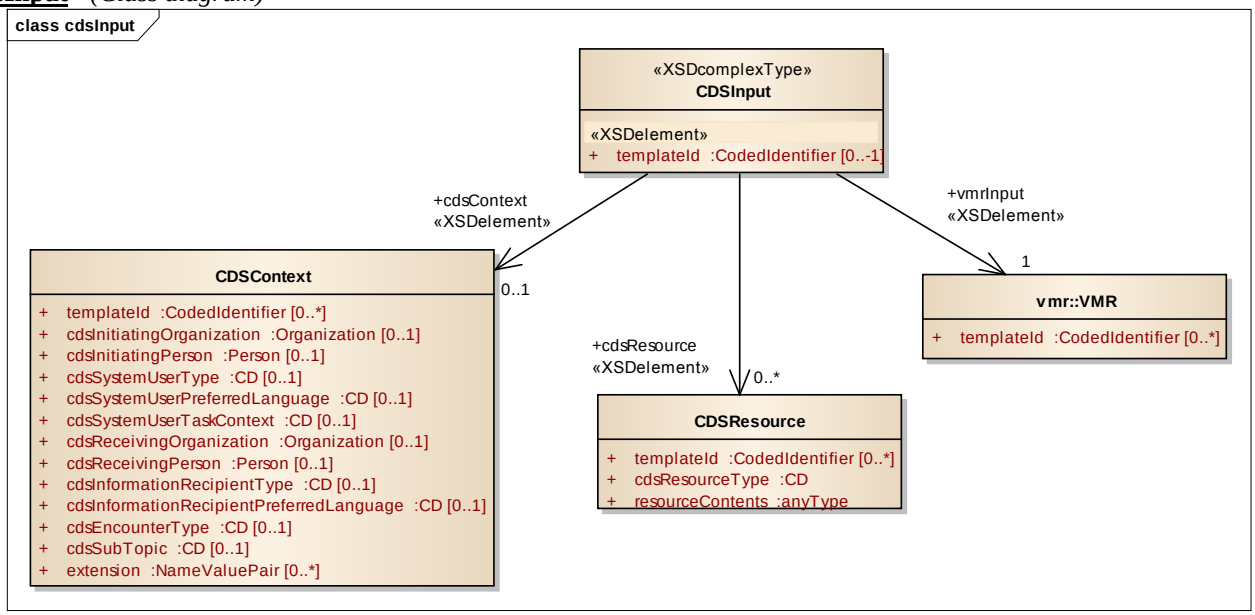

Figure: 21

7.1.1.3.1 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.).
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.

Attribute	Notes
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 NameValuePair [0..*]	Section for user-defined CDSContext attributes.

7.1.1.3.2 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.

As a specific example, a CDSInput may be used as the primary input data payload for a CDS guidance service compliant with the HL7 Decision Support Service standard. Further information regarding this type of use case can be found in the HL7 Decision Support Service specification and the HL7 Decision Support Service Implementation Guide.

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.

7.1.1.3.3 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.

Attribute	Notes
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).

7.1.1.4 cdsInputSpecification

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

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

cdsInputSpecification - *(Class diagram)*

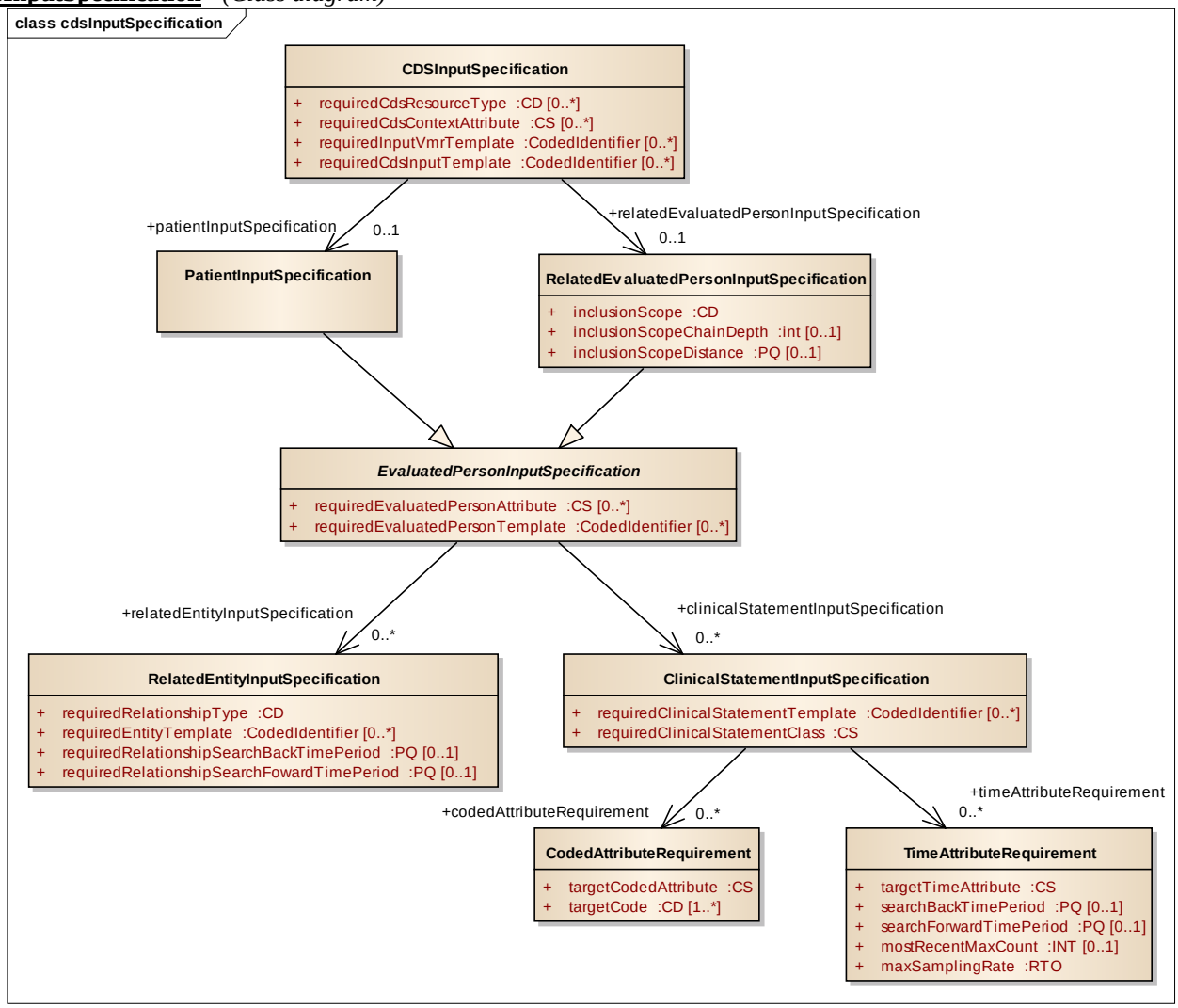

Figure: 22

7.1.1.4.1 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).

As a specific example, a CDSInputSpecification may be used to specify required CDS input by a CDS guidance service compliant with the HL7 Decision Support Service standard. Specifically, this type of specification can be encapsulated

within the "query" section of a Decision Support Service's specification of knowledge module data requirements. Further information regarding this type of use case can be found in the HL7 Decision Support Service specification and the HL7 Decision Support Service Implementation Guide.

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.

7.1.1.4.2 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.
requiredClinicalStatementClass CS	The specific leaf-level class of clinical statement required. E.g., ProcedureOrder, ObservationResult.

7.1.1.4.3 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 coded attribute subject to restriction. If the coded attribute is a direct attribute of the clinical statement, represented using the name of the coded attribute. E.g., problemCode, problemStatus. If the coded attribute resides within a class nested within the clinical statement, represented as [containing class attribute name].[coded attribute name]. E.g., affectedBodySite.bodySiteCode, substance.substanceCode.
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.

7.1.1.4.4 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.

7.1.1.4.5 PatientInputSpecification

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

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

7.1.1.4.6 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

Attribute	Notes
	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.

7.1.1.4.7 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, 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

Attribute	Notes
	sexual contact should be included.

7.1.1.4.8 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.

7.1.1.5 cdsOutput

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

Specifies output data generated by CDS systems.

cdsOutput - *(Class diagram)*

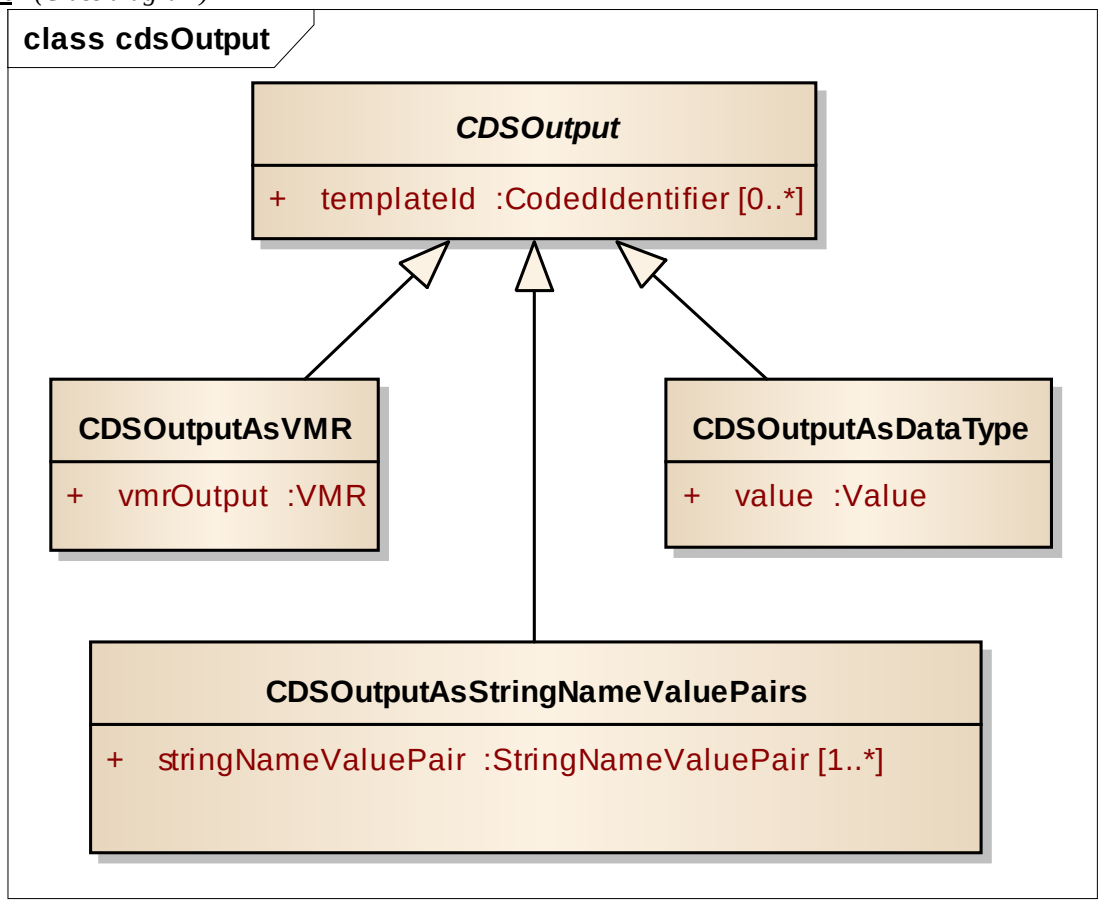

Figure: 23

7.1.1.5.1 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.

As a specific example, a CDSOutput may be used as the primary output data payload for a CDS guidance service compliant with the HL7 Decision Support Service standard. Further information regarding this type of use case can be found in the HL7 Decision Support Service specification and the HL7 Decision Support Service Implementation Guide.

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.

7.1.1.5.2 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.

7.1.1.5.3 CDSOutputAsStringNameValuePairs

Type: **Class** **CDSOutput**
Package: cdsOutput

A set of string name value pairs to communicate the results.

Attributes

Attribute	Notes
stringNameValuePair StringNameValuePair [1..*]	A pair of strings used to communicate an output result from CDS

7.1.1.5.4 CDSOutputAsVMR

Type: **Class** **CDSOutput**
Package: cdsOutput

A vMR data structure used to communicate the results.

Attributes

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

7.1.1.6 cdsOutputSpecification

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

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

cdsOutputSpecification - *(Class diagram)*

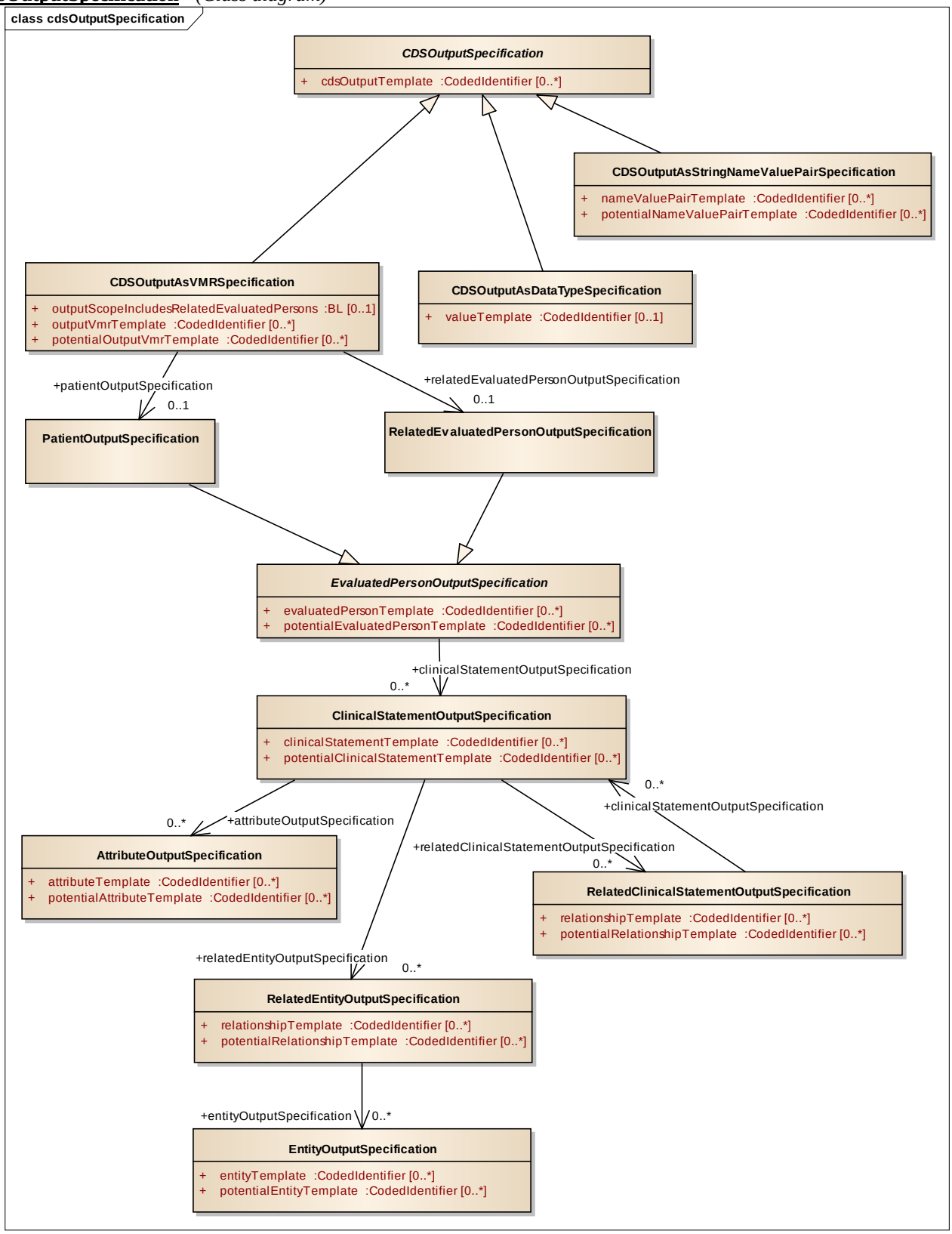

Figure: 24

7.1.1.6.1 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.

7.1.1.6.2 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
valueTemplate CodedIdentifier [0..1]	Identifier of a set of constraints that SHALL be placed on the output value.

7.1.1.6.3 CDSOutputAsStringNameValuePairSpecification

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

The parent class specifying the string name value pair output to be provided by a specific CDS use case.

Attributes

Attribute	Notes
nameValuePairTemplate CodedIdentifier [0..*]	Identifier of a set of constraints that SHALL be placed on the string name value pair.
potentialNameValuePairTemplate CodedIdentifier [0..*]	Identifier of a set of constraints that MAY be placed on the string name value pair.

7.1.1.6.4 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.
potentialOutputVmrTemplate CodedIdentifier [0..*]	Identifier of a set of constraints that MAY be placed on the output vMR.

7.1.1.6.5 CDSOutputSpecification

Type: **Class**
Package: cdsOutputSpecification

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

As a specific example, a CDSOutputSpecification may be used to specify details on the CDS output that will be returned by a CDS guidance service compliant with the HL7 Decision Support Service standard. Specifically, this type of specification can be encapsulated within the "CDS output specification" section of a Decision Support Service's specification of knowledge module evaluation result semantics. Further information regarding this type of use case can be found in the HL7 Decision Support Service specification and the HL7 Decision Support Service Implementation Guide.

Attributes

Attribute	Notes
cdsOutputTemplate CodedIdentifier [0..*]	Template to identify the output structure and specifications.

7.1.1.6.6 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.

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

7.1.1.6.7 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.

7.1.1.6.8 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.

7.1.1.6.9 PatientOutputSpecification

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

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

7.1.1.6.10 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.

7.1.1.6.11 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.

7.1.1.6.12 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.