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

Quality Data Model, Version 5.6

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

December 2020

Deleted: Original Publication Date May 2019¶
Updated Guidance added May 2020

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
5.3 Annotated	August, 2017	ESAC Inc.	Updated to add guidance for using QDM with CQL (no changes to the data model from 5.3)
5.4	August, 2018	ESAC Inc.	Updated to align with emerging standards (HL7 FHIR) and increase explicit capabilities. The update also addresses errata: inadvertent inclusions in attribute table, and adding three required attributes – *daysSupplied*, *prescriber id* and *dispenser id* for medications.
5.5	May, 2019	ESAC Inc.	Updated, as requested by measure developers and implementers, to: • improve descriptions, • address previous ambiguities, • address performers of actions, • add additional items to improve specificity to measures, and • update timing elements for QDM datatypes that indicate actions performed. This version includes new QDM entities to allow reference to information about performers of actions specified in measures. It also contains editorial changes to address inadvertent inclusions and exclusions from data tables.
5.5	July 2019	ESAC Inc.	Updated – remove ambiguity in descriptions of using *author dateTime*
5.5	April 2020	ESAC Inc.	Updated guidance and definition clarification based on implementer and testing feedback in Section 6. Also corrected grammatical, spelling, and formatting errors and consistently described QDM datatypes in quotation and attributes in italics.

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QDM Version	Date	Author / Owner	Description of Change
5.6	December 2020	Contractor	Updates based on measure developer and implementer feedback: • Addition of *relatedTo* attribute to "Procedure, Performed". • Creation of new *interpretation* attribute for "Laboratory Test, Performed" • Update all definitions and guidance recommended in the QDM 5.5 Guidance Update May 2020 • Fix typographical errors

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1. Introduction

1.1 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:	Timing Considerations	Describes the use of timing periods as attributes
Section 4:	QDM Definitions	Defines the QDM categories, datatypes, and attributes
Section 5:	Special Cases	Provides guidance for using the QDM data model with new concepts such as components and for cumulative medication duration
Section 6:	GuidanceGuidance	General guidance regarding usage and feasibility of QDM datatypes and attributes
Section 7:	Change Log	Lists changes since the version 5.3 (2017) release of the QDM specification
Section 8:	Acronyms	Lists and defines the acronyms used in this document

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1.2 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, 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 Electronic Clinical Quality Improvement (eCQI) Resource Center.

1.3 Purpose

The QDM describes clinical concepts in a standardized format to enable electronic quality measurement in support of federal programs and initiatives. This model is the backbone for representing clinical criteria used in quality measures. Stakeholders of the QDM include measure developers, federal agencies, health information technology (IT) vendors, standards organizations, informatics experts, clinicians, organizational providers, and researchers.

The QDM is intended to enable the automated retrieval of structured data captured through routine care in electronic health records (EHRs), personal health records (PHRs), 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., clinicians and

organizational 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 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 measure (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. CQL replaces the logic contained in prior versions of the QDM. The QDM 5.5 clarified how to address the performer of an action and using the concept 'entities' to address patients, practitioners, and organizations as the performers of actions. QDM 5.6 provides further clarification for attribute definitions and a new attribute, *interpretation*, to allow reference to abnormal and critical laboratory test values. The Measure Authoring Tool (MAT) and Bonnie implement the QDM specification, thus providing software tools for measure developers to author and test their measures in standard formats.

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1.4 Vision

The QDM must adapt and evolve to facilitate the introduction of quality measurement and feedback into a clinician'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. To meet this end, the QDM User Group and the Health Level Seven International® (HL7) Clinical Quality Information Workgroup carefully addressed each QDM datatype and its associated attributes to assess consistency with data to be expected from EHRs in interoperability messages. A number of HL7® standards used to address quality measures provide templates addressing each of the QDM datatypes and attributes.[1] The HL7 Clinical Quality Framework (CQF) initiative identifies, develops and harmonizes standards that promote integration and reuse between eCQMs and CDS.[2] Under the CQF, HL7 developed a Quality Improvement Core (QI-Core) Implementation Guide by defining a set of profiles based HL7 Fast Healthcare Interoperability Resources® (FHIR) Release 4 (R4). FHIR® R4 is currently recommended for data exchange in the US by the United States Core Data for Interoperability (USCDI) and the ONC Interoperability Standards Advisory (ISA).[3] QI-Core version 4.0.0 includes a direct mapping from QDM version 5.5. The benefit of assessing consistency with these HL7 FHIR resources is based on the FHIR maturity model, suggesting that resources considered should be present in approximately 80% of clinical systems and tested and stable. Moreover, aligning with the data exchange information model allows easier implementation of eCQMs.

[1] HL7 standards that incorporate templates for QDM datatypes and attributes include: HL7 CQL-based HQMF used for specifying eCQMs starting with QDM version 5.3, QRDA (Quality Reporting Document Architecture) which is used for reporting eCQM results. The templates in these standards map QDM to an HL7 version 3 standard, Consolidated Clinical Document Architecture (C-CDA).

[2] HL7 Clinical Quality Framework is available at: https://confluence.hl7.org/display/CQIWC/Clinical+Quality+Framework. Last accessed April 18, 2020.

[3] United States Core Date for Interoperability (USCDI) is available at: https://www.healthit.gov/isa/united-states-core-data-interoperability-uscdi. The ONC Interoperability Standards Advisory is available at: https://www.healthit.gov/isa/.

1.5 Scope

The QDM version 5.6 specification is to be used in conjunction with the version of CQL determined by CMS programs. CQL provides the ability to express logic that is human readable yet structured enough for electronically processing a query. QDM version 5.6 aims to accomplish:

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

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1.6 Audience

The audience includes all stakeholders responsible for translating and developing clinical quality measures into electronic specifications. They include, but are not limited to, measure developers, the MAT and Bonnie development teams, EHR vendors, clinicians and organizational providers reporting eCQMs, and the community developing health IT standards.

2. Data Model

2.1 QDM Basics

The QDM consists of criteria for data elements. Sections 2.2-2.8 describe the different components of a QDM data element. QDM data elements are defined using QDM Category, QDM Datatype, QDM Attributes, and QDM Entities. This section further describes how to apply codes to QDM data elements.

2.2 QDM Category

A QDM category consists of a single clinical concept identified by a value set. A category is the highest level of definition for a QDM data element. The QDM currently contains 22 categories. Some examples of categories are Medication, Procedure, Condition/Diagnosis/Problem, Communication, and Encounter. Table 1 lists the QDM categories.

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Table 1. QDM categories

QDM Categories	
Adverse Event	Immunization
Allergy/Intolerance	Individual Characteristics
Assessment	Intervention
Care Experience	Laboratory Test
Care Goal	Medication
Communication	Participation
Condition/Diagnosis/Problem	Physical Exam
Device	Procedure
Diagnostic Study	Related Person
Encounter	Substance
Family History	Symptom

2.3 QDM Datatype

A QDM 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. Each category contains from one to eight datatypes. Table 2 lists the 46 QDM datatypes.

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Table 2. QDM datatypes

QDM datatypes		
"Adverse Event"	"Family History"	"Procedure, Order"
"Allergy/Intolerance"	"Immunization, Administered"	"Procedure, Performed"
"Assessment, Performed"	"Immunization, Order"	"Procedure, Recommended"
"Assessment, Order"	"Patient Characteristics"	"Related Person"
"Assessment, Recommended"	"Intervention, Order"	"Substance, Administered"
"Patient Care Experience"	"Intervention, Performed"	"Substance, Order"
"Provider Care Experience"	"Intervention, Recommended"	"Substance, Recommended"
"Care Goal"	"Laboratory Test, Order"	"Symptom"
"Communication, Performed"	"Laboratory Test, Performed"	
"Diagnosis"	"Laboratory Test, Recommended"	
"Device Applied"	"Medication, Active"	
"Device, Order"	"Medication, Administered"	
"Device, Recommended"	"Medication, Discharge"	
"Diagnostic Study, Order"	"Medication, Dispensed"	
"Diagnostic Study, Performed"	"Medication, Order"	
"Diagnostic Study, Recommended"	"Participation"	
"Encounter, Order"	"Physical Exam, Order"	
"Encounter, Performed"	"Physical Exam, Performed"	
"Encounter, Recommended"	"Physical Exam, Recommended"	

2.4 QDM Attribute

A QDM a*ttribute* provides specific detail about a QDM datatype. QDM *attributes* represent metadata, or information about each QDM datatype that might be used in eCQM expressions to provide necessary details for calculation. QDM prior to versions 5.5 included *data flow attributes* to help define information about provenance of the data, especially source and recorder. QDM 5.5 added the concept 'entities' to enable eCQM developers to indicate specific information about performers of actions. Section 2.6 provides detailed explanation of QDM entities. Healthcare interoperability standards generally use the term metadata to refer to attributes as defined in QDM. Metadata in this context is information about the data that more specifically defines the details required to calculate the measure requirements.

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2.4.1 Datatype-Specific Attributes

Datatype-specific attributes provide detail about a QDM data element based on its datatype. For example, "Medication, Dispensed", "Medication, Order" and "Medication, Administered" all contain information about *dosage, supply, frequency,* and *route*. "Medication, Dispensed" and "Medication Order" include the attribute *refills*, but "Medication, Administered" does not. Because these attributes pertain to specific datatypes, they are called datatype-specific attributes.

Starting with QDM version 5.5, each QDM datatype includes an actor to allow reference to the individual or organization that performed the activity. Table 29 lists definitions of all QDM attributes including the new actor attributes. Table 3 lists the actor attributes associated with each QDM datatype. Note that some QDM datatypes do not include actors; these datatypes are not present in the table (e.g., "Patient Characteristics").

Table 3. Actors associated with each QDM datatype

QDM datatype	Actor	QDM datatype	Actor
"Adverse Event"	• *recorder*	"Intervention, Order"	• *requester*
"Allergy/Intolerance"	• *recorder*	"Intervention, Performed"	• *performer*
"Assessment, Performed"	• *performer*	"Intervention, Recommended"	• *requester*
"Assessment, Order"	• *requester*	"Laboratory Test, Order"	• *requester*
"Assessment, Recommended"	• *requester*	"Laboratory Test, Performed"	• *performer*
"Patient Care Experience"	• *recorder*	"Laboratory Test, Recommended"	• *requester*
"Provider Care Experience"	• *recorder*	"Medication, Active"	• *recorder*
"Care Goal"	• *performer*	"Medication, Administered"	• *performer*
"Communication, Performed"	• *sender* • *recipient*	"Medication, Discharge"	• *prescriber* • *recorder*
"Diagnosis"	• *recorder*	"Medication, Dispensed"	• *dispenser* • *prescriber*
"Device Applied"	• *performer*	"Medication, Order"	• *dispenser* • *prescriber*
"Device, Order"	• *requester*	"Participation"	• *recorder*
"Device, Recommended"	• *requester*	"Physical Exam, Order"	• *requester*
"Diagnostic Study, Order"	• *requester*	"Physical Exam, Performed"	• *performer*
"Diagnostic Study, Performed"	• *performer*	"Physical Exam, Recommended"	• *performer*
"Diagnostic Study, Recommended"	• *requester*	"Procedure, Order"	• *requester*
"Encounter, Order"	• *requester*	"Procedure, Performed"	• *performer*
"Encounter, Performed"	• *participant*	"Procedure, Recommended"	• *requester*
"Encounter, Recommended"	• *requester*	"Substance, Administered"	• *performer*
"Family History"	• *recorder*	"Substance, Order"	• *requester*
"Immunization, Administered"	• *performer*	"Substance, Recommended"	• *requester*
"Immunization, Order"	• *requester*	"Symptom"	• *recorder*

2.4.2 Data Flow Attributes

QDM Data flow attributes were retired with QDM version 5.5. Refer to individual QDM datatype descriptions to identify the how QDM now references the performer of each action as a clarification of the previous *source* data flow attribute and where QDM retains the previous *recorder* data flow attribute.

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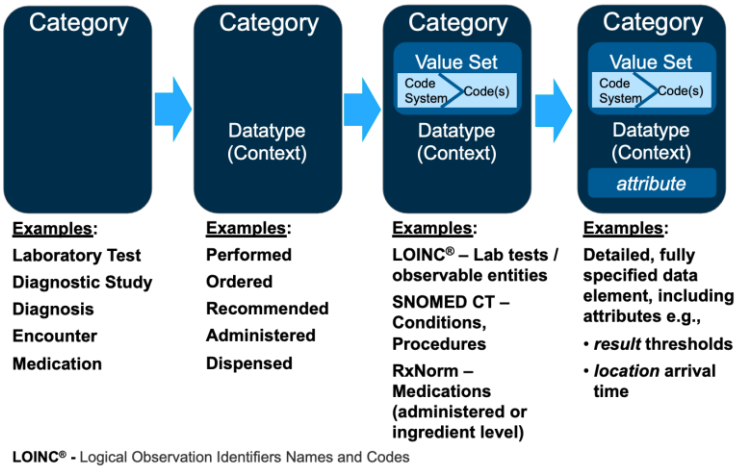
2.5 QDM Data Element

A QDM data element contains 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 applicable metadata about a clinical or administrative concept relevant to quality measurement. A QDM data 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.[4] Starting with QDM 5.3 and continuing with QDM 5.6, the tooling used to create an eCQM, the MAT, modifies the method by which a measure developer defines components of the QDM data element. However, the QDM data model structure remains the same. Figure 1 identifies the terminology and gives examples of use for the basic components that constitute a QDM data element.

Figure 1. QDM Data Element Structure



Only the category and context of the QDM data element with its related value set or direct reference code[5] displays in the HQMF. The QDM data model also specifies the attributes a measure developer may choose to include in the measure expression. Measure developers provide specific detail about these attributes within the CQL portion of the eCQM. CQL allows expression of multiple attributes and attributes of attributes. Figure 2 shows the general approach to defining a QDM data element using tooling that incorporates CQL logic.

[4] 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.

[5] Direct reference code is defined in Section 2.8, Value Sets.

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Figure 2. QDM 5.6 Data Element Definition Using CQL

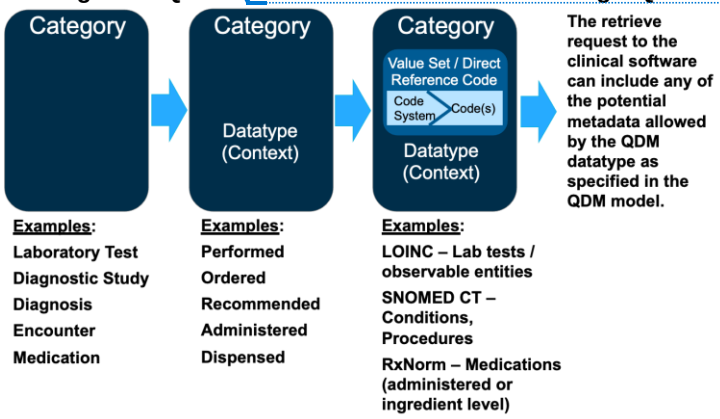
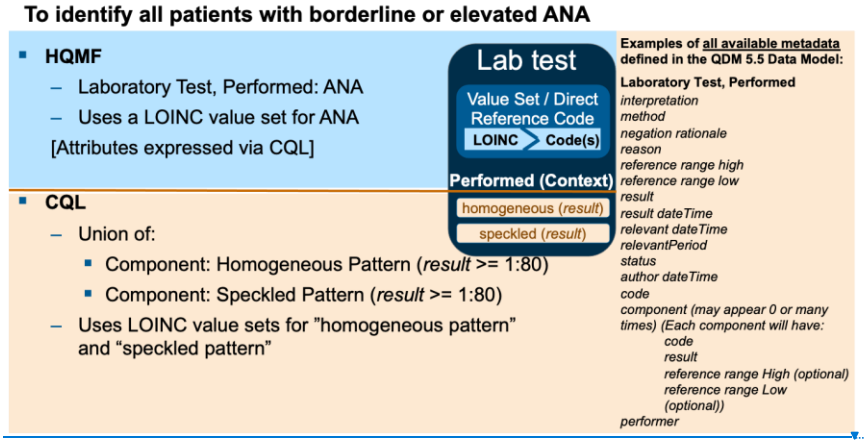


Figure 3 completes the definition of the QDM data element by specifying the required metadata in the CQL portion of the measure. In the example, the measure needs to specify only borderline or elevated results for the laboratory test, antinuclear antibody (ANA). Using CQL, the example allows specification of the two components of the ANA report (homogeneous pattern and speckled pattern). The CQL also allows the measure to indicate that one or both components' results must meet the criteria (result >= 1:80).

Appendices 5.2 and 5.4 provide further description about using components and results and continuing with QDM 5.6. Section 5.6 includes guidance regarding the use of result thresholds as attributes.

Figure 3. QDM 5.6 Description of Laboratory Test Attributes with CQL



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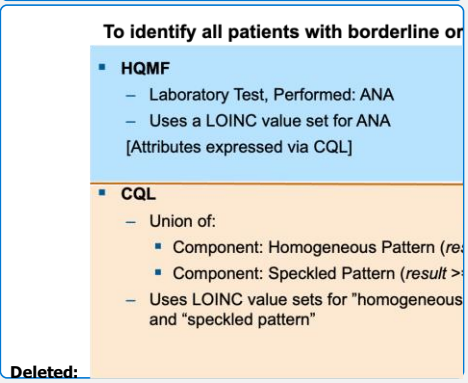

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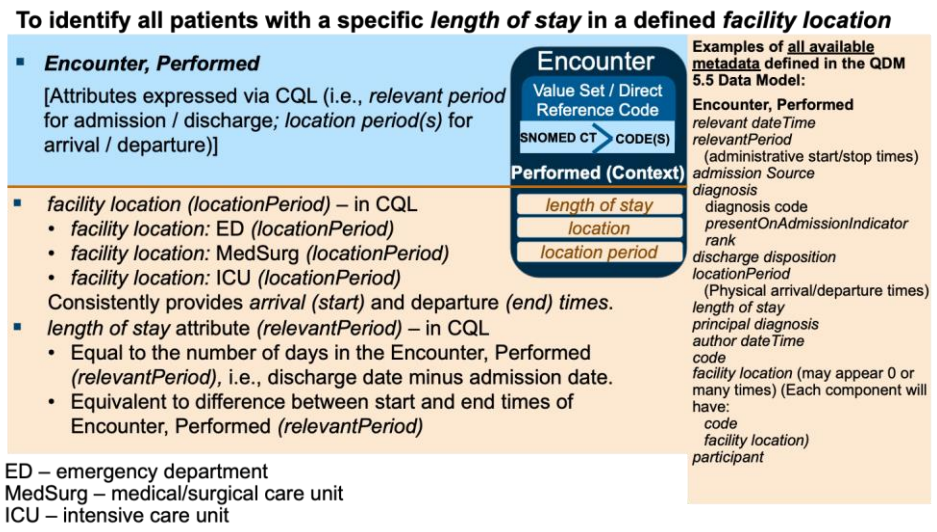
Figure 4 provides another example of a QDM data element using HQMF and the CQL portion of the measure. This example specifies the length of stay for an encounter and the arrival time. By convention, an Encounter, Performed start and stop times reference the admission and discharge times. These times are referenced by the attribute *location period* (the interval between start and stop times).[6] To determine arrival time requires specification of the *facility location* attribute, i.e., where in the facility the patient was treated within the scope of the encounter. The *location period* defines the arrival (start) and departure (stop) times for each *facility location* specified.[7] Earlier versions of QDM using QDM logic required a more complex description for the same specification. Section 5.1 describes the use of *facility location* attributes in greater detail.

Figure 4. QDM 5.6 Description of Encounter, Performed Attributes with CQL



2.6 QDM Entities

QDM 5.6 introduces a new concept, called QDM Entities. Entities are not QDM datatypes or attributes. They represent concepts that can be used to specify details about the actor (or performer) of any QDM datatype. An eCQM can use the entities to provide further information required for an individual or organization actor to meet the measure's criteria. An eCQM developer can require further detail for each of the actors in Table 4 **Error! Reference source not found.** by using a QDM Entity to describe it.

[6] Periods, the interval between start and stop times for a QDM data element are described in greater detail in Section 3.

[7] See Section 4.3 for definitions of *attributes*.

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Figure 4

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Table 4. Actors defined in QDM with associated QDM datatypes

Actor	QDM datatype	Actor	QDM datatype
participant	"Encounter, Performed"	*dispenser*	"Medication, Dispensed"
performer	"Assessment, Performed" "Device, Applied" "Diagnostic Study, "Performed" "Care Goal" "Intervention, Performed" "Immunization, Administered" "Laboratory Test, Performed" "Medication, Administered" "Physical Exam, Performed" "Procedure, Performed" "Substance, Administered"	*prescriber*	"Medication, Dispensed" "Medication, Order" "Medication, Discharge"
Recorder	"Adverse Event' "Allergy/Intolerance" "Patient Care Experience" "Provider Care Experience" "Diagnosis" "Family History" "Medication, Active" "Medication, Discharge" "Symptom"	*requester*	"Assessment, Order" "Assessment, Recommended" "Device, Order" "Device, Recommended" "Diagnostic Study, Order" "Diagnostic Study, Recommended" "Encounter, Order" "Encounter, Recommended" "Immunization, Order" "Intervention, Order" "Intervention, Recommended" "Laboratory Test, Order" "Laboratory Test, Recommended" "Physical Exam, Order" "Physical Exam, Recommended" "Procedure, Order" "Procedure, Recommended" "Substance, Order" "Substance, Recommended"
Recipient	"Communication, Performed"		
Sender	"Communication, Performed"		

The new QDM Entities include: Patient, Care Partner, Practitioner, and Organization. Patient references an individual receiving healthcare services. Care Partner is a person related to the care of a patient, but who is not the direct target of care and it includes an identifier and a relationship (for example, mother to a newborn infant). Practitioner is a person with formal responsibility to provide healthcare with an ability to reference an identifier, role, qualification, or specialty. Organization is a group of people or organizations with a common purpose and includes identifier and type attributes. Full definitions of each of the four entities and their respective attributes are:

- **Patient** – information about an individual receiving healthcare services
  - Identifier
  - id (instance identifier)

    Note: In remodeling QDM to include Entities, the Patient entity could include Patient Characteristics (e.g., race, ethnicity, payer). However, to retain backward compatibility with prior versions of QDM and avoid the need for eCQM developers and implementers to perform significant retooling, QDM 5.6 retains existing Patient Characteristics and only adds an identifier attribute to the Patient entity.

- **Care Partner** – a person that is related to a patient, but who is not the direct target of care
  - Identifier
  - id (instance identifier)
  - relationship

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- **Practitioner** – a person with a formal responsibility in the provisioning of healthcare or related services
  - Identifier
  - id (instance identifier)
  - role (role this practitioner may perform [e.g., physician, nurse])
  - specialty (specific specialty of the practitioner [e.g., anesthesia, cardiology, gastroenterology])
  - qualification (coded representation of the certification, licenses, or training pertaining to the provision of care [e.g., MD, CNE, CHPN, ACNP, PA][8])

    Note: QDM through version 5.4 included a QDM datatype called Provider Characteristic. QDM version 5.5 and 5.6 retires that QDM datatype to allow greater specificity using the practitioner and organization entities, each with specific attributes. No current CMS program measures use the Provider Characteristic QDM datatype.

- **Organization** –a grouping of people or organizations with a common purpose
  - Identifier
  - id (instance identifier)
  - type (kind of organization [e.g., hospital])

eCQM developers need to assure that specific information about actors is readily available in existing clinical systems to avoid adding undue burden on measure implementers. When considering inclusion of such detailed information in eCQM expressions, measure developers and EHR vendors should carefully evaluate the availability of such information, the feasibility of retrieving it, and its validity and reliability. Measure developers should also carefully assess whether local implementers can map their own identifiers and practitioner or organizational metadata to successfully calculate the information.

QDM Entity Examples

The following examples use QDM 5.6 Entities to further detail information about actors that perform activities defined by QDM datatypes.

2.6.1 Specifying an Organization for an Encounter Participant

This example describes how to require that a participant in an encounter is an organization of a specific type. In this case the actor, or *participant* attribute of "Encounter, Performed" (i.e., the organization that performed the encounter) should be an ambulatory clinical practice. Figure 5 shows the options available to the eCQM developer to specify a QDM Entity and information about that QDM Entity.

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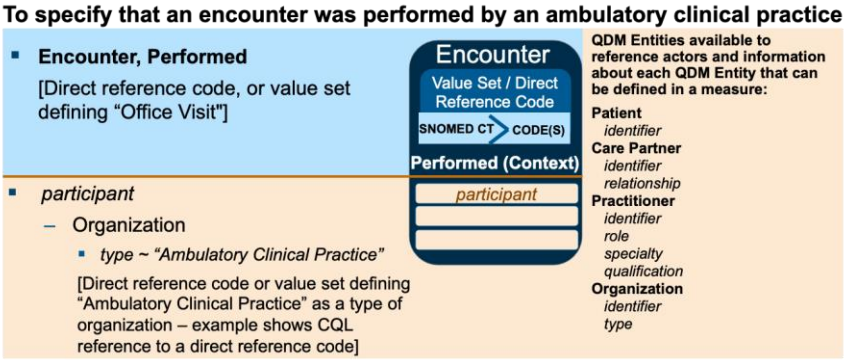
[8] MD – medical doctor, CNE – certified nurse educator, CHPN – certified hospice and palliative nurse, ACNP – acute care nurse practitioner, PA – physician assistant

Figure 5. Specifying an Organization as an Encounter Participant



In this example, the eCQM defines a qualifying encounter as performed by an ambulatory clinical practice using the QDM Entity Organization and its *type* attribute:

```
define "Qualifying Encounters"
  ["Encounter, Performed": "Office Visit"] Encounter
    where Encounter.participant is "Organization"
    and Encounter.participant.type is "Ambulatory Clinical Practice"
```

2.6.2 Specifying a Practitioner as an Encounter Participant

This example describes how to require that a participant in an encounter has the specialty needed to meet the measure intent. In this case the actor, or *participant* attribute of "Encounter, Performed" (i.e., the person who performed the encounter) should be an ophthalmology specialist. Figure 6 shows the options available to the eCQM developer to specify a QDM Entity and information about that QDM Entity.

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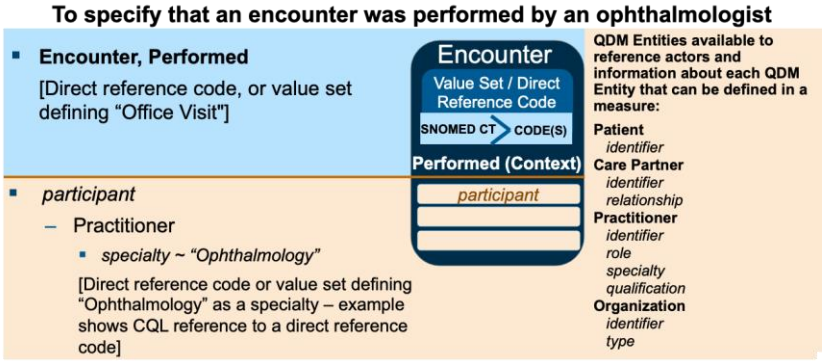
Figure 6. Specifying a Practitioner as an Encounter Participant



In this example, the eCQM uses the QDM Entity Practitioner and its *specialty* attribute to define a qualifying encounter as one performed by an ophthalmologist:

```
define "Qualifying Encounters"
  ["Encounter, Performed": "Office Visit"] Encounter
    where Encounter.participant is "Practitioner"
    and Encounter.participant.specialty is "Ophthalmology"
```

2.6.3 Specifying an Encounter Organization Identifier

This example describes how to require that participants in each of two distinct encounters are from the same organization. In this case the actor, or *participant* attribute of "Encounter, Performed" (i.e., the organization that performed the encounter) should have the same identifier for both encounters. Figure 7 shows the options available to the eCQM developer to specify a QDM Entity and information about that QDM Entity. In this example, the eCQM developer specifically requires that the naming system for organization identifier is the CMS Certification Number (CCN).

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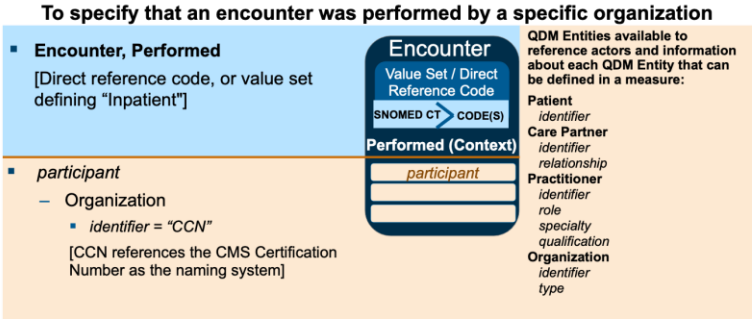
Figure 7. Specifying an Encounter Participant Identifier



This example shows how to determine that the primary participant (performer) of an inpatient encounter is the same as the primary participant (performer) of an emergency department encounter using the organization entity. The example defines a function that the required identifier is a CCN.

```
Define "Qualifying Encounters":
 ["Encounter, Performed": "Inpatient"] Encounter
   with ["Encounter, Performed": "ED"] ED
    such that ED.relevantPeriod ends 1 hour or less on or before start
of Encounter.relevantPeriod
     and CCNOf(ED.participant.identifiers) !=
CCNOf(Encounter.participant.identifiers)
define function CCNOf(identifiers: List<identifier>)
  singleton from (identifiers I where I.namingSystem = 'CCN Identifier
System' return I)
```

2.6.4 Specifying a Physical Examination Performed by a Care Partner

This example describes how to request that blood pressure was performed by a Care Partner (a person that is related to a patient, but who is not the direct target of care) for inclusion in the

eCQM. The example (Figure 8) expects that the Care Partner is a member of the patient's family which is defined by a value set.

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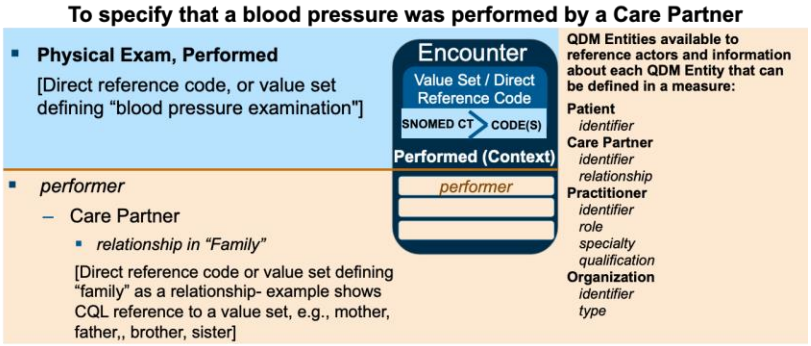
Figure 8. Specification that a Physical Exam was Performed by a Care Partner



This example shows how to determine that a blood pressure examination was performed by a Care Partner (a person that is related to a patient, but who is not the direct target of care). "Family" in this instance would use a value set of potential family members as defined by a measure developer (e.g., mother, father, brother, sister).

```
["Physical Exam, Performed": "Blood Pressure"] BloodPressure
     where (BloodPressure.performer is CarePartner
         and BloodPressure.relationship in "Family"
            )
```

2.6.5 Specifying an Individual Actor is a Member of an Organization

This example defines an organization as the QDM Entity used for the encounter participant similar to the expression in Section 2.6.1. Further, it indicates that the individual who orders an eye examination ("Intervention, Order") using the QDM Entity practitioner and that the practitioner identifier is within the organization that performed the qualifying encounter (see Section 2.6.4). The expression also assures the individual who performs the eye examination ("Intervention, Performed") is also a practitioner whose identifier is within the organization that performed the qualifying encounter. Note that this is a hypothetical example. All the actor identification requirements are optional at the discretion of the measure developer and all require validation that seeking such detail is feasible for implementation.

```
Define "Qualifying Encounters"
  ["Encounter, Performed": "Inpatient"] Encounter
    where Encounter.participant is "Organization"
define "Eye Exam Order"
  ["Intervention, Order": "Diabetic Eye Exam"] ExamOrder
    where ExamOrder.requester is Practitioner
```

```
      and ExamOrder.requester.id in (Encounter.participant as
Organization)
define "Eye Exam Complete"
  ["Intervention, Performed": "Diabetic Eye Exam"] EyeExam
    where EyeExam.performer is Practitioner
      and EyeExam.performer.id in Encounter.participant.organization
```

2.7 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. Specific code systems are used in applying the QDM to quality measures based on the initial recommendations from an ONC advisory committee. Recommendations have been updated based on the USCDI and the ONC ISA. For example, International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) for historical data, International Classification of Diseases, Tenth Revision (ICD-10), 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 System Blueprint for a complete review of code systems that should be used for each QDM datatype and attribute.

2.8 Value Sets and Direct Reference Codes

A value set (actually, the expansion of a versioned value set definition using a specified code system version) is a list of specific values (terms and their codes) derived from single or multiple standard vocabularies (or code systems) that then provides the set of codes that are to be used to identify when a required clinical condition, order, or situation has occurred (e.g., patients with diabetes, clinical visits, reportable diseases). Value sets are used in quality measures to support effective health information exchange. They 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 data elements, value sets can be used to define possible codes for the QDM data element's category, the QDM data element's attributes, or the QDM entities referenced in a measure. The National Library of Medicine's 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.

Measure developers are also able to specify a single concept code to describe a QDM data element rather than creating a value set. This will occur when only one concept, represented by that one code, is useful in the context of the specified CQL. The term used for such a single code in an eCQM without a value set is direct reference code (DRC). When used, the implication is that either there is only one way for this information to be stored in any health system (hopefully using the specified code), or any subtle differences represented by multiple distinct local codes are not important for this use and can all be mapped to the single DRC.

Prior to QDM 5.3 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. DRCs are included with the measure logic and included in a terminology section of the HQMF.

In many cases, eCQMs will use DRCs if there is only one concept that meets the definition of the eCQM data element. However, some value sets that contain only one code will continue to exist for when:

- 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 reference 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 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.

Implementers are expected to find whatever coded concepts are identified in the CQL (either a DRC or one of the codes within an expected value set expansion) within the patient health record data. If the actual expected code is not used in patient records (or the implemented user interface), then an implementation is expected to map equivalent patient record information that is found in the record, such as user interface terms or local encodings, to equivalent expected codes included in the CQL. Therefore, when evaluating CQL clauses, either the actual specified CQL code, or an equivalent mapped local code must be found in the record in order to consider the CQL clause criteria as true.

2.9 Value Sets and Direct Reference Codes that Define QDM Categories

Value sets define a QDM data element's category, not a QDM data element's datatype. Here is an example of a common QDM data element:

```
Laboratory Test, 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 example shows a QDM data 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 data element. Since the category is 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 reference codes define a QDM data element's category, not a QDM data element's datatype. Here is an example of a very common QDM data element using a DRC:

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

In this example, the DRC defines for which assessment the criterion is looking. 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 next example shows a QDM data element that includes the attribute components, in this example, components of an assessment:

Assessment, Performed: "Asthma Control Test using LOINC 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 Code (82669-3)
- During the past 4 weeks, how often have you had shortness of breath? Using LOINC 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 Code (82671-9)
- During the past 4 weeks, how often have you used your rescue inhaler or nebulizer medication (such as albuterol)? Using LOINC Code (82672-7)
- How would you rate your asthma control during the past 4 weeks? Using LOINC Code (82673-5)

  Total score ACT Using LOINC Code (82668-5)

In this example, the direct reference code Asthma Control Test defines the category of the QDM Assessment element. Since the category is an Assessment, direct reference code Asthma Control Test answers the question of which assessment. Six additional direct reference 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 A.1.

3. Timing Considerations for QDM Data Elements

Prior versions of QDM included timing attributes of QDM data elements, basically start and stop times or author times. QDM uses *author dateTime* to indicate the time a data element is documented, i.e., a single point in time. To assure accurate retrieval of time-related information from clinical software, beginning with QDM 5.3, the data model includes more explicit definitions of the intent of start and stop for each datatype. For events that can occur over a period of time, QDM now describes intervals between the *startTime* and the *stopTime* defined for each datatype. These versions use the term period to indicate these intervals to be consistent with current activities in HL7 FHIR. The major reason for identifying periods is to enable simpler logic expression in CQL, i.e., refer to start time as the beginning of the period and end time as the end of the period. QDM 5.3 introduced the *relevantPeriod* attribute for activities occurring over a time interval. QDM 5.5 added a *relevant dateTime* attribute to more clearly

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Deleted: and forward limit the number of types of periods while assuring their definitions are clear and concise. Some activities represented by a QDM datatype may occur at a point in time while other activities may occur over a period of time. To more clearly define the differences,

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differentiate activities occurring at a point in time, QDM 5.6 retains both of these attributes and adds clarifying definitions where needed.

Deleted: attribute for activities occurring over a time interval

3.0 Types of periods

3.1 *RelevantPeriod*

The *relevantPeriod* attribute is the default, or general, method to describe a start to stop time for 14 datatypes:

- "Assessment, Performed"
- "Care Goal"
- "Device, Applied"
- "Diagnostic Study, Performed"
- "Encounter, Performed"
- "Intervention, Performed"
- "Laboratory Test, Performed"
- "Medication, Active"
- "Medication, Administered"
- "Medication, Order"
- "Patient Characteristic, Payer"
- "Physical Exam, Performed"
- "Procedure, Performed"
- "Substance, Administered"

3.2 *PrevalencePeriod*

The *prevalencePeriod* attribute is specific to indicate those datatypes that signify the difference between *onset dateTime* and *abatement dateTime* for three datatypes:

- "Diagnosis"
- "Allergy/Intolerance"
- "Symptom"

3.3 Participation period

The *participation period* attribute is specific to the time an individual participates in a health plan, health management program, or a clinical treatment program for one datatype:

- "Participation"

3.4 Location periods

The *facility locationPeriod* attributes are specific to indicate the difference between the arrival and departure times with respect to the locations where the patient is treated (as an attribute of "Encounter, Performed"). QDM includes location periods for one datatype:

- "Encounter, Performed"

Note that any given "Encounter, Performed" can include zero to many *facility locations* (i.e., the facility locations has a cardinality of 0.. *). For each instance of *facility locations* attribute listed, it can only include a single *locationPeriod* (i.e., the physical arrival and physical departure times for that instance of the *facility location*).

3.5 Use of Timing Periods vs. Author Times

Note that some datatypes list periods and *author dateTime* as attributes. The reason is to allow a measure developer to differentiate in their logic the time an action occurs versus the time it is documented. In most cases, when the *start dateTime* of a period is not known, the retrieve should default to the *author dateTime* without having to specify *author dateTime* in the measure. Section 4.3 lists the attribute definitions.

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3.6 Available Timing for all QDM Datatypes

Table 5 provides a list of timing attributes available for all QDM datatypes. Some QDM datatypes include both *relevantPeriod* and *relevant dateTime* because activities described by such QDM datatypes can occur at a point in time or over a time interval. *Relevant dateTime* allows the measure expression to be more specific. Section 4 provides details and some examples with respect to timing for QDM datatypes.

Table 5. Available Timing for All QDM Datatypes

QDM Datatype	Available Timings
"Adverse Event"	*relevant dateTime* *author dateTime*
"Allergy/Intolerance"	*prevalencePeriod* *author dateTime*
"Assessment, Performed"	*relevant dateTime* *relevantPeriod* *author dateTime*
"Assessment, Order"	*author dateTime*
"Assessment, Recommended"	*author dateTime*
"Patient Care Experience"	*author dateTime*
"Provider Care Experience"	*author dateTime*
"Care Goal"	*relevantPeriod* *statusDate*
"Communication, Performed"	*sent dateTime* *received dateTime* *author dateTime*
"Diagnosis"	*prevalencePeriod* *author dateTime*
"Device, Applied"	*relevant dateTime* *relevantPeriod* *author dateTime*
"Device, Order"	*author dateTime*

QDM Datatype	Available Timings
"Device, Recommended"	*author dateTime*
"Diagnostic Study, Performed"	*relevant dateTime* *relevantPeriod* *author dateTime* *result dateTime*
"Diagnostic Study, Order"	*author dateTime*
"Diagnostic Study, Recommended"	*author dateTime*
"Encounter, Performed"	*relevantPeriod* *author dateTime* *facility location, locationPeriod*
"Encounter, Order"	*author dateTime*
"Encounter, Recommended"	*author dateTime*
"Family History"	*author dateTime*
"Immunization, Administered"	*relevant dateTime* *author dateTime*
"Immunization, Order"	*active dateTime* *author dateTime*
"Patient Characteristic"	*author dateTime*
"Patient Characteristic, Birthdate"	*birth dateTime*
"Patient Characteristic, Expired"	*expired dateTime*
"Patient Characteristic, Payer"	*relevantPeriod*
"Intervention, Performed"	*relevant dateTime* *relevantPeriod* *author dateTime*
"Intervention, Order"	*author dateTime*
"Intervention, Recommended"	*author dateTime*
"Laboratory Test, Performed"	*relevant dateTime* *relevantPeriod* *author dateTime* *result dateTime*
"Laboratory Test, Order"	*author dateTime*
"Laboratory Test, Performed"	*author dateTime*
"Medication, Active"	*relevant datetime* *relevantPeriod*
"Medication, Administered"	*relevant dateTime* *relevantPeriod* *author dateTime*
"Medication, Discharge"	*author dateTime*
"Medication, Dispensed"	*relevant dateTime* *relevantPeriod* *author dateTime*
"Medication, Order"	*relevantPeriod* *author dateTime*
"Participation"	*participation period*
"Physical Exam, Performed"	*relevant dateTime*

QDM Datatype	Available Timings
	relevantPeriod *author dateTime*
"Physical Exam, Order"	*author dateTime*
"Physical Exam, Recommended"	*author dateTime*
"Procedure, Performed"	*relevant dateTime* *relevantPeriod* *author dateTime* *incision dateTime*
"Procedure, Order"	*author dateTime*
"Procedure, Recommended"	*author dateTime*
"Substance, Administered"	*relevant dateTime* *relevantPeriod* *author dateTime*
"Substance, Order"	*author dateTime*
"Substance, Recommended"	*author dateTime*
"Symptom"	*prevalencePeriod*

4. QDM Definitions

4.1 Categories and Datatypes

4.1.1 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 6. 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 dateTime* references the adverse event occurred. The *author dateTime* references the time the adverse event was recorded.	• *relevant dateTime* • *code* • *type* *severity* • *facilityLocations* • *author dateTime* • *id* • *recorder*

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4.1.2 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 7. 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 p*revalence period* references the time from the onset date to the abatement date. Often an abatement date is not present as allergy or intolerance is ongoing. • The *author dateTime* references the recorded time.	• *prevalence period* • *code* • *type* • *severity* • *author dateTime* • *id* • *recorder*

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4.1.3 Assessment

Assessment is a category 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, clinicians, or other individuals, or a single observable entity that is part of a collection of questions.

Table 8. 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: • *relevant dateTime* references timing for an assessment that occurs at a single point in time. • *relevantPeriod* references a start and stop time for an assessment that occurs over a time interval • *author dateTime* references the time the action was recorded. • Refer to the eCQM expression to determine allowable timings to meet measure criterion. Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• *author dateTime* • *relevant dateTime* • *relevantPeriod* • *negation rationale* • *reason* • *method* • *result* • *relatedTo* • *code* • *id* • *components* (may appear 0 or many times) (Each component will have: – *code* – *result*) • *performer*
"Assessment, Order"	Data elements that meet criteria using this datatype should document an order 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). Notes: • *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*. • Orders address the time that the order is authored, a single point in time. Some assessment orders will be addressed as components of a care plan which incorporates the *period* (or timing) when the order is to be carried out. Measure developers should address the feasibility of clinical workflow to capture Assessment, Order when evaluating measures.	• *author dateTime* • *negation rationale* • *reason* • *code* • *id* • *requester*

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Datatype	Definition	Attributes
"Assessment, 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 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). Notes: • *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*. • 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 the feasibility of clinical workflow to capture recommendations when evaluating measures.	• *author dateTime* • *negation rationale* • *reason* • *code* • *id* • *requester*

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4.1.4 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 9. Care Experience Datatypes and Attributes

Datatype	Definition	Attributes
"Patient Care Experience"	Data elements that meet criteria using this datatype 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* • *id* • *recorder*
"Provider Care Experience"	Data elements that meet criteria using this datatype indicate the provider's experience with the 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* • *id* • *recorder*

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4.1.5 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 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 10. 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: • *relevantPeriod* – *startDate* – when the goal pursuit begins. – *endDate* (*dueDate*) – the target date for the goal outcome. • *statusDate* – when a goal status took effect. Notes: • Care Goal references dates (i.e., days) and not *dateTimes*. • The *performer* attribute references the US Core and FHIR R4 concept *expressedBy* – the individual or organization responsible for creating the goal.	• *relatedTo* (the problem, procedure, or other class of information to which the care goal is related) • *relevantPeriod* • *statusDate* • *target outcome* • *code* • *id* • *performer*

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4.1.6 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, and educational resources. The HL7 FHIR 3.0 resource Communication defines communication as a conveyance of information from one entity, a sender, to another entity, a receiver. The senders and receivers may be patients, practitioners, care partners, organizations, or devices. Established FHIR resources include:

- A reminder or alert delivered to a responsible provider
- A recorded notification from the nurse that a patient's temperature exceeds a value
- A notification to a public health agency of a patient presenting with a communicable disease reportable to the public health agency
- Patient educational material sent by a provider to a patient
- Non-patient specific communication use cases may include:
  - A nurse call from a hall bathroom
  - Advisory for battery service from a pump

Generally, direct patient counseling, training, or education represents an intervention (Section 4.1.14) or procedure (Section 4.1.19). A time and a date stamp are required.

QDM through version 5.3 included three communication QDM datatypes:

- "Communication, Provider to Patient"
- "Communication, Patient to Provider"

- "Communication, Provider to Provider"

These three datatypes restricted the measure developer to communication between patients and providers and among providers. The structure of the datatypes also provided implicit guidance to implementers to define what type of provider based on the intent of the measure.

QDM 5.4 merged the three communication QDM datatypes into one, "Communication, Performed" to allow greater expressivity and more explicit definition of the sender and receiver and to indicate the anticipated communication medium. This new QDM modeling is more consistent with other QDM datatypes and it is also modeled more consistently with existing communication interoperability resources (e.g., HL7 FHIR). Note that measure developers need to test measures that use "Communication, Performed" to determine if the sender and recipient attribute information is available. Confirmation regarding receipt of communications requires interoperability.

Table 11. Communication Datatype and Attributes

Datatype	Definition	Attributes
"Communication, Performed"	Data elements that meet criteria using this datatype reference conveyance of information from one entity (e.g., person, organization, or device) to another. The "Communication, Performed" *code* attribute represents the reason for the communication (i.e., the subject). The *category* attribute allows reference to the type, or category, of communication (e.g., notification, request). In many cases, the eCQM developer may not know the local workflow to address the type of communication; hence, it is listed as an attribute to be used as feasibility allows. Timing: • *sent dateTime* – when the communication was sent. • *received dateTime* – when the communication was received. Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• *category* • *medium* • *negation rationale* • *sent dateTime* • *received dateTime* • *author dateTime* • *relatedTo* • *code* • *id* • *sender* • *recipient*

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4.1.7 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 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-CM and/or ICD-10-CM.

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

Table 12. 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 not present, 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 *prevalencePeriod* references the time from the *onset date* to the *abatement date*.	• *prevalencePeriod* • *anatomical location site* • *severity* • *code* • *author dateTime* • *id* • *recorder*

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4.1.8 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.[10]

Documented evidence of a device may exist in a clinical record in various ways:

- A provider may document placement of a device as an intervention or procedure (e.g., the QDM datatypes Intervention, Performed, or Procedure, Performed).
  - Example: Procedure, Performed: Pacemaker insertion.
- The provider may document presence of the device as a finding, perhaps including the finding on the problem list. Example: Diagnosis: Pacemaker present, or Assessment, Performed: Pacemaker present.
- A provider may also document the device in a specific device use statement or assessment.
  - Example: Device, Applied: Transtelephonic monitoring of pacemaker assessment. Note that the current use of the QDM datatype "Device, Applied" usually references the procedure to "apply" the device (i.e., to use for the patient, to use on the patient's body, or to implant in the patient's body). Each of these current uses should address the concept using the QDM datatypes, Intervention, Performed, or Procedure, Performed.

Given the variation in determining evidence of device usage, a measure developer may need to include multiple queries (or retrieves) to assure capture of all devices present in the measure population. The QDM datatype, Device, Applied, provides the best method to determine specific

[10]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 April 2019.

details about the device in use if a device usage assessment exists to provide such information. It also allows a measure developer to explicitly express which devices should be included in the query.

Table 13. Device Datatypes and Attributes

Datatype	Definition	Attributes
"Device, Applied" (retired)	QDM 5.6 retires the QDM datatype "Device, Applied". See section 6.1 for rationale and recommendations for expressing device-related procedures and usage.	QDM datatype retired
"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.* Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• *negation rationale* • *reason* • *author dateTime* • *code* • *id* • *requester*
"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). Notes: • *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*. • 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* • *id* • *requester*

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Deleted: 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: ¶
relevantPeriod addresses:¶
startTime – When the device is inserted or first used.¶
stopTime – when the device is removed or last used.¶
relevantPeriod references a start and stop time for a device if the application occurred over a time interval.¶
relevant dateTime addresses the time the device is applied if it was used at a single point in time. ¶
author dateTime references the time the action was recorded.¶
Refer to the eCQM expression to determine allowable timings to meet measure criteria.¶
Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.¶

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4.1.9 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).[11] The QDM defines diagnostic studies as those that are not performed in organizations that perform testing on

[11] Canada Health Infoway EHR Glossary, https://www.infoway-inforoute.ca/. Last accessed March 2019.

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, and vascular laboratory testing.

Table 14. 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, and vascular laboratory testing. Timing: The time the order is signed; *author dateTime.* Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• *negation rationale* • *reason* • *author dateTime* • *code* • *id* • *requester*

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Datatype	Definition	Attributes
"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: • *relevant dateTime* references the time the diagnostic study is performed if it occurs at a single point in time. • *relevantPeriod* references a start and stop time for an assessment that occurs over a time interval: ○ *startTime* – when the diagnostic study is initiated. ○ *stopTime* – when the diagnostic study is completed. • *author dateTime* references the time the action was recorded. • Refer to the eCQM expression to determine allowable timings to meet measure criterion. Examples using *relevantPeriod*: • 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 Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• *facility location* • *method* • *negation rationale* • *reason* • *result* • *result dateTime* • *relevant dateTime* • *relevantPeriod* • *status* • *code* • *author dateTime* • *id* • *components (may appear 0 or many times) (Each component will have:* – *code* – *result)* • *performer*

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Datatype	Definition	Attributes
"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). Notes: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*. 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 the clinical workflow to capture recommendations when evaluating measures.	• *negation rationale* • *author dateTime* • *code* • *id* • *requester*

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4.1.10 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.[12] 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* attribute defines the patient's location at the time of measurement. Different levels and modes of interaction can be specified in the direct reference code or value set value associated with the element.

[12]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 March 2019.

Table 15. 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 ordered. Timing: The time the order is signed; *author dateTime*. Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• *facility Location* • *negation rationale* • *priority* • *reason* • *author dateTime* • *code* • *id* • *requester*
"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 or has been completed. The "Encounter, Performed" *participant* references the primary participant. Previous versions of QDM included an attribute *principal diagnosis*, defined as the condition that, after study, was determined to be the principal cause of the admission. QDM version 5.6 addresses that concept using the *diagnosis rank=1.* Timing: • The *relevantPeriod* addresses: ○ *startTime* – The time the encounter began (admission time). ○ *stopTime* – The time the encounter ended (discharge time). • *author dateTime* references the time the action was recorded. • Refer to the eCQM expression to determine allowable timings to meet measure criteria. Notes: • *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*. • The *locationPeriod* is an attribute of the attribute *facility location* that addresses: ○ *startTime* – the time the patient arrived at the location. The time the encounter began (admission time). ○ *stopTime* – the time the patient departed from the location.	• *relevantPeriod* • *admission source* • *diagnoses* (3 components) – *diagnosis (code)* – *presentOnAdmissionIndicator (code)* – *rank* • *discharge disposition* • *length of stay* • *priority* • *author dateTime* • *code* • *id* • *facility locations* (may appear 0 or many times) (Each component will have: – *code* – *locationPeriod)* • *participant* [QDM 5.6 retires the use of the *negation rationale* attribute for "encounter, Performed". See section 6.2 for rationale.]

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Datatype	Definition	Attributes
"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). Notes: • *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*. • 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 the feasibility of clinical workflow to capture recommendations when evaluating measures.	• *facility location* • *negation rationale* • *reason* • *author dateTime* • *code* • *id* • *requester*

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4.1.11 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 Quality Reporting Document Architecture (QRDA) reporting constraints.

Table 16. Family History Datatypes and Attributes

Datatype	Definition	Attributes
"Family History"	To meet criteria using this datatype, the diagnosis/problem indicated by the Family History 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* • *id* • *recorder*

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4.1.12 Immunization

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

Table 17. 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 *relevant dateTime* references the point in time the immunization is administered. Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• *dosage* • *negation rationale* • *reason* • *route* • *relevant dateTime* • *author dateTime* • *code* • *id* • *performer*
"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.* Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• *active dateTime* • *dosage* • *negation rationale* • *reason* • *route* • *supply* • *author dateTime* • *code* • *id* • *requester*

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4.1.13 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 18. 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. Note, individual patient characteristics have not been remodeled as part of the new QDM entity, Patient to allow backward compatibility rather than requiring re-expression of all existing characteristics in eCQMs. Timing: The time the characteristic is authored.	• *author dateTime* • *code* • *id*
"Patient Characteristic, Birthdate"	The "Patient Characteristic Birthdate" 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.	• *birth dateTime* • *code* • *id*
"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 *relevantPeriod* addresses: • *startTime* – The time the clinical trial began. • *stopTime* – The time the clinical trial ended.	• *reason* • *relevantPeriod* • *code* • *id*
"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* • *id*
"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* • *expired dateTime* • *code* • *id*

Datatype	Definition	Attributes
"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 *relevantPeriod* addresses: • *startTime* – The first day of insurance coverage with the referenced payer. • *stopTime* – The last day of insurance coverage with the referenced payer.	• *relevantPeriod* • *Code* • *id*
"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* • *id*
"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* • *id*

4.1.14 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.

Note that while the QDM categories Intervention and Procedure are modeled identically and interoperability standards do not differentiate between them, both are retained in the QDM as they are more clinically expressive for clinicians to understand the measure intent.

Table 19. 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.* Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• *negation rationale* • *reason* • *author dateTime* • *code* • *id* • *requester*

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Datatype	Definition	Attributes
"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: • *relevant dateTime* references the time the intervention is performed when the intervention occurs at a single point in time. • *relevantPeriod* references a start and stop time for an intervention that occurs over a time interval. *relevantPeriod* addresses: o *startTime* – The time the intervention begins. o *stopTime* – The time the intervention ends. • *author dateTime* references the time the action was recorded. • Refer to the eCQM expression to determine allowable timings to meet measure criterion. Notes: • 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* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• *negation rationale* • *reason* • *result* • *relevant dateTime* • *relevantPeriod* • *author dateTime* • *status* • *code* • *id* • *performer*
"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). Notes: • *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*. • 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 the feasibility of clinical workflow to capture recommendations when evaluating measures.	• *negation rationale* • *reason* • *author dateTime* • *code* • *id* • *requester*

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4.1.15 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.[13] The QDM data category Laboratory Test is only used for information about the subject of record.

Table 20. 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*. Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• *negation rationale* • *reason* • *author dateTime* • *code* • *id* • *requester*

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[13]National Cancer Institute (NCI). Bethesda, MD: NCI; 2010. Available at: www.cancer.gov/. Last accessed March 2019.

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: • *relevant dateTime* references the time the laboratory test is performed when the laboratory test occurs at a single point in time. • *relevantPeriod* references a start and stop time for a laboratory test that occurs over a time interval. *relevantPeriod* addresses: ○ *startTime* – The time the laboratory test begins. ○ *stopTime* – The time the laboratory test ends. • *author dateTime* references the time the action was recorded. • Refer to the eCQM expression to determine allowable timings to meet measure criterion. Examples: • Initiation of a venipuncture for a fasting blood glucose to the time venipuncture for the fasting blood glucose is completed – use *relevant dateTime* to reference this 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 – use *relevantPeriod* to reference the start to stop time for this event. Notes: • The time that the result report is available is a separate attribute than the time of the study (specimen collection). • *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• *interpretation* • *method* • *negation rationale* • *reason* • *reference range high* • *reference range low* • *result* • *result dateTime* • *relevant dateTime* • *relevantPeriod* • *status* • *author dateTime* • *code* • *id* • *components* (may appear 0 or many times) (Each component will have: – *code* – *result* – *reference range high* (optional) – *reference range low* (optional)) • *performer*

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Datatype	Definition	Attributes
"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). Notes: • 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 the feasibility of clinical workflow to capture recommendations when evaluating measures. • *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• *negation rationale* • *reason* • *author dateTime* • *code* • *id* • *requester*

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4.1.16 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 directly referenced values or value sets containing values derived from code systems such as RxNorm.[14]

[14] See https://www.nlm.nih.gov/research/umls/rxnorm/. Last accessed March 2019.

Table 21. 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: • *relevant dateTime* references the time the medication is active on the medication record if it was given or taken at a single point in time. • *relevantPeriod* references a start and stop time for an active medication on the medication record that is given or taken over a time interval: • The *relevantPeriod* addresses: o *startTime* = when the medication is first known to be used (generally the time of entry on the medication list). o *stopTime* = when the medication is no longer active. [updated definition QDM 5.6]	• *dosage* • *frequency* • *route* • *relevant dateTime* • *relevantPeriod* • *code* • *id* • *recorder*
"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: • *relevant dateTime* references the time the medication is administered if it was given or taken at a single point in time. • *relevantPeriod* references a start and stop time for medication administration if the administration event occurred over a time interval (e.g., an intravenous infusion). The *relevantPeriod* addresses: o *startTime* = when a single medication administration event starts (e.g., the initiation of an intravenous infusion). o *stopTime* = when a single medication administration event ends (e.g., the end time of the intravenous infusion). • *author dateTime* references the time the action was recorded. • Refer to the eCQM expression to determine allowable timings to meet measure criterion.	• *dosage* • *frequency* • *negation rationale* • *reason* • *route* • *relevant dateTime* • *relevantPeriod* • *author dateTime* • *code* • *id* • *performer*

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In the original QDM 5.5 publication, *stopTime* stated: when the medication is discontinued (generally, the time discontinuation is recorded on the medication list). **See Appendix B.3 for clarification regarding definition of "Medication, Active" *relevantPeriod stopTime*.**

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Datatype	Definition	Attributes
"Medication, Administered", Continued	Notes: • Measure developers should address multiple administrations over a period of time using CQL logic. • *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*. Refer to Special Cases in Section 5.7 for scenarios to consider in calculating cumulative medication duration.	Content not continued
"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. Note: the QDM "Medication, Discharge" datatype includes the *supply* attribute since some EHRs populate some medications on the medications discharge list provided to the patient from prescriptions written at discharge. Therefore, such newly prescribed medications may include the supply prescribed. Other medications on the discharge medication list will not have supply information since they represent medications for which the patient already has a supply at home or those the patient may purchase without prescription (i.e., over-the-counter). Thus, measure developers need to address data availability and feasibility when using the supply attribute with "Medication, Discharge". Timing: The time the discharge medication list on the discharge instruction form is authored. The "Medication, Discharge" QDM datatype includes two performers or actors – *prescriber* and *recorder*. The list of medications a patient should take after hospital discharge may come from two sources. The first source originates from medications ordered from a community pharmacy directly from the clinical software (e.g., eprescribing). That source will include the prescriber. The second method of providing content for the discharge medication list is via entry of medications known to be present in the home or over-the-counter substances, neither of which result in a prescription. The individual entering these latter medications is the *recorder*. Hence, content in the discharge medication list may include both performers. Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• *dosage* • *frequency* • *supply* • *days supplied* • *negation rationale* • *refills* • *route* • *author dateTime* • *code* • *id* • *prescriber* • *recorder*

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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 or fulfillment information 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. The QDM datatype, "Medication, Administered" addresses medication taken; to address the source of the information, a measure addressing such patient attestation would require use of the entity fulfilling the role of the *performer* attribute for the administration event. Timing: • *relevant dateTime* references the *dateTime* the prescription dispensing event occurred, i.e., the time the prescription was handed over to the patient or patient's representative. • *relevantPeriod* addresses the time referenced in the dosage instruction indicating when the medication administration should start and end. [updated definition in QDM 5.6] • *author dateTime* references the date and time the dispensing event is recorded. Notes: • When calculating cumulative medication duration, the medication dispensed *stopTime* may be present directly in the fulfillment record. If the *stopTime* is not available, the duration in days is the difference between the *relevantPeriod* start and stop times. The record may indicate which of the available refills the fulfillment represents but each dispensing event is unique. Therefore, the measure developer should use CQL logic to address multiple dispensing events over a period of time. • *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*. Refer to Special Cases in Section 5.7 for scenarios to consider in calculating cumulative medication duration.	• *dosage* • *supply* • *days supplied* • *frequency* • *negation rationale* • *refills* • *route* • *relevant dateTime* • *relevantPeriod* • *author dateTime* • *code* • *id* • *dispenser* • *prescriber*

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<#>For clarification, see **Appendix B.4 with additional guidance for referencing *relevantPeriod* updating the definition for "Medication, Order", "Medication Dispensed", and "Substance, Order".**¶

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Datatype	Definition	Attributes
"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: • *relevantPeriod* addresses the time referenced in the dosage instruction indicating when the medication administration should start and end. [updated definition in QDM 5.6] • *author dateTime* references the date and time the medication order (prescription) is authored. Notes: • When calculating cumulative medication duration, the *stopTime* may be present directly in the medication order. If the *stopTime* is not available, the duration in days is the difference between the *relevantPeriod* start and stop times multiplied by (1 + the number of refills). • *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*. Refer to Special Cases in Section 5.7 for scenarios to consider in calculating cumulative medication duration.	• *Dosage* • *supply* • *days supplied* • *frequency* • *code* • *setting* • *negation rationale* • *reason* • *refills* • *relevantPeriod* • *route* • *author dateTime* • *id* • *prescriber*

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<#>In the initial publication of QDM 5.5, *relevantPeriod* referenced the validity period, i.e., the time period for which the ordered supply is authorized by the prescription authorizing the dispensing event.¶
<#>**For clarification, see Appendix B.4 with additional guidance for referencing *relevantPeriod* updating the definition for "Medication, Order", "Medication Dispensed", and "Substance, Order".¶**

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4.1.17 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.[15]

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

Table 22. 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, Blue Cross Blue Shield Association, Cigna). The *code* attribute indicates the coverage type indicating the program in which the subject of record participates (e.g., health insurance plan policy, disease specific policy, health maintenance organization policy) Timing: *participationPeriod* addresses: • *enrollmentStartdate* – The time the patient enrolled in the program. • *enrollmentEnddate* – The time the patient's enrollment in the program ends.	• *Code* • *participationPeriod* • *id* [QDM 5.6 retires the recorder attribute for "Participation". See section 6.3 for rationale.]

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Deleted: with 2020 guidance suggesting that eCQM developers not use the recorder attribute for Participation.

4.1.18 Physical Exam

Physical Exam represents the evaluation of the patient's body and/or mental status 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). In the context of quality measurement, the physical exam category is also used to represent calculations based upon measurements (such as body mass index [BMI]). Physical exam includes psychiatric examinations.

Table 23. 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*. Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• *anatomical location site* • *negation rationale* • *reason* • *author dateTime* • *code* • *id* • *requester*
"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:	• *anatomical location site* • *method* • *negation rationale* • *reason*

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Datatype	Definition	Attributes

	• *relevant dateTime* references the time the physical exam is performed when the physical exam occurs at a single point in time.
	• *relevantPeriod* references a start and stop time for a physical exam that occurs over a time interval. *relevantPeriod* addresses:
	  ○ *startTime* – The time the physical exam begins.
	  ○ *stopTime* – The time the physical exam ends.
	• *author dateTime* references the time the action was recorded.
	• Refer to the eCQM expression to determine allowable timings to meet measure criteria.
	Notes:
	• 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.
	• *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.
		• *result*
		• *relevant dateTime*
		• *RelevantPeriod*
		• *code*
		• *author dateTime*
		• *id*
		• *components* (may appear 0 or many times) (Each *component* will have:
		  – *code*
		  – *result*
		• *performer*

"Physical Exam, Recommended"	Data elements that meet criteria using this datatype should document a recommendation 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). Notes: • *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*. • 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 the feasibility of clinical workflow to capture recommendations when evaluating measures.	• *anatomical location site* • *negation rationale* • *reason* • *author dateTime* • *code* • *Id* • *requester*

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4.1.19 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."[16] 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. [17]

Table 24. 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*. Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• *anatomical location site* • *negation rationale* • *rank* • *priority* • *reason* • *author dateTime* • *code* • *id* • *requester*

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[16] HL7, available at: http://www.hl7.org/documentcenter/public_temp_9D8B62D1-1C23-BA17-0C978A875D9E7083/wg/java/apidocs/org/hl7/rim/Procedure.html. Last accessed April 2019.

[17] Modified from Canada Health Infoway, available at: https://www.infoway-inforoute.ca/. Last accessed April 2019.

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: • *relevant dateTime* references the time the procedure is performed when the procedure occurs at a single point in time. • *relevantPeriod* references a start and stop time for a procedure that occurs over a time interval. *relevantPeriod* addresses: ○ *startTime* – The time the procedure begins. ○ *stopTime* – The time the procedure ends. • *author dateTime* references the time the action was recorded. • Refer to the eCQM expression to determine allowable timings to meet measure criterion. Notes: • 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. • The *incision dateTime* is a single point in time available from the Operating Room and/or Anesthesia Record. • *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*. • See section 6.4 for guidance about differentiating between successful and unsuccessful procedures.	• *anatomical location site* • *incision dateTime* • *method* • *negation rationale* • *rank* • *reason* • *relatedTo* • *result* • *relevant dateTime* • *relevantPeriod* • *author dateTime* • *status* • *code* • *id* • *components* (may appear 0 or many times) (Each *component* will have: ○ *code* ○ *result)* • *performer* [QDM 5.6 retires the use of the *priority* attribute for "Procedure, Performed". See section 6.5 for rationale.]

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<#>For clarification, see Appendix B.7 with 2020 guidance suggesting that eCQM developers avoid using the "Procedure, Performed" *priority* attribute.¶
<#>*Reason*

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Datatype	Definition	Attributes
"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). Notes: • *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*. • 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 location site* • *negation rationale* • *rank* • *reason* • *author dateTime* • *code* • *id* • *requester*

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4.1.20 Related Person

A "Related Person" typically has a personal or non-healthcare-specific professional relationship to the patient. A "Related Person" QDM datatype is primarily used to reference another person involved with the patient's care or as a source to gain information about the patient. Some individuals may serve as both an activity performer (i.e., referenced as the Care Partner entity), and a "Related Person" (i.e., the individual from whose record clinical information should be retrieved to support care provided to a patient).[18] The QDM datatype, "Related Person", references the latter.

– Example "Related Persons" are a patient's mother, father, spouse, partner, relatives, friends, a neighbor bringing a patient to the hospital, or a patient's attorney or guardian.

An example to describe usage of the "Related Person" QDM datatype is to determine clinical information about a newborn infant's mother. In this hypothetical example, a measure might want to evaluate gestational age at the time of birth. One method is to expect entry on the infant's record of an observation question about gestational age at the time of birth requesting the estimated due date such that it can be compared with the actual birth date. That method uses the QDM datatype "Assessment, Performed" to request the estimated due date. However, to be able to directly reference the mother's record for the estimated due date requires the QDM datatype "Related Person". This datatype enables authors to reference information from other data items as appropriate. The CQL expression for this information assuming the infant is the subject of the measure:

[18] Paraphrased from HL7 FHIR R4. Available at: https://www.hl7.org/fhir/relatedperson.html. Accessed 15 March 2019.

```
context Patient

define "Mother": (singleton from (["Related Person": "Mother
Relationship"]))

define "Estimated Due Date"
   Last (
       ["Mother" -> "Physical Exam, Performed": "Estimated Due Date"]
Exam
         Sort by start of relevantPeriod
    ).result as DateTime

define "Gestational Age in Days at Birth":
   (280 - (duration in days between "Estimated Due Date" and "Birth
Date")) div 7
```

Table 25. Related Person Datatype and Attributes

Datatype	Definition	Attributes
"Related Person"	A person who has a personal or non-healthcare-specific professional relationship to the patient. The *code* attribute references the relationship to the index patient. Timing: A "Related Person" has no associated timing. The "Related Person" QDM datatype references only an *identifier* and a *relationship*. The *relationship* references the nature of the relationship (e.g., a direct reference code or a value set for "Mother Relationship" using the example provided).	• *id* • *code* • *identifier* • *linkedPatientId*

Specifically, for a "Related Person", the eCQM should be tested to determine if the index patient's record can access information from the record of the expected related person. Some feedback suggests that a patient's record may have a link to another inpatient record (e.g., an infant's chart might have a link to the mother's chart), but it is not clear that codified information from the related person can be accessed. In previous versions of QDM, such information had to be referenced as an observation related to the patient that is the subject of the measure. "Assessment, Performed" is used to reference such an observation and QDM 5.6 retains that same capability.

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4.1.21 Substance

Substance represents a homogeneous material with definite composition that includes allergens, biological materials, chemicals, foods, drugs, and materials.[19] 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).

[19] HL7 FHIR. Value Set Substance Category. Release 4, version 4.0.1. October 30, 2019. Available at: https://www.hl7.org/fhir/valueset-substance-category.html. Last accessed March 2019.

Measure developers have considered the use of the QDM substance category in light of alignment with existing interoperability data standards. Two use cases require further investigation and effort in the HL7 FHIR realm:

Nutrition [Considerations for Future Use]
The nutrition mappings from QDM to FHIR resources require continued effort as of the printing of this QDM 5.6 version. The FHIR NutritionOrder Resource is a record of the request for the supply of a diet, oral supplement or enteral formulas for a patient, and thus allow specification of a complete diet order, but not an order for an individual nutrient. The NutritionOrder resource is currently at a low maturity level (i.e., it has had limited testing).
Therefore, for the current QDM 5.6 reference, substance is modeled similarly to medications.

Blood Products [Considerations for Future Use]
The HL7 FHIR version 4.0 resource for blood products allow specification of the blood product as a biologically derived product, but specification for how such products are administered remains in development. Therefore, for the current QDM 5.6 reference, blood product administration can be managed using QDM datatypes "Procedure, Performed" or "Substance, Administered" based on measure developer findings during measure implementation testing.

Table 26. 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:
	• *relevant dateTime* references the time the substance is administered if it was given or taken at a single point in time.
	• *relevantPeriod* references a start and stop time for substance administration if the administration event occurred over a time interval.
	• The *relevantPeriod* addresses:
	  ○ *startTime* = when a single substance administration event starts (e.g., the initiation of an intravenous infusion).
	  ○ *stopTime* = when a single substance administration event ends (e.g., the end time of the intravenous infusion).
	• *author dateTime* references the time the substance administration was recorded and applies only when the record has no reference to the time the substance administration occurred and only the recorded time is available.
		• *dosage*
		• *frequency*
		• *negation rationale*
		• *route*
		• *relevant dateTime*
		• *relevantPeriod*
		• *author dateTime*
		• *code*
		• *id*
		• *performer*

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Datatype	Definition	Attributes
"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: • *relevantPeriod* addresses the time referenced in the dosage instruction indicating when the medication administration should start and end. [updated definition in QDM 5.6] • *author dateTime* references the date and time the substance order is authored. Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• *dosage* • *frequency* • *negation rationale* • *reason* • *supply* • *refills* • *route* • *relevantPeriod* • *author dateTime* • *code* • *id* • *requester*
"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). Notes: • *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*. • 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 the feasibility of clinical workflow to capture recommendations when evaluating measures.	• *dosage* • *frequency* • *negation rationale* • *reason* • *refills* • *route* • *author dateTime* • *code* • *id* • *requester*

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<#>In the initial publication of QDM 5.5, *relevantPeriod* referenced the validity period, i.e., the time period for which the ordered supply is authorized by the prescription authorizing the dispensing event.¶
<#>**For clarification, see Appendix B.4 with additional guidance for referencing *relevantPeriod* updating the definition for "Medication, Order", "Medication Dispensed", and "Substance, Order".¶**

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4.1.22 Symptom

Symptom represents an indication that a person has a condition or disease. Some examples are headache, fever, fatigue, nausea, vomiting, and pain.[20] Also, symptoms are subjective manifestations of the disease perceived by the patient.[21] As an example to differentiate symptom from finding, the patient's subjective symptom of fever is distinguished from the temperature (a finding). A finding could reference a temperature-measuring device and a recorder. The recorder

[20] UMLS Dictionary, available at: http://www.nlm.nih.gov/research/umls/. Last accessed April 2019.

[21] National Cancer Institute (NCI), Bethesda, MD; NCI 2010, available at: www.cancer.gov/. Last accessed April 2019.

could be the device (with electronic data capture) or an individual (healthcare provider, patient, etc.).

Note that while many symptoms are entered as findings as part of assessments and, therefore, may not be included in a specific EHR "symptom" section, QDM 5.6 retains the QDM datatype, "Symptom", for clarity of expression in the human readable eCQM.

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Table 27. 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 *prevalencePeriod* 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.	• *prevalencePeriod* • *severity* • *code* • *id* • *recorder*

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4.2 Entities

Table 28 lists the four QDM entities including definitions, attributes, type of information used, and cardinality. Cardinality refers to the number of instances of the attribute that can be included in the measure description or the performance report (e.g., only once or multiple times). Note that cardinality for Entity attributes is 0.. 1 (i.e., not required to be present and can occur up to 1 time). Refer to Section 4.3 for additional context on attributes.

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Table 28. QDM Entities

Entity	Definition	Attributes	Type of Information	Cardinality
Patient	an individual receiving healthcare services	• *identifier*	• Identifier	• 0..1
		• *id*	• Instance identifier	• 0..1
Care Partner	a person that is related to the care of a patient, but who is not the direct target of care	• *identifier*	• Identifier	• 0..1
		• *id*	• Instance identifier	• 0..1
		• *relationship*	• Codable concept	• 0..1
Practitioner	a person with a formal responsibility in the provisioning of healthcare or related services	• *identifier*	• Identifier	• 0..1
		• *id*	• Instance identifier	• 0..1
		• *role* (role this practitioner may perform)	• Codable concept	• 0..1
		• *specialty* (specific specialty of the practitioner, e.g., anesthesia, cardiology)	• Codable concept	• 0..1

Entity	Definition	Attributes	Type of Information	Cardinality
		• *qualification* (coded representation of the certification, licenses, or training pertaining to the provision of care)	•Codable concept	• 0.f.1
Organization	a grouping of people or organizations with a common purpose	• *identifier*	•Identifier	• 0..1
		• *id*	•Instance identifier	• 0..1
		• *type* (kind of organization, e.g., hospital)	•Codable concept	• 0..1

4.3 Attributes

Table 29 lists QDM attributes including definitions, QDM datatypes with which they are used and cardinality. Cardinality refers to the number of instances of the attribute that can be included in the measure description or the performance report (e.g., only once or multiple times). The purpose of this information is to be more explicit in guiding specification of QDM data elements. Note that cardinality for most attributes is 0.. 1 (i.e., not required to be present and can occur up to 1 time). A cardinality of 1..1 or 1..* indicates that the item must be present to meet criteria for the data element and is limited to only 1 (1..1) or may occur multiple times (1..*). The only attributes that have cardinality of 0.. * (i.e., not required to be present and can occur multiple times) are:

- *diagnoses* used with "Encounter, Performed"
- *components* used with "Assessment, Performed"; "Diagnostic Study, Performed"; "Laboratory Test, Performed"; "Physical Exam, Performed"; and "Procedure, Performed"
- *facility locations* used with "Encounter, Performed"
- *relatedTo* used with "Care Goal"; "Communication, Performed"

Note that, where cardinality is greater than 1 (i.e., 0.. *), the attributes use the plural form rather than singular (except *relatedTo* which can be plural or singular). The reason is that use of the plural more clearly informs the implementer to search among all instances of the element to retrieve the appropriate content and avoid errors in the retrieval. For example, "Encounter, Performed": "Inpatient Hospitalization" (*diagnoses*: atrial fibrillation) informs the implementer to search all relevant diagnosis addressed during the encounter (i.e., all on the diagnosis list) to find atrial fibrillation. The singular 'diagnosis' term could cause an error if the implementer interprets it to look for atrial fibrillation as the first diagnosis listed. Refer to Table 29 for definitions of the attributes.

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Table 29. QDM Attribute Definitions

Attribute	Definition	Datatype(s) or Entities	Cardinality
active dateTime	When the order indicates the first immunization administration should occur. *active dateTime* is most often used to specify immunizations for which administration is intended at a	• "Immunization, Order"	• 0.. 1

Attribute	Definition	Datatype(s) or Entities	Cardinality
	specific time in the future. If *active dateTime* is not specified, it defaults to the *author dateTime* (when signed).		
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 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) • "Procedure, Performed" (b) • "Procedure, Recommended" (b)	• 0.. 1
author dateTime	The time the data element was entered into the clinical software. Note, some datatypes include both *relevant dateTime* and *author dateTime* attributes. When both are present, *author dateTime* is included to accommodate *negation rationale*. The *author dateTime* addresses when an activity is documented. Documentation can occur at the beginning, during, at the end, or subsequent to the end of the activity. The *author dateTime* should be used only if the *relevantPeriod* cannot be obtained or to represent the time *negation rationale* is documented. Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*.	• "Assessment, Order" • "Assessment, Performed" • "Care Goal" • "Communication, Performed" • "Device, Applied" • "Device, Order" • "Device, Recommended" • "Diagnostic Study, Order" • "Diagnostic Study, Performed" • "Encounter, Order" • "Encounter, Performed" • "Encounter, Recommended" • "Immunization, Administered" • "Immunization, Order"	• 0.. 1 • For *negation rationale*, 1..1

Attribute	Definition	Datatype(s) or Entities	Cardinality
		• "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" • "Physical Exam, Order" • "Physical Exam, Performed" • "Physical Exam, Recommended" • "Procedure, Order" • "Procedure, Performed" • "Procedure, Recommended" • "Provider Care Experience" • "Substance, Administered" • "Substance, Order" • "Substance, Recommended"	
category	The type of message conveyed by a communication (e.g., notification, alert, reminder, instruction).	• "Communication, Performed"	• 0..1
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 explicitly specifies	• All Datatypes except "Related Person"	• 0..1

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Attribute	Definition	Datatype(s) or Entities	Cardinality
	the value set (or direct reference code) 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. • All QDM data elements require a QDM datatype with either a value set or direct reference code to specify the data element and a code is required. • If the QDM data element's attribute specifies a value set or direct reference code, the *code* attribute is required. • If the QDM data element's attribute does not specify a value set or direct reference code, the *code* attribute is not required. 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[22] 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*.	• *code* can also be used with QDM attributes (see individual attribute descriptions)	
birth dateTime	The date and time that the patient was born.	• "Patient Characteristic, Birthdate"	• 0.. 1
components	Elements included or documented as part of evaluations or test panels. • Examples include: specific questions included in assessments, 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*. *components* also reference specific details about an encounter diagnosis.	• "Assessment, Performed" (*result*) • "Diagnostic Study, Performed" (*result*) • "Encounter, Performed" (*diagnosis*) • "Laboratory Test, Performed" (*result*) • "Physical Exam, Performed" (*result*) • "Procedure, Performed" (*result*)	• 0.. *

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[22] CQL supports other data models besides QDM. CQL Model Info is used in implementations to map the particular data model to CQL expressions.

Attribute	Definition	Datatype(s) or Entities	Cardinality
	• Examples include an "Encounter, Performed" *diagnosis* that is also present on admission and refers to the principal diagnosis (*rank* = 1).		
expired dateTime	The date and time that the patient passed away.	• "Patient Characteristic Expired"	• 0.. 1
days supplied	Amount of medication expressed as a timing amount, i.e., the number of days over which the medication is expected to last.	• "Medication, Order" • "Medication, Dispensed" • "Medication, Discharge"	• 0.. 1
diagnoses	Coded diagnoses/problems addressed during the encounter. The diagnoses attribute has three components: • *diagnosis* (code) • *presentOnAdmissionIndicator* (code) • *rank* (positive integer) To reference an encounter diagnosis, the expression **must** include the diagnosis *code* component. The other components are optional. The expression should only include the *presentOnAdmissionIndicator* if it is necessary to reference present on admission and should only include the *rank* if it is necessary to reference principal diagnosis. The "Encounter, Performed" *diagnosis* attribute is intended to capture ALL *diagnoses*, including the principal diagnosis, i.e., all diagnoses addressed during the encounter represented by the *diagnosis (code)* used in the expression. The *presentOnAdmissionIndicator* (*code*) allows the eCQM developer to include criteria about whether each specific "Encounter, Performed" *diagnosis* was present at the time of admission (an indicator used to evaluate patient safety and adverse events). See *presentOnAdmissionIndicator* attribute definition and Section A.1.4 for information about using	• "Encounter, Performed"	• 0.. *

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diagnoses ¶

Attribute	Definition	Datatype(s) or Entities	Cardinality
	the "Encounter, Performed" *diagnosis* attribute. The "Encounter, Performed" *diagnosis (rank)* replaces the *principal diagnosis* attribute. To reference a principal diagnosis, eCQM developers should express the "Encounter, Performed" *diagnosis* with a *diagnosis (code)* and a *rank* of 1. See definition of *rank* in this attribute table. With an "Encounter, Performed" *diagnosis,* there is no dependency on the timing of the *diagnosis* in relation to the encounter. – Use of the "Encounter, Performed": *diagnoses* attribute component and the "Diagnosis" datatype is redundant for relating the diagnosis to the "Encounter, Performed". The "Encounter, Performed": *diagnoses* component syntax is preferred. – Referencing the same diagnosis using "Encounter, Performed" (*diagnoses* attribute) and "Diagnosis" (datatype) should only occur if the measure must define a specified length of a *prevalencePeriod*, e.g., ▪ The measure must assure that the diagnoses – have been present for at least some defined time period before the encounter, and – were addressed during the "Encounter, Performed"		
discharge disposition	The disposition, or location to which the patient is transferred at the time of hospital discharge.	• "Encounter, Performed"	• 0.. 1

Attribute	Definition	Datatype(s) or Entities	Cardinality
dispenser	The individual performing the dispense. The *dispenser* attribute references the new QDM entities (Patient, Care Partner, Practitioner, or Organization) and any or all of the attributes of the respective QDM entity. For example, a measure developer seeking to assure the dispensing pharmacy is part of the same organization as the prescribing physician can specify that both the "Medication, Order" *prescriber* and *dispenser* and specify the same QDM entity = organization *identifer* for each.	• "Medication, Dispensed"	• 0.. 1
dosage	Details of how much medication is taken or is to be taken, i.e., the quantity (mg, mL) to be taken at a single administration. [updated definition in QDM 5.6]	• "Immunization, Administered" • "Immunization, Order" • "Medication, Active" • "Medication, Administered" • "Medication, Dispensed" • "Medication, Order" • "Medication, Discharge" • "Substance, Administered" • "Substance, Order" • "Substance, Recommended"	• 0.. 1
facility location *facility locations*	The particular locations in a facility in which the diagnostic study or encounter occurs or occurred. Examples include intensive care units (ICUs), non-ICUs, burn critical care unit, neonatal ICU, and respiratory care unit. Each "Encounter, Performed" may have one or more locations. For example, a patient treated in multiple locations during an individual encounter might be expressed as: ▪ "Encounter, Performed": Inpatient Admission, *facility locations* ○ ICU (*locationPeriod*) ○ Non-ICU Admission (*locationPeriod*) ○ Rehab (*locationPeriod*)	• "Adverse Event" • "Diagnostic Study, Performed" • "Encounter, Order" • "Encounter, Performed" • "Encounter, Recommended"	• 0.. 1 (singular) for all except "Encounter, Performed" • 0.. * (plural) for "Encounter, Performed"

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For clarification about the addition of the word much to the definition, see Appendix B.8 with 2020 guidance about this change.¶

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Attribute	Definition	Datatype(s) or Entities	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

id	The identifier of a specific instance of any QDM data element. CQL logic uses the *id* reference to specify that a query expects a specific instance of an element to be retrieved. See Section 5.8 for examples for using *id* to indicate specific instances of QDM data elements in CQL statements with the *relatedTo* attribute.	• "Adverse Event" • "Allergy/Intolerance" • "Assessment, Order" • "Assessment, Performed" • "Assessment, Recommended" • "Patient Experience" • "Provider Care Experience" • "Care Goal" • "Communication, Performed" • "Diagnosis" • "Device, Applied" • "Device, Order" • "Device, Recommended" • "Diagnostic Study, Order" • "Diagnostic Study, Performed" • "Diagnostic Study, Recommended" • "Encounter, Order" • "Encounter, Performed" • "Encounter, Recommended" • "Family History" • "Immunization, Administered" • "Immunization, Order" • "Patient Characteristic" • "Patient Characteristic, Birthdate" • "Patient Characteristic, Clinical Trial Participant" • "Patient Characteristic, Ethnicity" • "Patient Characteristic, Expired"	• 0..1

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		• "Patient Characteristic, Payer"
		• "Patient Characteristic, Race"
		• "Patient Characteristic, Sex"
		• "Intervention, Order"
		• "Intervention, Performed"
		• "Intervention, Recommended"
		• "Laboratory Test, Order"
		• "Laboratory Test, Performed"
		• "Laboratory Test, Recommended"
		• "Medication, Active"
		• "Medication, Administered"
		• "Medication, Discharge"
		• "Medication, Dispensed"
		• "Medication, Order"
		• "Participation"
		• "Physical Exam, Order"
		• "Physical Exam, Performed"
		• "Physical Exam, Recommended"
		• "Procedure, Order"
		• "Procedure, Order"
		• "Procedure, Recommended"
		• "Substance, Administered"
		• "Substance, Order"
		• "Substance, Recommended"
		• "Symptom"
		• QDM Entities:
		  ○ Patient
		  ○ Care Partner
		  ○ Practitioner
		  ○ Organization	

Attribute	Definition	Datatype(s) or Entities	Cardinality

identifier	External identifiers for the QDM Entity (Patient, Care Partner, Practitioner or Organization) and the QDM datatype "Related Person". Unless specified in program or measure-specific guidance, eCQMs generally allow implementers to use local identifiers for such individuals or organizations. Program or measure-specific guidance may specify a required identification system (e.g., National Provider Identifier [NPI] for practitioners, or CMS Certification Number [CCN] for hospitals).	• "Related Person"
		• QDM Entities:
		  ○ Patient
		  ○ Care Partner
		  ○ Practitioner
		  ○ Organization
			• 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
interpretation	A categorical assessment of an observation value. For example, high, low, normal, critical high, critical low.	• "Laboratory Test, Performed"	• 0.. 1
length of stay	The difference between 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
linkedPatientId	The instance identity for a specific Patient instance that is the Patient record for this "Related Person". CQL logic uses the *linkedPatientId* to establish the context identity when expressing a query to a related patient context.	• "Related Person"	• 0.. 1

locationPeriod	The time the patient arrived at the location to the time the patient departed from the location. Each "Encounter, Performed" may have one or more *facility locations*. For example, a patient treated in multiple *facility locations* during an individual encounter might be expressed as:
	▪ "Encounter, Performed": Inpatient Admission *facility locations*
	  ○ ICU (*locationPeriod*)
	  ○ Non-ICU Admission (*locationPeriod*)
	  ○ Rehab (*locationPeriod*)
		• "Encounter, Performed"	• 0.. 1

Attribute	Definition	Datatype(s) or Entities	Cardinality
	locationPeriod is used with a *code* for the location. The pair of *code* and *locationPeriod* is associated with each item in the *facility locations* list attribute.		
medium	A channel used for a communication (e.g., fax, email)	• "Communication, Performed"	• 0.. 1
method	Indicates the procedure or technique used in its performance.	• "Assessment, Performed" • "Diagnostic Study, Performed" • "Laboratory Test, Performed • "Physical Exam, Performed" • "Procedure, Performed"	• 0.. 1
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 versus lack of documentation about allergies). QDM assumes a world view that absence of evidence indicates information does not exist or an action did not happen. To express such lack of evidence, an eCQM author should use the CQL expression *not exists* with reference to the data element rather than the QDM data model. *negation rationale* in QDM signifies *only* a *reason* for such absence, i.e., the *reason* must be present to qualify for *negation rationale*. The syntax in the human readable HQMF is addressed in CQL examples and in the MAT User Guide. Prior versions of QDM used the syntax, "Procedure, Performed *not done*." QDM versions starting with 5.3 use the syntax, "Procedure, not Performed." Section A-5 provides examples for expressing negation rationale in CQL.	• "Assessment, Order" • "Assessment, Performed" • "Assessment, Recommended" • "Communication, Performed" • "Device, Applied" • "Device, Order" • "Device, Recommended" • "Diagnostic Study, Order" • "Diagnostic Study, Performed" • "Diagnostic Study, Recommended" • "Encounter, Order" [QDM 5.6 retires the use of *negation rationale* for QDM datatype "Encounter, Peformed". Rationale provided in section 6.2.]	• 0.. 1

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Attribute	Definition	Datatype(s) or Entities	Cardinality
	Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*. For updated guidance and implementer feedback regarding use of the QDM *negation rationale* attribute see Section 6.6.	• "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" • "Physical Exam, Order" • "Physical Exam, Performed" • "Physical Exam, Recommended" • "Procedure, Order" • "Procedure, Performed" • "Procedure, Recommended" • "Substance, Administered" • "Substance, Order" • "Substance, Recommended"	
Ordinality (retired)	*ordinality* has been removed as an attribute since QDM version 5.5. Its only use had been to reference principal procedures. The attribute *rank* allows an integer indicating the order in a series in procedure-related QDM datatypes and in the "Encounter, Performed" *diagnosis* attribute as a component. *rank* = 1 refers	• See the attribute *rank*	• NA

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Attribute	Definition	Datatype(s) or Entities	Cardinality
	to a principal diagnosis or a principal procedure. See *rank* in the attribute table.		
participant	*participant* references a practitioner or the organization taking part in an encounter. For the purpose of QDM, participant references the primary performer, i.e., restricted to the principal or primary participant in the encounter. The *participant* attribute references the new QDM entities (Patient, Care Partner, Practitioner, or Organization) and any or all the attributes of the respective QDM entity. For example, to reference that the physician who was the primary participant (performer) of an encounter, was also the *requester* of a "Medication, Order", and assure the physician's specialty meets the measures requirements the eCQM can use the Practitioner entity and its attributes. The eCQM could also reference a physician practice or a hospital as the participant and reference the Organization entity and indicate the identifier and/or the organization type. [See Section 2.6 for description of Entities]	• "Encounter, Performed"	• 0.. 1
participationPeriod	The time from: • *enrollmentStartdate* – The time the patient enrolled in the program. *to* • *enrollmentEnddate* – The time the patient's enrollment in the program ends. Note: *participationPeriod* references the QDM datatype "Participation", representing a patient's coverage by a program such as an insurance or medical plan or a payment agreement. The *participationPeriod* is not to be confused with the QDM *participant* attribute used with the "Encounter, Performed" QDM datatype.	• "Participation"	• 0.. 1
performer	The *performer* is the person or organization that is responsible for the action (e.g., the individual or organization carrying out the activity). The *performer*	• "Assessment, Performed" • "Device, Applied"	• 0.. 1

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Attribute	Definition	Datatype(s) or Entities	Cardinality
	references a QDM entity and any or all of the attributes of the selected QDM entity. For example, to reference that a physician who performed a procedure is the same person who was the primary *participant* in an Encounter and assure the physician's specialty meets the measure's requirements, the eCQM can reference the Practitioner entity and its attributes. Should the eCQM choose to reference a physician practice or a hospital, the performer can reference the Organization entity and indicate the identifier and/or the organization type. [See Sections 2.6 and 4.2 for description of Entities]	• "Diagnostic Study, Performed" • "Care Goal" • "Intervention, Performed" • "Immunization, Administered" • "Laboratory Test, Performed" • "Medication, Administered" • "Physical Exam, Performed" • "Procedure, Performed" • "Substance, Administered"	
prescriber	The person who ordered the prescription. The *prescriber* attribute references the new QDM entities (Patient, Care Partner, Practitioner, or Organization) and any or all of the attributes of the respective QDM entity. For example, to reference that a physician who prescribed a medication is the same person who was the primary *participant* in an Encounter and assure the physician's specialty meets the measures requirements, the eCQM can use the Practitioner Entity and its attributes. Should the eCQM choose to reference a physician practice or a hospital, the performer can reference the Organization Entity and indicate the identifier and/or the organization type. [See Section 2.6 for description of Entities]. The CQL can specify which identifier the measure expects to be used (e.g., NPI or Tax Identifier Number) or it can avoid referencing an identifier to allow the implementing organization or practice to use its own identifier.	• "Medication, Order" • "Medication, Dispensed" • "Medication, Discharge"	• 0..1
presentOnAdmissionIndicator	The Diagnosis Present on Admission (POA) is an indicator assigned to Inpatient Encounter diagnoses and is used in quality and patient safety measures. QDM references this indicator as	• "Encounter, Performed" (component of *diagnosis* attribute)	• 0..1

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Attribute	Definition	Datatype(s) or Entities	Cardinality
	a component of each "Encounter, Performed" *diagnosis* attribute. At the time of publication of QDM 5.6, two LOINC concepts reference this item: 89251-3 (condition present on admission – used in the wound assessment model) and 78026-2 (diagnosis present on admission – used in C-CDA). The full set of allowable values in the UB-04[23] standard include: **Y** - Diagnosis was present at the time of admission **N** - Diagnosis was not present at the time of admission **U** - Documentation insufficient to determine if condition was present at the time of inpatient admission **W** - Clinically undetermined. Provider unable to clinically determine whether the condition was present at the time of inpatient admission **1** – Unreported/not used (exempt from POA reporting – equivalent to a blank on the UB-04 form)		
prevalencePeriod	*prevalancePeriod* is the time from *onset dateTime* to *abatement dateTime*.	• "Allergy/Intolerance" • "Diagnosis" • "Symptom"	• 0.. 1

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[23] CMS UB04 Uniform Bill. Information available at: https://www.cms.gov/Medicare/CMS-Forms/CMS-Forms/CMS-Forms-Items/CMS1196256.html. Accessed 27 March 2019.

Attribute	Definition	Datatype(s) or Entities	Cardinality
principal diagnosis **(retired)**	*principal diagnosis* is no longer included as an attribute in QDM. The "Encounter, Performed" diagnosis component, *rank,* allows specification of an encounter diagnosis with a rank of 1 to indiate a principal diagnosis. The updated modeling in QDM 5.6 reduces the need for redundancy as implementers previously had to report the same diagnosis as a principal diagnosis and an encounter diagnosis. Thus, any encounter diagnosis can be expressed and reported once with its respective code and, if requested an indication of *rank* (integer = 1 for principal diagnosis) and present on admission indicator (defined with a code or value set). *principal diagnosis* refers to the coded diagnosis/problem established after study to be chiefly responsible for occasioning the admission of the patient to the hospital for care.	• See "Encounter, Performed" diagnosis attribute components	• 0.. 1
priority	*priority* indicates the urgency of the procedure or the encounter referenced. In eCQMs the *priority* attribute will help specify elective from urgent encounters (e.g., hospital admissions) or procedures. *priority* is a codable concept (i.e., may use a direct reference code or a value set). For example, priority is used to express an elective procedure or encounter from an emergency procedure or encounter.)	• "Encounter, Order" • "Encounter, Performed" • "Procedure, Order" [QDM 5.6 retires the use of the *priority* attribute for "Procedure, Performed". Rationale provided in section 6.5.]	• 0.. 1
rank	*rank* defines a position in a hierarchy for diagnoses or procedures. It replaces *ordinality* previously assigned to "Procedure, Performed", "Procedure, Order", and "Procedure, Recommended". *ordinality* does not align with any FHIR resources; it does align with definitions for FHIR encounter.diagnosis. Thus, the concept fits best consistently across QDM for the concept of principal for encounter diagnosis and for procedure.	• "Encounter, Performed" (*diagnosis component*) • "Procedure, Order" • "Procedure, Performed" • "Procedure, Recommended"	• 0..1

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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, Order" • "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"	• 0.. 1

Attribute	Definition	Datatype(s) or Entities	Cardinality
		• "Substance, Order" • "Substance, Recommended"	
received dateTime	The time a communication was received.	• "Communication, Performed"	• 0..1
recipient	The entity (e.g., person, organization, clinical information system, or device) which is the target of a communication. The recipient attribute references the new QDM entities (Patient, Care Partner, Practitioner, or Organization) and any or all of the attributes of the respective QDM entity.	• "Communication, Performed"	• 0..1
recorder	The recorder indicates who recorded (or documented) the information (e.g., the individual or organization documenting the information). Note that HL7 FHIR modeling includes reference to *asserter* for concepts such as diagnosis and Allergy/Intolerance. Feedback from implementers and EHR vendors suggest that asserter fields default to the individual entering the information without clear evidence about how often clinicians change the default to the person who reported the information. Therefore, QDM retains a *recorder* attribute for the referenced QDM datatypes. The prescriber attribute references the new QDM entities (Patient, Care Partner, Practitioner, or Organization) and any or all of the attributes of the respective QDM entity. For example, to reference that a physician who recorded a diagnosis is the same person who was the primary participant in an "Encounter, Performed" and assure the physician's specialty meets the measure's requirements, the eCQM can use the Practitioner Entity and its attributes. Should the eCQM choose to reference a physician practice or a hospital, the performer can reference the Organization Entity and indicate the identifier and/or the organization type. [See Section 2.6 for description of Entities]	• "Adverse Event" • "Allergy/Intolerance" • "Patient Care Experience" • "Provider Care Experience" • "Diagnosis" • "Family History" • "Medication, Active" • "Medication, Discharge" • "Symptom"	• 0..1

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Attribute	Definition	Datatype(s) or Entities	Cardinality
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
relatedTo	An attribute that indicates one QDM data element fulfills the expectations of another QDM data element. See Section 5.8 for examples for using *relatedTo*.	• "Care Goal" • "Communication, Performed" • "Assessment, Performed" • "Procedure, Performed"	• 0.. *
relationship	The *relationship* of the family member or related person 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" • "Related Person"	• 0.. 1

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Attribute	Definition	Datatype(s) or Entities	Cardinality
relevant dateTime	*relevant dateTime* addresses the time an activity occurs as a single point in time. If the activity occurs over a period of time, use *relevantPeriod*.	• "Adverse Event" • "Assessment, Performed" • "Device Applied" • "Diagnostic Study, Performed" • "Immunization, Administered" • "Intervention, Performed" • "Laboratory Test, Performed" • "Medication, Active" • "Medication, Administered" • "Medication, Dispensed" • "Physical Exam, Performed" • "Procedure, Performed" • "Substance, Administered" • "Substance, Order"	• 0.. 1

Attribute	Definition	Datatype(s) or Entities	Cardinality
relevantPeriod	*relevantPeriod* addresses the time between the start of an action to the end of an action. Each QDM datatype using *relevantPeriod* defines specific definitions for the start and stop time for the action listed. Note: *negation rationale* indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a reason always use the *author dateTime* attribute to reference timing and must not use *relevantPeriod*	• "Assessment Performed" • "Care Goal" • "Device, Applied" • "Diagnostic Study, Performed" • "Encounter, Performed" • "Intervention, Performed" • "Laboratory Test, Performed" • "Medication, Active" • "Medication, Administered" • "Medication, Order" • "Patient Characteristic, Payer" • "Physical Exam, Performed" • "Procedure, Performed" • "Substance, Administered" • "Substance, Order"	• 0.. 1
requester	The *requester* is who or what is requesting service (e.g., the individual or organization asking for the service to be carried out). The *requester* attribute references the new QDM entities (Patient, Care Partner, Practitioner, or Organization) and any or all of the attributes of the respective QDM entity. For example, to reference that a physician who requested a procedure is the same person who was the primary *participant* in an "Encounter, Performed" and assure the physician's specialty meets the measures requirements, the eCQM can use the Practitioner Entity and its attributes. Should the eCQM choose to reference a physician practice or a hospital, the performer can reference the Organization Entity and indicate the identifier and/or the organization type. [See Section 2.6 for description of Entities.]	• "Assessment, Order" • "Assessment, Recommended" • "Device, Order" • "Device, Recommended" • "Diagnostic Study, Order" • "Diagnostic Study, Recommended" • "Encounter, Order • "Encounter, Recommended" • "Immunization, Order" • "Intervention, Order" • "Intervention, Recommended" • "Laboratory Test, Order"	• 0.. 1

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Attribute	Definition	Datatype(s) or Entities	Cardinality
		• "Laboratory Test, Recommended" • "Physical Exam, Order" • "Physical Exam, Recommended" • "Procedure, Order" • "Procedure, Recommended" • "Substance, Order" • "Substance, Recommended"	

result	The final consequences or data collected from the datatype. *results* can be used in four ways to express:
	• That a *result* is present in the electronic record but any entry is acceptable
	• A numerical *result* is reported directly as a value. Values may be integers or decimal numbers without units, or as a quantity with a value and units – examples:
	  ○ 100 mg/dL for a lab test
	  ○ 140 mmHg for blood pressure
	  ○ as a percentage (actually a quantity with % as units)
	  ○ as a titer or ratio (e.g., 1:4, 1:80)
	• A *result* that matches one of a specific set of coded concepts in a value set or a code that matches a direct reference code
	• A *result* as a *dateTime* ("Assessment, Performed" and components)
		• "Assessment, Performed"
		• "Diagnostic Study, Performed"
		• "Intervention, Performed"
		• "Laboratory Test, Performed"
		• "Physical Exam, Performed"
		• "Procedure, Performed"
			• 0.. 1

result dateTime	The date and time this version of the observation was made available to providers, typically after the results have been reviewed and verified. [updated definition in QDM 5.6]	• "Diagnostic Study, Performed" • "Laboratory Test, Performed"	• 0.. 1

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In the original QDM 5.5 publication, *result dateTime* stated: the time the result report is generated and saved in the database. **See Appendix B.10 for clarification regarding the definition of *result dateTime*.**

Attribute	Definition	Datatype(s) or Entities	Cardinality
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" • "Medication, Order" • "Substance, Administered" • "Substance, Order" • "Substance, Recommended"	• 0.. 1
sender	The entity (e.g., person, organization, clinical information system, or device) that is the source of a communication. The *sender* attribute references the new QDM entities (Patient, Care Partner, Practitioner, or Organization) and any or all of the attributes of the respective QDM entity.	• "Communication, Performed"	• 0.. 1
sent dateTime	The time a communication was sent.	• "Communication, Performed"	• 0.. 1
setting	Where the medication is expected to be consumed or administered. Examples: • Inpatient – in the hospital during the current inpatient stay • Outpatient – in an outpatient facility such as an ambulatory surgical center • Community – in the ambulatory setting (e.g., at home)	• "Medication, Order"	• 0.. 1
severity	Indicates the intensity of the specified datatype (e.g., persistent, moderate, or severe).	• "Allergy/Intolerance" • "Adverse Event" • "Diagnosis" • "Symptom"	• 0.. 1

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Attribute	Definition	Datatype(s) or Entities	Cardinality
status	Indicates the particular stage of the action represented by the datatype.	• "Diagnostic Study, Performed" • "Intervention, Performed" • "Laboratory Test, Performed" • "Procedure, Performed"	• 0.. 1
status date	The date a "Care Goal" was updated and/or changed status.	• "Care Goal"	• 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) indicated to be given during a procedure, diagnostic test, or medication, or substance administration 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, Discharge" includes medications the provider has indicated the patient should take after discharge from the hospital. This medication list is part of the discharge instructions provided to a patient. The list may include medication supply if it incorporates medication orders written at discharge even though the supply will not be present for medications the patient already has at home or purchases over-the-counter (without a prescription).	• "Medication, Discharge" • "Medication, Dispensed" • "Immunization, Order" • "Medication, Order" • "Substance, Order"	• 0.. 1
target outcome	The expected outcome that will indicate the "Care Goal" is achieved or met. The *target outcome* can be expressed using a code, integer, decimal, quantity (value and units), or ratio.	• "Care Goal"	• 0.. 1

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

5. Special Cases for Consideration

5.1 Use of Components Attributes

5.2 "Laboratory Test, Performed" Example Showing *components*

Figure 3 in Section 2.5 uses the components attributes for "Laboratory Test, Performed" as:

"Laboratory Test, Performed": Antinuclear Antibody Test

- *components*: ANA Homogeneous Pattern (result >= 1:80)
- *components*: ANA Speckled Pattern (result >= 1:80)

5.3 "Encounter, Performed" Example Showing *facility locations*

QDM 5.6 models the facility locations attribute in the same way as components. "Encounter, Performed" as:

"Encounter, Performed": Inpatient Admission (*relevantPeriod*)

- *facility locations*: ED (*locationPeriod*)
- *facility locations*: MedSurg (*locationPeriod*)
- *facility locations*: ICU (*locationPeriod*)

5.4 Describing Results Associated with *components*

The *components* attribute can be used with:

- "Assessment, Performed"
- "Diagnostic Study, Performed"
- "Laboratory Test, Performed"
- "Physical Exam, Performed"
- "Procedure, Performed"

When specifying a measure and determining components, the measure developer should consider the method for specifying results. As noted in Section 4.3, Table 29. QDM Attribute Definitions, results may be reported in several ways:

- That a result is present in the electronic record, but any entry is acceptable.
- A numerical result is reported directly as a value (e.g., 100 mg/dL for a lab test, 140 mmHg for blood pressure) or as a ratio (e.g., 1:4, 1:80). A value is not limited to integers; it can reference fractions (decimals). Beginning with QDM 5.3 measures use CQL logic to express the mathematical operators to constrain desired results to those above or below a certain threshold.
- 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").

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5.5 Describing "Encounter, Performed" *diagnoses* with *components*

The QDM datatype "Encounter, Performed" *diagnoses* attribute now has three components. The first component is *diagnosis (code)* defining the diagnosis that must be addressed during the encounter to meet the measure criteria. The *diagnosis (code)* component is required to express an encounter diagnosis in CQL. The second component is *presentOnAdmissionIndicator* defining whether the encounter diagnosis was present at the time of admission. This component is optional and suggested only for measure expressions that need to differentiate present on admission (POA) status. POA reporting is required for all claims involving inpatient admissions to general acute care hospitals.[24] The third component is *rank*, the position of a diagnosis or procedure in a hierarchy. An encounter diagnosis with a *rank* = 1 is equivalent to the principal diagnosis, the condition that, after study, was the cause of a hospitalization. Use of the *rank* encounter *diagnosis* component is only necessary when a measure expression must reference a principal diagnosis. To recap, an encounter diagnosis has 3 components – *diagnosis (code)*, *presentOnAdmissionIndicator (code)*, and *rank*.

QDM 5.4 reference to "Encounter, Performed" *diagnoses* were expressed as:

```
define "Encounter With Ischemic Stroke Diagnosis":
  ["Encounter, Performed": "Inpatient"] E
    where exists (E.diagnoses D where D in "Ischemic Stroke")
```

QDM 5.5 and 5.6 require the expression to request an "Encounter, Performed" *diagnosis*:

```
define "Encounter With Ischemic Stroke Diagnosis":
  ["Encounter, Performed": "Inpatient"] E
    where exists (E.diagnoses D where D.code in "Ischemic Stroke")
```

[Note the additional requirement for D.code in the expression)]

QDM 5.5 and 5.6 also allow reference to a *presentOnAdmissionIndicator*. Looking for a *presentOnAdmissionIndicator*:

```
define "Encounter With Ischemic Stroke Diagnosis Present On Admission":
["Encounter, Performed": "Inpatient"] E
    where exists (E.diagnoses D where D.code in "Ischemic Stroke"
      and D.presentOnAdmissionIndicator in "Present on Admission"
```

5.6 Specifying Results with Value Sets

When combining observable entities (assessments, diagnostic studies, laboratory tests, physical exams) or procedures into value sets, the method for specifying results may dictate whether similar sounding entities can be included in the same value set. Specifically, to constrain data elements for a measure to numerical results in the normal range, each test within the value set should define normal the same way. Since only observable entities with similar definitions of normal or abnormal can be grouped together, the measure may require different data elements to define tests, each with its respective result constraints.

Example:

Here are Lyme disease antibody tests identified by LOINC codes with three methods for reporting results. Hence, if the measure needs to constrain a result to a positive or negative response using the numerical value, the three types of tests cannot be included in the same value set. Three different data elements would be required in such an instance.

1. "Laboratory Test, Performed": Lyme Disease Presence

[24] https://www.cms.gov/medicare/medicare-fee-for-service-payment/hospitalacqcond/coding.html. Last Accessed April 2019

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- Value set:
  - 11006-4 Borrelia burgdorferi Ab [Presence] in Serum
  - 26006-7 Borrelia burgdorferi Ab [Presence] in Serum by Hemagglutination
- *result* can be reported as present or positive versus absent or negative

2. "Laboratory Test, Performed": Lyme Disease IgG/IgM ratio
   - Value set (example):
     - 41279-1 Borrelia burgdorferi IgG/IgM Ab [Ratio] in Serum
   - *result* can be reported as a ratio
3. "Laboratory Rest, Performed": Lyme Disease Ab
   - Value set (example):
     - 22121-8 Borrelia burgdorferi Ab [Units/volume] in serum
   - *result* can be reported in units/volume

Another option is to represent the results of a set of observable entities using SNOMED CT concepts for positive and negative results and require the local implementation site to interpret results that match the measure criteria. This option may be necessary in situations where the normal ranges vary by site.

Note, these considerations apply only when using value sets for observable entities with QDM datatypes or attributes. QDM datatypes that use direct reference codes have only one code and, by definition, only one result or response method.

When unsure how to proceed with respect to using value sets, consult with a terminologist.

5.7 Evaluating Cumulative Medication Duration

Cumulative medication duration (CMD) is the duration of medication therapy in days for a specific course of treatment. This concept is distinctly different than the lifetime cumulative dose that evaluates the total of all doses of a medication administered over the course of a patient's lifetime. Lifetime cumulative dose is significant especially with respect to agents that cause significant toxicity above known thresholds, for example, the risk of developing congestive heart failure with cumulative doses of doxorubicin exceeding 400 mg/m^2.[25] Such calculation requires information about all doses ever provided to the patient; it is not the subject of this section. This section will focus only on the cumulative medication duration that represents a specific course of treatment.

Two scenarios have presented for existing measures:

- A physician should not order more than 90 days' supply for some medications for patients $\geq$ 65 years.
- A patient discharged from the hospital with a principal diagnosis of major depressive disorder should receive medication to treat depression for at least 180 days after the discharge.

5.7.1 Options for determining CMD include:

- Use "Medication, Order" – This QDM datatype addresses medication order or prescriptions as written by the provider, i.e., the amount of medication supply available to the patient and the length of time addressed by that supply based on the frequency of planned administration and the number of available refills. The order is generally the most directly available information from an EHR even though the patient may not fill the

[25] Doxorubicin profile, Drugs.com. Available at: https://www.drugs.com/pro/doxorubicin.html. Last accessed April 2019.

prescription or the refills, and actual administration (or self-administration) may differ from the anticipated frequency and duration.

- Use "Medication, Dispensed" – This QDM datatype addresses the amount of the medication order that has been fulfilled, i.e., the quantity the patient received. While closer to administration, dispensed medication does not necessarily mean the patient's self-administration will mirror the anticipated frequency or duration.
- Use "Medication, Administered" – This QDM datatype addresses the medication used to treat the condition identified. The information is generally available for medication administered by a clinician or direct observed therapy during which a clinician watches a patient take the drug. Alternatively, a patient's documentation of self-administration might be used if it were available.

5.7.2 CMD Data Validity and Reliability Considerations

All these calculations are confounded by changes to the medication regimen that occur based on telephone discussions between the patient and physician and unstructured clinical notes to represent the changes. Measure developers should address these issues when determining the feasibility, validity, and reliability of their measures.

Data quality may impact measure reliability in determining a clinician's compliance with expected prescribing guidelines. Measure developers using cumulative medication duration that relies on medication order frequency data should evaluate the impact of conflicting or missing data in the prescription. Surescripts' analysis of 26,341 prescriptions found 66.1% with inappropriate content including 19% with patient directions (i.e., free text instructions) that conflicted with directions included in the designated standard structured field intended for that purpose.[26] Each measure developer should evaluate validity and reliability of the data during measure testing; the QDM data model and CQL expressions cannot evaluate such data quality issues. Note, the measure developer can use a CQL expression to request information about data that are missing or inconsistent with accepted standards-based content.

5.7.3 Calculating CMD

5.7.3.1 CMD for Medication, Order

1. Preferred Method - Calculate based on start and stop times (*relevantPeriod*) for "Medication, Order".

    - *relevantPeriod* for "Medication, Order" is defined as:
        - *startTime* = when the first administration of the medication is expected. The first administration may be expected at the time of the order or at a specified future date (i.e., the active time for the order); such information should be identified in the medication order. If the *startTime* is not specified in the order, the *startTime* defaults to the *author dateTime* (the time the order is signed).
        - *stopTime* = when the medication supply provided by the medication order is expected to be completed, including all fulfillments covered by the number of refills.

[26] Dhavle AA, Yang Y, Rupp MT, *et. al.* Analysis of prescriber's notes in electronic prescriptions in ambulatory practice, *JAMA Intern Med.* 2016;176(4):463-470. Available at: http://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2498845. Last accessed April 2019.

Note that when calculating cumulative medication duration, the *stopTime* may be present directly in the medication order. If the *stopTime* is not available, the duration in days is the difference between the *relevantPeriod* start and stop times multiplied by (1 + the number of refills).

- CMD = [end of *relevantPeriod* – start of *relevantPeriod*]
  Result provided in days.

2. Alternate, Non-preferred Method - Calculate based on frequency and supply

- CMD = [# doses prescribed (*supply*) / daily *frequency*] X [1 + # *refills*]

This option uses existing QDM attributes, but it is complex since frequency is listed as an abbreviation or phrase (e.g., every 8 hours, q8 hours, TID). The representation may vary by site and must be translated into the number of doses per day.
Uses existing attributes, but too complex and inconsistent data availability.

5.7.3.2 CMD for "Medication, Dispensed"

- *relevantPeriod* for "Medication, Dispensed" addresses:
  - *startTime* = when the first administration of the medication is expected. If not specified. the *startTime* defaults to the *author dateTime* (the time the dispensing event is documented).
  - *stopTime* = when the medication supply provided by the dispensing event is expected to be completed.

Note that when calculating cumulative medication duration, the medication dispensed *stopTime* may be present directly in the fulfillment record. If the *stopTime* is not available, the duration in days is the difference between the *relevantPeriod* start and stop times. The record may indicate which of the available refills the fulfillment represents, but each dispensing event is unique. Therefore, the measure developer should use CQL logic to address multiple dispensing events over a period of time.

- CMD = the sum of all dispensing events with each event providing [end of *relevantPeriod* – beginning of *relevantPeriod*] in days.

5.7.3.3 CMD for "Medication, Administered"

- The *relevantPeriod* 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).

Measure developers should address multiple administrations over a period of time using CQL logic. CMD = [date of last "Medication, Administered" – date of first "Medication Administered"].

5.7.3.4 Cumulative Medication Duration Examples

- "Medication, Dispensed": Ibuprofen 500 mg every 8 hours to begin after dental procedure in one week from the order date and continue for 20 days with 2 refills, dispense 60.

- *relevantPeriod* start --- *effectiveTime* low = date dispensed.
- *relevantPeriod* end --- *effectiveTime* high = date dispensed plus 20 days.

Cumulative medication duration = 20 days (*effectiveTime* high date - *effectiveTime* low date). Must sum each dispensing event to = 60 days.

- "Medication, Order": Ibuprofen 800 mg every 8 hours (no start date noted so assume start = now) for 10 days with 1 refill, dispense 30.
  - *relevantPeriod* start --- effectiveTime low = today's date.
  - *relevantPeriod* end --- effectiveTime high = today's date + 10 days + 1 refill of 10 days.

  Cumulative medication duration = 20 days.
- "Medication Order": Ibuprofen 800 mg every 12 hours (no start date noted so assume start – now) for 7 days (no refill), dispense 14.
  - *relevantPeriod* start --- *effectiveTime* low = today's date.
  - *relevantPeriod* end --- *effectiveTime* high = today's date + 7 days + no refills.

  Cumulative medication duration = 14 days.

Note, the calculation subtracts the end date from the start date and provides a result in number of calendar days. Example:

> Ibuprofen 800 mg every 12 hours, dispense 14 written at 17:00 on August 7 would include *start dateTime* as 201708071700 and the *end dateTime* as 20170814. For this example, the calculated result is August 14 minus August 7 = 7 days. Note that, because the *start dateTime* is specified to the minute (17:00), the calculation could result in uncertainty between 6 and 7 days because durations are whole calendar periods. Thus, to achieve 7 days requires the *end dateTime* to include 17:00 as well.

5.8 Use of *relatedTo* Attribute

The *relatedTo* attribute allows an expression to indicate that one QDM data element fulfills the expectations of another QDM data element. The attribute is allowed for datatypes:

- "Assessment, Performed"
- "Communication, Performed"
- "Care Goal"
- "Procedure, Performed"

The item to which the QDM data element is *relatedTo* must be expressed by any fully defined QDM data element including its datatype and associated value set or direct reference code and any required attributes. A QDM data element cannot be directly *relatedTo* an attribute. This item (i.e., *relatedTo* QDM datatype:code) is identified in the CQL as an instance identifier (i.e., a specific instance of the activity defined by the QDM data element). The instance identifier is identified as .id as shown in two examples using CQL expressions.

5.9 Referral Management

Assess whether a specialist consultation has been performed as ordered for a patient with newly diagnosed hepatitis C. Based on workflow practices, measure developers have evaluated the use of "Encounter, Order", "Intervention, Order", and "Communication, Performed" to express the

request for a consult and receipt of the resulting consult report. Since adding the QDM datatype "Assessment, Performed", the resulting consult report is more appropriately referenced as an assessment. Three examples show the use of "Intervention, Order", "Encounter, Order", and "Communication, Performed" to express referral management. Note the use of the *reason* attribute to indicate the reason, or topic of the consult. "Intervention, Order" or "Encounter, Order" may be more consistent with requests for consults as managed in clinical software. Measure developers should assess feasibility for retrieving the level of detail desired.

5.9.1 Referral Management using "Intervention, Order"

```
define "Referral":
["Intervention, Order": "Patient referral to specialist[a]"] R

define "Assessment":
["Assessment, Performed": "Consultation[b] (reason: chronic hepatitis C
disorder[c]"] A

define "Fulfills With Assessment":
"Assessment" A
where exists ("Referral" R where R.id in A.relatedTo)
```

5.9.2 Referral Management using "Encounter, Order"

```
define "Referral":
["Encounter, Order": "Patient referral to specialist[a]"] R

define "Assessment":
["Assessment, Performed": "Consultation[b] (reason: chronic hepatitis C
disorder[c]"] A

define "Fulfills With Assessment":
"Assessment" A
where exists ("Referral" R where R.id in A.relatedTo)
```

5.9.3 Referral Management using "Communication, Performed"

```
define "Referral":
["Communication, Performed": "Patient referral to specialist[a]"] R

define "Assessment":
["Assessment, Performed": "Consultation[b] (reason: chronic hepatitis C
disorder[c]"] A

define "Fulfills With Assessment":
"Assessment" A
where exists ("Referral" R where R.id in A.relatedTo)
```

5.9.4 Assess if a "Care Goal" of weight loss has been established for a patient with a diagnosis of essential hypertension

```
define "Essential Hypertension":
["Diagnosis": "Essential Hypertension[d]"] E
define "Care Goal":
["Care Goal": "Weight loss"[e]] C
define "Fulfills With Care Goal":
"Care Goal" C
where exists ("Diagnosis" E where E.id in C.relatedTo)
```

5.10 Expressing *negation rationale*

In some cases, CQL supports identifying when something has not occurred. In this case the condition, order, situation of interest would not be found in the patient record, because it has not occurred! Even so, the "thing not done or that has not occurred" will be represented in CQL by a direct reference code, or by a value set. The QDM attribute, *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). QDM assumes that any information expected will be in a clinical record. The situation is different when something that normally would be expected to be done is specifically not done because of a valid clinical reason (such as the patient is allergic, they are suffering from a complication, or some other rationale). In this case, the "thing not done" is rarely documented, especially as a code, in the patient record. To express such lack of evidence, an eCQM author should use a CQL *not exists* expression noted in the examples, and they must also capture the *negation rationale* to capture a reason for the absence, i.e., the *reason* must be included to qualify as a *negation rationale* type expression. The syntax in the human readable HQMF is described in CQL examples and in the MAT User Guide. Prior versions of QDM used the syntax, "Procedure, Performed not done." QDM 5.6 uses the syntax, "Procedure, not Performed" and this is then associated with either a direct reference code or a value set used to identify "the expected thing," that in this case was not done. The *negation rationale* attribute value indicates a one-time documentation of a reason an activity is not performed. Negation of QDM datatype-related actions for a *reason* always use the *author dateTime* attribute to reference timing.

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Table 30. *negation rationale* Expression in CQL

QDM Datatype	*negation rationale* Expression
"Assessment, Order"	"Assessment, Not Order"
"Assessment, Performed"	"Assessment, Not Performed"
"Assessment, Recommended"	"Assessment, Not Recommended"
"Communication, Performed"	"Communication, Not Performed"
"Device, Applied"	"Device, Not Applied"
"Device, Order"	"Device, Not Order"
"Device, Recommended"	"Device, Not Recommended"
"Diagnostic Study, Order"	"Diagnostic Study, Not Order"
"Diagnostic Study, Performed"	"Diagnostic Study, Not Performed"
"Diagnostic Study, Recommended"	"Diagnostic Study, Not Recommended"
"Encounter, Order"	"Encounter, Not Order"
"Encounter Recommended"	"Encounter Not Recommended"
"Immunization, Administered"	"Immunization, Not Administered"
"Immunization, Order"	"Immunization, Not Order"
"Intervention, Order"	"Intervention, Not Order"
"Intervention, Performed"	"Intervention, Not Performed"
"Intervention, Recommended"	"Intervention, Not Recommended"

Deleted: "Encounter, Performed"

QDM Datatype	*negation rationale* Expression
"Laboratory Test, Order"	"Laboratory Test, Not Order"
"Laboratory Test, Performed"	"Laboratory Test, Not Performed"
"Laboratory Test, Recommended"	"Laboratory Test, Not Recommended"
"Medication, Administered"	"Medication, Not Administered"
"Medication, Discharge"	"Medication, Not Discharge"
"Medication, Dispensed"	"Medication, Not Dispensed"
"Medication, Order"	"Medication, Not Order"
"Physical Exam, Order"	"Physical Exam, Not Order"
"Physical Exam, Performed"	"Physical Exam, Not Performed"
"Physical Exam, Recommended"	"Physical Exam, Not Recommended"
"Procedure, Order"	"Procedure, Not Order"
"Procedure, Performed"	"Procedure, Not Performed"
"Procedure, Recommended"	"Procedure, Not Recommended"
"Substance, Administered"	"Substance, Not Administered"
"Substance, Order"	"Substance, Not Ordered"
"Substance, Recommended"	"Substance, Not Recommended"

The examples differentiate methods to indicate (a) presence of evidence of an action, (b) absence of evidence of an action, and (c) *negation rationale* for not performing an action. In each case, the "action" is administration of a medication included within a value set for "Antithrombotic Therapy."

(a) Evidence that "Antithrombotic Therapy" (defined by a medication-specific value set) was administered:

```
define "Antithrombotic Administered":
    ["Medication, Administered": "Antithrombotic Therapy"]
AntithromboticTherapy
        where AntithromboticTherapy.code in "Antithrombotic Therapy"
```

(b) No evidence that "Antithrombotic Therapy" medication was administered:

```
define "No Antithrombotic Administration ":
    not exists (
            ["Medication, Administered": "Antithrombotic Therapy"]
      )
```

(c) Evidence that "Antithrombotic Therapy" medication administration did not occur for an acceptable medical reason as defined by a value set referenced by the eCQM (i.e., *negation rationale*):

```
define "Antithrombotic Not Administered":
    ["Medication, Not Administered": "Antithrombotic Therapy"]
NotAdministered
        where NotAdministered.negationRationale in "Medical Reason"
```

In this example for *negation rationale*, the logic looks for a member of the value set "Medical Reason" as the rationale for not administering the medication. However, underlying systems might not represent the negated action with a code from the "Antithrombotic Therapy" value set. When justifying the reason for not administering a class of medications, clinicians do not generally specify one of the medications in the class, they most often indicate avoidance of the

entire class. In these cases, the value set may be used as a placeholder to indicate the medication class was not administered. Implementations processing data reported in this way should take into account that the reported data may not be returned with a single code, but rather a value set identifier and should consider data with the appropriate value set identifier as satisfying the criteria for value set membership. Similarly, "Procedure, Not Performed": "Cardiac Surgery" should not require specification of which cardiac surgery in a value set was not performed, but only reference any member of the class of procedures defined by the value set. The same process works for any application of *negation rationale*.

6. Guidance

This guidance clarifies some issues identified through the ONC Project Tracking System, discussions in the QDM User Group, discussions with measure developers and implementers and the effort to align QDM with HL7 Quality Improvement (QI)-Core, US Core and Fast Healthcare Interoperability Resources® (FHIR). This information should improve QDM interpretation by implementers as FHIR Release 4.0.1 is recommended for clinical data interchange among clinical organizations in the ONC Interoperability Standards Advisory (ISA) and United States Core Data for Interoperability (USCDI).

6.1 "Device, Applied" retired

Rationale for retiring QDM datatype "Device, Applied" in version 5.6:

The QDM datatype "Device, Applied" led to misinterpretation of measure expressions and it is a duplicate concept to "Procedure, Performed" which is sufficient to indicate placement of an implantable device.

Suggested options to provide greater clarity for expressing device placement or usage include:

- The QDM datatype "Procedure, Performed" addresses
  - placement/insertion of a device, or
  - use/manipulation of a device for which the *result* attribute can reference the expected outcome of such use.
- The QDM datatype "Assessment, Performed" allows reference to an observation about device usage, stability, and presence.
- The QDM datatype "Diagnosis" allows reference to the existence of an implantable device on a problem list.
- The QDM datatype "Device, Order" enables reference to an order for the device with the *requester* attribute indicating the source of the order information (e.g., *requester* is practitioner if ordered by the physician; the *requester* is patient / Care Partner if the patient or caregiver reports the device is in use, i.e., not initiated by a clinician order for durable medical equipment).

HL7 FHIR Reference

HL7's QI-Core, US Core and FHIR further differentiate types of devices:

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Use of Device, Applied should be discouraged in favor of "Procedure, Performed", "Device, Order", "Assessment, Performed", "Diagnosis" as referenced in the rationale section.¶
Rationale:
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Deleted: since
Deleted: is basically a procedure and indication that a device is in use may be documented as an observation, a procedure indicating the type of usage, or a report from a patient or caregiver that a device is used.
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- Implantable Device – a device that is intended to be placed in a surgically or naturally formed cavity of the human body…for a continuous period of 30 days or more.[27] Also, any active medical device which is intended to be totally or partially introduced, surgically or medically, into the human body or by medical intervention into a natural orifice, and which is intended to remain after the procedure.[28]
- Non-implantable Device – not well defined except that this category represents everything other than implantable devices.
  - Devices used by clinicians for diagnostic or treatment purposes.
  - Patient-use or home use devices intended for users in any environment outside of a professional healthcare facility. This includes devices intended for use in both professional healthcare facilities and homes.[29]
    - A user is a patient (care recipient), caregiver, or family member that directly uses the device or provides assistance in using the device. Example from eCQMs – antithrombotic pneumatic devices designed to prevent thrombosis.
    - A qualified healthcare professional is a licensed or non-licensed healthcare professional with proficient skill and experience with the use of the device so that they can aid or train care recipients and caregivers to use and maintain the device. Examples include wheelchairs, glucometers, and continuous positive airway pressure (CPAP) devices.

Measure developers should always work with clinicians, implementers, and EHR vendors to determine which option is most consistent with clinical workflow to retrieve the information desired.

6.2 "Encounter, Performed", *negation rationale* attribute retired

Rationale for retiring "Encounter, Performed" *negation rationale* attribute:

No CMS program measures have used the "Encounter, Performed" *negation rationale* attribute. The QDM User Group did not identify a clear use case for evaluating a reason for encounters that have not occurred. There is no known clinical documentation to support an encounter that has not occurred for a reason (other than cancelled or no-show).

HL7 FHIR Reference

Existing QI-Core and base FHIR® Encounter resources have no mechanism to express an encounter that did not occur for a reason.

6.3 "Participation" *recorder* attribute retired

Rationale for retiring "Participation" *recorder* attribute:

The QDM User Group did not identify any use case for requesting information about the individual who recorded a patient's health plan coverage. Clinical software may only be able to determine the recorder of coverage information by performing a system audit.

[27] US Food and Drug Administration Center for Devices and Radiological Health. Home Use Devices. https://www.fda.gov/medical-devices/home-health-and-consumer-devices/home-use-devices. Accessed 13 March 2020.

[28] BSI Group. Active implantable medical devices: https://www.bsigroup.com/en-US/medical-devices/Technologies/Active-Implantable-Medical-Devices/. Accessed 13 March 2020.

[29] US Food and Drug Administration Center for Devices and Radiological Health. Home Use Devices. https://www.fda.gov/medical-devices/home-health-and-consumer-devices/home-use-devices. Accessed 13 March 2020.

Deleted: **Updated guidance¶**
Measure developers should refrain from expressing eCQMs with QDM "Encounter, Performed" *negation rationale*.¶

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Deleted: **<#>"Medication, Active" *relevantPeriod* attribute *stopTime*¶**
<#>Updated guidance¶
<#>"Medication, Active" *relevantPeriod stopTime* definition has been changed to "when the medication is no longer active."¶
<#>¶
<#>Rationale¶
<#>QDM 5.5 initial publication defined the QDM datatype "Medication, Active" *relevantPeriod stopTime* as "when the medication is discontinued (generally the time the discontinuation is recorded on the medication list)." The QDM User Group determined this definition to be confusing as removing a medication from the active list has several workflow-related challenges: ¶
<#>The medication may have lapsed based on medication dispensing events, but the patient may be taking it at a reduced frequency; thus, the patient remains on the medication even though it has lapsed.¶
<#>Some EHRs automatically remove medications from a medication list based on a locally determined time after it has lapsed.¶
<#>Without clearly matching orders from dispensing events, the actual number of remaining doses cannot be determined.¶
<#>Clinicians do not necessarily discontinue medications in the ambulatory setting; they remove them from the active medication list during medication reconciliation.¶
<#>Based on these considerations the User Group concluded the only way to address the end of the "Medication, Active" *relevantPeriod* is to indicate "When the medication is no longer active."¶
<#>HL7 FHIR Reference¶
<#>HL7 QI-Core addresses the medication list similar to US Core, using MedicationRequest.dosageInstruction.timing to indicate the expected time that medication should be expected to be administered. For the reasons indicated in the rationale using the expected end time for the medication is problematic. There are significant reasons why any given medications may be used less than or longer than the expected period of time noted in the dosage instruction. Therefore, the QDM User Group changed the cited description to "When the medication is no longer active."¶
<#>"Medication, Order", "Medication, Dispensed" and "Substance, Order" *relevantPeriod* attribute¶
<#>Updated guidance¶
<#>The "Medication, Dispensed", "Medication, Order", and "Substance, Order" *relevantPeriod* definition should be updated to "The time referenced in the dosage instruction indicating when the medication administration should start and end."¶
<#>Rationale¶
<#>The current definition for "Medication, Dispensed", "Medication, Order", and "Substance, Order" *relevantPeriod* is the validity period, i.e., the time period for which the ordered supply is authorized by the prescription authorizing the dispensing event. However, this definition does not clearly differentiate between the time period during which the patient should be taking the medication as compared to the time period a pharmacist may fill the existing prescription without asking for a new prescription. Therefore, the QDM User Group modified the definition to more accurately express the intended meaning.¶

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Measure developers should avoid the use of the "Participation" *recorder* attribute.¶

Deleted: QDM 5.5 added the *recorder* attribute to allow all QDM datatypes to reference a performer (i.e., the individual or organization that performed an activity). However, t

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HL7 FHIR Reference

The HL7 QI-Core and FHIR resource Coverage represents the insurance applicable to a patient at any given time. Coverage does not include a performer or recorder.

6.4 "Procedure, Performed" completed vs. outcome

Guidance

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To address procedure adequacy, measure developers should review what represents success with subject matter experts in the clinical field addressed by the measure. The most effective method to identify an effective procedure may be to look for an observation that indicates a desired result. Meeting eCQM criteria for the QDM datatype "Procedure, Performed" indicates that the procedure referenced has ended, i.e., is complete. However, a completed procedure has ended, but it may or may not have been terminated without meeting its objective. QDM "Procedure, Performed" *relevantPeriod* addresses only the end time. The related QRDA reporting template also fixes the statusCode as completed. QDM does not currently provide a mechanism to identify a "Procedure, Performed" that has been unsuccessful. For example, a colonoscopy procedure may be terminated early due to patient, preparation, or anesthetic factors, but the procedure still has an end time. Determining which procedures are potentially inadequate or unsuccessful is challenging. Current Procedural Terminology (CPT) modifiers used with claims help to indicate the reason a procedure is terminated, but CPT modifiers are not included in eCQM value sets. Examples of existing CPT modifiers used to indicate terminated procedures in claims submitted are:

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Rationale¶

- Modifier 73: "surgical procedure is terminated due to the onset of medical complications after the patient has been prepared for surgery and taken to the operating room, but before anesthesia has been induced or the procedure initiated."
- Modifier 74: "a medical complication arises which causes the procedure to be terminated after anesthesia has been induced or the procedure initiated."
- Modifier 52: "discontinued radiology procedures and other procedures that do not require anesthesia." By default, patients for whom claims include CPT modifiers are included as meeting numerator criteria in eCQM reports.

The CMS Measures Blueprint lists terminologies for use with QDM datatypes and attributes, but CPT modifiers are not included in the list of acceptable codes. A measure developer can use the "Procedure, Performed" *status* attribute to specify that an incomplete procedure should be excluded from the measure. However, feedback from vendors indicates there is no clear, consistent manner in which EHRs or EHR implementers handle procedures that are inadequate. Measure developers have not been able to find consistent ways to determine successful outcomes for procedures.

The QDM User Group agreed that addressing procedure adequacy in an eCQM requires careful review of data feasibility, reliability, and validity based on actual clinical documentation.

HL7 FHIR Reference

The QDM datatype "Procedure, Performed" maps directly to an HL7 FHIR Procedure with Procedure.status = completed. The Procedure.outcome element allows reference to a successful, unsuccessful, or partially successful outcome. However, there is no direct representation of outcome in QDM to align with this element. Moreover, there is no standard definition of what is meant by a successful outcome. Multiple discussions in HL7 Workgroups suggest that the most

effective way to identify an effective procedure is to look for an observation that indicates a desired result. Using the colonoscopy example, a successful result can be expressed as (a) no cancer/suspicious lesions, (b) polyps/suspicious lesions identified, etc.

6.5 "Procedure, Performed" *priority* attribute retired

Rationale for retiring "Procedure, Performed" *priority* attibute:

The reason for initially including a *priority* attribute for "Procedure, Performed" was to differentiate elective from urgent procedures. QDM User Group discussed clinical workflow methods to identify this information and determined that a consistent process to reference such information does not exist. The most effective method for determining the priority of a procedure is to evaluate the priority of the order requesting it, although this method may provide inconsistent results. QDM now provides that ability in version 5.6 with the addition of *relatedTo* to "Procedure, Performed". Some of the factors considered:

- The retired QDM "Procedure, Performed" *priority* attribute did not map easily to structures in an EHR.
- Procedures intended to occur during a hospital encounter, but scheduled prior to the initiation of the encounter, may be referenced in scheduling systems or as "orders" but may not be accessible from the encounter record.
- Changes to an existing procedure order priority may occur via verbal communication, messaging, or possibly by a change to the original procedure order, but workflow is sufficiently variable that the information is inconsistently available.

HL7 FHIR Reference

HL7 QI-Core and FHIR address the priority of a specific procedure based on the priority of the encounter during which it occurs or the ServiceRequest (order) for that procedure.

The Procedure resource includes Procedure.basedOn that directly references an order that includes a priority (ServiceRequest.priority) specifying the elective or urgent nature of a procedure. If the procedure priority changes, the ServiceRequest.priority might be updated as a new order. The QDM 5.6 datatype "Procedure, Performed" includes the *relatedTo* attribute to allow this capability.

6.6 *negation rationale* attribute

Guidance

Measure developers should consider potential clinician burden issues that might result from *negation rationale* requirements in eCQMs and specifically avoid requiring documentation of *negation rationale* multiple times for the same clinical event.

Rationale

The QDM-241 Jira ticket raised a question about how often a practitioner needs to document *negation rationale*; i.e., whether it necessary to document the reason for avoiding an action at every visit or if documentation from a previous visit. Some EHRs have functionality that allows providers to document the length of time an intervention should be deferred based on medical reasons or patient preferences. For example, if a patient declines an influenza vaccine at the beginning of influenza season but indicates they will think about it, the provider can defer for two months (for the codified reason of "patient refused") so that when the patient returns for

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Avoid use of the *priority* attribute for the QDM datatype "Procedure, Performed". Measure developers should carefully address clinical workflow and documentation practice to evaluate feasibility for data elements. To determine the priority of a principal procedure, use the "Encounter, Performed" *priority* attribute for the encounter in which the procedure occurs.¶

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Deleted: **<#>*dosage* attribute¶**
<#>Updated guidance¶
<#>The *dosage* definition should read: "Details of how much medication is taken or is to be taken, i.e., the quantity (mg, mL) to be taken at a single administration."¶
<#>Rationale¶
<#>The current definition for QDM *dosage* attribute is, "Details of how medication is taken or is to be taken, i.e., the quantity (mg, mL, meq) to be taken at a single administration." The QDM User Group agreed to clarify the definition by specifying how much medication is taken or is to be taken, i.e., the quantity (mg, mL) to be taken at a single administration.¶
<#>HL7 FHIR Reference¶
<#>HL7 QI-Core, US Core and FHIR reference dose in different resources, each with a slightly different text description (MedicationAdministration, MedicationRequest, MedicationStatement). However, all basically address dose as the amount of medication at one administration event. ¶

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follow-up, the issue can be raised again. If the patient says they don't want an influenza vaccination this season, the length of time can be set to 11 months so that when the patient returns the next influenza season, vaccination can be readdressed. If a patient indicates a religious or cultural preference as a reason for refusing vaccination, the vaccine can be permanently deferred (for the codified reason of patient refused for religious reasons) and the provider need never ask again.

Implementers would like to use the clinician designated length of time in reporting logic so that the deferral is valid during the specified timeframe (e.g., 2 months, 11 months, forever). In the example of the patient who refused for religious reasons, this prevents the clinician from asking the patient at each visit or each year and documenting the same information multiple times.

Here is a hypothetical example based on CMS 147 Preventive Care and Screening: Influenza Immunization

Define "Patient Declined Influenza Vaccination"

["Communication, Performed": "Influenza Vaccination Declined"]
CommunicateFluVaccinationDeclined

where CommunicateFluVaccinationDeclined.authorDatetime during "Influenza Season Including August and September of the Prior Year"

HL7 FHIR Reference

HL7 QI-Core, US Core and FHIR provide mechanisms to identify an action intentionally not taken for a reason, but resources address the issue inconsistently. To assist eCQM developers, QI-Core version 4.0.0 includes nine profiles that constrain resources to identify the QDM concept of *negation rationale*.

7. Change Log

7.1 QDM 5.6 Changes

The Quality Data Model, Version 5.6 specification contains changes from the Quality Data Model, Version 5.5 Guidance Update May 2020:

- Added new *interpretation* attribute for "Laboratory Test, Performed"
- Added existing *relatedTo* attribute to "Procedure, Performed"
- Retired "Device, Applied"
- Retired "Encounter, Performed" *negation rationale* attribute
- Updated definition for "Medication, Active" *relevantPeriod* attribute *end time*
- Updated definition for "Medication, Dispensed", "Medication, Order" and "Substance, Order" *relevantPeriod* attribute
- Retired "Participation" *recorder* attribute
- Retained guidance for determining "Procedure, Performed" completed vs. outcome
- Retired "Procedure, Performed" *priority* attribute
- Updated definition for *dosage* attribute
- Retained guidance for using the *negation rationale* attribute
- Updated definition for *result dateTime* attribute

This version also corrects some typographical and formatting issues.

Deleted: Updated guidance: ¶

Deleted: <#>*result dateTime* attribute¶
<#>Updated guidance¶
<#>Use *result dateTime* to mean "the date and time this version of the observation was made available to providers, typically after the results have been reviewed and verified."¶
<#>Rationale ¶
<#>The original QDM 5.5 publication defined *result dateTime* as the time the result report is generated and saved in the database. The QDM User Group reviewed feedback from an implementation site and three vendors indicating that most systems reference two times for a laboratory test: the collection time of the sample and the result time that most closely aligns with issued or made available. There are cases where a health information exchange receives the result before making it available to the clinical site, thus potentially delaying availability. However, such differences in availability result from local implementation issues.¶
<#>HL7 FHIR Reference¶
<#>HL7 QI-Core, US Core and FHIR identify a result with the resource Observation with an Observation.value. The comparable element for the QDM attribute *result dateTime* is Observation.issued, defined as "the date and time this version of the observation was made available to providers, typically after the results have been reviewed and verified."¶

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7.2 April 2020 Guidance Changes in QDM 5.5

The Quality Data Model, Version 5.5 guidance update specification contains new guidance based on implementer feedback from QDM 5.5 testing. There is no change to the overall structure, all the new information is to provide clarifications in definitions and/or guidance regarding use of QDM datatypes or attributes. Details and rationale for all new guidance is provided in Section 6 with references inserted at respective locations in the QDM definitions in **bold red** text.

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- B.1 "Device, Applied"
- B.2 "Encounter, Performed" *negation rationale* attribute
- B.3 "Medication, Active" *relevantPeriod* attribute *end time*
- B.4 "Medication, Dispensed", "Medication, Order" and "Substance, Order" *relevantPeriod* attribute
- B.5 "Participation" *recorder* attribute
- B.6 "Procedure, Performed" completed vs. outcome
- B.7 "Procedure, Performed" *priority* attribute
- B.8 *dosage* attribute
- B.9 *negation rationale* attribute
- B.10 *result dateTime* attribute

This update also corrects some typographical and formatting issues and the description of Section A.1.4 for expressing "Encounter, Performed" *diagnoses* with *components*.

7.3 July 2019 Errata Changes in QDM 5.5

The Quality Data Model, Version 5.5 *errata2* specification contains the changes from the Quality Data Model Version 5.5 *errata:*

- The descriptions of how to apply *author dateTime* in several QDM datatypes are updated to remove any ambiguity:
  - "Assessment, Performed"
  - "Device, Applied"
  - "Diagnostic Study, Performed"
  - "Encounter, Performed"
  - "Intervention, Performed"
  - "Laboratory Test, Performed"
  - "Medication, Administered"
  - "Physical Exam, Performed"
  - "Procedure, Performed"
  - "Substance, Administered"

7.4 Changes in QDM 5.5 Implementation-based edits

The Quality Data Model, Version 5.5 *errata* specification contains changes from the Quality Data Model Version 5.5:

- Removed "Medication, Order" from *relevant dateTime* table (Table 26).
- Added .id attribute to each of the new Entities – Patient, Care Partner, Practitioner and Organization to reference the instance specified in a CQL expressions.
- Added text to explain the *performer* attribute for "Care Goal" references the same concept as the US Core R4 and FHIR R4 *expressedBy* attribute.

- Changed the "Family History" (Table 16) to reference *relationship* as an attribute instead of *relationships* (i.e., reference the singular instance rather than a plural). The attribute table had indicated the singular *relationship* as an attribute.
- Added three attributes to the new "Related Person" QDM datatype - *code*, *LinkedPatientId*, and *identifier* to reference the relationship between the "Related Person" and the index patient and to establish context for queries to the "Related Person".
- Added "Identifier" section to Attribute table (Table 29).

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7.5 Changes in QDM 5.5

The Quality Data Model, Version 5.5 specification contains changes from the Quality Data Model, Version 5.4:

- Removed all QDM data flow attributes (*source, recorder, health record field*).
- Added a new QDM item, called Entities, including Patient, Care Partner, Practitioner and Organization to allow greater expressivity in requesting information about performer-type attributes.
- Removed QDM datatype "Provider Characteristic".
- Added QDM datatype "Related Person".
- Added performer-type attributes to each of the existing QDM datatypes. Based on the context of the QDM datatype, a performer may be referenced as *performer, requester, participant, sender, recipient, prescriber, or dispenser* (note that sender, recipient, prescriber, and dispenser existed in QDM 5.4).
- Prescriber.id and dispenser.id were modified to *prescriber* and *dispenser* to allow eCQMs to take advantage of new QDM Entities to specify additional information about performers of actions consistently.
- Added *priority* attribute to "Encounter, Order", "Encounter, Performed", "Procedure, Order" and "Procedure, Performed".
- Modified "Encounter, Performed" *diagnosis* attribute to reference two components: *diagnosis (code)* and a new item, *presentOnAdmissionIndicator*.
- Clarified timing statement for "Encounter, Performed" *diagnosis* attribute.
- Changed "Immunization, Administered" timing attribute to *relevantPeriod* and retained *author dateTime* for *negation rationale*.
- Clarified description of timing for *negation rationale* attributes.
- Removed the *ordinality* and *principal diagnosis* attributes; added *rank* as an attribute to "Encounter, Performed" as a component of *diagnosis* and to "Procedure, Performed", "Procedure, Order" and "Procedure, Recommended". *Rank*, represented as an integer, defines the principal diagnosis as the encounter diagnosis with a rank of 1; similarly it defines a principal procedure as a procedure with a rank of 1.
- Modify timing options:
    - Add *relevantPeriod* timing to "Assessment, Performed"
    - Add *relevant dateTime* to "Adverse Event"; "Assessment, Performed"; "Device Applied"; "Diagnostic Study, Performed"; "Immunization, Administered"; "Intervention, Performed"; "Laboratory Test, Performed"; "Medication, Active"; "Medication, Administered"; "Medication, Dispensed"; "Physical Exam, Performed"; "Procedure, Performed"; "Substance, Administered"
    - Change "Communication, Performed" timing to directly reference *sent dateTime* and *received dateTime*

- Add *status dateTime* to "Care Goal" to allow timing of care plan updates in measures

7.6 Changes in QDM 5.4

The Quality Data Model, Version 5.4 specification contains changes from the Quality Data Model, Version 5.3, Annotated:

- Updated to address errata: inadvertent inclusions in attribute Table 29. QDM Attribute Definitions – "Laboratory Test, Order" and "Laboratory Test, Recommended" removed from *status* attribute.
- Added the attribute *daysSupplied* for "Medication, Order"; "Medication, Dispensed and Medication, Discharge".
- Added the attribute *prescriberIdentifier* to "Medication, Order" and Medication, Dispensed".
- Added the attribute *dispenserIdentifier* to "Medication, Dispensed".
- Added QDM datatype, "Assessment, Order" to be consistent with modeling of other QDM datatypes and allow for an order, not merely a recommendation for a future assessment.
- Added *setting* attribute to QDM datatype "Medication, Order" to allow a measure developer to specify the setting in which the medication order is expected to be consumed by the patient.
- Removed the *method* attribute from all datatypes with a recommended or order context ("Assessment, Recommended"; "Assessment, Order"; "Diagnostic Study, Order"; "Diagnostic Study, Recommended"; "Laboratory Test, Order"; "Laboratory Test, Recommended"; "Procedure, Order"; "Procedure, Recommended"; "Substance, Recommended"; "Physical Exam, Order"; "Physical Exam, Recommended").

QDM 5.4 retains the *method* attribute for "Assessment, Performed"; "Diagnostic Study, Performed"; "Laboratory Test, Performed"; "Physical Exam, Performed"; "Procedure, Performed"

- Provided additional guidance to the use of the QDM datatype "Device, Applied".
- Provided additional guidance for the use of the QDM datatype, "Symptom".
- Removed the *supply* attribute from QDM datatypes for which clinical data does not provide supply information – "Medication, Active"; "Medication, Administered"; "Substance, Administered"; "Substance Recommended"; and "Immunization, Administered". QDM 5.4 retains the *supply* attribute for "Medication, Dispensed"; "Medication, Order"; "Substance, Order"; and "Medication, Discharge".
- Removed the *anatomical approach site* attribute from QDM datatypes "Device, Applied"; "Procedure, Performed"; "Procedure, Order"; "Procedure, Recommended". The pre-coordinated terminology for the procedure provides approach site information. Moreover, specific location terminology and device terminology can meet the current use cases without this attribute which has never been used in any CMS program measures.
- Retained the distinction between QDM categories Intervention and Procedure even though interoperability standards do not provide any differentiate between the two concepts. Measure developers find the QDM definitions useful and believe that clinicians reading the human readable eCQMs will find the distinction useful.
- Merged three Communication QDM datatypes – "Communication, Provider to Patient"; "Communication, Patient to Provider"; "Communication, Provider to Provider" into a single QDM datatype, "Communication, Performed". This new datatype allows greater

and more explicit expressivity adding attributes *category* (type of message – alert, notification, reminder, instruction, etc.), *medium* (channel of communication – e.g., email, fax), *sender* (entity that is the source of the communication), and *recipient* (entity that is the receiver of the communication) and assigned a *relevantPeriod* to "Communication, Performed".

- Provided some guidance on the use of the QDM substance category with existing use cases (blood product administration and exclusive breast milk feeding for newborn infants in the hospital).

7.7 Changes in QDM 5.3 Annotated

The Quality Data Model, Version 5.3 Annotated specification contains changes from the Quality Data Model, Version 5.3:

- Added *relevantPeriod* to "Medication, Order" and "Medication, Dispensed".
- Removed *active dateTime* from "Medication, Order".
- Changed QDM attributes with cardinality greater than 1 to plural (changes attributes *diagnosis* to *diagnoses*, *component* to *components*, and *facility location* to *facility locations* for "Encounter, Performed").
- Added description of how QDM 5.3 data elements are expressed in tooling and in the HQMF and the CQL logic.
- Added explanation for new timing attributes – periods.
- Added explanation for new cardinality specification for QDM attributes.
- Added explanations for special cases – use of components, specifying results with value sets, and considerations for cumulative medication duration.
- Added clarifications for attributes *relatedTo*, *target outcome*, *result*, *facility locations*, *locationPeriod*, and *code*.
- Added id attribute to all datatypes to allow expression of specific instances for any QDM data element in the CQL logic.

7.8 Changes in QDM 5.3

The Quality Data Model, Version 5.3 specification contains 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: *participationPeriod*.
- 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 Study, 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 *facility 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 – All datatypes use cardinality of 0.. 1 except:
  - *diagnosis* (0.. *).
  - *facility location* (only for the "Encounter, Performed" datatype – 0.. *).
  - *locationPeriod* (0.. *).
  - *relatedTo* (0.. *).

Deleted: <#>Changes in QDM 5.02 Proposed DRAFT¶
<#>The Quality Data Model, Version 5.02 Proposed DRAFT specification contains 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*.¶
<#>Changes in QDM 5.01 Proposed DRAFT¶
<#>The Quality Data Model, Version 5.01 Proposed DRAFT specification contains change from the Quality Data Model, Version 5.0 specification:¶
<#>Added *components* attribute to "Assessment, Performed"; "Diagnostic Study, Performed"; "Laboratory Test, Performed". The *components* attribute includes a *code* and *result* and, for "Laboratory Test, Performed" includes optional *reference range high* and *reference range low*.¶
<#>¶
<#>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:¶
<#>*prevalencePeriod* for all datatypes requiring onset dateTime and abatement dateTime¶
<#>*relevantPeriod* for action datatypes with specific timing descriptions of start and stop elements of *relevantPeriod*¶
<#>*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.¶
<#>Changes in QDM 4.3¶
<#>The Quality Data Model, Version 4.3 specification contains 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.¶
<#>Changes in QDM 4.2¶
<#>The Quality Data Model, Version 4.2 specification contains changes from the Quality Data Model, Version 4.1.2 specification:¶
<#>Enhanced support for encounter *diagnoses* and *principal diagnoses*¶
<#>Re-specified the "Diagnosis" datatypes¶

8. Acronyms

AHRQ	Agency for Healthcare Research and Quality
CDS	Clinical Decision Support
CMD	Cumulative Medication Duration
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
FHIR®	Fast Healthcare Interoperability Resources®
HL7®	Health Level Seven International®
HQMF	Health Quality Measure Format
ICD-9-CM	International Classification of Diseases, Ninth Revision, Clinical Modification
ICD-10	International Classification of Diseases, Tenth Revision
ISO	International Organization for Standardization
IT	Information Technology
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
UCUM	Unified Code for Units of Measure