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HL7 Domain Analysis Model: Health Quality, Release 1

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HL7 Informative Ballot

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QIDAM learns from and builds upon work done in several other projects and specifications including HL7 FHIR, vMR, QDM, QRDA, and CCDA. Many of the model elements and their documentation are drawn from these and other specifications.

Revision History

|  |  |  |  |
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| Rev | Date | By Whom | Changes |
| 1 | 12/9/13 | Aziz Boxwala | Consolidate drafts into the HL7 template |
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# Introduction

Electronic clinical quality measures (eCQMs) and clinical decision support (CDS) artifacts are currently expressed using two different data models: eCQMs are expressed using the Quality Data Model (QDM) [1], while CDS artifacts are expressed using the Virtual Medical Record (vMR) [2]. This is unfortunate since clinical quality measurement and clinical quality improvement via clinical decision support are intimately related and share common requirements in identifying patients to which a particular eCQM or CDS artifact applies.

<def name=*"Pregnancy"*>

<expression xsi:type=*"ClinicalRequest"* cardinality=*"Multiple"*

dataType=*"vmr:Problem"* codeProperty=*"problemCode"*

dateProperty=*"problemEffectiveTime.low"*

useValueSets=*"true"* subjectProperty=*"evaluatedPersonId"*>

<codes xsi:type=*"ValueSet"* id=*"2.16.840.1.113883.3.600.1622"*

authority=*"Quality Insights of Pennsylvania"*

version=*"20130614"* />

</expression>

</def>

Figure 1. Excerpt from a CDS artifact mapping the term “Pregnancy” to an element in the HL7 Virtual Medical Record schema

Figure 1 shows an excerpt from a CDS artifact in the HL7 Knowledge Artifact Schema. The excerpt illustrates the mapping of the term “Pregnancy” to problems with the codes specified in the value set. This example uses the Problem class from the vMR to define the data specification.

Figure 2. Excerpt from an eCQM artifact mapping the term “Pregnancy” to an element in the QualityData Model

Figure 2 shows an excerpt from an eCQM that maps the term “Diagnosis, Active: Pregnancy” to a QDM class of Diagnosis with the specified value set.

## Purpose

The Health Quality Improvement Domain Analysis Model (QIDAM) seeks to create a conceptual data model that can be used to create data mapping expressions, such as those illustrated above, consistently across eCQMs and CDS artifacts. It specifies the types of elements needed in the data model. More broadly, the primary purpose of the QIDAM is to serve as a model of clinical data within data mapping expressions, logical criteria, population criteria, formulae, and other expressions in health quality improvement artifacts.

The QIDAM harmonizes the existing eCQM and CDS data models into a single, unified conceptual model. It is designed as an abstract fact model. This model can be mapped onto existing logical models while defining the structure and domain concepts required by eCQMs and CDS artifacts.

## Audience

The audience for this document includes knowledge workers in the health quality domains of measurement, management, and reporting as well as artifact authors and implementers, standards analysts and developers, tooling developers, and systems integrators. Readers must be familiar with object-oriented design principles and understand class diagrams in the Unified Modeling Language (UML).

## Background

Certification of electronic health record (EHR) systems to Meaningful Use Stage 2 (MU2) standards requires implementation of CDS artifacts that support improvement of approved eCQM results. The use of different data models for eCQM and CDS artifacts:

* Prevents sharing of patient data requirement specifications between eCQMs and CDS artifacts
* Requires EHR vendors to implement two different mappings from their source data
* Prevents development of shared modules that can be used for eCQM calculation and CDS artifact evaluation

As mentioned earlier, CDS artifacts use the Virtual Medical Record (vMR) as the data model, and eCQMs currently use QDM as their fact model.

The vMR logical model is an HL7 domain analysis model; HL7 is currently in the process of publishing release 2. The logical model is defined in terms of UML class diagrams. The model draws concepts from the HL7 Clinical Statements model and uses a simplification of the HL7 version 3 datatypes release 2. Similar to the latter model, at the core of the vMR is a class known as ClinicalStatement. Concrete classes such as ProcedureEvent are derived from this abstract class. vMR, unlike, the QDM also includes classes modeling proposals for actions. These “proposal” classes support the output from CDS systems such as recommendations from a rule, or items in an order set.

QDM defines the model in terms of components and specifies how the components can be assembled into a data mapping expression. The components include:

* Category (e.g., Procedure, Medication, Communication)
* State (e.g., Active, Administered)
* Attribute (e.g., Dosage, Frequency, Admission Date Time)
* Timing Operators (e.g., Starts Before or During)

Thus, while the two models have significant overlap in the concepts they aim to represent, they take very different approaches. The QIDAM unifies the modeling approach and the concepts represented in these models, as described later.

## Approach

Prior to the development of the QIDAM, several different data models in addition to vMR and QDM were considered. These models were reviewed against the requirements listed in Chapter 3. Among the models considered were those in:

* HL7 Fast Healthcare Interoperability Resources (FHIR) Specification [3]
* Federal Health Information Model (FHIM) Specification [4]

These models covered the concepts to be represented in QIDAM. However, the structures in these models were not optimal for use in semantically precise and compact logical criteria and expressions.

Therefore, a new model was created that harmonizes the functional capabilities of vMR and QDM. The model reuses elements from the other models named above when appropriate for use in QIDAM.

As sources of input to the model, document templates used for healthcare quality applications were also reviewed. Specifically, templates contained in the following specifications were used to inform QIDAM on the concepts to be modeled and their structure:

* Quality Reporting Document Architecture Level 1 Templates [5]
* vMR Templates [6]
* Consolidated Clinical Document Architecture Templates [7]

The supplemental worksheet (QDM-vMR-cross-map.xlsx) maps each Quality Data Model (QDM) class and field [1] to equivalent classes and properties in the vMR and starts preliminary mapping to the QIDAM. The original mapping was against the Virtual Medical Record (vMR) for Clinical Decision Support [2]; changes in the current balloted version of vMR Release 2 (May 2013) have been annotated in the comments column of the worksheet as appropriate.

The summary worksheet shows the mapping of the QDM elements to the QRDA section (July 2012) and vMR classes, with each top-level QDM element category (e.g., Substance) followed by the specific element (e.g., Substance, Administered), which is mapped to the SubstanceAdministrationEvent vMR class.

The other tabs in the worksheet are associated with the appropriate QDM category (e.g., Diagnosis, Encounter, Intervention, etc.) in which each category lists the QDM attributes which are mapped to the equivalent vMR classes and properties. The Additional Notes column notes exceptions or limitations.

Scope

The primary scope of this model is limited to the data elements needed to be represented in eCQMs and CDS artifacts. The working definition of the scope is the union of the existing concepts represented in QDM [1] and vMR [2] that are further informed by the templates specifications previously listed.

The primary objective of this version was to develop the core structure of the model and establish the design approach. Further, this version models many of the concepts in scope. In some cases, the model uses an inconsistent level of detail compared to other aspects of the model (e.g., Patient-Controlled Analgesia and Respiratory Care Procedures). This was done intentionally to illustrate how the model can be extended.

The model currently addresses concepts related to:

* Encounters
* Medication
* Procedures
* Observations
* Conditions including findings, diagnoses, symptoms
* Allergies, intolerances, and adverse events

However, in this version of the document, the complete scope of the QIDAM has not been specified. Future versions of QIDAM will model other concepts including, but not limited to:

* Immunizations
* Nutrition and Diet
* Communication
* Health Education
* Care Goals
* Care Plans and Protocols

Many of these concepts have placeholders (the names are prefixed with “TBD” for *to be developed*) in the current model. These will be further developed in the next version.

# Use Cases

## eCQM and CDS Artifact Development

|  |  |
| --- | --- |
| **Description** | Developer creates clinical units of meaning (data criterion) |
| **Scenario identifier** | M1 |
| **Actors** | eCQM developer or CDS artifact developer |
| **Pre-conditions** | A data criterion exists in a descriptive (free text) form in a measure or guideline (e.g., discharge medication: aspirin, dose). |
| **Actions** | 1. Developer identifies the appropriate clinical concept type from the QIDAM to represent the data criterion (e.g., medication). 2. Developer identifies the context of the data criterion (e.g., discharge) and uses that to select the appropriate clinical concept class from the QIDAM. 3. Developer identifies properties of interest (e.g., medication dose) and specifies the QIDAM identifier of the properties. |
| **Post-conditions** | The QIDAM allows for an accurate and complete definition of the data criterion (e.g., discharge medication dose). The QIDAM includes appropriate attributes such as dosage, codes or value sets, and timestamps.  The QIDAM does not preclude the use of the individual data criteria in the description of logic criteria (e.g., establishment of timing relationships or relationship to a particular encounter). |
| **Comments** | While the QIDAM provides attributes for codes, constraints on the codes to be used (e.g., value sets, terminologies) are outside the scope of a conceptual model. |

## eCQM and CDS Artifact Implementation

|  |  |
| --- | --- |
| **Description** | Analyst at a clinical site maps data criteria defined using the QIDAM to record entries in an electronic health record system or a clinical data repository.  This scenario applies equally to an analyst at a vendor of a complete EHR system or EHR module. |
| **Scenario identifier** | M2 |
| **Actors** | eCQM implementer or CDS artifact implementer |
| **Pre-conditions** | A data criterion exists in an eCQM or CDS artifact. The data criterion maps a symbol used in the artifact to its definition in the QIDAM. |
| **Actions** | 1. Implementer identifies the appropriate element (a table, a class) in the target system that is equivalent to the data criterion in the QIDAM.  2. Implementer uses the definition (including attribute values) to construct the equivalent data definition in the target environment.  3. Implementer consults this document if the meaning or purpose of a QIDAM element or attribute is unclear.  4. Implementer repeats this task for all data specifications. |
| **Post-conditions** | Implementer correctly maps all data criteria from the eCQM or CDS artifact to the equivalent in the target environment. |
| **Comments** | Some data criteria may not have equivalent elements in the target environment; those will not be mapped according to the above use case. |

# Requirements

## Coverage

The following requirements define the domain, focus, and content of the QIDAM:

* Represents data typically found in an electronic health record of a patient that are pertinent to clinical quality.
* Only includes data elements used in eCQMs and CDS artifacts; omits data elements that are not used in these domains. For example:
  + Omit details of an order transmittal data flow between an EHR and ancillary systems or within an EHR itself but captures that an order was placed, when, and its status.
* Includes everything in vMR and QDM
* Represents the canonical basis of clinical concepts
  + No overlap
* Is suitable for extension/refinement to create specialized concepts (e.g., SurgicalProcedure extends Procedure with data about anesthesia)

### Out of scope

* The language used to specify data mapping expressions or other expressions is not in scope of the QIDAM.

## Format

The QIDAM will be defined in the form of a UML class diagram and will be thoroughly and clearly documented. The purpose, scope, and constraints of each element in the model will be described.

## Usability

The QIDAM will provide a bridge between clinical and technical users by using intuitive or clinical names for classes, especially at the leaf level. Technical jargon for names will be avoided. Classes should be unambiguous, well defined, and non-overlapping so that users of the model can distinguish when to use different model elements.

Data element criteria in the QIDAM need to relate in a way that is intuitive both to authors of eCQMs and CDS artifacts as well as to users of them. Categories or classes and the states associated with them will be clearly defined.

Additional established principles of usability to be met by the QIDAM include:

* **Effectiveness** – Ensure that the model allows all users to achieve their goals accurately by building the QIDAM based on how it will be used.
* **Efficiency** – Ensure that all users will be able to use the model to achieve their goals for their context of use in an efficient manner. Having unambiguous, non-overlapping concepts aids in this efficiency. Extensibility will also aid in efficiency.
* **Familiarity** – Name QIDAM concepts in a manner familiar to users. Avoid unfamiliar technical terms.

## Computability

The QIDAM will balance the needs for human expressivity and computability. The following are key areas that the QIDAM needs to address:

* **Semantic clarity** – The QIDAM must represent clinical concepts and attributes in an unambiguous manner. In cases where semantic clarity and human expressivity compete, semantic clarity will trump.
* **“Just enough” concept granularity** – The model will define concepts at a level of granularity that meet the needs of the clinical community and our use cases. Granularity must also be consistent across concepts (e.g., frequency or criticality should not be specified differently from one concept to another).
* **Inferencing**– The QIDAM will define concept relationships (e.g., IS-A and PART-OF relationships) that support the inferencing needs of CDS systems. This includes the definition of general (broader) concepts at higher levels in a concept hierarchy that may then be composed together to represent lower-level concepts more familiar to clinicians. CDS systems may operate on these broader concepts, while eCQM or CDS artifact authors may operate on lower-level concepts.
* **Incomplete knowledge and uncertainty** – The QIDAM will support the representation of uncertain knowledge and incomplete information. Source pedigree representation, non-deterministic model annotations, or non-exact concept alignments are examples of sources for such uncertainty.

## Interoperability

Each concept and property of vMR and QDM must have an unambiguous mapping to a QIDAM equivalent.

## Extensibility

The QIDAM, initially, will only address existing concepts from vMR and QDM, and will therefore not include a representation for all types of clinical data. For example, the QIDAM may include a class for DiagnosticTestResult but not for GeneticTestResult that would require specific properties for representing genes. The QIDAM will therefore be extensible to fill gaps in the model.

It is expected that gaps in the models will be addressed through the standardization process. However, there often is a need to incorporate additional classes and attributes into a model even before the standardization is completed. Thus, the QIDAM must be extensible by the users and implementers of the specification.

The approach to extending the QIDAM is not part of the conceptual model, the scope of this document. Thus, we do not specify an extension mechanism here. Rather, it will be specified as part of the health quality information logical model. However, we expect that extension classes will degrade gracefully to the core model class that they extend. For example, a GeneticTestResult extension of a DiagnosticTestResult will still be processable by a system as a DiagnosticTestResult.

# Model Overview

## Design Approach

The core concept in the model is an abstract class called Statement. Patient data are specified as Statements. The model dichotomizes statements into two types:

* **StatementAboutAction**: These are statements about performing actions (usually healthcare-related) on or for the patient (e.g., administering a medication). Statements about actions are further split into two subtypes: statements about performing actions (**ActionPerformance**) and statements about not performing an action (**ActionNonPerformance**, e.g., a missed dose of a medication).
* **StatementAboutObservation**: These are statements about observations about the patient’s health (e.g., heart rate, diagnosis of hypertension). These statements also are further split into two subtypes: statements about an observation being present (**ObservationPresence**) and statements that an observation or a finding was not present (**ObservationAbsence**, e.g., no chest pain).

Concrete statement types are created by subclassing the four classes named above: ActionPerformance, ActionNonPerformance, ObservationPresence, and ObservationAbsence.

Further, the concrete statement types must implement specified interfaces.

Subclasses of ActionPerformance or ActionNonPerformance must implement at least these two interfaces: a subtype of the **EnactableDescriptor** interface and a subtype of the **EnactmentPhase** interface. The former provides a structured description of the action that was performed or is to be performed (e.g., a procedure). The latter provides a description of the phase (e.g., order, plan) of the action described in the statement. Thus, a concrete statement type like ProcedureOrder (subclassed from ActionPerformance) implements the interfaces ProcedureDescriptor and Order.

Table 1. List of statements about actions

| **Statement Type** | **Derived From** | **Enactable Interface** | **EnactmentPhase Interface** |
| --- | --- | --- | --- |
| EncounterProposal | ActionPerformance | EncounterDescriptor | Proposal |
| EncounterRequest | ActionPerformance | EncounterDescriptor | Order |
| MissedAppointment | ActionNonPerformance | EncounterDescriptor | Plan |
| ScheduledEncounter | ActionPerformance | EncounterDescriptor | Plan |
| EncounterEvent | ActionPerformance | EncounterDescriptor | Performance |
| MedicationStatement | ActionPerformance | MedicationAdministtrationDescriptor | Performance |
| MedicationDispensation | ActionPerformance | MedicationAdministtrationDescriptor | Performance |
| MedicationDoseAdministration | ActionPerformance | MedicationAdministtrationDescriptor | Performance |
| UndeliveredMedicationDose | ActionNonPerformance | MedicationAdministtrationDescriptor | Performance |
| MedicationPrescription | ActionPerformance | MedicationAdministtrationDescriptor | Order |
| MedicationAdministrationProposal | ActionPerformance | MedicationAdministtrationDescriptor | Proposal |
| ProcedureProposal | ActionPerformance | ProcedureDescriptor | Proposal |
| ProcedureOrder | ActionPerformance | ProcedureDescriptor | Order |
| ScheduledProcedure | ActionPerformance | ProcedureDescriptor | Plan |
| ProcedureEvent | ActionPerformance | ProcedureDescriptor | Performance |
| UndeliveredProcedure | ActionNonPerformance | ProcedureDescriptor | Performance |

Subclasses of ObservationPresence and ObservationAbsence must implement a subtype of the **ObservableDescriptor** interface. This interface allows expression of the details of the observation such as a finding or a diagnostic test result.

Table 2. List of statements about observations

|  |  |  |
| --- | --- | --- |
| **Statement Name** | **Derived From** | **Implemented ObservationDescriptor Interface** |
| AdverseEvent | ObservationPresence | ConditionDescriptor |
| NoAdverseEvent | ObservationAbsence | ConditionDescriptor |
| AllergyIntolerance | ObservationPresence | AllergyIntoleranceDescriptor |
| NoAllergyIntolerance | ObservationAbsence | AllergyIntoleranceDescriptor |
| Condition | ObservationPresence | ConditionDescriptor |
| ConditionAbsent | ObservationAbsence | ConditionDescriptor |
| ContraindicationToMedication | ObservationPresence | ContraindicationDescriptor |
| ContraindicationToProcedure | ObservationPresence | ContraindicationDescriptor |
| Prognosis | ObservationPresence | PrognosisDescriptor |
| FamilyHistoryObservation | ObservationPresence | ObservationResultDescriptor |
| ObservationResult | ObservationPresence | ObservationResultDescriptor |

## Datatypes

Since QIDAM is a conceptual data model, it provides very high-level datatypes. These datatypes will be further subtyped and have detailed attributes specified in a logical model realized from QIDAM. These are the datatypes currently used within QIDAM classes and interfaces.

Table 3. Datatypes in QIDAM

|  |  |
| --- | --- |
| **QIDAM Datatype** | **Description** |
| Code | A value taken from a controlled terminology, such as a code from LOINC |
| IntervalOfQuantity | A range expressed over a quantity (i.e., has low and high values) |
| Quantity | A numeric value expressing an amount, with or without units |
| Text | A string of characters, formatted or unformatted for presentation |
| TimePoint | A particular time point that may be expressed at different levels of granularity such as date or date+time (e.g., Nov 15 2013, or Nov 15 2013 11:42:07 am EST) |
| TimePeriod | An interval of time bounded by TimePoint values indicating the beginning and the ending of the period |
| Value | Any of the above types |

## Entities and Other Extended Types

QIDAM also specifies the availability of certain entities and complex datatypes. That is, QIDAM names the types but does not model them in detail in the conceptual model. The types are listed here and described in detail in the next chapter.

* BodySite
* Device
* Location
* Medication
* Organization
* Person
* Person Role
  + Patient
  + Practictioner
  + RelatedPerson
* Schedule
* Substance

Cardinality and Optionality

QIDAM specifies the cardinality of attributes and connections but not the optionality. The convention used in the class diagram is as follows:

* When the cardinality is intended to be single, cardinality is not specified in the class diagram.
* When the cardinality is intended to be multiple, the cardinality is specified as “0..\*”   
  (i.e., zero to many). The zero should not be interpreted as an indication of the optionality of the attribute or connection. This constraint is more appropriately specified in a logical model.

# Model Specification

This document provides a complete overview of all element details. It lists all classes and interfaces and their attributes and connections.

## Model Diagrams

### Core - (Class diagram)



### Enactable - (Class diagram)



### Enactable-Medication - (Class diagram)



### Enactable-Procedure - (Class diagram)



### EnactmentPhase - (Class diagram)



### EntitiesAndExtendedTypes - (Class diagram)



### Observable - (Class diagram)



### Statements-AdverseEvent - (Class diagram)



### Statements-Allergy - (Class diagram)



### Statements-Condition - *(Class diagram)*



### Statements-Encounter - (Class diagram)



### Statements-Inference - (Class diagram)



### Statements-Medication-1 - (Class diagram)



### Statements-Medication-2 - (Class diagram)



### Statements-Observation - (Class diagram)



### Statements-Procedure-1 - (Class diagram)



### Statements-Procedure-2 - (Class diagram)



## ActionNonPerformance

Type: **Class** StatementAboutAction

A statement about an action that should not be performed, was not performed, or will not be performed.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ActionNonPerformance | Public  StatementAboutAction |  |
| Generalization  Source -> Destination | Public  MissedAppointment | Public  ActionNonPerformance |  |
| Generalization  Source -> Destination | Public  UndeliveredMedicationDose | Public  ActionNonPerformance |  |
| Generalization  Source -> Destination | Public  UndeliveredProcedure | Public  ActionNonPerformance |  |

## ActionPerformance

Type: **Class** StatementAboutAction

A statement about an action that is being performed, will be performed, should be performed, or was performed.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ActionPerformance | Public  StatementAboutAction |  |
| Generalization  Source -> Destination | Public  ProcedureProposal | Public  ActionPerformance |  |
| Generalization  Source -> Destination | Public  ProcedureEvent | Public  ActionPerformance |  |
| Generalization  Source -> Destination | Public  ProcedureOrder | Public  ActionPerformance |  |
| Generalization  Source -> Destination | Public  ScheduledProcedure | Public  ActionPerformance |  |
| Generalization  Source -> Destination | Public  MedicationStatement | Public  ActionPerformance |  |
| Generalization  Source -> Destination | Public  EncounterProposal | Public  ActionPerformance |  |
| Generalization  Source -> Destination | Public  EncounterRequest | Public  ActionPerformance |  |
| Generalization  Source -> Destination | Public  ScheduledEncounter | Public  ActionPerformance |  |
| Generalization  Source -> Destination | Public  EncounterEvent | Public  ActionPerformance |  |
| Generalization  Source -> Destination | Public  MedicationDoseAdministration | Public  ActionPerformance |  |
| Generalization  Source -> Destination | Public  MedicationDispensation | Public  ActionPerformance |  |
| Generalization  Source -> Destination | Public  MedicationPrescription | Public  ActionPerformance |  |
| Generalization  Source -> Destination | Public  MedicationAdministrationProposal | Public  ActionPerformance |  |

## AdverseEvent

Type: **Class** ObservationPresence

An unintended result or effect of exposure to some health action, that is undesirable and/or sometimes harmful.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  AdverseEvent | Public  ObservationPresence |  |
| Realization  Source -> Destination | Public  AdverseEvent | Public  ConditionDescriptor |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **agent** Code  Public | An agent that causes or contributes to the allergy or intolerance, identified with as much specificity as available. Used for allergies, intolerances, and other reactions to a known agent. E.g., penicillin, peanuts, latex. | *Default:* |
| **precedingExposure** ActionPerformance  Public | An action that led to the adverse event. Examples: administration of a substance, procedure. | *Default:* |

## AllergyIntolerance

Type: **Class** ObservationPresence

An statement about an allergy or intolerance triggered by a known or suspected agent.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Realization  Source -> Destination | Public  AllergyIntolerance | Public  AllergyIntoleranceDescriptor |  |
| Generalization  Source -> Destination | Public  AllergyIntolerance | Public  ObservationPresence |  |

## BodySite

Type: **Class**

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

## Condition

Type: **Class** ObservationPresence

A statement about a condition that the patient was or is believed to have had.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Association  Source -> Destination | Public  EncounterEvent | Public admissionDiagnosis  Condition |  |
| Association  Source -> Destination | Public  EncounterEvent | Public dischargeDiagnosis  Condition |  |
| Association  Source -> Destination | Public  EncounterEvent | Public encounterDiagnosis  Condition |  |
| Realization  Source -> Destination | Public  Condition | Public  ConditionDescriptor |  |
| Generalization  Source -> Destination | Public  Condition | Public  ObservationPresence |  |

## ConditionAbsent

Type: **Class** ObservationAbsence

A statement asserting that the subject was not known to have the condition within the duration that is specified.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ConditionAbsent | Public  ObservationAbsence |  |
| Realization  Source -> Destination | Public  ConditionAbsent | Public  ConditionDescriptor |  |

## ContraindicationToMedication

Type: **Class** ObservationPresence

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ContraindicationToMedication | Public  ObservationPresence |  |
| Realization  Source -> Destination | Public  ContraindicationToMedication | Public  ContraindicationDescriptor |  |
| Association  Source -> Destination | Public  ContraindicationToMedication | Public contraindicatedMedication  MedicationAdministrationDescriptor |  |

## ContraindicationToProcedure

Type: **Class** ObservationPresence

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ContraindicationToProcedure | Public  ObservationPresence |  |
| Realization  Source -> Destination | Public  ContraindicationToProcedure | Public  ContraindicationDescriptor |  |
| Association  Source -> Destination | Public  ContraindicationToProcedure | Public contraindicatedProcedure  ProcedureDescriptor |  |

## Device

Type: **Class**

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.

## EncounterEvent

Type: **Class** ActionPerformance

EncounterEvent is the record of an interaction between an EvaluatedPerson and the healthcare system.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  EncounterEvent | Public  ActionPerformance |  |
| Realization  Source -> Destination | Public  EncounterEvent | Public  EncounterDescriptor |  |
| Realization  Source -> Destination | Public  EncounterEvent | Public  Performance |  |
| Association  Source -> Destination | Public  EncounterEvent | Public admissionDiagnosis  Condition |  |
| Association  Source -> Destination | Public  EncounterEvent | Public dischargeDiagnosis  Condition |  |
| Association  Source -> Destination | Public  EncounterEvent | Public encounterDiagnosis  Condition |  |

## EncounterProposal

Type: **Class** ActionPerformance

A proposal for an encounter to take place between a patient and a provider, e.g., a proposed referral, a proposed hospitalization.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  EncounterProposal | Public  ActionPerformance |  |
| Realization  Source -> Destination | Public  EncounterProposal | Public  EncounterDescriptor |  |
| Realization  Source -> Destination | Public  EncounterProposal | Public  Proposal |  |

## EncounterRequest

Type: **Class** ActionPerformance

A request or order by a provider for an encounter, e.g., an admission order, a referral request.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  EncounterRequest | Public  ActionPerformance |  |
| Realization  Source -> Destination | Public  EncounterRequest | Public  EncounterDescriptor |  |
| Realization  Source -> Destination | Public  EncounterRequest | Public  Order |  |

## FamilyHistoryObservation

Type: **Class** ObservationPresence

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Realization  Source -> Destination | Public  FamilyHistoryObservation | Public  FamilyHistoryDescriptor |  |
| Generalization  Source -> Destination | Public  FamilyHistoryObservation | Public  ObservationPresence |  |

## InferenceOpposed

Type: **Class** StatementAboutInference

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  InferenceOpposed | Public  StatementAboutInference |  |

## InferenceSupported

Type: **Class** StatementAboutInference

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  InferenceSupported | Public  StatementAboutInference |  |

## Location

Type: **Class**

Details and position information for a physical place where services are provided and resources and participants may be stored, found, contained or accommodated.

A Location includes both incidental locations (a place which is used for healthcare without prior designation or authorization) and dedicated, formally appointed locations. Locations may be private, public, mobile or fixed and scale from small freezers to full hospital buildings or parking garages.

Examples of Locations are:

Building, ward, corridor or room

Freezer, incubator

Vehicle or lift

Home, shed, or a garage

Road, parking place, a park

## Medication

Type: **Class**

Primarily used for identification and definition of Medication, but also covers ingredients and packaging.

## MedicationAdministrationProposal

Type: **Class** ActionPerformance

An proposal to supply and/or administer a medication to a patient.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Realization  Source -> Destination | Public  MedicationAdministrationProposal | Public  Proposal |  |
| Realization  Source -> Destination | Public  MedicationAdministrationProposal | Public  MedicationAdministrationDescriptor |  |
| Generalization  Source -> Destination | Public  MedicationAdministrationProposal | Public  ActionPerformance |  |

## MedicationDispensation

Type: **Class** ActionPerformance

Dispensing a medication to a patient. This includes a description of the supply provided and the instructions for administering the medication.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  MedicationDispensation | Public  ActionPerformance |  |
| Realization  Source -> Destination | Public  MedicationDispensation | Public  MedicationAdministrationDescriptor |  |
| Realization  Source -> Destination | Public  MedicationDispensation | Public  Performance |  |

## MedicationDoseAdministration

Type: **Class** ActionPerformance

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. Related resources tie this event to the authorizing prescription, and the specific encounter between patient and health care practitioner.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  MedicationDoseAdministration | Public  ActionPerformance |  |
| Realization  Source -> Destination | Public  MedicationDoseAdministration | Public  Performance |  |
| Realization  Source -> Destination | Public  MedicationDoseAdministration | Public  MedicationAdministrationDescriptor |  |

## MedicationPrescription

Type: **Class** ActionPerformance

An order for both supply of the medication and the instructions for administration of the medicine to a patient.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  MedicationPrescription | Public  ActionPerformance |  |
| Realization  Source -> Destination | Public  MedicationPrescription | Public  MedicationAdministrationDescriptor |  |
| Realization  Source -> Destination | Public  MedicationPrescription | Public  Order |  |

## MedicationStatement

Type: **Class** ActionPerformance

This is a record of medication being taken by a patient, or that the medication has been given to a patient where the record is the result of a report from the patient, or a clinician. A medication statement is not a part of the prescribe->dispense->administer sequence but is a report that such a sequence (or at least a part of it) did take place resulting in a belief that the patient has received a particular medication.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  MedicationStatement | Public  ActionPerformance |  |
| Realization  Source -> Destination | Public  MedicationStatement | Public  Performance |  |
| Realization  Source -> Destination | Public  MedicationStatement | Public  MedicationAdministrationDescriptor |  |

## MissedAppointment

Type: **Class** ActionNonPerformance

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

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  MissedAppointment | Public  ActionNonPerformance |  |
| Realization  Source -> Destination | Public  MissedAppointment | Public  EncounterDescriptor |  |
| Realization  Source -> Destination | Public  MissedAppointment | Public  Plan |  |

## NoAdverseEvent

Type: **Class** ObservationAbsence

Although the patient was exposed to the action, no adverse event was observed.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  NoAdverseEvent | Public  ObservationAbsence |  |
| Realization  Source -> Destination | Public  NoAdverseEvent | Public  ConditionDescriptor |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **agent** Code  Public | An agent that causes or contributes to the allergy or intolerance, identified with as much specificity as available. Used for allergies, intolerances, and other reactions to a known agent. E.g., penicillin, peanuts, latex. | *Default:* |
| **precedingExposure** ActionPerformance  Public | An action that led to the adverse event. Examples: administration of a substance, procedure. | *Default:* |

## NoAllergyIntolerance

Type: **Class** ObservationAbsence

A statement asserting that the subject is not known to have an allergy or intolerance to the specified substance.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Realization  Source -> Destination | Public  NoAllergyIntolerance | Public  AllergyIntoleranceDescriptor |  |
| Generalization  Source -> Destination | Public  NoAllergyIntolerance | Public  ObservationAbsence |  |

## ObservationAbsence

Type: **Class** StatementAboutObservation

A statement asserting that an observation is not present, e.g., no headache.

Note that this is different than stating that an action was not conducted to assess the value or presence of an observation. Such a statement would be specified as a subtype of an ActionNonPerformance.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ObservationAbsence | Public  StatementAboutObservation |  |
| Generalization  Source -> Destination | Public  NoAllergyIntolerance | Public  ObservationAbsence |  |
| Generalization  Source -> Destination | Public  NoAdverseEvent | Public  ObservationAbsence |  |
| Generalization  Source -> Destination | Public  ConditionAbsent | Public  ObservationAbsence |  |

## ObservationPresence

Type: **Class** StatementAboutObservation

A statement asserting the presence or value of an observation.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ObservationPresence | Public  StatementAboutObservation |  |
| Generalization  Source -> Destination | Public  AllergyIntolerance | Public  ObservationPresence |  |
| Generalization  Source -> Destination | Public  ContraindicationToProcedure | Public  ObservationPresence |  |
| Generalization  Source -> Destination | Public  ContraindicationToMedication | Public  ObservationPresence |  |
| Generalization  Source -> Destination | Public  Symptom | Public  ObservationPresence |  |
| Generalization  Source -> Destination | Public  FamilyHistoryObservation | Public  ObservationPresence |  |
| Generalization  Source -> Destination | Public  Prognosis | Public  ObservationPresence |  |
| Generalization  Source -> Destination | Public  AdverseEvent | Public  ObservationPresence |  |
| Generalization  Source -> Destination | Public  ObservationResult | Public  ObservationPresence |  |
| Generalization  Source -> Destination | Public  Condition | Public  ObservationPresence |  |

## ObservationResult

Type: **Class** ObservationPresence

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Realization  Source -> Destination | Public  ObservationResult | Public  ObservationResultDescriptor |  |
| Generalization  Source -> Destination | Public  ObservationResult | Public  ObservationPresence |  |

## Organization

Type: **Class**

A formally or informally recognized grouping of people or organizations formed for the purpose of achieving some form of collective action. Includes companies, institutions, corporations, departments, community groups, healthcare practice groups, etc.

## Participant

Type: **Class**

Person playing a specified role in an action.

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **individual** PersonRole  Public | The healthcare professional or related person participating in the encounter. | *Default:* |
| **participantRole** Code  Public    [0..\*] | Role of participant in encounter, e.g., admitter, attending, primary care physician | *Default:* |

## Patient

Type: **Class** PersonRole

Demographics and other administrative information about a person or animal receiving care or other health-related services.

This Resource covers data about persons and animals involved in a wide range of health-related activities, including:

* Curative activities
* Psychiatric care
* Social services
* Pregnancy care
* Nursing and assisted living
* Dietary services
* Tracking of personal health and exercise data

The data in the Resource covers the "who" information about the patient: it's attributes are focused on the demographic information necessary to support the administrative, financial and logistic procedures. A Patient record is generally created and maintained by each organization providing care for a patient. A person or animal receiving care at multiple organizations may therefore have its information present in multiple Patient Resources.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  Patient | Public  PersonRole |  |

## Person

Type: **Class**

Demographic and identification information for an individual.

Additional attributes to be added in future versions.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Aggregation  Source -> Destination | Public person  Person | Public role  PersonRole |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **birthDate** TimePoint  Public | The date and time of birth for the individual. | *Default:* |
| **gender** Code  Public | Administrative Gender - the gender that the patient is considered to have for administration and record keeping purposes. | *Default:* |

## PersonRole

Type: **Class**

The role of individuals in a healthcare action.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  Practitioner | Public  PersonRole |  |
| Generalization  Source -> Destination | Public  Patient | Public  PersonRole |  |
| Generalization  Source -> Destination | Public  RelatedPerson | Public  PersonRole |  |
| Aggregation  Source -> Destination | Public person  Person | Public role  PersonRole |  |

## Practitioner

Type: **Class** PersonRole

Demographics and qualification information for an individual who is directly or indirectly involved in the provisioning of healthcare.

Practitioner covers all individuals who are engaged in the healthcare process and healthcare-related services as part of their formal responsibilities and this Resource is used for attribution of activities and responsibilities to these individuals. Practitioners include (but are not limited to):

* physicians, dentists, pharmacists
* physician assistants, nurses, scribes
* midwives, dietitians, therapists, optometrists, paramedics
* medical technicians, laboratory scientists, prosthetic technicians, radiographers
* social workers, professional home carers, official volunteers
* receptionists handling patient registration
* IT personnel merging or unmerging patient records

The Resource SHALL not be used for persons involved without a formal responsibility like individuals taking care for friends, relatives or neighbours. These can be registered as a Patient's Contact.

Practitioner performs different roles within the same or even different organizations. Depending on jurisdiction and custom, it may be necessary to maintain a specific Practitioner Resource for each such role or have a single Practitioner with multiple roles. The role can be limited to a specific period, after which authorization for this role ends. Note that the represented organization need not necessarily be the (direct) employer of a Practitioner.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  Practitioner | Public  PersonRole |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **role** Code  Public    [0..\*] | Roles which this practitioner is authorized perform for the organization. | *Default:* |

## ProcedureEvent

Type: **Class** ActionPerformance

The actual event of performing a procedure.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Realization  Source -> Destination | Public  ProcedureEvent | Public  Performance |  |
| Realization  Source -> Destination | Public  ProcedureEvent | Public  ProcedureDescriptor |  |
| Generalization  Source -> Destination | Public  ProcedureEvent | Public  ActionPerformance |  |

## ProcedureOrder

Type: **Class** ActionPerformance

An order for procedure to be performed.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ProcedureOrder | Public  ActionPerformance |  |
| Realization  Source -> Destination | Public  ProcedureOrder | Public  ProcedureDescriptor |  |
| Realization  Source -> Destination | Public  ProcedureOrder | Public  Order |  |

## ProcedureProposal

Type: **Class** ActionPerformance

Proposals for a procedure to take place, e.g., generated by a CDS system or by a consulting clinician.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ProcedureProposal | Public  ActionPerformance |  |
| Realization  Source -> Destination | Public  ProcedureProposal | Public  ProcedureDescriptor |  |
| Realization  Source -> Destination | Public  ProcedureProposal | Public  Proposal |  |

## Prognosis

Type: **Class** ObservationPresence

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Realization  Source -> Destination | Public  Prognosis | Public  PrognosisDescriptor |  |
| Generalization  Source -> Destination | Public  Prognosis | Public  ObservationPresence |  |

## RelatedPerson

Type: **Class** PersonRole

Information about a person that is involved in the care for a patient, but who is not the target of healthcare, nor has a formal responsibility in the care process.

RelatedPersons typically have a personal or non-healthcare-specific professional relationship to the patient. A RelatedPerson resource is primarily used for attribution of information, since RelatedPersons are often a source of information about the patient. For keeping information about persons for contact purposes for a patient, use a Patient's Contact element instead. Example RelatedPersons are:

* A patient's wife or husband
* A patient's relatives or friends
* A neighbour bringing a patient to the hospital
* The owner or trainer of a horse
* A patient's attorney or guardian

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  RelatedPerson | Public  PersonRole |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **relationship** Code  Public | The nature of the relationship between a patient and the related person. | *Default:* |

## Schedule

Type: **Class**

The recurrence pattern of events, e.g., three times a day after meals.

## ScheduledEncounter

Type: **Class** ActionPerformance

An encounter that has been scheduled, e.g., an outpatient visit.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ScheduledEncounter | Public  ActionPerformance |  |
| Realization  Source -> Destination | Public  ScheduledEncounter | Public  EncounterDescriptor |  |
| Realization  Source -> Destination | Public  ScheduledEncounter | Public  Plan |  |

## ScheduledProcedure

Type: **Class** ActionPerformance

A procedure that has been scheduled to take place.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ScheduledProcedure | Public  ActionPerformance |  |
| Realization  Source -> Destination | Public  ScheduledProcedure | Public  ProcedureDescriptor |  |
| Realization  Source -> Destination | Public  ScheduledProcedure | Public  Plan |  |

## Statement

Type: **Class**

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 or of something that is or was observed about the patient.

This is an abstract class that is further specialized to describe specific statements about the patient.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  StatementAboutAction | Public  Statement |  |
| Generalization  Source -> Destination | Public  StatementAboutObservation | Public  Statement |  |
| Generalization  Source -> Destination | Public  StatementAboutInference | Public  Statement |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **comment** Text  Public | A comment, instruction, or note associated with the statement. | *Default:* |
| **resultsFrom** Statement  Public    [0..\*] | The statements about the clinical actions that caused this action or observation. For example, a blood glucose observation may be the result of an order for a blood glucose test; a prescription for atenolol may result from a proposal to prescribe a beta-blocker. The resultsFrom and resultsIn properties are intended to describe associations amongst statements; they are not to be used for describing clinical causal relationships, e.g., administration of statin caused muscle pain. | *Default:* |
| **resultsIn** Statement  Public    [0..\*] | This statement may result in other clinical actions and observations which are recorded as statements. For example, a statement about a laboratory test order can result in one or more observations. | *Default:* |
| **semanticReference** Code  Public    [0..\*] | Maps this clinical statement type to a type specified in an external ontology or taxonomy of clinical concept types. For example, the semanticType of a statement about Condition may specify the condition as a patient-reported symptom or a problem. | *Default:* |
| **statementSource** Code  Public | The person, device, or other system that was the source of this statement.  ISSUES: NEED TO MAKE THE DISTINCTION BETWEEN PERSON RECORDING THE STATEMENT AND THE SYSTEM THAT STORES THE SYSTEM.  NEED ALSO TO ABLE TO VERIFY/AUTHENTICATE STATEMENTS | *Default:* |
| **statementTime** TimePoint  Public | The time at which the statement was made/recorded. This may not be the same time as the occurrence of the action or the observation event. | *Default:* |
| **subject** Patient  Public |  | *Default:* |

## StatementAboutAction

Type: **Class** Statement

Actions are healthcare related activities performed on patients by patients, caregivers, and healthcare professionals. A statement about action is a statement recording such an action.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  StatementAboutAction | Public  Statement |  |
| Generalization  Source -> Destination | Public  ActionPerformance | Public  StatementAboutAction |  |
| Generalization  Source -> Destination | Public  ActionNonPerformance | Public  StatementAboutAction |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **actionParticipant** Participant  Public    [0..\*] | A participant in the action. ,e.g., the attending physician, performer of a procedure | *Default:* |
| **occurredDuring** EncounterEvent  Public | The encounter within which the action occurs. | *Default:* |
| **reason** Code  Public | The thought process or justification for proposing performance of an action or for not proposing the performance of an action. In some scenarios, specific actions require a reason to justify them. Reasons may also be specified for not performing an action. Examples include patient, system, or medical-related reasons for declining to perform specific actions. | *Default:* |

## StatementAboutInference

Type: **Class** Statement

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  StatementAboutInference | Public  Statement |  |
| Generalization  Source -> Destination | Public  InferenceSupported | Public  StatementAboutInference |  |
| Generalization  Source -> Destination | Public  InferenceOpposed | Public  StatementAboutInference |  |

## StatementAboutObservation

Type: **Class** Statement

An observation is a phenomenon about a patient's health including physiological and pathological ones. It also includes an inferred phenomenon such as a contraindication.

A statement about an observation records such a phenomenon.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  StatementAboutObservation | Public  Statement |  |
| Generalization  Source -> Destination | Public  ObservationPresence | Public  StatementAboutObservation |  |
| Generalization  Source -> Destination | Public  ObservationAbsence | Public  StatementAboutObservation |  |

## Substance

Type: **Class**

A homogeneous material with a definite composition used in healthcare.

## Symptom

Type: **Class** ObservationPresence

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  Symptom | Public  ObservationPresence |  |

## UndeliveredMedicationDose

Type: **Class** ActionNonPerformance

Documents the non-delivery of a medication dose. E.g., documents that a dose of an anti-tuberculosis medication was not taken or given.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  UndeliveredMedicationDose | Public  ActionNonPerformance |  |
| Realization  Source -> Destination | Public  UndeliveredMedicationDose | Public  MedicationAdministrationDescriptor |  |
| Realization  Source -> Destination | Public  UndeliveredMedicationDose | Public  Performance |  |

## UndeliveredProcedure

Type: **Class** ActionNonPerformance

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

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  UndeliveredProcedure | Public  ActionNonPerformance |  |
| Realization  Source -> Destination | Public  UndeliveredProcedure | Public  ProcedureDescriptor |  |
| Realization  Source -> Destination | Public  UndeliveredProcedure | Public  Performance |  |

## Activity

Type: **Interface**

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Aggregation  Source -> Destination | Public subTask  Activity | Public  Performance | The performance of an action may have multiple subtasks associated with it. For example, a surgical procedure may have anesthesia administration, incision, actual procedure, close up. A care plan might involve enrollment, executing the plan, and possibly discharging.  Subtasks may not be used to specify instances of a repeating action. |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **performedAtTime** TimePeriod  Public | The time period in which the task was performed. | *Default:* |
| **task** Code  Public | The task to be performed, e.g., anesthesia, sedation, incision. | *Default:* |

## AllergyIntoleranceDescriptor

Type: **Interface** ObservableDescriptor

A description of an undesirable physiologic reaction to an amount of a substance that would not produce a reaction in most individuals.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  AllergyIntoleranceDescriptor | Public  ObservableDescriptor |  |
| Realization  Source -> Destination | Public  AllergyIntolerance | Public  AllergyIntoleranceDescriptor |  |
| Realization  Source -> Destination | Public  NoAllergyIntolerance | Public  AllergyIntoleranceDescriptor |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **criticality** Code  Public | The potential seriousness of a future reaction. This represents a clinical judgment about the worst case scenario for a future reaction. It would be based on the severity of past reactions, the dose and route of exposure that produced past reactions, and the life-threatening or organ system threatening potential of the reaction type. | *Default:* |
| **sensitivityType** Code  Public | A code that indicates whether this sensitivity is of an allergic nature or an intolerance to a substance. | *Default:* |
| **substance** Code  Public | A substance is a physical entity and for purposes of this aspect of the model can mean a drug or biologic, food, chemical agent, plants, animals, plastics etc. | *Default:* |

## CompositeIntravenousMedicationAdministration

Type: **Interface** MedicationParameters

Parameters for IV fluid administration that may consist of one or more additives mixed into a diluent. Additives and diluents are represented as constituents with the appropriate constituentType.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  CompositeIntravenousMedicationAdministration | Public  MedicationParameters |  |
| Aggregation  Source -> Destination | Public constituent  Constituent | Public  CompositeIntravenousMedicationAdministration | The constituent of this composite IV medication. |

## ConditionDescriptor

Type: **Interface** ObservableDescriptor

Use to record detailed information about conditions, problems or diagnoses recognized by a clinician. There are many uses including: recording a Diagnosis during an Encounter; populating a problem List or a Summary Statement, such as a Discharge Summary.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Aggregation  Source -> Destination | Public conditionModifier  ObservableModifier | Public  ConditionDescriptor | The modifiers allow specifying more details or restrictions. e.g., severity, triggering factors, stage. |
| Generalization  Source -> Destination | Public  ConditionDescriptor | Public  ObservableDescriptor |  |
| Aggregation  Source -> Destination | Public  ConditionDescriptor | Public  ConditionDetail |  |
| Realization  Source -> Destination | Public  Condition | Public  ConditionDescriptor |  |
| Realization  Source -> Destination | Public  ConditionAbsent | Public  ConditionDescriptor |  |
| Realization  Source -> Destination | Public  NoAdverseEvent | Public  ConditionDescriptor |  |
| Realization  Source -> Destination | Public  AdverseEvent | Public  ConditionDescriptor |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **abatement** TimePoint  Public | The date or estimated date that the condition resolved or went into remission. This is called "abatement" because of the many overloaded connotations associated with "remission" or "resolution" - Conditions are never really resolved, but they can abate. | *Default:* |
| **bodySite** BodySite  Public    [0..\*] | Indicates the location of the symptom on the subject's body. | *Default:* |
| **category** Code  Public | A category assigned to the condition. E.g. finding | diagnosis | concern | symptom. | *Default:* |
| **name** Code  Public | Identification of the condition, problem or diagnosis. e.g., diabetes mellitus type II, headache. | *Default:* |
| **onset** TimePoint  Public | Estimated or actual date the condition began, in the opinion of the clinician. | *Default:* |
| **status** Code  Public | The state of the condition at the time of the observation, e.g., active, inactive. | *Default:* |

## Constituent

Type: **Interface**

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

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Aggregation  Source -> Destination | Public constituent  Constituent | Public  CompositeIntravenousMedicationAdministration | The constituent of this composite IV medication. |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **constituentType** Code  Public | 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. | *Default:* |
| **substance** AdministerableSubstance  Public | Generally the ingredient of the constituent (e.g., dopamine) such as an additive in a composite IV. | *Default:* |
| **substanceAmount** IntervalOfQuantity  Public | The amount of the constituent that makes up the whole. e.g., 500 mL (of D5w). | *Default:* |

## ContraindicationDescriptor

Type: **Interface** InferableDescriptor

Describes a contraindication to a healthcare related action, e.g., medication intake, procedure.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ContraindicationDescriptor | Public  InferableDescriptor |  |
| Realization  Source -> Destination | Public  ContraindicationToProcedure | Public  ContraindicationDescriptor |  |
| Realization  Source -> Destination | Public  ContraindicationToMedication | Public  ContraindicationDescriptor |  |

## Dispensation

Type: **Interface**

Details of the dispensation such as the days supply and quantity of medication (to be) dispensed.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Aggregation  Source -> Destination | Public dispense  Dispensation | Public  MedicationAdministrationDescriptor | Dispensation details to be used only when needed, e.g., as part of a statement about a prescription or a dispensation event. |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **amount** Quantity  Public | The number of units of the supply to be or that are actually dispensed. e.g., 30 tablets | *Default:* |
| **dispenseTime** TimePeriod  Public | The time at which the supply was dispensed. | *Default:* |
| **numberOfRepeatsAllowed** Quantity  Public | The number of times the supply may be dispensed. For example, the number of times the prescribed quantity is to be supplied including the initial standard fill. | *Default:* |

## Dosage

Type: **Interface**

Indicates how the medication is to be administered to or used by the patient.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Aggregation  Source -> Destination | Public dosageInstruction  Dosage | Public  MedicationAdministrationDescriptor |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **additionalInstructions** Code  Public | Additional instructions such as "Swallow with plenty of water" which may or may not be coded. | *Default:* |
| **administrationSchedule** Schedule  Public | The frequency pattern for administration of doses. e.g., three times per day after meals | *Default:* |
| **administrationSite** BodySite  Public | The anatomic site where the medication first enters the body, e.g., left subclavian vein. | *Default:* |
| **approachBodySite** Code  Public | The body site used for gaining access to the target body site for the purposes of the substance administration. | *Default:* |
| **deliveryRoute** Code  Public | The physical route through which the substance is administered. E.g., IV, PO. | *Default:* |
| **dosageInstructionsText** Text  Public | Free text dosage instructions for cases where the instructions are too complex to code. | *Default:* |
| **doseQuantity** Quantity  Public | The amount of the therapeutic or other substance given at one administration event. e.g., 500 mg, 1 tablet, 1 teaspoon | *Default:* |
| **doseType** Code  Public | The type of dose. E.g., initial, maintenance, loading. | *Default:* |
| **maxDosePerPeriod** Quantity  Public | The maximum total quantity of a therapeutic substance that may be administered to a subject over the period of time. E.g. 1000mg in 24 hours. | *Default:* |
| **method** Code  Public | A coded value indicating the method by which the medication is introduced into or onto the body. Most commonly used for injections. Examples: Slow Push; Deep IV. Terminologies used often pre-coordinate this term with the route and or form of administration. | *Default:* |
| **rate** Quantity  Public | The speed with which the substance is introduced into the subject. Typically the rate for an infusion. e.g., 200ml in 2 hours. | *Default:* |

## EnactableDescriptor

Type: **Interface**

Description of a healthcare action, independent of the performance of the action.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  MedicationAdministrationDescriptor | Public  EnactableDescriptor |  |
| Generalization  Source -> Destination | Public  EncounterDescriptor | Public  EnactableDescriptor |  |
| Generalization  Source -> Destination | Public  ProcedureDescriptor | Public  EnactableDescriptor |  |
| Generalization  Source -> Destination | Public  TBDCommunicationDescriptor | Public  EnactableDescriptor |  |
| Generalization  Source -> Destination | Public  TBDGoalDescriptor | Public  EnactableDescriptor |  |
| Generalization  Source -> Destination | Public  TBDEducationDescriptor | Public  EnactableDescriptor |  |
| Generalization  Source -> Destination | Public  TBDNutritionDescriptor | Public  EnactableDescriptor |  |
| Generalization  Source -> Destination | Public  TBDCarePlanParticipationDescriptor | Public  EnactableDescriptor |  |
| Generalization  Source -> Destination | Public  TBDEquipmentOrSuppliesApplicationDescriptor | Public  EnactableDescriptor |  |
| Generalization  Source -> Destination | Public  TBDProtocolParticipationDescriptor | Public  EnactableDescriptor |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **performanceTime** TimePeriod  Public | The time when the action is performed. | *Default:* |

## EnactmentPhase

Type: **Interface**

A healthcare action may evolve through multiple phases from being proposed, considered to being delivered and then completed. A statement about an action specifies the phase of that action.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  Plan | Public  EnactmentPhase |  |
| Generalization  Source -> Destination | Public  Proposal | Public  EnactmentPhase |  |
| Generalization  Source -> Destination | Public  Order | Public  EnactmentPhase |  |
| Generalization  Source -> Destination | Public  Performance | Public  EnactmentPhase |  |

## EncounterDescriptor

Type: **Interface** EnactableDescriptor

Description of an interaction between a patient and healthcare provider(s) for the purpose of providing healthcare service(s) or assessing the health status of a patient.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  EncounterDescriptor | Public  EnactableDescriptor |  |
| Realization  Source -> Destination | Public  EncounterProposal | Public  EncounterDescriptor |  |
| Realization  Source -> Destination | Public  EncounterRequest | Public  EncounterDescriptor |  |
| Realization  Source -> Destination | Public  MissedAppointment | Public  EncounterDescriptor |  |
| Realization  Source -> Destination | Public  ScheduledEncounter | Public  EncounterDescriptor |  |
| Realization  Source -> Destination | Public  EncounterEvent | Public  EncounterDescriptor |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **class** Code  Public | Classification of the encounter. For example, inpatient, outpatient, virtual | *Default:* |
| **dischargeDisposition** Code  Public | The final place or setting to which the patient was discharged on the day of discharge. e.g., home, hospice, expired | *Default:* |
| **encounterSchedule** Schedule  Public | If the encounter is repeated, the frequency pattern for repetitions. | *Default:* |
| **length** Quantity  Public | Quantity of time the encounter lasted. | *Default:* |
| **location** Location  Public | The location the encounter takes place, e.g., clinic location, hospital bed | *Default:* |
| **serviceProvider** Organization  Public | Department or team providing care. | *Default:* |
| **serviceType** Code  Public | The type of service provided during the encounter. For example, surgery, rehabilitation, annual physical exam | *Default:* |

## FamilyHistoryDescriptor

Type: **Interface** ObservableDescriptor

Significant health event or condition for people related to the subject, relevant in the context of care for the subject.

This information can be known to different levels of accuracy. Sometimes the exact condition ('asthma') is known, and sometimes it is less precise ('some sort of cancer'). Equally, sometimes the person can be identified ('my aunt agatha') and sometimes all that is known is that the person was an uncle.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  FamilyHistoryDescriptor | Public  ObservableDescriptor |  |
| Realization  Source -> Destination | Public  FamilyHistoryObservation | Public  FamilyHistoryDescriptor |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **condition** Code  Public | Condition that the related person had. | *Default:* |
| **deceasedAge** Quantity  Public | If dead, age at which family member died. | *Default:* |
| **onsetAge** Quantity  Public | When condition first manifested | *Default:* |
| **outcome** Code  Public | deceased | permanent disability | etc. | *Default:* |
| **relationship** Code  Public | Relationship to the subject | *Default:* |

## ImagingProcedure

Type: **Interface** ProcedureParameters

Parameters for an Imaging examination. For instance, Chest Radiograph - PA and Lateral.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ImagingProcedure | Public  ProcedureParameters |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **contrastNeeded** Code  Public | Specification of whether contrast should be administered as part of the imaging study (e.g., Yes, No, Per Radiology) | *Default:* |
| **contrastRoute** Code  Public | Specification of the route of contrast (e.g., Oral, IV, Per Radiology) to be given as part of an imaging proposal. | *Default:* |
| **contrastSubstance** AdministerableSubstance  Public | Specification of the kind of contrast (e.g., Barium, Gastrograffin) to be given as part of an imaging proposal. For example, Barium, Gastrograffin. | *Default:* |
| **isolationCode** Code  Public | 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. | *Default:* |
| **portableExam** YesNo  Public | 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). | *Default:* |
| **sedation** YesNo  Public | Sedation is required or was administered for this procedure. | *Default:* |
| **stressor** Code  Public | 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. | *Default:* |
| **transportMode** Code  Public | How a patient will be moved from their hospital room to the performing department | *Default:* |

## InferableDescriptor

Type: **Interface** ObservableDescriptor

An inference made, about the patient's health, from other statements.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  InferableDescriptor | Public  ObservableDescriptor |  |
| Generalization  Source -> Destination | Public  ContraindicationDescriptor | Public  InferableDescriptor |  |
| Generalization  Source -> Destination | Public  PrognosisDescriptor | Public  InferableDescriptor |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **inferenceMethod** Code  Public    [0..1] | The algorithm, tool, or instrument used to make the inference. E.g., Framingham Risk Score, Immunization Rule Set. | *Default:* |
| **inferredFrom** Statement  Public    [0..\*] | The statements that form the basis for the inference. E.g., diagnosis of diabetes mellitus, and blood pressure observations to calculate risk of heart disease. | *Default:* |

## LaboratoryTestProcedure

Type: **Interface** ProcedureParameters

Parameters for a procedure to test a specimen from a patient.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  LaboratoryTestProcedure | Public  ProcedureParameters |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **collectionMethod** Code  Public | Specification of how the specimen for testing should be obtained | *Default:* |
| **specialHandling** Code  Public    [0..\*] | Special instructions on how to handle a laboratory specimen. For example, 'Keep on ice'. | *Default:* |
| **specimenSource** Code  Public | The source of the laboratory specimen to be collected. | *Default:* |
| **suspectedPathogen** Code  Public    [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. | *Default:* |

## MedicationAdministrationDescriptor

Type: **Interface** EnactableDescriptor

A description of the action of prescribing or administering medication to a patient.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  MedicationAdministrationDescriptor | Public  EnactableDescriptor |  |
| Association  Source -> Destination | Public  ContraindicationToMedication | Public contraindicatedMedication  MedicationAdministrationDescriptor |  |
| Realization  Source -> Destination | Public  MedicationStatement | Public  MedicationAdministrationDescriptor |  |
| Realization  Source -> Destination | Public  MedicationDispensation | Public  MedicationAdministrationDescriptor |  |
| Realization  Source -> Destination | Public  MedicationPrescription | Public  MedicationAdministrationDescriptor |  |
| Realization  Source -> Destination | Public  MedicationDoseAdministration | Public  MedicationAdministrationDescriptor |  |
| Aggregation  Source -> Destination | Public dosageInstruction  Dosage | Public  MedicationAdministrationDescriptor |  |
| Realization  Source -> Destination | Public  MedicationAdministrationProposal | Public  MedicationAdministrationDescriptor |  |
| Aggregation  Source -> Destination | Public dispense  Dispensation | Public  MedicationAdministrationDescriptor | Dispensation details to be used only when needed, e.g., as part of a statement about a prescription or a dispensation event. |
| Realization  Source -> Destination | Public  UndeliveredMedicationDose | Public  MedicationAdministrationDescriptor |  |
| Aggregation  Source -> Destination | Public details  MedicationParameters | Public  MedicationAdministrationDescriptor | Specification of parameters applicable to the particular type of medication administration. |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **medication** Medication  Public | Identifies the medication being dispensed or administered. | *Default:* |

## MedicationParameters

Type: **Interface**

Parameters for specific types of medications that can be administered.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  PatientControlledAnalgesia | Public  MedicationParameters |  |
| Generalization  Source -> Destination | Public  CompositeIntravenousMedicationAdministration | Public  MedicationParameters |  |
| Aggregation  Source -> Destination | Public details  MedicationParameters | Public  MedicationAdministrationDescriptor | Specification of parameters applicable to the particular type of medication administration. |

## MicrobiologySensitivtyResult

Type: **Interface** ResultDetail

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  MicrobiologySensitivtyResult | Public  ResultDetail |  |
| Aggregation  Source -> Destination | Public organismSensitivity  OrganismSensitivity | Public  MicrobiologySensitivtyResult |  |

## ObservableDescriptor

Type: **Interface**

Description of the pathology, physiology, or behavior that is being recorded.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  InferableDescriptor | Public  ObservableDescriptor |  |
| Generalization  Source -> Destination | Public  FamilyHistoryDescriptor | Public  ObservableDescriptor |  |
| Generalization  Source -> Destination | Public  AllergyIntoleranceDescriptor | Public  ObservableDescriptor |  |
| Generalization  Source -> Destination | Public  ConditionDescriptor | Public  ObservableDescriptor |  |
| Generalization  Source -> Destination | Public  ObservationResultDescriptor | Public  ObservableDescriptor |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **observedAtTime** TimePoint  Public | The time at which the observation was made. This may be different than the time at which the finding occurred and when the statement was created. This is the time at which history is elicited or an examination is conducted. | *Default:* |

## ObservableModifier

Type: **Interface**

Further modification or limitation on the finding, for example intensity, volume.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Aggregation  Source -> Destination | Public conditionModifier  ObservableModifier | Public  ConditionDescriptor | The modifiers allow specifying more details or restrictions. e.g., severity, triggering factors, stage. |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **modifierName** Code  Public | What about the observation is being modified. e.g.., color | *Default:* |
| **modifierValue** Value  Public | How the observation is being modified. e.g., red | *Default:* |

## ObservationResultDescriptor

Type: **Interface** ObservableDescriptor

Assertions and measurements made about a patient, device or other subject.

ObservationResults are a central element in healthcare, used to support diagnosis, monitor progress, determine baselines and patterns and even capture demographic characteristics. Fundamentally, observations are name/value pair assertions. Simple observation values, such a body temperature, are specified in the value attribute. Richer values, e.g., result panels, aggregate observations from diagnostic imaging, and microbiology sensitivity results, are specified in the detailedResult attribute.,

This data type does not support the storage of the image or signal sequences such as electrocardiogram data. However, the observations and interpretation made from the images and signals can be represented here.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ObservationResultDescriptor | Public  ObservableDescriptor |  |
| Realization  Source -> Destination | Public  ObservationResult | Public  ObservationResultDescriptor |  |
| Aggregation  Source -> Destination | Public detailedResult  ResultDetail | Public  ObservationResultDescriptor | Detailed complex result values. |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **bodySite** BodySite  Public | Indicates where on the subject's body the observation was made. | *Default:* |
| **interpretation** Code  Public | The assessment made based on the result of the observation. | *Default:* |
| **method** Code  Public | The technique or mechanism used to perform the observation. | *Default:* |
| **name** Code  Public | Identifies what type of observation was performed. e.g., body temperature | *Default:* |
| **reliability** Code  Public | An estimate of the degree to which quality issues have impacted on the value reported. e.g., ok, error, ongoing | *Default:* |
| **status** Code  Public | The status of the result value. e.g., preliminary, final | *Default:* |
| **value** Value  Public | The information determined as a result of making the observation. e.g., 120 mm Hg, small, 2013-11-30 | *Default:* |

## Order

Type: **Interface** EnactmentPhase

An order is an instruction by a healthcare provider to another healthcare provider to perform some action.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  Order | Public  EnactmentPhase |  |
| Realization  Source -> Destination | Public  ProcedureOrder | Public  Order |  |
| Realization  Source -> Destination | Public  EncounterRequest | Public  Order |  |
| Realization  Source -> Destination | Public  MedicationPrescription | Public  Order |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **orderedAtTime** TimePeriod  Public | The time at which the order was created. | *Default:* |
| **originationMode** Code  Public | The mode the order was received (such as by telephone, electronic, verbal, written). | *Default:* |
| **urgency** Code  Public | Characterizes how quickly the action must be initiated. Includes concepts such as stat, urgent, routine. | *Default:* |

## OrganismSensitivity

Type: **Interface**

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Aggregation  Source -> Destination | Public organismSensitivity  OrganismSensitivity | Public  MicrobiologySensitivtyResult |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **antiMicrobialAgent** Substance  Public | The antimicrobial agent that was tested for sensitivity, e.g., vancomycin | *Default:* |
| **organism** Code  Public | The microorganism whose sensitivity is being tested. | *Default:* |
| **sensitivity** Code  Public | The response of the microorgranism to the agent. For example, resistant, susceptible. | *Default:* |

## PatientControlledAnalgesia

Type: **Interface** MedicationParameters

Parameters for Patient Controlled Analgesia administration. For instance, morphine PCA, 5 mg loading dose, followed by 10 mg/hr basal rate, 1 mg demand dose, lockout interval 10 min.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  PatientControlledAnalgesia | Public  MedicationParameters |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **lockoutInterval** IntervalOfQuantity  Public | 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. | *Default:* |

## Performance

Type: **Interface** EnactmentPhase

The actual performance of a healthcare-related action, e.g.., administer a medication, perform a procedure.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  Performance | Public  EnactmentPhase |  |
| Realization  Source -> Destination | Public  ProcedureEvent | Public  Performance |  |
| Realization  Source -> Destination | Public  MedicationStatement | Public  Performance |  |
| Realization  Source -> Destination | Public  EncounterEvent | Public  Performance |  |
| Realization  Source -> Destination | Public  MedicationDoseAdministration | Public  Performance |  |
| Realization  Source -> Destination | Public  MedicationDispensation | Public  Performance |  |
| Aggregation  Source -> Destination | Public subTask  Activity | Public  Performance | The performance of an action may have multiple subtasks associated with it. For example, a surgical procedure may have anesthesia administration, incision, actual procedure, close up. A care plan might involve enrollment, executing the plan, and possibly discharging.  Subtasks may not be used to specify instances of a repeating action. |
| Realization  Source -> Destination | Public  UndeliveredMedicationDose | Public  Performance |  |
| Realization  Source -> Destination | Public  UndeliveredProcedure | Public  Performance |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **enactedAtTime** TimePeriod  Public | The overall time period in which the action is performed. This may be different than the scheduled time. Time for different activities performed within this action can be specified as subTasks. | *Default:* |

## Plan

Type: **Interface** EnactmentPhase

Description of action that is planned to be performed. Typically, this would include a time at which the action is scheduled to be performed.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  Plan | Public  EnactmentPhase |  |
| Realization  Source -> Destination | Public  ScheduledProcedure | Public  Plan |  |
| Realization  Source -> Destination | Public  MissedAppointment | Public  Plan |  |
| Realization  Source -> Destination | Public  ScheduledEncounter | Public  Plan |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **plannedAtTime** TimePerioid  Public | The time at which the plan was created. | *Default:* |

## ProcedureDescriptor

Type: **Interface** EnactableDescriptor

A procedure is an activity that is performed with or on a patient as part of the provision of care. This can be a physical 'thing' like an operation, or less invasive like counseling or hypnotherapy. Examples include surgical procedures, diagnostic procedures, endoscopic procedures, biopsies, and exclude things for which there are specific resources, such as immunizations, drug administrations.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ProcedureDescriptor | Public  EnactableDescriptor |  |
| Realization  Source -> Destination | Public  ProcedureProposal | Public  ProcedureDescriptor |  |
| Realization  Source -> Destination | Public  ProcedureEvent | Public  ProcedureDescriptor |  |
| Realization  Source -> Destination | Public  ProcedureOrder | Public  ProcedureDescriptor |  |
| Realization  Source -> Destination | Public  ScheduledProcedure | Public  ProcedureDescriptor |  |
| Association  Source -> Destination | Public  ContraindicationToProcedure | Public contraindicatedProcedure  ProcedureDescriptor |  |
| Aggregation  Source -> Destination | Public details  ProcedureParameters | Public  ProcedureDescriptor | Specification of parameters applicable to the particular procedure. |
| Realization  Source -> Destination | Public  UndeliveredProcedure | Public  ProcedureDescriptor |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **approachBodySite** BodySite  Public | The body site used for gaining access to the target body site. E.g., femoral artery for a coronary angiography. | *Default:* |
| **procedureCode** Code  Public | This is the code that identifies the procedure with as much specificity as available, or as required. E.g., appendectomy, coronary artery bypass graft surgery. | *Default:* |
| **procedureMethod** Code  Public | 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. | *Default:* |
| **procedureSchedule** Schedule  Public | If the procedure is repeated, the frequency pattern for repetitions. | *Default:* |
| **targetBodySite** BodySite  Public | The body site where the procedure takes place. E.g., left lower arm for fracture reduction. | *Default:* |

## ProcedureParameters

Type: **Interface**

The parameters that are specific to different types of procedures.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ImagingProcedure | Public  ProcedureParameters |  |
| Generalization  Source -> Destination | Public  RespiratoryCareProcedure | Public  ProcedureParameters |  |
| Aggregation  Source -> Destination | Public details  ProcedureParameters | Public  ProcedureDescriptor | Specification of parameters applicable to the particular procedure. |
| Generalization  Source -> Destination | Public  LaboratoryTestProcedure | Public  ProcedureParameters |  |

## PrognosisDescriptor

Type: **Interface** InferableDescriptor

An inference about the likelihood of a patient's risk for a condition in the specific timespan.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  PrognosisDescriptor | Public  InferableDescriptor |  |
| Realization  Source -> Destination | Public  Prognosis | Public  PrognosisDescriptor |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **condition** Code  Public | The condition that is being predicted. e.g., heart disease | *Default:* |
| **likelihood** Value  Public | The likelihood of acquiring the condition specified as a numeric probability or a coded ordinal value. | *Default:* |
| **within** TimePerioid  Public | The time span within which the condition will be reached. e.g., 10 years. | *Default:* |

## Proposal

Type: **Interface** EnactmentPhase

Description of a an action that is being proposed to be performed. The proposal may be a recommendation from a clinical decision support system or advice from a consultation.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  Proposal | Public  EnactmentPhase |  |
| Realization  Source -> Destination | Public  ProcedureProposal | Public  Proposal |  |
| Realization  Source -> Destination | Public  EncounterProposal | Public  Proposal |  |
| Realization  Source -> Destination | Public  MedicationAdministrationProposal | Public  Proposal |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **proposedAtTime** TimePeriod  Public | The time when the proposal was made. | *Default:* |
| **urgency** Code  Public | Characterizes how quickly an action must be initiated. Includes concepts such as stat, urgent, routine. | *Default:* |

## RespiratoryCareProcedure

Type: **Interface** ProcedureParameters

Procedures that encompass supplemental oxygen (eg, nasal cannula, face mask), BiPAP/CPAP, and mechanical ventilation.

Note: While these are vastly different respiratory care concepts, the associated data elements can be constrained through templates.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  RespiratoryCareProcedure | Public  ProcedureParameters |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **ePAP** IntervalOfQuantity  Public | Expiratory positive airway pressure, often expressed in cmH20 in the United States. Example: 5 cmH2O | *Default:* |
| **fiO2** IntervalOfQuantity  Public | Fraction of inspired oxygen, expressed as a percentage. For example, 100%. | *Default:* |
| **inspiratoryTime** IntervalOfQuantity  Public | Specification of the duration of the positive airway pressume applied by a mechanical ventilator. For example, 1 second. | *Default:* |
| **iPAP** IntervalOfQuantity  Public | Inspiratory positive airway pressure, often expressed in cmH20 in the United States. For example, 10 cmH2O. | *Default:* |
| **isolationCode** Code  Public | 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. | *Default:* |
| **oxygenFlowRate** IntervalOfQuantity  Public | The rate at which oxygen is administered to the patient; generally in liters per minute | *Default:* |
| **peakFlowRate** IntervalOfQuantity  Public | Specification of the maximum allowable rate of airflow delivered by a mechanical ventilator. For example, 60 L/min. | *Default:* |
| **peakInspiratoryPressure** IntervalOfQuantity  Public | 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. | *Default:* |
| **pEEP** IntervalOfQuantity  Public | 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. | *Default:* |
| **pressureSupport** IntervalOfQuantity  Public | 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 | *Default:* |
| **respiratoryRate** IntervalOfQuantity  Public | Number of machine-delivered breaths per minute, in the context of mechanical ventilation, expressed as breaths/minute. For example, 14 breaths/minute. | *Default:* |
| **spO2Range** IntervalOfQuantity  Public | Target oxygen saturation, expressed as a percentage. For instance, 95-100%. | *Default:* |
| **spO2Titration** IntervalOfQuantity  Public | Titration instructions to achieve target oxygen saturation. An example might include: "Titrate oxygen to maintain SpO2 > 93%". | *Default:* |
| **tidalVolume** IntervalOfQuantity  Public | Volume of air delivered with each machine-delivered breath, often expressed in mL in the United States. For example, 500 mL. | *Default:* |
| **ventilatorMode** Code  Public | 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). | *Default:* |

## ResultDetail

Type: **Interface**

Result values that have more complex structures than can be represented by the simple value attribute.

It is expected that this general type will be extended for representation of specific type of result values.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ResultGroup | Public  ResultDetail |  |
| Aggregation  Source -> Destination | Public detailedResult  ResultDetail | Public  ObservationResultDescriptor | Detailed complex result values. |
| Generalization  Source -> Destination | Public  MicrobiologySensitivtyResult | Public  ResultDetail |  |

## ResultGroup

Type: **Interface** ResultDetail

A group of related result values such as a laboratory result panel. e.g., complete blood count, blood pressure

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  ResultGroup | Public  ResultDetail |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **component** ObservationResultDescriptor  Public    [0..\*] | An observation result that is one of the components of the group, e.g., systolic blood pressure, white blood cell count. | *Default:* |

## TBDCarePlanParticipationDescriptor

Type: **Interface** EnactableDescriptor

This concept has not been modeled yet. It will be developed in the next version of the specification.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  TBDCarePlanParticipationDescriptor | Public  EnactableDescriptor |  |

## TBDCommunicationDescriptor

Type: **Interface** EnactableDescriptor

This concept has not been modeled yet. It will be developed in the next version of the specification.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  TBDCommunicationDescriptor | Public  EnactableDescriptor |  |

## TBDEducationDescriptor

Type: **Interface** EnactableDescriptor

This concept has not been modeled yet. It will be developed in the next version of the specification.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  TBDEducationDescriptor | Public  EnactableDescriptor |  |

Attributes

| **Attribute** | **Notes** | **Constraints and tags** |
| --- | --- | --- |
| **topic** Code  Public |  | *Default:* |

## TBDEquipmentOrSuppliesApplicationDescriptor

Type: **Interface** EnactableDescriptor

This concept has not been modeled yet. It will be developed in the next version of the specification.

=

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  TBDEquipmentOrSuppliesApplicationDescriptor | Public  EnactableDescriptor |  |

## TBDGoalDescriptor

Type: **Interface** EnactableDescriptor

This concept has not been modeled yet. It will be developed in the next version of the specification.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  TBDGoalDescriptor | Public  EnactableDescriptor |  |

## TBDNutritionDescriptor

Type: **Interface** EnactableDescriptor

This concept has not been modeled yet. It will be developed in the next version of the specification.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  TBDNutritionDescriptor | Public  EnactableDescriptor |  |

## TBDProtocolParticipationDescriptor

Type: **Interface** EnactableDescriptor

This concept has not been modeled yet. It will be developed in the next version of the specification.

*Connections*

| **Connector** | **Source** | **Target** | **Notes** |
| --- | --- | --- | --- |
| Generalization  Source -> Destination | Public  TBDProtocolParticipationDescriptor | Public  EnactableDescriptor |  |

# Examples

The examples below illustrate the use of the QIDAM in creating data mapping expressions. The leftmost column shows the identifier of the document from which the source expression was obtained. Where the source document is prefixed with NQF, it indicates the document was from the National Quality Forum. The subsequent digits provide the identifier assigned by NQF to that measure. The second column contains the original expression from the source document. In the third column, the expressions are written in pseudocode. For the semantic references, these examples use the QIDAM category.

Table 4. Example expressions written with QIDAM

|  |  |  |
| --- | --- | --- |
| **Source  Document ID** | **Source Expression** | **QIDAM based expression** |
| NQF 0068 | Diagnosis, Active: Acute Myocardial Infarction" <= 12 month(s) starts before start of "Measurement Period" using "Acute Myocardial Infarction Grouping Value Set (2.16.840.1.113883.3.464.1003.104.12.1001)" | Condition with - semanticReference = "Diagnosis, Active" - name in AMI Grouping VS - status = Active - onset <= 12 months before start of "Measurement period" |
| NQF 0068 | Procedure, Performed: Percutaneous Coronary Interventions <= 12 month(s) ends before start of "Measurement Period" using "Percutaneous Coronary Interventions Grouping Value Set (2.16.840.1.113883.3.464.1003.104.12.1010) | ProcedureEvent with - semanticReference = "Procedure, Performed" - procedureCode in PCI Grouping VS - enactedAtTime.end <= 12 months before start of "Measurement period" |
| NQF 0068 | Medication, Active: Aspirin and Other Anti-thrombotics" ends before start of "Measurement Period | MedicationStatement with - semanticReference = "Medication, Active" - medication in ASA+AT Grouping VS - enactedAtTime.end <= start of "Measurement period" |
| NQF 0440 | Encounter, Performed: Non-Elective Inpatient Encounter (admission datetime)" <= 1 hour(s) starts after end of "Occurrence A of Encounter, Performed: Emergency Department Visit (facility location departure datetime)" | EncounterEvent with -semanticReference="Encounter, Performed" -serviceTypeCode in Non-Elective Inpatient Encounter VS -enactedAtTime.begin<=1 hour after end of "Encounter, Performed: Emergency Department Visit" |
| NQF 0002 | "Laboratory Test, Result: Group A Streptococcus Test (result)" <= 3 day(s) starts before or during "Occurrence A of Encounter, Performed: Ambulatory/ED Visit" | ObservationResult with -semanticReference="Laboratory Test, Result" -name in Group A Streptococcus Test VS -observedAtTime.begin<=3 days before "Encounter, Performed: Ambulatory/ED visit" |
| NQF 0565 | AND: "Physical Exam, Finding: Best Corrected Visual Acuity (result: 'Visual acuity 20/40 or Better')" <= 90 day(s) starts after end of "Occurrence A of Procedure, Performed: Cataract Surgery" | ObservationResult with -semanticReference="Physical Exam, Finding" -name in Best Corrected Visual Acuity VS -value > Visual acuity 20/40 -observedAtTime.begin <=90 days after" Procedure, performed: Cataract surgery" |
| NQF 0018 | AND: "Physical Exam, Finding: Systolic Blood Pressure (result < 140 mmHg)" during MOST RECENT: "Encounter, Performed: Office Visit" | ObservationResult with - semanticReference="Physical Exam, Finding" - name in Systolic BP VS - value < 140 mm Hg - observedAtTime within (mostRecentOfficeVisitEnc - enactedAtTime) |
| NQF 0059 | Laboratory Test, Result: HbA1c Laboratory Test" during "Measurement Period" AND: "Occurrence A of Laboratory Test, Result: HbA1c Laboratory Test (result > 9 %)" | ObservationResult with -semanticReference="Laboratory Test, Result" -name in HbA1c Laboratory Test in -observedAtTime within measurement period -value > 9% |
| NQF 1659 | AND: "Procedure, Performed not done: Drug not available" during "Occurrence A of Encounter, Performed: Encounter Inpatient" | UndeliveredProcedure with -semanticReference="Procedure, Performed" -reasonCode in Drug not available VS -occurredDuring = "Encounter, Performed: Encounter Inpatient |
| NQF 528 | OR: "Medication, Administered: Hospital measures-IV Vancomycin (route: "Hospital measures-Route IV")" <=1440 minutes(s) starts before start of "Occurrence A of Procedure, Performed: Hospital measures-Joint Commission evidence of a surgical procedure requiring general or neuraxial anesthesia (incision datetime)" | MedicationDoseAdministration with -semanticReference="Medication, Administered" -medication in -IV Vancomycin VS -deliveryRoute in Hospital measures-Route IV VS -enactedAtTime.begin<=1440 minute(s) before (Procedure, Performed: Hospital measures-Joint commission evidence of a surgical procedure requiring general or neuraxial anesthesia" - enactedAtTime.begin) |
| [https://www.icsi.org/\_asset/dwy1nl/ACSOS1112.doc](https://www.google.com/url?q=https://www.icsi.org/_asset/dwy1nl/ACSOS1112.doc&sa=D&usg=ALhdy293yqCgXMDh4Sqs4psot1WwM8XFmQ) | Glucose by finger stick screening 4 times daily (before meals and at bedtime) for 24 hours | ProcedureOrder with -semanticReference="Procedure, Order" -procedureCode=Glucose Measurement by Finger stick screening VS -performanceTime=4 times daily (before meals and at bedtime) for 24 hrs |
| [https://www.icsi.org/\_asset/dwy1nl/ACSOS1112.doc](https://www.google.com/url?q=https://www.icsi.org/_asset/dwy1nl/ACSOS1112.doc&sa=D&usg=ALhdy293yqCgXMDh4Sqs4psot1WwM8XFmQ) | Ticagrelor 180 mg loading dose by mouth once 90 mg by mouth twice daily | MedicationPrescription with -semantic type="Medication, Order" -medicationCode in Ticagrelor VS -dosage - doseType=loadingDose - deliveryRoute=oral - doseQuantity=180 mg - schedule=Once on day 1 -dosage - deliveryRoute=oral - doseQuantity=90 mg - administrationSchedule=twice daily one day starting day 2 |

# References

|  |  |
| --- | --- |
| [1] | "Quality Data Model," National Quality Forum, Washington, DC, 2012. |
| [2] | "HL7 Version 3 Domain Analysis Model: Virtual Medical Record for Clinical Decision Support - (vMR-CDS), Release 2 [Sept ballot)," HL7, Ann Arbor, MI, 2013. |
| [3] | "FHIR Specification Home Page," HL7, 2013. [Online]. Available: http://www.hl7.org/fhir. [Accessed 01 11 2013]. |
| [4] | "The Federal Health Information Model," J P Systems, Inc., 2013. [Online]. Available: http://www.fhims.org/. [Accessed 01 11 2013]. |
| [5] | "HL7 Implementation Guide for CDA® Release 2: Quality Reporting Document Architecture (QRDA) – Category I, DSTU Release 2 – July," HL7, Ann Arbor, MI, 2013. |
| [6] | "HL7 Virtual Medical Record for Clinical Decision Support (vMR-CDS) Templates, Release 1 Sep Ballot," HL7, Ann Arbor, MI, 2013. |
| [7] | "HL7 Implementation Guide for CDA® Release2: IHE Health Story Consolidation, DSTU Release 1.1," Ann Arbor, MI, 2012. |
| [8] | "HL7 Implementation Guide: Clinical Decision Support Knowledge Artifact Implementation Guide, Release 1 (pending publication)," HL7, Ann Arbor, MI, 2013. |
| [9] | "HL7 Version 3 DSTU: Representation of the Health Quality Measures Format (eMeasure), DSTU Release 2 (pending publication)," Ann Arbor, MI, 2013. |
| [10] | "HL7 Version 3: Reference Information Model (RIM)," HL7, Ann Arbor, MI, 2013. |