Centers for Medicare & Medicaid Services
Office of the National Coordinator for Health Information Technology

Quality Data Model, Version 5.3

FOR USE BY MEASURE DEVELOPERS CREATING MEASURES USING CLINICAL QUALITY LANGUAGE (CQL)

June 2017

Record of Changes

QDM Version	Date	Author / Owner	Description of Change
4.0	April 25, 2014	The MITRE Corporation	Updated for MU3 measure development
4.1	July 25, 2014	The MITRE Corporation	Updated for MU3 measure development
4.1.1	September 16, 2014	The MITRE Corporation	Updated for MU3 measure development
4.1.2	January 13, 2015	The MITRE Corporation	Updated for MU3 measure development
4.2	August 31, 2015	The MITRE Corporation	Updated for MU3 measure development
4.3	September, 2016	ESAC, Inc.	Updated for MU3 measure development
5.0	September, 2016	ESAC, Inc.	Updated DRAFT for measure developers testing measure development using CQL
5.01	October, 2016	ESAC, Inc.	Updated Proposed DRAFT for measure developers testing measure development using CQL
5.02	November, 2016	ESAC, Inc.	Updated Proposed DRAFT for measure developers testing measure development using CQL
5.3	June, 2017	ESAC Inc.	Updated for measure development using CQL

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1. Introduction

1.1 Background

In 2009, the National Quality Forum convened the Health Information Technology Expert Panel, which established the Quality Data Model (QDM) to enable electronic clinical quality expressions for measurement. The QDM was developed at the request of the American Health Information Community and the Office of the National Coordinator for Health Information Technology (ONC), with funding from the Agency for Healthcare Research and Quality (AHRQ). January 1, 2014, responsibility for maintenance and evolution of the QDM transitioned to the Centers for Medicare & Medicaid Services (CMS) and in conjunction with its federal partner, the ONC, assumed responsibility for its maintenance and evolution. ESAC, Inc. currently manages the QDM under the direction of CMS. Previously published versions of QDM included the data model (i.e., how to specify the information needed for the measure) and the logic required to compare one data element with another. Beginning with QDM version 5.0, the QDM includes only the data model. This and future versions require a separate method for expressing logic, Clinical Quality Language (CQL). Readers can access information about CQL at the eCQI Resource Center (https://ecqi.healthit.gov/).

1.2 Purpose

The QDM describes clinical concepts in a standardized format to enable electronic quality performance measurement in support of operationalizing the Meaningful Use Program of the Health Information Technology for Economic and Clinical Health Act. This model is the backbone for representing criteria used in quality measures by stakeholders involved in electronic quality measurement development and reporting. Stakeholders of the QDM include measure developers, federal agencies, Health Information Technology (HIT) vendors, standards organizations, informatics experts, providers, and researchers.

The QDM is intended to enable automation of structured data captured through routine care in electronic health records (EHR), personal health records (PHR), and other electronic clinical sources. It provides a structure for describing clinical concepts contained within quality measures in a standardized format, allowing individuals (e.g., providers, researchers, or measure developers) who monitor clinical performance and outcomes to communicate information concisely and consistently.

The QDM is one of several standards in the broader electronic Clinical Quality Improvement (eCQI) landscape and operates concurrently with changing measure concepts, tools, and other standards for electronically representing quality measures. The QDM is pivotal in the electronic Clinical Quality Measures (eCQM) ecosystem to encourage improved quality of the measure outputs. The QDM conceptual data model allows measure developers to express information for eCQMs selected for use in CMS quality reporting programs. The QDM 5.3 represents a significant change from prior production versions as it no longer contains any logic expression. Clinical Quality Language (CQL) replaces the logic contained in prior versions of QDM.[1] The

[1] Clinical Quality Language (CQL) information is available from the eCQI Resource Center at: https://ecqi.healthit.gov/cql.

Measure Authoring Tool[2] (MAT) implements the QDM specification, thus providing a software tool for measure developers to author their measures in standard formats.

1.3 Vision

The QDM must adapt and evolve to facilitate the introduction of quality measurement and feedback into a provider's daily routine. It must adapt as eCQMs advance from process- to outcomes-based measures and increasingly use patient-reported data. The QDM must evolve to align Clinical Decision Support (CDS) rules with quality measurement. As the QDM changes to enable expression of new measure types and CDS rules, its updates must be capable of incorporation into the MAT, where needed, and be compatible with quality and CDS standards.

1.4 Scope

The QDM version 5.3 specification is to be used in conjunction with Clinical Quality Language (CQL) version 1 which provides the ability to express logic that is human readable yet structured enough for electronically processing a query. QDM version 5.3 aims to accomplish the following:

- Provide the method for describing individual data elements within a measure that can be expressed using CQL to specify measure criteria; and
- Provide continuity from prior published versions of the QDM.

1.5 Audience

The audience includes all stakeholders responsible for translating Clinical Quality Measures into electronic specifications. They include, but are not limited to, measure developers, the MAT development team, EHR vendors, providers reporting eCQMs, and the community developing health IT standards.

1.6 Document Organization

This document is organized as follows:

Section		Purpose
Section 1:	Introduction	Provides an overview and the background of the QDM
Section 2:	Data Model	Describes the general data model for the QDM
Section 3:	Component Definitions	Defines the QDM categories, datatypes, and attributes
Appendix A:	Change Log	Lists changes since the December 2013 release of the QDM specification
Acronyms		Lists and defines the acronyms used in this document

[2] Available at https://www.emeasuretool.cms.gov. Last accessed August 2016.

2. Data Model

2.1 QDM Basics

The QDM consists of criteria for data elements, relationships for relating data element criteria to each other, and functions for filtering criteria to the subset of data elements that are of interest. The following sections describe the different components of the QDM.

2.2 Category

A *category* consists of a single clinical concept identified by a value set. A category is the highest level of definition for a QDM element. The QDM currently contains 19 categories. Some examples of categories are Medication, Procedure, Condition/Diagnosis/Problem, Communication, and Encounter.

2.3 Datatype

A *datatype* is the context in which each category is used to describe a part of the clinical care process. Examples of datatypes include '*Medication, Active'* and *'Medication, Administered'* as applied to the Medication category.

2.4 Attribute

An *attribute* provides specific detail about a QDM element. QDM elements have two types of attributes, *datatype-specific* and *data flow* attributes.

2.4.1 Datatype-Specific Attributes

Datatype-specific attributes provide detail about a QDM element based on its datatype. For example, *Medication, Dispensed* and *Medication, Ordered* contain information about dosage, route, strength, and duration of a medication. A *Medication allergy*, however, contains information about the allergy type, allergy severity, and more. Because these attributes pertain to specific datatypes, they are called datatype-specific attributes.

2.4.2 Data Flow Attributes

Data flow attributes provide specific detail about the location of data represented by a QDM element. In order to identify the authoritative source of an element in a particular use case, the electronic record requires related information – a location of the information of that type within a particular clinical context. For example, a diabetes medication order may be found in medication orders, whereas allergies related to diabetes medication will be on the allergy list. Similarly, a clinician's account of an allergy may be found in an EHR allergy list, but a patient's account of an allergy will be found in a PHR allergy list. Data flow attributes allow a measure developer to clearly define the location of the data so that the intended meaning can be achieved. The following data flow attributes apply to all QDM elements.
Health Record Field: The location within an electronic record where the data should be found.
Source: The originator of the quality data element. The source may be an individual or a device.

Recorder: The individual or device that enters the data element into a health record field. The desired recorder also may be, but is not necessarily, the source of the data.
Users should note that including data flow attributes in measures requires careful evaluation of feasibility as the required data provenance details are not necessarily available in real-world settings.

2.5 QDM Element

A *QDM element* encapsulates a certain category with an associated datatype. It is a discrete unit of information used in quality measurement to describe part of the clinical care process, including a clinical entity and its context of use. It can include criteria for any relevant metadata about a clinical or administrative concept relevant to quality measurement. A QDM element provides an unambiguous definition and enables consistent capture and use of data for quality measurement. It may be defined for any given measure and reused when the same information is required for another measure. Reuse encourages standardization of quality measures and reduces the generation of additional software requirements for every new measure.[3] The figure below identifies the terminology and gives examples of usage for the basic components that constitute a QDM element.

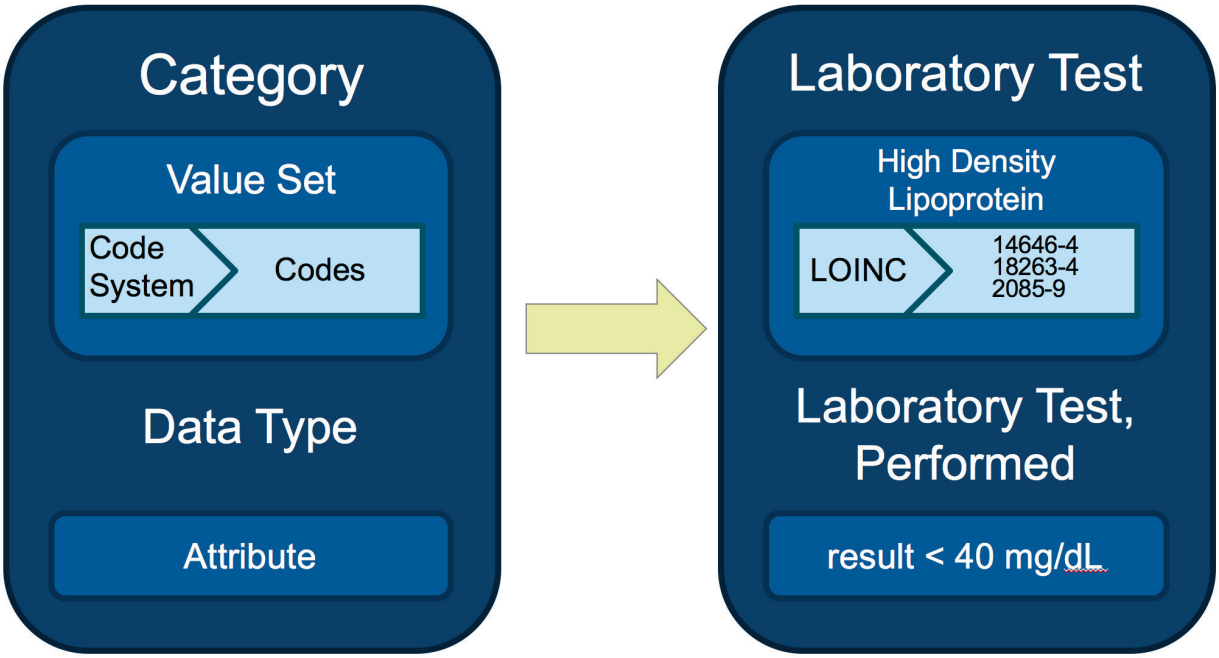

Figure 1. QDM Element Structure

2.6 Code System

A *code system* is a collection of coded concepts with definitions from a particular taxonomy, vocabulary, or classification system. Concepts from a code system are used in *value sets*.

[3] NQF Health Information Technology Expert Panel II (HITEP II), *HIT Automation of Quality Measurement: Quality Data Set and Data Flow*. Washington DC: National Quality Forum; 2009.

Specific code systems are used in applying the QDM to quality measures based on the recommendations of the HIT Standards Committee of the ONC and established certification rules for meaningful use. For example, International Classification of Diseases, Ninth Revision (ICD-9-CM), International Classification of Diseases, Tenth Revision (ICD-10), Systematized Nomenclature of Medicine – Clinical Terms (SNOMED-CT®), and Current Procedural Terminology (CPT®) are examples of code systems. The concept of *diabetes* may be described in the QDM with ICD-9-CM, ICD-10, and/or SNOMED-CT®. Refer to the Measures Management Blueprint for a complete review of code systems that should be used for each QDM datatype and attribute.

2.7 Value Sets

A *value set* is a list of specific values (terms and their codes) derived from single or multiple standard vocabularies (or *code systems*) used to define clinical concepts (e.g., patients with diabetes, clinical visits, reportable diseases) used in quality measures and to support effective health information exchange. Value sets are used to define the set of codes that can possibly be found in a patient record for a particular concept, or to which codes used locally can be mapped. In QDM elements, value sets can be used to define possible codes for the QDM element's category or the QDM element's attributes. The National Library of Medicine Value Set Authority Center provides measure developers with the ability to create new value sets or re-use value sets previously developed and associated with published eCQMs.[4] Note, beginning with QDM 5.3, measure developers will be able to specify individual codes to describe QDM elements rather than creating value sets.

Initially all data elements in eCQMs used value sets to identify the appropriate code(s) to be used. In some cases, the value set contained only a single code. The "single code value sets" are concerning because they create an alternative identifier (the value set identifier) for the code system concept. The practice of creating "single code value sets" also creates additional work for the eCQM implementer to unpack the value set rather than just use the code as specified. There are situations where a "single code value set" is appropriate, but in many cases the intent is for the measure to only consider patient data with a single specific code. **The term used for such a single code in an eCQM without a value set is *direct referenced code*.** Current uses of direct referenced codes include birth date and death date since these two concepts are used in many measures. These codes are embedded in the MAT structure so that measure developers do not need to create a direct referenced code or value set for these concepts. Beginning with implementation of QDM 5.3 and CQL, direct referenced codes will be included directly with the measure logic and included in a new terminology section of the HQMF.

In many cases, eCQMs will use direct referenced codes if there is only one concept that meets the definition of the eCQM data elements. However, some value sets that contain only one code will continue to exist for the following circumstances:

- There is only one code available at the time the value set is created; however, there is a reasonable expectation that additional codes will be created to represent the intent of the value set. Thus, rather than creating a direct referenced code for a quality data element in a measure and later changing it to a value set, the author may create a single code value

[4] The Value Set Authority Center provides downloadable access to all official versions of the vocabulary value sets contained in published measures. For more information, visit https://vsac.nlm.nih.gov/. Last accessed August 2016.

set. For example, there is only one test for antibodies for a specific virus currently available, but additional tests are in development and will be equally appropriate to meet the intent of the measure clause. Because the tests are not yet available, they have not been submitted to LOINC for coding. The measure author may create a value set containing the existing code in this instance.

- A value set initially contained multiple codes, however all except one was retired by the code system(s). Since the measure may need to allow look-back, the value set remains valid with only one active code.

2.7.1 Value Sets and Direct Referenced Codes that Define QDM Categories

It is important to note that value sets define a QDM element's category, not a QDM element's datatype. Here is an example of a very common QDM element:

```
Procedure, Performed: "value set A"
```

In this example, the value set defines which procedure the criterion is looking for. The codes in this value set should only indicate the procedure, not whether the procedure was performed, ordered, or recommended, since that is represented using different datatypes. The following example shows a QDM element with an attribute:

```
Laboratory Test, Performed: "value set A" (result: "value set B")
```

In this example, *value set A* defines the category of the QDM element. Since the category is a Laboratory Test, *value set A* answers the question of which laboratory test. *Value set B*, on the other hand, defines the attribute result. *Value set B* should contain codes for different coded result values.

Similarly, direct referenced codes define a QDM element's category, not a QDM element's datatype. Here is an example of a very common QDM element using a direct referenced code:

```
Assessment, Performed: "Asthma Control Test using LOINC version 2.59
   Code (82674.3)"
```

In this example, the direct referenced code defines which assessment the criterion is looking for. The codes provided should only indicate the specific assessment, and not its context (i.e., whether the procedure was performed, ordered, or recommended), since the context is represented using different datatypes. The following example shows a QDM element with an attribute:

```
Assessment, Performed: "Asthma Control Test using LOINC version 2.59
   Code (82674.3)"
Components:
  • In the past 4 weeks, how much of the time did your asthma keep you
    from getting as much done at work, school or at home? Using LOINC
    version 2.59 Code (82669-3)
  • During the past 4 weeks, how often have you had shortness of breath?
    Using LOINC version 2.59 Code (82670-1)
  • During the past 4 weeks, how often did your asthma symptoms
    (wheezing, coughing, shortness of breath, chest tightness or pain)
    wake you up at night or earlier than usual in the morning? Using
    LOINC version 2.59 Code (82671-9)
  • During the past 4 weeks, how often have you used your rescue inhaler
    or nebulizer medication (such as albuterol)? Using LOINC version
    2.59 Code (82672-7)
```

- How would you rate your asthma control during the past 4 weeks? Using LOINC version 2.59 Code (82673-5)
  Total score ACT Using LOINC version 2.59 Code (82668-5)

In this example, *the direct referenced code* Asthma Control Test *defines* the category of the QDM Assessment element. Since the category is an Assessment, *direct referenced* code Asthma Control Test answers the question of which assessment. Six additional *direct referenced codes* define the attributes (in this case the individual assessment questions in the test) associated with the assessment. More information about components can be found in section 3.

2.7.2 Value Sets that Define QDM Attributes

Some QDM attributes can be defined by value sets or direct referenced codes, similar to how QDM Categories are defined by value sets.

2.7.3 Value Set Groupings

Direct referenced codes indicate a specific code and, therefore, addressed only one code system. Each value set contains codes from one code system. However, multiple value sets can be combined into one value set called a *value set grouping*. A *parent* value set may also contain *child* (or nested) value sets that define the same category. The approach is consistent with the Health Level 7 (HL7) definition for a value set as "a uniquely identifiable set of valid concept representations, where any concept representation can be tested to determine whether or not it is a member of the value set … A sub-value set is a sub-set of a 'parent' value set … When a value set entry references another value set, the child value set is referred to as a *nested value set.* There is no pre-set limit to the level of nesting allowed within value sets. Value sets cannot contain themselves or any of their ancestors (i.e., they cannot be defined recursively)."[5] With respect to value sets, a *value* is a specific code defined by a given taxonomy. Values are included in value sets. In the context of QDM elements, some categories (e.g., laboratory test) have an attribute of "result." A result may be expressed as a value (numeric or alphanumeric).

[5] HL7 Domain and Value Set Definitions and Binding, available at: http://wiki.hl7.org/index.php?title=Domain_and_Value_Set_Definitions_and_Binding. Last accessed August 2016.

3. Component Definitions

3.1 Categories and Datatypes

3.1.1 Adverse Event

Adverse Event is used to define any untoward medical occurrence associated with the clinical care delivery, whether or not considered drug related.

Table 1. Adverse Event Datatypes and Attributes

Datatype	Definition	Attributes
Adverse Event	Data elements that meet criteria using this datatype should document the Adverse Event and its corresponding value set. The Relevant Period references: *startTime* – the time the adverse event began *stopTime* – the time the adverse event completed	• Relevant Period • code • Type • Severity • FacilityLocation • Author Datetime

3.1.2 Allergy/Intolerance

Allergy is used to address immune-mediated reactions to a substance such as type 1 hypersensitivity reactions, other allergy-like reactions, including pseudo-allergy. *Intolerance* is a record of a clinical assessment of a propensity, or a potential risk to an individual, to have a non-immune mediated adverse reaction on future exposure to the specified substance, or class of substance.

Table 2. Allergy/Intolerance Datatypes and Attributes

Datatype	Definition	Attributes
Allergy/Intolerance	Data elements that meet criteria using this datatype should document the Allergy or intolerance and its corresponding value set. Timing: The Prevalence Period references the time from the *onset date* to the *abatement date*.	• Prevalence Period • Code (for Substance) • Type • Severity • Author Date/Time

3.1.3 Assessment

Assessment is a resource used to define specific observations that clinicians use to guide treatment of the patient. An assessment can be a single question, or observable entity with an expected response, an organized collection of questions intended to solicit information from patients, providers or other individuals, or a single observable entity that is part of such a collection of questions.

Table 3. Assessment Datatypes and Attributes

Datatype	Definition	Attributes
Assessment, Performed	Data elements that meet criteria using this datatype should document completion of the assessment indicated by the QDM category and its corresponding value set. Timing: The time the assessment is completed; Author Datetime.	• Author Datetime • Negation Rationale • Reason • Method • Result (allow datetime as a result response type; add percentage as a result response type) • Code • Component (may appear 0 or many times) (Each component will have: – code – result
Assessment, Recommended	Data elements that meet these criteria using this datatype should document a recommendation for a request by a clinician or appropriately licensed care provider to a patient or an appropriate provider or organization to perform an assessment indicated by the QDM category and its corresponding value set. Timing: The time the recommendation is authored (i.e., provided to the patient). NOTE: Recommendations address the time that the recommendation occurs, a single point in time. Vendors have expressed concerns that recommendations are not necessarily captured or managed in a standard manner as part of structured data capture in clinical workflow; many are documented as part of assessments in narrative text. Measure developers should address feasibility of clinical workflow to capture recommendations when evaluating measures.	• Author Datetime • Negation Rationale • Reason • Method • Code

3.1.4 Care Experience

Care Experience represents the experience a patient has when receiving care or a provider has when providing care. The individual *Care Experience* datatypes should be consulted for further details.

Table 4. Care Experience Datatypes and Attributes

Datatype	Definition	Attributes
Patient Care Experience	Data elements that meet this criterion indicate the patient's care experience, usually measured with a validated survey tool. The most common tool is the Consumer Assessment of Healthcare Providers and Systems. Timing: The time the care experience is recorded; Author Datetime.	• Author Datetime • Code
Provider Care Experience	Data elements that meet this criterion indicate the provider's experience with availability of resources (e.g., scheduling, equipment, space, and such consumables as medications). Provider care experience gauges provider satisfaction with key structures, processes, and outcomes in the healthcare delivery system. Timing: The time the care experience is recorded; Author Datetime.	• Author Datetime • Code

3.1.5 Care Goal

Care Goal represents a defined target or measure to be achieved in the process of patient care, that is, an expected outcome. A typical goal is expressed as a change in status expected at a defined future time. That change can be an observation represented by other QDM categories (diagnostic tests, laboratory tests, symptoms, etc.) scheduled for some time in the future and with a particular value. A goal can be found in the plan of care (care plan), the structure used by all stakeholders, including the patient, to define the management actions for the various conditions, problems, or issues identified for the target of the plan. This structure, through which the goals and care-planning actions and processes can be organized, planned, communicated, and checked for completion, is represented in the QDM categories as a Record Artifact. A time/date stamp is required. Specifically, a care plan is composed of the following elements:

- *Problem*, which is managed by other QDM standard categories (condition/diagnosis/ problem) and their related data elements.
- *Procedure*, which is managed by other standard categories and their related data elements. Note that procedures are a continuum of interventions ranging from actions patients can do for themselves to those that can be performed by others (caregivers or clinical professionals), including detailed complex surgical procedures requiring highly trained physicians, nurses, and state-of-the-art facilities.
- *Goal,* which is what is expected to happen.
- *Outcome,* which is what happened. An outcome can be shown by other QDM standard categories and their related data elements.

Table 5. Care Goal Datatype and Attributes

Datatype	Definition	Attributes
Care Goal	Unlike other QDM datatypes, the Care Goal datatype does not indicate a specific context of use. Instead, to meet this criterion, there must be documentation of a care goal as defined by the Care Goal QDM category and its corresponding value set. Timing: The Relevant Period references the period between: • startTime – when the goal is recorded, and therefore should be considered effective, • stopTime – when the target outcome is expected to be met	• Related To (the problem, procedure (or other class of information) to which the care goal is related) • Relevant Period • Target Outcome (add percentage as a target outcome response type) • Code

3.1.6 Communication

Communication represents the transmission, receipt, or acknowledgement of information sent from a source to a recipient, such as from one clinician to another regarding findings, assessments, plans of care, consultative advice, instructions, educational resources, etc. It also may include the receipt of response from a patient with respect to any aspect of the care provided. Furthermore, it may include the conveying of information from provider to patient (e.g., results, findings, plans for care, medical advice, instructions, educational resources, appointments). A time and date stamp is required.

Table 6. Communication Datatypes and Attributes

Datatype	Definition	Attributes
Communication: From Patient to Provider	To meet criteria using this datatype, the communication indicated by the Communication QDM category and its corresponding value set must be communicated from a patient to a provider. Timing: The time the communication occurs, or is sent; Author Datetime.	• Negation Rationale • Author Datetime • Code
Communication: From Provider to Patient	To meet criteria using this datatype, the communication indicated by the Communication QDM category and its corresponding value set must be communicated from a provider to a patient. Timing: The time the communication occurs, or is sent; Author Datetime.	• Negation Rationale • Author Datetime • Code
Communication: From Provider to Provider	To meet criteria using this datatype, the communication indicated by the Communication QDM category and its corresponding value set must be communicated from one provider to another. Timing: The time the communication occurs, or is sent; Author Datetime.	• Negation Rationale • Author Datetime • Code

3.1.7 Condition/Diagnosis/Problem

Condition/Diagnosis/Problem represents a practitioner's identification of a patient's disease, illness, injury, or condition. This category contains a single datatype to represent all of these concepts: *Diagnosis*. A practitioner determines the *diagnosis* by means of examination, diagnostic test results, patient history, and/or family history. *Diagnoses* are usually considered unfavorable, but may also represent neutral or favorable conditions that affect a patient's plan of care (e.g., pregnancy).

The QDM does not prescribe the source of *diagnosis* data in the EHR. *Diagnoses* may be found in a patient's problem list, encounter diagnosis list, claims data, or other sources within the EHR. The preferred terminology for diagnoses is SNOMED-CT, but diagnoses may also be encoded using ICD-9/10.

The *Diagnosis* datatype should not be used for *differential diagnoses* or *rule-out diagnoses* (neither of which are currently supported by the QDM).

Table 7. Condition/Diagnosis/Problem Datatypes and Attributes

Datatype	Definition	Attributes
Diagnosis	Data elements that meet criteria using this datatype should document the Condition/Diagnosis/Problem and its corresponding value set. *The onset datetime corresponds to the implicit start datetime of the datatype and the abatement datetime corresponds to the implicit stop datetime of the datatype. If the abatement datetime is null, then the diagnosis is considered to still be active.* When this datatype is used with timing relationships, the criterion is looking for an active diagnosis for the time frame indicated by the timing relationships. Timing: The Prevalence Period references the time from the *onset date* to the *abatement date.*	• Prevalence Period • Anatomical Location Site • Severity • Code • Author Datetime

3.1.8 Device

Device represents an instrument, apparatus, implement, machine, contrivance, implant, in-vitro reagent, or other similar or related article, including a component part or accessory, intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease and not dependent on being metabolized to achieve any of its primary intended purposes.[6]

[6] Derived from the device definition of the U.S. Food and Drug Administration (FDA), Department of Health and Human Services, Washington DC; 2010. Available at: http://www.fda.gov/. Last accessed August 2016.

Table 8. Device Datatypes and Attributes

Datatype	Definition	Attributes
Device, Applied	Data elements that meet criteria using this datatype should document that the device indicated by the QDM category and its corresponding value set is in use, or impacts or alters the treatment, care plan, or encounter (e.g., an antithrombotic device has been placed on the patient's legs to prevent thromboembolism, or a cardiac pacemaker is in place). Timing: The Relevant Period addresses: startTime – When the device is inserted or first used stopTime – when the device is removed or last used	• Anatomical Approach Site • Anatomical Location Site • Negation Rationale • Reason • Relevant Period • Author Datetime • Code
Device, Order	Data elements that meet criteria using this datatype should document an order for the device indicated by the QDM category and its corresponding value set. Timing: The time the order is signed; Author Datetime.	• Negation Rationale • Reason • Author Datetime • Code
Device, Recommended	Data elements that meet criteria using this datatype should document a recommendation to use the device indicated by the QDM category and its corresponding value set. Timing: The time the recommendation is authored (i.e., provided to the patient). NOTE: Recommendations address the time that the recommendation occurs, a single point in time. Vendors have expressed concerns that recommendations are not necessarily captured or managed in a standard manner as part of structured data capture in clinical workflow; many are documented as part of assessments in narrative text. Measure developers should address feasibility of clinical workflow to capture recommendations when evaluating measures.	• Negation Rationale • Reason • Author Datetime • Code

3.1.9 Diagnostic Study

Diagnostic Study represents any kind of medical test performed as a specific test or series of steps to aid in diagnosing or detecting disease (e.g., to establish a diagnosis, measure the progress or recovery from disease, confirm that a person is free from disease).[7] The QDM defines diagnostic studies as those that are not performed in organizations that perform testing on samples of human blood, tissue, or other substance from the body. Diagnostic studies may make use of digital images and textual reports. Such studies include but are not limited to imaging studies, cardiology studies (electrocardiogram, treadmill stress testing), pulmonary-function testing, vascular laboratory testing, and others.

[7] Canada Health Infoway EHR Glossary, https://www.infoway-inforoute.ca/. Last accessed August 2016.

Table 9. Diagnostic Study Datatypes and Attributes

Datatype	Definition	Attributes
Diagnostic Study, Order	Data elements that meet criteria using this datatype should document a request by a clinician or appropriately licensed care provider to an appropriate provider or organization to perform the diagnostic study indicated by the QDM category and its corresponding value set. The request may be in the form of a consultation or a direct order to the organization that performs the diagnostic study. Diagnostic studies are those that are not performed in the clinical laboratory. Such studies include but are not limited to imaging studies, cardiology studies (electrocardiogram, treadmill stress testing), pulmonary function testing, vascular laboratory testing, and others. Timing: The time the order is signed; Author Datetime.	• Method • Negation Rationale • Radiation Dosage • Radiation Duration • Reason • Author Datetime • Code
Diagnostic Study, Performed	Data elements that meet criteria using this datatype should document the completion of the diagnostic study indicated by the QDM category and its corresponding value set. Timing: The Relevant Period addresses: startTime – when the diagnostic study is initiated stopTime – when the diagnostic study is completed Examples: • Initiation of a treadmill stress test to the time the treadmill stress test has completed • Initiation of the ultrasound study until completion of the ultrasound study	• Facility Location • Method • Negation Rationale • Radiation Dosage • Radiation Duration • Reason • Result • Result DateTime • Relevant Period • Status • Code • Author Datetime • Component (may appear 0 or many times) (Each component will have: – code – result)
Diagnostic Study, Recommended	Data elements that meet criteria using this datatype should document a recommendation for a request by a clinician or appropriately licensed care provider to an appropriate provider or organization to perform the diagnostic study indicated by the QDM category and its corresponding value set. Timing: The time the recommendation is authored (i.e., provided to the patient). NOTE: Recommendations address the time that the recommendation occurs, a single point in time. Vendors have expressed concerns that recommendations are not necessarily captured or managed in a standard manner as part of structured data capture in clinical workflow; many are documented as part of assessments in narrative text. Measure developers should address feasibility of clinical workflow to capture recommendations when evaluating measures.	• Method • Negation Rationale • Radiation Dosage • Radiation Duration • Author Datetime • Code

3.1.10 Encounter

Encounter represents an identifiable grouping of healthcare-related activities characterized by the entity relationship between the subject of care and a healthcare provider; such a grouping is determined by the healthcare provider.[8] A *patient encounter* represents interaction between a healthcare provider and a patient with a face-to-face patient visit to a clinician's office, or any electronically remote interaction with a clinician for any form of diagnostic treatment or therapeutic event. Encounters can be billable events but are not limited to billable interactions. Each encounter has an associated location or modality within which it occurred (such as an office, home, electronic methods, phone encounter, or telemedicine methods). The *encounter location* is the patient's location at the time of measurement. Different levels of interaction can be specified in the value associated with the element while modes of interaction (e.g., telephone) may be modeled using the data flow attribute.

Table 10. Encounter Datatypes and Attributes

Datatype	Definition	Attributes
Encounter, Order	Data elements that meet criteria using this datatype should document that an order for the encounter indicated by the QDM category and its corresponding value set has been recommended. Timing: The time the order is signed; Author Datetime.	• Facility Location • Negation Rationale • Reason • Author Datetime • Code
Encounter, Performed	Data elements that meet criteria using this datatype should document that the encounter indicated by the QDM category and its corresponding value set is in progress and/or has been completed. Timing: The Relevant Period addresses: startTime – The time the encounter began (admission time) stopTime – The time the encounter ended (discharge time) The Location Period addresses: *StartTime* = the time the patient arrived at the location; *StopTime* = the time the patient departed from the location	• Relevant Period • Admission Source • Diagnosis • Discharge Disposition • Location Period • Length of Stay • Negation Rationale • Principal Diagnosis • Author Datetime • Code • Facility Location (may appear 0 or many times) (Each component will have: – code – facility location
Encounter, Recommended	Data elements that meet criteria using this datatype should document that the encounter indicated by the QDM category and its corresponding value set has been recommended. Timing: The time the recommendation is authored (i.e., provided to the patient).	• Facility Location • Negation Rationale • Reason • Author Datetime • Code

[8] International Organization for Standardization (ISO), *Health Informatics – Requirements for an Electronic Health Record Architecture, ISO 18308:2011*. Available at: http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=52823. Last accessed August 2016.

Datatype	Definition	Attributes
	NOTE: Recommendations address the time that the recommendation occurs, a single point in time. Vendors have expressed concerns that recommendations are not necessarily captured or managed in a standard manner as part of structured data capture in clinical workflow; many are documented as part of assessments in narrative text. Measure developers should address feasibility of clinical workflow to capture recommendations when evaluating measures.	

3.1.11 Family History

Family History represents a diagnosis or problem experienced by a family member of the patient. Typically, a family history will not contain very much detail, but the simple identification of a diagnosis or problem in the patient's family history may be relevant to the care of the patient. If a relationship is specified, codes from the HL7 Personal Relationship Role Type value set (2.16.840.1.113883.1.11.19563) should be used to ensure compatibility with QRDA reporting constraints.

Table 11. Family History Datatypes and Attributes

Datatype	Definition	Attributes
Family History	To meet criteria using this datatype, the diagnosis/problem indicated by the FamilyHistory QDM category and its corresponding value set should reflect a diagnosis/problem of a family member. Timing: The time the family history item is authored (i.e., entered into the record). NOTE – Measure developers suggested that onset age for family history represents one item in a risk assessment for individual patients. Thus, onset age (when the family member developed the condition indicated in the Family History) can be determined using the Assessment, Performed QDM datatype.	• Author Datetime • Relationship • Code

3.1.12 Immunization

Immunization represents vaccines administered to patients in healthcare settings but does not include non-vaccine agents.

Table 12. Immunization Datatypes and Attributes

Datatype	Definition	Attributes
Immunization, Administered	Data elements that meet criteria using this datatype should document that the vaccine indicated by the QDM category and its corresponding value set was actually administered to the patient. Timing: The time the immunization is administered, i.e., a single point in time, or Author Datetime.	• Dosage • Negation Rationale • Reason • Route • Author Datetime • Supply • Code
Immunization, Order	Data elements that meet criteria using this datatype should document a request for the immunization indicated by the QDM category and its corresponding value set. Timing: The time the order is signed; Author Datetime.	• Active Datetime • Dosage • Negation Rationale • Reason • Route • Supply • Author Datetime • Code

3.1.13 Individual Characteristic

Individual Characteristic represents specific factors about a patient, clinician, provider, or facility. Included are demographics, behavioral factors, social or cultural factors, available resources, and preferences. *Behaviors* reference responses or actions that affect (either positively or negatively) health or healthcare. Included in this category are mental health issues, adherence issues unrelated to other factors or resources, coping ability, grief issues, and substance use/abuse. *Social/cultural factors* are characteristics of an individual related to family/caregiver support, education, and literacy (including health literacy), primary language, cultural beliefs (including health beliefs), persistent life stressors, spiritual and religious beliefs, immigration status, and history of abuse or neglect. *Resources* are means available to a patient to meet health and healthcare needs, which might include caregiver support, insurance coverage, financial resources, and community resources to which the patient is already connected and from which the patient is receiving benefit. *Preferences* are choices made by patients and their caregivers relative to options for care or treatment (including scheduling, care experience, and meeting of personal health goals) and the sharing and disclosure of their health information.

Table 13. Individual Characteristic Datatypes and Attributes

Datatype	Definition	Attributes
Patient Characteristic	Data elements that meet criteria using this datatype should document a characteristic of the patient not represented by one of the more specific *Individual Characteristic* datatypes. Timing: The time the characteristic is authored.	• Author Datetime • Code

Datatype	Definition	Attributes
Patient Characteristic Birthdate	The *Patient Characteristic Birthdate* data element should document the patient's date of birth. Timing: The Patient Characteristic, Birthdate is a single point in time representing the date and time of birth. It does not have a start and stop time. Note: *Patient Characteristic Birthdate* is fixed to LOINC code 21112-8 (Birth date) and therefore cannot be further qualified with a value set.	• BirthDateTime • Code
Patient Characteristic Clinical Trial Participant	Data elements that meet criteria using this datatype should document that the patient is a clinical trial participant for the clinical trial indicated by the QDM category and its corresponding value set. Timing: The Relevant Period addresses: startTime – The time the clinical trial began stopTime – The time the clinical trial ended	• Reason • Relevant Period • Code
Patient Characteristic Ethnicity	Data elements that meet criteria using this datatype should document that the patient has one or more of the ethnicities indicated by the QDM category and its corresponding value set. Timing: Ethnicity does not have a specific timing. Measures using Patient Characteristic, Ethnicity should address the most recent entry in the clinical record.	• Code
Patient Characteristic Expired	The *Patient Characteristic Expired* data element should document that the patient is deceased. Timing: The Patient Characteristic, Expired is a single point in time representing the date and time of death. It does not have a start and stop time. Note: *Patient Characteristic Expired* is fixed to SNOMED-CT® code 419099009 (Dead) and therefore cannot be further qualified with a value set.	• Cause • ExpiredDateTime • Code
Patient Characteristic Payer	Data elements that meet criteria using this datatype should document that the patient has one or more of the payers indicated by the QDM category and its corresponding value set. Timing: The Relevant Period addresses: startTime – The first day of insurance coverage with the referenced payer stopTime – The last day of insurance coverage with the referenced payer	• Relevant Period • Code

Datatype	Definition	Attributes
Patient Characteristic Race	Data elements that meet criteria using this datatype should document the patient's race. Timing: Race does not have a specific timing. Measures using Patient Characteristic, Race should address the most recent entry in the clinical record.	• Code
Patient Characteristic Sex	Data elements that meet criteria using this datatype should document that the patient's sex matches the QDM category and its corresponding value set. Timing: Birth (administrative) sex does not have a specific timing.	• Code
Provider Characteristic	Data elements that meet criteria using this datatype should document a characteristic of the provider. Timing: The time the characteristic is authored.	• Author Datetime • Code

3.1.14 Intervention

Intervention represents a course of action intended to achieve a result in the care of persons with health *problems* that does not involve direct physical contact with a patient. Examples include patient education and therapeutic communication.

Table 14. Intervention Datatypes and Attributes

Datatype	Definition	Attributes
Intervention, Order	Data elements that meet criteria using this datatype should document a request to perform the intervention indicated by the QDM category and its corresponding value set. Timing: The time the order is signed; Author Datetime	• Negation Rationale • Reason • Author Datetime • Code
Intervention, Performed	Data elements that meet criteria using this datatype should document the completion of the intervention indicated by the QDM category and its corresponding value set. Timing: The Relevant Period addresses: startTime – The time the intervention begins stopTime – The time the intervention ends NOTE - timing refers to a single instance of an intervention. If a measure seeks to evaluate multiple interventions over a period of time, the measure developer should use CQL logic to represent the query request.	• Negation Rationale • Reason • Result • Relevant Period • Author Datetime • Status • Code

Datatype	Definition	Attributes
Intervention, Recommended	Data elements that meet criteria using this datatype should document a recommendation for the intervention indicated by the QDM category and its corresponding value set. Timing: The time the recommendation is authored (i.e., provided to the patient). NOTE: Recommendations address the time that the recommendation occurs, a single point in time. Vendors have expressed concerns that recommendations are not necessarily captured or managed in a standard manner as part of structured data capture in clinical workflow; many are documented as part of assessments in narrative text. Measure developers should address feasibility of clinical workflow to capture recommendations when evaluating measures.	• Negation Rationale • Reason • Author Datetime • Code

3.1.15 Laboratory Test

Laboratory Test represents a medical procedure that involves testing a sample of blood, urine, or other substance from the body. Tests can help determine a diagnosis, plan treatment, check to see if treatment is working, or monitor the disease over time.[9] This QDM data category for Laboratory Test is only used for information about the subject of record.

Table 15. Laboratory Test Datatypes and Attributes

Datatype	Definition	Attributes
Laboratory Test, Order	Data elements that meet criteria using this datatype should document a request for the laboratory test indicated by the QDM category and its corresponding value set. Timing: The time the order is signed; Author Datetime.	• Method • Negation Rationale • Reason • Author Datetime • Code

[9] National Cancer Institute (NCI). Bethesda, MD: NCI; 2010. Available at: www.cancer.gov/. Last accessed August 2016.

Datatype	Definition	Attributes
Laboratory Test, Performed	Data elements that meet criteria using this datatype should document the laboratory test indicated by the QDM category and its corresponding value set was performed. Timing: The Relevant Period addresses: startTime – When the laboratory test is initiated (i.e., the time the specimen collection begins) stopTime – when the laboratory test is completed (i.e., the time the specimen collection ends) Examples: • Initiation of a venipuncture for a fasting blood glucose to the time venipuncture for the fasting blood glucose is completed – basically a single point in time for many specimen collections • Initiation of a 24-hour urine collection for measured creatinine clearance until completion of the 24-hour urine collection Note – the time that the result report is available is a separate attribute than the time of the study (specimen collection)	• Method • Negation Rationale • Reason • Reference Range High • Reference Range Low • Result • Result DateTime • Relevant Period • Status • Author Datetime • Code • Component (may appear 0 or many times) (Each component will have: – code – result – reference range High (optional) – reference range Low (optional))
Laboratory Test, Recommended	Data elements that meet criteria using this datatype should document a recommendation for the laboratory test indicated by the QDM category and its corresponding value set. Timing: The time the recommendation is authored (i.e., provided to the patient). NOTE: Recommendations address the time that the recommendation occurs, a single point in time. Vendors have expressed concerns that recommendations are not necessarily captured or managed in a standard manner as part of structured data capture in clinical workflow; many are documented as part of assessments in narrative text. Measure developers should address feasibility of clinical workflow to capture recommendations when evaluating measures.	• Method • Negation Rationale • Reason • Author Datetime • Code

3.1.16 Medication

Medication represents clinical drugs or chemical substances intended for use in the medical diagnosis, cure, treatment, or prevention of disease. Medications are defined as direct referenced values or value sets containing values derived from code systems such as RxNorm.[10]

[10] See https://www.nlm.nih.gov/research/umls/rxnorm/. Last accessed August 2016.

Table 16. Medication Datatypes and Attributes

Datatype	Definition	Attributes
Medication, Active	Data elements that meet criteria using this datatype should document that the medication indicated by the QDM category and its corresponding value set is being taken by the patient. Keep in mind that when this datatype is used with timing relationships, the criterion is looking for a medication being taken for the time frame indicated by the timing relationships. Timing: The Relevant Period addresses: *StartTime* = when the medication is first known to be used (generally the time of entry on the medication list); *StopTime* = when the medication is discontinued (generally, the time discontinuation is recorded on the medication list)	• Dosage • Supply • Frequency • Route • Relevant Period • Code
Medication, Administered	Data elements that meet criteria using this datatype should document that the medication indicated by the QDM category and its corresponding value set was actually administered to the patient. Timing: The Relevant Period addresses: *StartTime* = when a single medication administration event starts (e.g., the initiation of an intravenous infusion, or administering a pill or IM injection to a patient); *StopTime* = when a single medication administration event ends (e.g., the end time of the intravenous infusion, or the administration of a pill or IM injection is completed - for pills and IM injections, the start and stop times are the same) NOTE – Measure developers should address multiple administrations over a period of time using CQL logic.	• Dosage • Supply • Frequency • Negation Rationale • Reason • Route • Relevant Period • Author Datetime • Code
Medication, Discharge	Data elements that meet criteria using this datatype should document that the medications indicated by the QDM category and its corresponding value set should be taken by or given to the patient after being discharged from an inpatient encounter. Timing: The time the discharge medication list on the discharge instruction form is authored.	• Dosage • Frequency • Supply • Negation Rationale • Refills • Route • Author Datetime • Code

Datatype	Definition	Attributes
Medication, Dispensed	Data elements that meet criteria using this datatype should document that a prescription for the medication indicated by the QDM category and its corresponding value set has been dispensed and provided to the patient or patient proxy. In the ambulatory setting, medications are primarily taken directly by patients and not directly observed. Hence, dispensed is the closest health provider documentation of medication compliance. In settings where patients attest to taking medications in electronic format (perhaps a Personal Health Record), patient attestation of "medication taken" may be available. Timing: The time the medication dispensing event occurs; the Author Datetime. NOTE: The measure developer should use CQL logic to address multiple dispensing events over a period of time.	• Dosage • Supply • Frequency • Negation Rationale • Refills • Route • Author Datetime
Medication, Order	Data elements that meet criteria using this datatype should document a request to a pharmacy to provide the medication indicated by the QDM category and its corresponding value set. Timing: The time the order is signed; Author Datetime.	• Active Datetime • Dosage • Supply • Frequency • Code • Method • Negation Rationale • Reason • Refills • Route • Author Datetime

3.1.17 Participation

Participation represents a patient's coverage by a program such as an insurance or medical plan or a payment agreement. Such programs can include patient-centered medical home, disease-specific programs, etc.[11]

Table 17. Participation Datatypes and Attributes

Datatype	Definition	Attributes
Participation	Data elements that meet criteria using this datatype should document the type of plan or program in which the patient is expected to be enrolled. The program is identified as the Issuer (e.g., Aetna, BCBSA, Cigna, etc.). The code attribute indicates the *coverage type* indicating the program in which the subject of record participates (e.g., health insurance plan policy,	• Code • Participation Period

[11] Definitions modeled similar to HL7 FHIR STU 3.0 - https://www.hl7.org/fhir/coverage.html.

Datatype	Definition	Attributes
	disease specific policy, health maintenance organization policy, etc.) Timing: Participation Period addresses: enrollmentStartdate – The time the patient enrolled in the program enrollmentEnddate – The time the patient's enrollment in the program ends	

3.1.18 Physical Exam

Physical Exam represents the evaluation of the patient's body and/or mental status exam to determine its state of health. The techniques of examination can include palpation (feeling with the hands or fingers), percussion (tapping with the fingers), auscultation (listening), visual inspection or observation, inquisition and smell. Measurements may include vital signs (blood pressure, pulse, respiration) as well as other clinical measures (such as expiratory flow rate and size of lesion). Physical exam includes psychiatric examinations.

Table 18 Physical Exam Datatypes and Attributes

Datatype	Definition	Attributes
Physical Exam, Order	Data elements that meet criteria using this datatype should document a request for the physical exam indicated by the QDM category and its corresponding value set. The datatype is expected to be used to identify orders such as "vital signs, frequency every x hours," or "pedal pulse check, frequency every 15 minutes for x hours." Timing: The time the order is signed; Author Datetime.	• Anatomical Location Site • Method • Negation Rationale • Reason • Author Datetime • Code
Physical Exam, Performed	Data elements that meet criteria using this datatype should document the completion of the physical exam indicated by the QDM category and its corresponding value set. Timing: The Relevant Period addresses: startTime – The time the physical examination activity begins stopTime – The time the physical examination activity ends NOTE - timing refers to a single instance of a physical examination activity. If a measure seeks to evaluate multiple physical examination activities over a period of time, the measure developer should use CQL logic to represent the query request.	• Anatomical Location Site • Method • Negation Rationale • Reason • Result • Relevant Period • Code • Author Datetime • Component (may appear 0 or many times) (Each component will have: – code – result)
Physical Exam, Recommended	Data elements that meet criteria using this datatype should document a recommendation	• Anatomical Location Site • Method

Datatype	Definition	Attributes
	for the physical exam indicated by the QDM category and its corresponding value set. Timing: The time the recommendation is authored (i.e., provided to the patient). NOTE: Recommendations address the time that the recommendation occurs, a single point in time. Vendors have expressed concerns that recommendations are not necessarily captured or managed in a standard manner as part of structured data capture in clinical workflow; many are documented as part of assessments in narrative text. Measure developers should address feasibility of clinical workflow to capture recommendations when evaluating measures.	• Negation Rationale • Reason • Author Datetime • Code

3.1.19 Procedure

Procedure is derived directly from HL7 and Canada Health Infoway: "An Act whose immediate and primary outcome (post-condition) is the alteration of the physical condition of the subject. … Procedure is but one among several types of clinical activities such as observation, substance-administrations, and communicative interactions … Procedure does not comprise all acts of *[sic]* whose intent is intervention or treatment."[12] A *procedure* may be a surgery or other type of physical manipulation of a person's body in whole or in part for purposes of making observations and diagnoses or providing treatment. [13]

Table 19. Procedure Datatypes and Attributes

Datatype	Definition	Attributes
Procedure, Order	Data elements that meet criteria using this datatype should document a request for the procedure indicated by the QDM category and its corresponding value set. Timing: The time the order is signed; Author Datetime.	• Anatomical Approach Site • Anatomical Location Site • Method • Negation Rationale • Ordinality • Radiation Duration • Reason • Author Datetime • Code

[12] HL7, available at: http://www.hl7.org/documentcenter/public_temp_9D8B62D1-1C23-BA17-0C978A875D9E7083/wg/java/apidocs/org/hl7/rim/Procedure.html. Last accessed August 2016.

[13] Modified from Canada Health Infoway, available at: https://www.infoway-inforoute.ca/. Last accessed August 2016.

Datatype	Definition	Attributes
Procedure, Performed	Data elements that meet criteria using this datatype should document the completion of the procedure indicated by the QDM category and its corresponding value set. Timing: The Relevant Period addresses: *StartTime = the time the procedure begins;* *StopTime = the time the procedure is completed* NOTE: 1) Timing refers to a single instance of a procedure. If a measure seeks to evaluate multiple procedures over a period of time, the measure developer should use CQL logic to represent the query request. 2) The Incision DateTime is a single point in time available from the Operating Room and/or Anesthesia Record.	• Anatomical Approach Site • Anatomical Location Site • Incision Datetime • Method • Negation Rationale • Ordinality • Radiation Dosage • Radiation Duration • Reason • Result • Relevant Period • Author Datetime • Status • Code • Component (may appear 0 or many times) (Each component will have: ○ Code ○ result)
Procedure, Recommended	Data elements that meet criteria using this datatype should document the recommendation for the procedure indicated by the QDM category and its corresponding value set. Timing: The time the recommendation is authored (i.e., provided to the patient). NOTE: Recommendations address the time that the recommendation occurs, a single point in time. Vendors have expressed concerns that recommendations are not necessarily captured or managed in a standard manner as part of structured data capture in clinical workflow; many are documented as part of assessments in narrative text. Measure developers should address feasibility of clinical workflow to capture recommendations when evaluating measures.	• Anatomical Approach Site • Anatomical Location Site • Method • Negation Rationale • Ordinality • Reason • Author Datetime • Code

3.1.20 Substance

Substance represents a homogeneous material with definite composition that includes allergens, biological materials, chemicals, foods, drugs and materials.[14] QDM distinguishes between medications from non-medication substances by separately listing medication datatypes. Substance may or may not have a code or be classified by a code system such RxNorm. Examples of a substance may include environmental agents (e.g., pollen, dust) and food (e.g., vitamins).

[14] HL7 Fast Health Information Resources (FHIR). 1.25.2.1.279. Value Set Substance Category. DSTU 2. 24 October 2015. Available at: https://www.hl7.org/fhir/valueset-substance-category.html. Last accessed December 2016.

Table 20. Substance Datatypes and Attributes

Datatype	Definition	Attributes
Substance, Administered	Data elements that meet criteria using this datatype should document that the substance indicated by the QDM category and its corresponding value set was actually given to the patient. Timing: The Relevant Period addresses: *StartTime = when a single substance administration event starts (e.g., the initiation of an intravenous infusion, or administering the substance orally or topically to a patient);* *StopTime = when a single substance administration event ends (e.g., the end time of the intravenous infusion, or the administration of a substance orally or topically is completed - for oral or topical administration, the start and stop times are the same)*	• Dosage • Frequency • Negation Rationale • Route • Relevant Period • Author Datetime • Supply
Substance, Order	Data elements that meet criteria using this datatype should document a request for the substance indicated by the QDM category and its corresponding value set. Timing: The time the order is signed; Author Datetime.	• Dosage • Frequency • Method • Negation Rationale • Reason • Supply • Refills • Route • Author Datetime • Code
Substance, Recommended	Data elements that meet criteria using this datatype should document a recommendation for the substance indicated by the QDM category and its corresponding value set. Timing: The time the recommendation is authored (i.e., provided to the patient). NOTE: Recommendations address the time that the recommendation occurs, a single point in time. Vendors have expressed concerns that recommendations are not necessarily captured or managed in a standard manner as part of structured data capture in clinical workflow; many are documented as part of assessments in narrative text. Measure developers should address feasibility of clinical workflow to capture recommendations when evaluating measures.	• Dosage • Frequency • Method • Negation Rationale • Reason • Refills • Route • Author Datetime • Code

3.1.21 Symptom

Symptom represents an indication that a person has a condition or disease. Some examples are headache, fever, fatigue, nausea, vomiting, and pain.[15] Also, symptoms are subjective

[15] UMLS Dictionary, available at: http://www.nlm.nih.gov/research/umls/. Last accessed August 2016.

manifestations of the disease perceived by the patient.[16] As an example to differentiate *symptom* from *finding*, the patient's subjective symptom of fever is distinguished from the temperature (a finding). For a finding, there is either a source of either a temperature-measuring device together with a recorder of the device (electronically) or an individual (healthcare provider, patient, etc.).

Table 21. Symptom Datatypes and Attributes

Datatype	Definition	Attributes
Symptom	Data elements that meet criteria using this datatype should document the symptom and its corresponding value set. Timing: The Prevalence Period references the time from the *onset date* to the *abatement date.* *The onset datetime corresponds to the implicit start datetime of the datatype and the abatement datetime corresponds to the implicit stop datetime of the datatype. If the abatement datetime is null, then the symptom is considered to still be active.* When this datatype is used with timing relationships, the criterion is looking for whether the symptom was active for the time frame indicated by the timing relationships.	• Prevalence Period • Severity • Code

3.2 Attributes

Table 22. Attribute Definitions

Attribute	Definition	Datatype(s)	Cardinality
Active Datetime	The date and time at which an order becomes active. In most cases, this is the same as the *author* (*signed) datetime*, but with advance orders it may be after the *signed datetime*.	• Immunization, Order • Medication, Order	• 0.. 1
Admission Source	The location from which the patient was admitted (e.g., physician referral, facility from which the patient was transferred).	• Encounter, Performed	• 0.. 1
Anatomical Approach Site	The anatomical site or structure through which the action represented by the datatype reaches, or should reach, its target.	• Device, Applied • Procedure, Order • Procedure, Performed • Procedure, Recommended	• 0.. 1
Anatomical Location Site	The anatomical site or structure • Where the diagnosis/problem manifests itself (a). • That is the focus of the action represented by the datatype (b).	• Diagnosis (a) • Device, Applied (b) • Physical Exam, Order (b) • Physical Exam, Performed (b) • Physical Exam, Recommended (b) • Procedure, Order (b)	• 0.. 1

[16] National Cancer Institute (NCI), Bethesda, MD; NCI 2010, available at: www.cancer.gov/. Last accessed August 2016.

Attribute	Definition	Datatype(s)	Cardinality
		• Procedure, Performed (b) • Procedure, Recommended (b)	
Author Datetime	The time the data element was entered into the clinical software. Note, some datatypes include both Relevant Time and Author Datetime attributes. The purpose is to accommodate Author Datetime if the actual start and stop times are not available when evaluating for feasibility, and also to allow specification of a time for Negation Rationale .	• Assessment, Performed • Care Goal • Communication: from Patient to Provider • Communication: from Provider to Patient • Communication: from Provider to Provider • Device, Applied • Device, Order • Device, Recommended • Diagnostic Study, Order • Diagnostic Study, Performed • Encounter, Order • Encounter, Performed • Encounter, Recommended • Immunization, Administered • Immunization, Order • Intervention, Order • Intervention, Performed • Intervention, Recommended • Laboratory Test, Order • Laboratory Test, Performed • Laboratory Test, Recommended • Medication, Administered • Medication, Discharge • Medication, Dispensed • Medication, Order • Patient Care Experience • Patient Characteristic • Physical Exam, Order • Physical Exam, Performed • Physical Exam, Recommended • Procedure, Order • Procedure, Performed • Procedure, Recommended • Provider Care Experience • Provider Characteristic • Substance, Administered	• 0.. 1

Attribute	Definition	Datatype(s)	Cardinality
		• Substance, Order • Substance, Recommended	
Cause	The recorded cause of death. Note: Previous versions of the QDM referred to this attribute as reason.	• Patient Characteristic Expired	• 0.. 1
Code	The single code or a member of the value set used to represent the quality data element. The *code* attribute explicity specifies the value set filter such that the query will retrieve only values defined by the QDM data element value or value set. Previous versions of QDM datatypes implicitly refer to attributes about a set of items that are included in a value set. Earlier versions did not explicitly state that the datatype attributes only refer to a specific item that is a member of the defined value set. The code is applied in the CQL Model Info used to translate the CQL into the Expression Logical Model (ELM) to enhance computer readability. Measure developers do not need to specify any additional 'code.'	• All Datatypes	• 0.. 1
BirthDateTime	The date and time that the patient was born.	• Patient Characteristic Birthdate	• 0.. 1
Component	Elements included or documented as part of evaluations or test panels. Examples include: specific questions included in assesments, tests included in a laboratory test panel, observations included in a cardiac exam during a physical examination. Each assessment, diagnostic study, laboratory test, physical exam or procedure may have one or more components.	• Assessment, Performed • Diagnostic Study, Performed • Laboratory Test, Performed • Physical Exam, Performed • Procedure, Performed	• 0.. *
ExpirationDateTime	The date and time that the patient passed away.	• Patient Characteristic Expired	• 0.. 1
Diagnosis	A coded diagnosis/problem addressed during the encounter. Diagnosis attribute is intended to capture ALL diagnoses, including principal diagnosis. – Use of the Encounter, Performed: *diagnosis* attribute and the Diagnosis datatype is redundant for relating the diagnosis to the Encounter, Performed. The Encounter, Performed: *diagnosis* syntax is preferred. – Referencing the same diagnosis using Encounter, Performed (diagnosis attribute) and	• Encounter, Performed	• 0.. *

Attribute	Definition	Datatype(s)	Cardinality
	Diagnosis (datatype) should only occur if the measure must define a specified length of a *prevalence period*, e.g., ▪ The measure must assure that the diagnosis – has been present for at least some defined time period before the encounter, and – was addressed during the Encounter		
Discharge Disposition	The disposition, or location to which the patient is transferred at the time of hospital discharge.	• Encounter, Performed	• 0.. 1
Dosage	Details of how medication is/is to be taken, i.e., the quantity (mg, cc, tablets) to be taken at a single administration.	• Immunization, Administered • Immunization, Order • Medication, Active • Medication, Administered • Medication, Dispensed • Medication, Order • Medication, Discharge • Substance, Administered • Substance, Order • Substance, Recommended	• 0.. 1
Facility Location	The particular location of a facility in which the diagnostic study or encounter occurs or occurred. Examples include, but are not limited to, intensive care units (ICUs), non-ICUs, burn critical-care unit, neonatal ICU, and respiratory-care unit. Each Encounter, Performed may have 1 or more locations. For example, a patient treated in multiple locations during an individual encounter might be expressed as: ▪ Encounter, Performed: Inpatient Admission ○ ICU (location period) ○ Non-ICU Admission (location period) ○ Rehab (location period)	• Adverse Event • Diagnostic Study, Performed • Encounter, Order • Encounter, Performed • Encounter, Recommended	• 0.. 1 for all *except* Encounter, Performed • 0.. * for Encounter Performed

Attribute	Definition	Datatype(s)	Cardinality
Frequency	Indicates how frequently the medication or substance • Is administered to a patient for an active medication (a). • Was administered to the patient (b). • Should be taken by the patient or administered to the patient (c). • Is recommended to be given to the patient (d).	• Medication, Active (a) • Medication, Administered (b) • Substance, Administered (b) • Medication, Discharge (c) • Medication, Dispensed (c) • Medication, Order (c) • Substance, Order (c) • Substance, Recommended (d)	• 0.. 1
Incision Datetime	The date and time of the first incision of the procedure. Incision DateTime is a single point in time available from the Operating Room and/or Anesthesia Record.	• Procedure, Performed	• 0.. 1
Length of Stay	The difference of the admission date/time and the discharge date/time for the encounter. This attribute should not be used for outpatient encounters.	• Encounter, Performed	• 0.. 1
Location Period	The time the patient arrived at the location to the time the patient departed from the location. Each Encounter, Peformed may have 1 or more locations. For example, a patient treated in multiple locations during an individual encounter might be expressed as: ▪ Encounter, Performed: Inpatient Admission ○ ICU (location period) ○ Non-ICU Admission (location period) ○ Rehab (location period)	• Encounter, Performed	• 0.. *
Method	Indicates the procedure or technique to be • Used in the datatype (a). • Used in or for the datatype (b). • Used in the administration of the ordered medication or substance (c).	• Assessment, Performed • Assessment, Recommended • Diagnostic Study, Order (a) • Laboratory Test, Order (a) • Physical Exam, Order (a) • Procedure, Order (a) • Diagnostic Study, Recommended (a) • Laboratory Test, Recommended (a) • Physical Exam, Recommended (a)	• 0.. 1

Attribute	Definition	Datatype(s)	Cardinality
		• Procedure, Recommended (a) • Substance, Recommended (a) • Diagnostic Study, Performed (b) • Laboratory Test, Performed (b) • Physical Exam, Performed (b) • Procedure, Performed (b) • Medication, Order (c) • Substance, Order (c)	
Negation Rationale	Indicates the reason that an action was not performed. Only QDM datatypes that represent actions (e.g., performed, recommended, communication, order, dispensed) allow the "negation rationale" attribute. The intent is to indicate a justification that such action did not happen as expected. This attribute specifically does **not** address the presence or absence of information in a clinical record (e.g., documented absence of allergies Vs lack of documentation about allergies). The syntax in the human readable HQMF is address in CQL examples and in the MAT User Guide. Prior versions of QDM used the syntax, "Procedure, Performed *not done*." QDM 5.0 DRAFT uses the syntax, "Procedure, not Performed." Note, some datatypes include both Relevant Time and Author Datetime attributes. The purpose is to accommodate Author Datetime if the actual start and stop times are not available when evaluating for feasibility, and also to allow specification of a time for Negation Rationale.	• Assessment, Performed • Assessment, Recommended • Communication: From Patient to Provider • Communication: From Provider to Patient • Communication: From Provider to Provider • Device, Applied • Device, Order • Device, Recommended • Diagnostic Study, Order • Diagnostic Study, Performed • Diagnostic Study, Recommended • Encounter, Order • Encounter, Performed • Encounter Recommended • Immunization, Administered • Immunization, Order • Intervention, Order • Intervention, Performed • Intervention, Recommended	• 0.. 1

Attribute	Definition	Datatype(s)	Cardinality
		• Laboratory Test, Order • Laboratory Test, Performed • Laboratory Test, Recommended • Medication, Administered • Medication, Discharge • Medication, Dispensed • Medication, Order • Physical Exam, Order • Physical Exam, Performed • Physical Exam, Recommended • Procedure, Order • Procedure, Performed • Procedure, Recommended • Substance, Administered • Substance, Order • Substance, Recommended	
Ordinality	The scale in which different procedures are ordered in terms of the qualitative value, as opposed to a ranking performed strictly numerically or quantitatively.	• Procedure, Intolerance • Procedure, Order • Procedure, Performed • Procedure, Recommended	• NA
Participation Period	The time from: • enrollmentStartdate – The time the patient enrolled in the program to • enrollmentEnddate – The time the patient's enrollement in the program ends	• Participation	• 0.. 1
Prevalence Period	Prevalance Period is the time from onset dateTime to abatement dateTime.	• Allergy/Intolerance • Diagnosis • Symptom	• 0.. 1
Principal Diagnosis	The coded diagnosis/problem established after study to be chiefly responsible for occasioning the admission of the patient to the hospital for care.	• Encounter, Performed	• 0.. 1

Attribute	Definition	Datatype(s)	Cardinality
Reason	The thought process or justification for the datatype. In some measures, specific treatments are acceptable inclusion criteria only if a justified reason is present. Each of these measures uses a value set (often, but not exclusively, using SNOMED-CT®) to express acceptable justification reasons. Other measures specify reasons as justification for exclusions. Examples include patient, system, or medical-related reasons for declining to perform specific actions. Each of these measures also uses a value set to express acceptable justification reasons for declining to perform expected actions.	• Assessment, Performed • Assessment, Recommended • Device, Applied • Device, Order • Device, Recommended • Diagnostic Study, Order • Diagnostic Study, Performed • Encounter, Order • Encounter, Recommended • Immunization, Administered • Immunization, Order • Intervention, Order • Intervention, Performed • Intervention, Recommended • Laboratory Test, Order • Laboratory Test, Performed • Laboratory Test, Recommended • Medication, Administered • Medication, Order • Patient Characteristic Clinical Trial Participant • Physical Exam, Order • Physical Exam, Performed • Physical Exam, Recommended • Procedure, Order • Procedure, Performed • Procedure, Recommended • Substance, Order • Substance, Recommended	• 0.. 1
Reference Range High	The high bound (inclusive) of values that are considered normal.	• Laboratory Test, Performed	• 0.. 1
Reference Range Low	The low bound (inclusive) of values that are considered normal.	• Laboratory Test, Performed	• 0.. 1
Refills	The number of refills allowed by the prescription.	• Medication, Discharge • Medication, Dispensed • Medication, Order • Substance, Order • Substance, Recommended	• 0.. 1
Related To	Something to which the *Care Goal* is related.	• Care Goal	• 0.. *

Attribute	Definition	Datatype(s)	Cardinality
Relationship	The relationship of the family member to the patient. To ensure compatibility with QRDA reporting constraints, relationship codes should come from the HL7 Personal Relationship Role Type value set (2.16.840.1.113883.1.11.19563).	• Family History	• 0.. 1
Relevant Period	Relevant Period addresses the time between the start of an action to the end of an action. Each datatype using relevant period defines specific definitions for the start and stop time for the action listed.	• Adverse Event • Care Goal • Device, Applied • Diagnostic Study, Performed • Encounter, Performed • Intervention, Performed • Laboratory Test, Performed • Medication, Active • Medication, Administered • Patient Characteristic, Payer • Physical Exam, Performed • Procedure, Performed • Substance, Administered	• 0.. 1
Result	The final consequences or data collected from the datatype. Results can be used in five ways, to express: • That a result is present in the electronic record but any entry is acceptable • A numerical result, combined with a mathematical operator and units (e.g., LDL >= 100 mg/dL, or systolic blood pressure is < 140 mmHg) • A result that matches one of a specific set of coded concepts in a value set • A result as a dateTime (Assessment, Performed) • A result as a percentage (Assessment, Performed)	• Assessment, Performed • Diagnostic Study, Performed • Intervention, Performed • Laboratory Test, Performed • Physical Exam, Performed • Procedure, Performed	• 0.. 1
Result dateTime	The time the result report is generated and saved in the database.	• Diagnostic Study, Performed • Laboartory Test, Performed	• 0.. 1
Route	Refers to the path by which the medication or substance should be taken into the body systems, such as intradermally, intrathecally, intramuscularly, intranasally, intravenously, orally, rectally, subcutaneously, sublingually, topically, or vaginally.	• Immunization, Administered • Immunization, Order • Medication, Active • Medication, Administered • Medication, Discharge • Medication, Dispensed	• 0.. 1

Attribute	Definition	Datatype(s)	Cardinality
		• Medication, Order • Substance, Administered • Substance, Order • Substance, Recommended	
Severity	Indicates the intensity of the specified datatype (e.g., persistent, moderate, or severe).	• Allergy/Intolerance • Adverse Event • Diagnosis • Symptom	• 0.. 1
Status	Indicates the particular stage of the action represented by the datatype.	• Diagnostic Study, Performed • Intervention, Performed • Laboratory Test, Ordered • Laboratory Test, Performed • Laboratory Test, Recommended • Procedure, Performed	• 0.. 1
Supply	The quantity (amount) of therapeutic agent that was provided to a patient (i.e., number of doses, number of tablets or pills, volume of medication) • Used while the patient was on the given medication (a). • Actually administered to a patient (b). • Indicated to be given during a procedure, diagnostic test, or medication or substance administration (c). • Dispensed to a patient to be taken at a later time (d). • Indicated to be given to a patient (e). • Recommended to be taken or administered to a patient (f). Note: Prior versions of the QDM (4.3 and earlier) addressed “dose” with two potential interpretations – (1) the quantity to be taken or administered with each administration and (2) the quantity of medication supplied (i.e., number of doses). QDM 5.0 and subsequent versions clarify the difference by defining “dosage” and “supply,” respectively.	• Medication, Active (a) • Immunization, Administered (b) • Medication, Administered (b) • Substance, Administered (b) • Medication, Discharge (c) • Medication, Dispensed (d) • Immunization, Order (e) • Medication, Order (e) • Substance, Order (e) • Substance, Recommended (f)	• 0.. 1
Target Outcome	The expected outcome that will indicate the care goal is achieved, or met.	• Care Goal	• 0.. 1

Attribute	Definition	Datatype(s)	Cardinality
Type	The characterization of the reaction (e.g., hypersensitivity, rash, gastroenteric symptoms, etc.)	• Adverse Event • Allergy/Intolerance	• 0.. 1

Appendix A. Change Log

A.1 Changes in QDM 5.3

Data Model, Version 5.3 specification contains the following changes from the Quality Data Model, Version 5.02 Proposed DRAFT specification:

- Removed Encounter, Active as this datatype can be managed by using Encounter, Performed with no end datetime.
- Added Author Datetime to three QDM datatypes: Diagnosis, Allergy/Intolerance, and Adverse Event to account for situations in which the onset and abatement times are unknown.
- Added a QDM datatype for Participation and new attribute to support: Participation Period.
- Removed Radiation Dose and Radiation Duration attributes as they have not been used and the use case is not defined. The concepts can be expressed using Assessment, Performed or Diagnostic Test, Performed.
- Added guidance to Diagnosis attribute for Encounter, Performed to make it explicit that is intended to capture ALL diagnoses, including principal diagnosis.
- Modeled the Location attribute for Encounter, Performed to allow for describing the patient's presence in more than one location during an individual Encounter.
- Removed Reason attribute from Encounter, Performed since it has never been used and the Encounter, Performed (diagnosis) attribute allows description of reason.
- Clarified that the QDM category Laboratory Test refers to tests performed for the subject of record.
- Added guidance to QDM data flow attributes to consider feasibility before using the attributes.
- Assigned cardinality to all QDM attributes Component – All datatypes use cardinality of 0.. 1 except:
  - Diagnosis (0.. *)
  - Facility location (only for the Encounter, Performed datatype – 0.. *)
  - Location Period (0.. *)
  - Related to (0.. *)

A.2 Changes in QDM 5.02 Proposed DRAFT

The Quality Data Model, Version 5.02 Proposed DRAFT specification contains the following changes from the Quality Data Model, Version 5.01 specification:

- Added authorTime to nine QDM datatypes that include the negation rationale attribute: Device, Applied; Diagnostic Study, Performed; Intervention, Performed; Encounter, Performed; Laboratory Test, Performed; Medication, Administered; Physical Exam, Performed; Procedure, Performed; Substance, Administered. The purpose is to more easily allow specification of a time for Negation Rationale.
- QDM 5.02 AuthorTimeErrata – changed all Author Times to Author Datetime to be consistent with expectations for data capture. Also, corrected Medication, discharge attribute from *dose* to *dosage.*

A.3 Changes in QDM 5.01 Proposed DRAFT

The Quality Data Model, Version 5.01 Proposed DRAFT specification contains the following changes from the Quality Data Model, Version 5.0 specification:

- Added Component attribute to Assessment, Performed; Diagnostic, Performed; Laboratory Test, Performed. The Component attribute includes a code and result and, for laboratory test, performed includes optional reference range high and reference range low.

A.4 Changes in QDM 5.0 DRAFT

The Quality Data Model, Version 5.0 DRAFT specification contains the following changes from the Quality Data Model, Version 4.3 specification:

- All logic content is removed. Logic is managed using CQL. The reader should refer to the CQL Formatting Guide to address logic.
- Added *Allergy/Intolerance* datatype
- Added *Adverse Event* datatype
- Removed all previous datatypes referencing *Allergy, Intolerance* and *Adverse Reaction*
- Added "code" attribute to all datatypes
- Added result response = *dateTime* or *percentage* to Assessment, Performed (result)
- Added Care Goal target outcome response = *percentage*
- Modified datatype timings to address:
  - Prevalence period for all datatypes requiring onset dateTime and abatement dateTime
  - Relevant period for action datatypes with specific timing descriptions of start and stop elements of relevant period
  - Author Datetime for datatypes addressing orders, recommendations and other points in time
- Removed Transfer to datatype
- Removed Transfer from datatype
- Added attributes for Encounter, Performed and Encounter, Active – Admission Source and Discharge Disposition (replaces Discharge status)
- Cumulative Medication Duration has been removed as the concept can be expressed directly using existing QDM datatypes and attributes with CQL logic expressions.

A.5 Changes in QDM 4.3

The Quality Data Model, Version 4.3 specification contains the following changes from the Quality Data Model, Version 4.2 specification:

- Added *Assessment, Performed* datatype
- Added *Assessment, Recommended* datatype
- Removed *Risk Category Assessment* datatype

- Removed *Functional Status, Performed* datatype
- Removed *Functional Status, Recommended* datatype
- Removed *Functional Status, Ordered* datatype
- Added clarification of timing for datatypes with *Order* actions
- Added clarification of feasibility requirements for all datatypes with *Recommended* actions

A.6 Changes in QDM 4.2

The Quality Data Model, Version 4.2 specification contains the following changes from the Quality Data Model, Version 4.1.2 specification:

- Enhanced support for encounter diagnoses and principal diagnoses
- Re-specified the *Diagnosis* datatypes
- Re-specified the *Diagnosis, Family History* datatype (now *Family History*)
- Re-specified the *Symptom* datatypes
- Added the *Immunization* category and datatypes
- Added reference range attributes to *Laboratory Test, Performed*
- Removed *patient preference* and *provider preference* attributes from all datatypes
- Removed *negation rationale* from inappropriate datatypes
- Fixed transposed descriptions of *Transfer From* and *Transfer To* datatypes

A.7 Changes in QDM 4.1.2

The Quality Data Model, Version 4.1.2 specification contains the following changes from the Quality Data Model, Version 4.1.1 specification:

- Removed *anatomical approach site* attribute from all *Physical Exam* datatypes
- Removed *method* attribute from *Procedure, Intolerance* datatype
- Clarified the meaning of *start datetime* and *stop datetime* in all *Order* datatypes
- Updated Appendix B to indicate where quantity-based temporal comparisons can and cannot be used

A.8 Changes in QDM 4.1.1

The Quality Data Model, Version 4.1.1 specification contains the following changes from the Quality Data Model, Version 4.1 specification:

- Replaced *DateDiff* and *TimeDiff* functions with *DateTimeDiff*
- Specified *DateTimeDiff* function to be used in measure observations only
- Added new section describing the use of attribute filters
- Added support for filtering date/time attributes by date
- Re-specified *Overlaps* to interpret missing end dates/times as *ongoing*

A.9 Changes in QDM 4.1

The Quality Data Model, Version 4.1 specification contains the following changes from the Quality Data Model, Version 4.0 specification:

- New QDM functions and operators
  - Union
  - Intersection
  - Fulfills
- New QDM temporal operators
  - Starts Concurrent With End Of
  - Ends Concurrent With Start Of
- Clarified names of existing QDM temporal operators
  - Starts Before or Concurrent With → Starts Before or Concurrent With Start Of
  - Starts After or Concurrent With → Starts After or Concurrent With Start Of
  - Starts Before or During → Starts Before End Of
  - Ends Before or Concurrent With → Ends Before or Concurrent With End Of
  - Ends After or Concurrent With → Ends After or Concurrent With End Of
  - Ends Before or During → Ends Before End Of
- Modified existing datatypes
  - Added *signed datetime* and *active datetime* to *Medication, Order*
  - Added *target outcome* to *Care Goal*
  - Renamed *reason* to *cause* in *Patient Characteristic Expired*
  - Clarified or removed ambiguous attributes (see QDM-46 for details)
- Removed *System Characteristic Datatype*
- Removed *Measurement Start Date* and *Measurement End Date* in favor of *MeasurementPeriod*
- Restricted QDM elements to use only one attribute at a time
- Added an appendix covering the representation of Cumulative Medication Duration

A.10 Changes in QDM 4.0

The Quality Data Model, Version 4.0 specification contains the following changes from the Quality Data Model, December 2013 specification:

- New document template and layout to improve readability
- Updated the wording in some sections to improve clarity
- Added definitions for all QDM functions, operators, and timing relationships
- New high-level QDM language constructs
  - Variable assignment
  - Inline comments
- New QDM functions and operators
  - Age At
  - Satisfies Any
  - Satisfies All

- New QDM temporal operators
  - Starts Before or Concurrent With
  - Starts Before of Concurrent With End Of
  - Starts After or Concurrent With
  - Starts After or Concurrent With End Of
  - Ends Before or Concurrent With
  - Ends Before or Concurrent With Start Of
  - Ends After or Concurrent With
  - Ends After or Concurrent With Start
- Incorporated guidance from eCQM Measure Logic and Implementation Guidance and Technical Release Notes, Version 1.7[17]
  - Specific occurrences
  - Calculation of time intervals

[17] Available at: http://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/Downloads/eCQM_MeasureLogicGuidance_2014.pdf. Last accessed August 2014.

Acronyms

AHRQ	Agency for Healthcare Research and Quality
CDS	Clinical Decision Support
CMD	Cumulative Medication Directive
CMS	Centers for Medicare & Medicaid Services
CPT®	Current Procedural Terminology
CQL	Clinical Quality Language
eCQI	Electronic Clinical Quality Improvement
eCQM	Electronic Clinical Quality Measure
EHR	Electronic Health Record
HIT	Health Information Technology
HL7	Health Level 7
ICD-9-CM	International Classification of Diseases, Ninth Revision
ICD-10	International Classification of Diseases, Tenth Revision
ISO	International Organization for Standardization
MAT	Measure Authoring Tool
ONC	Office of the National Coordinator for Health Information Technology
PHR	Personal Health Record
QDM	Quality Data Model
QRDA	Quality Reporting Document Architecture
SI	International System of Units
SNOMED-CT®	Systematized Nomenclature of Medicine – Clinical Terms
UCUM	Unified Code for Units of Measure