QDM Version 5.5 Overview

Floyd Eisenberg

ESAC, Inc.

Healthcare IT and Life Sciences Data Management Solutions Contractor

August 20, 2019

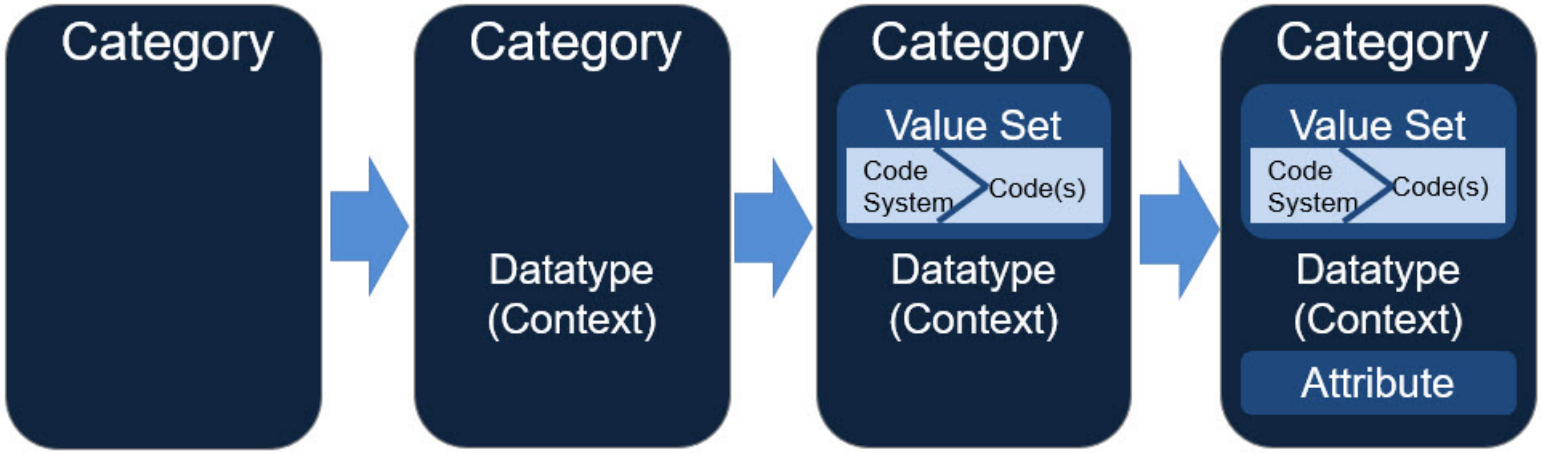
Agenda

- Quality Data Model (QDM) Overview
- QDM v5.5 Changes
  - Timing
  - Datatypes
  - Attributes
- Questions and Answers

Quality Data Model (QDM)

- QDM describes clinical concepts in a standardized format to enable electronic quality measurement in support of federal programs and initiatives.
- QDM's purpose is to enable the automated retrieval of structured data captured through routine care in electronic health records (EHR), personal health records (PHR), and other electronic clinical sources.

QDM Basic Structure



Category:

- Highest level of definition for a QDM data element
- Information class (e.g., medication, procedure, diagnosis, etc.)

QDM datatype:

- Applies *context* to the QDM Category
- Examples:
  - Medication, Active
  - Medication, Order
  - Medication, Dispensed

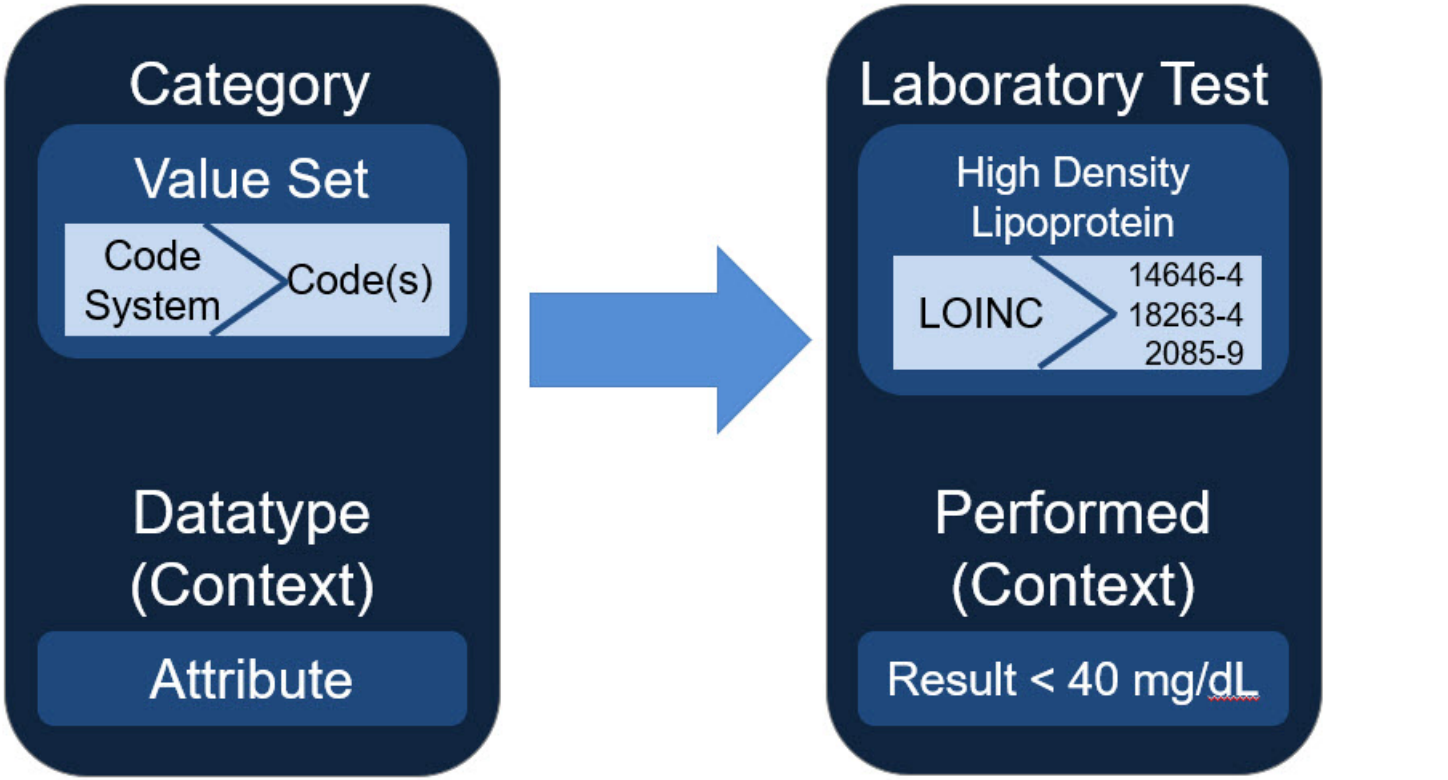
QDM data element:

- Adds coded value or *value set* to indicate a specific data element required for the measure

QDM attributes:

- Adds more detail about QDM data elements
- Examples:
  - Encounter *diagnosis*
  - Encounter, *location*

QDM Basic Structure (Cont'd)



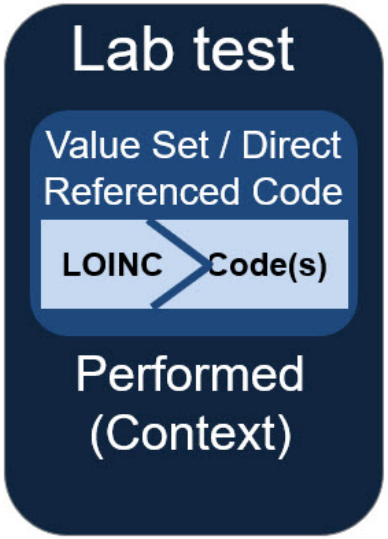
Data Element Basic Structure

Specific Data Element – HDL < 40 mg/dL

QDM *datatypes*

- Adverse Event
- Allergy/Intolerance
- Assessment, Performed
- Assessment, Order
- Assessment, Recommended
- Patient Care 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
- 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, Performed
- Procedure, Recommended
- Substance, Administered
- Substance, Order
- Substance, Recommended
- Symptom

QDM *attributes*



The retrieve request to the clinical software can include any of the potential metadata allowed by the QDM datatype as specified in the QDM model.

Example:

LOINC – Lab tests / observable entities

Examples of all potential attributes:

Laboratory Test, Performed

Method
Negation Rationale
Reason
Reference Range High
Reference Range Low
Result
Result dateTime
Relevant dateTime
Relevant Period
Status
Author dateTime
Code
Component (may appear 0 or many times)
(Each component will have:
- code
- result
- reference range High (optional)
- reference range Low (optional))

Performer

QDM 5.5 Changes

1. QDM 5.5 Overview
2. New Timing Options in QDM 5.5
3. QDM Entities
4. QDM 5.5 Change *source* attribute
5. QDM Entity use cases
6. New QDM datatype: Related Person
7. Addition of Present on Admission indicator for Encounter
   - Change to Encounter, Performed *diagnosis* modeling
8. Add *priority* attribute (Encounter, Procedure)

Changes in QDM 5.5 – New Time Options

- QDM datatype timing options (versions 5.3 and 5.4)
  - Some QDM datatypes limited timing to author dateTime
    - Example: Assessment, Performed only allowed author dateTime
    - Result of the limitation:
      - A provider assesses the patient's pain using a pain scale during the encounter on July 5
      - The provider does not complete documentation about the encounter until July 8, but in that documentation assigns the actual time of the pain assessment to the hour of the encounter
      - The author dateTime in the measure causes the pain assessment to appear to occur 24 hours after the encounter, possibly affecting whether the assessment meets numerator criteria
- QDM 5.5 Change – Allows greater flexibility for measure developers to indicate the occurrence time

Changes in QDM 5.5 – New Time Options

QDM Datatype	New Timing† ‡
Adverse Event	Relevant dateTime* Remove - Relevant Period*
Allergy Intolerance	*No change*
Assessment, Performed	Author dateTime Relevant dateTime* Relevant Period*
Care Goal	Relevant Period statusDate (when updated)*
Communication, Performed	Sent (dateTime)* Received (dateTime)* Remove Relevant Period* Remove Author dateTime*
Diagnosis	No change
Device, Applied	Author dateTime Relevant dateTime* Relevant Period
Diagnostic Study, Performed	Author dateTime Relevant dateTime* Relevant Period
Encounter, Performed	*No change*
Immunization, Administered	Author dateTime Relevant dateTime*
Intervention, Performed	Author dateTime Relevant dateTime* Relevant Period

QDM Datatype	New Timing † ‡
Laboratory Test, Performed	Author dateTime Relevant dateTime* Relevant Period
Medication, Active	Author dateTime Relevant dateTime* Relevant Period
Medication, Administered	Author dateTime Relevant dateTime* Relevant Period
Medication, Discharge	No change
Medication, Dispensed	Author dateTime Relevant dateTime* Relevant Period (validity period)
Medication, Order	No change
Participation	*No change*
Physical Exam, Performed	Author dateTime Relevant dateTime* Relevant Period
Procedure, Performed	Author dateTime Relevant dateTime* Relevant Period
Substance, Administered	Author dateTime Relevant dateTime* Relevant Period
Substance, Order	Author dateTime Relevant Period (validity period)*
Symptom	*No change*

† QDM datatypes not listed have no timing changes
‡ Numbers in parentheses = number of instances in 2018 program measures
* Starred items are new in QDM 5.5

Changes in QDM 5.5 – QDM Entities

- QDM (versions 5.3 and 5.4) allowed reference to the source of information, but the description was vague and never used.
  - Measure developers needed to be able to indicate if the individual or organization that performed a task is the same or different than the individual or organization that performed another task.
    - Example:
      - Assure the practitioner performing the eye examination is an eye care practitioner
      - Exclude patient visits performed by a hospital outside of a defined network
- QDM 5.5 Change – Added a new concept called *Entities* to allow a measure expression to reference the *performer* of a task.

Changes in QDM 5.5 – QDM Entities

- QDM 5.5 Entities
  - Patient – information about an individual receiving health care services
    - identifier
  - Care Partner – a person that is related to a patient, but who is not the direct target of care
    - identifier
    - relationship
  - Practitioner – a person with a formal responsibility in the provisioning of healthcare or related services
    - identifier
    - role (role this practitioner may perform, e.g., doctor, nurse)
    - specialty (specific specialty of the practitioner, e.g., Anesthesia, Cardiology)
    - qualification (coded representation of the certification, licenses, or training pertaining to the provision of care, e.g., MD, DO, CRN, CNP)
  - Organization – a grouping of people or organizations with a common purpose
    - identifier
    - type (kind of organization, e.g., hospital)

* The previous Provider, Characteristic QDM datatype was intended to meet the requirement fulfilled by Entities but it was never used and was, therefore, removed.

Changes in QDM 5.5 – Change *source attribute*

- **Change *source* to:**

New Attribute	QDM Datatypes	
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, Recommended • Laboratory Test, Order • Physical Exam, Recommended • Physical Exam, Order • Procedure, Order • Procedure, Recommended • Substance, Order • Substance, Recommended
Participant	• Encounter, Performed	
Performer	• Assessment, Performed • Care Goal • Device, Applied • Diagnostic Study, Performed • Family History • Immunization, Administered • Intervention, Performed	• Laboratory Test, Performed • Medication, Administered • Patient Care Experience • Physical Exam, Performed • Procedure, Performed • Provider Care Experience • Substance, Administered
Communication, Performed – already includes *sender, recipient* *Medication, Discharge; Medication, Order; Medication, Dispensed – prescriber Identifier* *Medication, Dispensed – dispenser Identifier*		

Changes in QDM 5.5 – Change *source attribute*

- Remove *dataflow* attributes (in favor of the new *performer* attributes)
  - *Health Record Field*: The location within an electronic record where the data should be found.
  - *Source*: The originator of the quality data element. The source may be an individual or a device.
  - *Recorder*: The individual or device that enters the data element into a health record field. The desired recorder also may be, but is not necessarily, the source of the data.

Changes in QDM 5.5 – QDM Entities

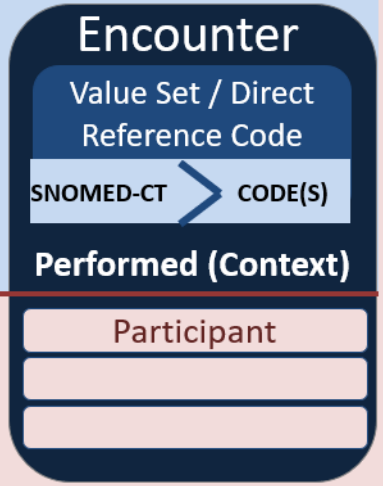
To specify that an encounter was performed by an ophthalmologist

- ***Encounter, Performed***

  [Direct reference code, or value set defining "Office Visit"]

- *Participant*
  - *Practitioner*
    - *Specialty ~ "Ophthalmology"*

    [Direct reference code or value set defining "Ophthalmology" as a specialty – example shows CQL reference to a direct reference code]



QDM Entities available to reference actors and information about each QDM Entity that can be defined in a measure:

Patient
identifier
Care Partner
identifier
relationship
Practitioner
identifier
role
specialty
qualification
Organization
identifier
type

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"

Changes in QDM 5.5 – QDM Entities

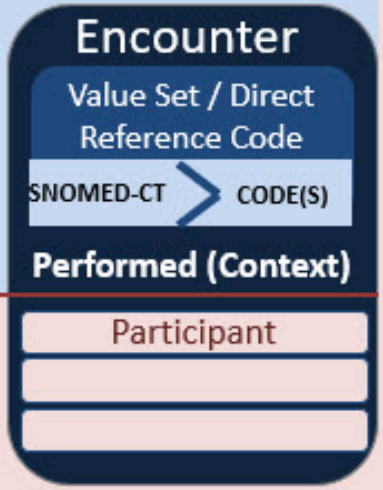
To specify that an encounter was performed by a specific organization

- ***Encounter, Performed***

  [Direct reference code, or value set defining "Office Visit"]

- *Participant*
  - *Organization*
    - *Identifier = "CCN"*

    [CCN references the CMS Certification Number as the naming system]



QDM Entities available to reference actors and information about each QDM Entity that can be defined in a measure:

Patient
- ***identifier***

Care Partner
- ***identifier***
- ***relationship***

Practitioner
- ***identifier***
- ***role***
- ***specialty***
- ***qualification***

Organization
- ***identifier***
- ***type***

Changes in QDM 5.5 – QDM Entities

This example shows how to determine that the organization provider participant of an inpatient encounter is the same as the organization provider participant of an emergency department encounter using the *organization* entity.
The example defines a function that the required identifier is a CMS Certification Number (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)
```

Changes in QDM 5.5 – QDM Entities

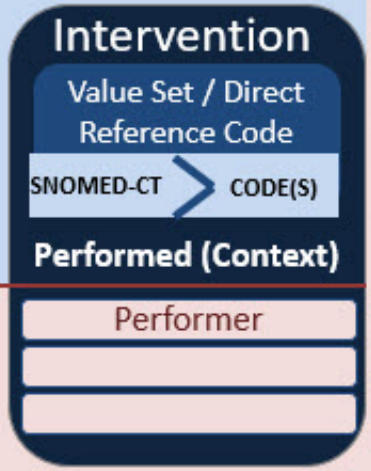
To specify that a blood pressure was performed by a care partner

- ***Physical Exam, Performed***

  [Direct reference code, or value set defining "blood pressure examination"]

- *Performer*
  - *Care Partner*
    - *Relationship in "Family"*

    [Direct reference code or value set defining "Family" as a relationship – example shows CQL reference to a value set, e.g., mother, father, brother, sister, etc.]



QDM Entities available to reference actors and information about each QDM Entity that can be defined in a measure:

Patient
identifier
Care Partner
identifier
relationship
Practitioner
identifier
role
specialty
qualification
Organization
identifier
type

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, etc.).

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

Changes in QDM 5.5 – QDM Entities

Specifying that an individual actor is a member of an organization:

```
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
```

QDM new datatype - Related Person

QDM datatype Related Person

Example: Directly reference the mother's record for an estimated due date to calculate gestational age in an infant's medical record. This Related Person datatype allows authors to reference information from other patients. The CQL expression for this information assumes the infant is the subject of the measure:

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" using the example provided).	• id • code • identifier • linkedPatientId

QDM new datatype - Related Person

QDM datatype Related Person

Example: Directly reference the mother's record for an estimated due date to calculate gestational age in an infant's medical record. This Related Person datatype allows authors to reference information from other patients. The CQL expression for this information assumes the infant is the subject of the measure:

```
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
```

QDM 5.5 – Add Present on Admission

- The Diagnosis Present on Admission (POA) is an indicator assigned to Inpatient Encounter Diagnosis and is used extensively in quality and patient safety measures. The valid indicators according to the UB-04 standard are:

  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 blank on UB-04

QDM 5.5 – Add Present on Admission

- Change from:
  - Encounter, Performed *diagnosis*
  - Encounter, Performed *principal diagnosis*
- TO: Encounter, Performed *diagnosis* with 3 components:
  - diagnosis (code)
  - presentOnAdmissionIndicator (code)
  - rank (positive integer) [defined as a position in a hierarchy]*

* Principal diagnosis: an encounter diagnosis with a rank = 1 (*rank* replaces the previous *ordinality* attribute)

QDM 5.5 – Add *priority* attribute

- QDM 5.5 – Add *priority* attribute to:
  - Procedure, Performed
  - Procedure, Order
  - Encounter, Performed
  - Encounter, Order

- Allows reference to an elective or urgent
  - Encounter or procedure
  - Order for an encounter or procedure

QDM 5.5 – *Relevant dateTime*

- QDM 5.5 – Add Relevant dateTime attribute to:
  - Introduces a Relevant dateTime to reference activities occurring at a point in time.
  - Retains Relevant Period for activities occurring over a time interval.
  - Author dateTime references the point in time the information is entered into the clinical software (documented).

Changes in QDM 5.5 – New Time Options

QDM Datatype	New Timing† ‡
Adverse Event	Relevant dateTime* Remove - Relevant Period*
Allergy Intolerance	*No change*
Assessment, Performed	Author dateTime Relevant dateTime* Relevant Period*
Care Goal	Relevant Period statusDate (when updated)*
Communication, Performed	Sent (dateTime)* Received (dateTime)* Remove Relevant Period* Remove Author dateTime*
Diagnosis	No change
Device, Applied	Author dateTime Relevant dateTime* Relevant Period
Diagnostic Study, Performed	Author dateTime Relevant dateTime* Relevant Period
Encounter, Performed	*No change*
Immunization, Administered	Author dateTime Relevant dateTime*
Intervention, Performed	Author dateTime Relevant dateTime* Relevant Period

QDM Datatype	New Timing † ‡
Laboratory Test, Performed	Author dateTime Relevant dateTime* Relevant Period
Medication, Active	Author dateTime Relevant dateTime* Relevant Period
Medication, Administered	Author dateTime Relevant dateTime* Relevant Period
Medication, Discharge	No change
Medication, Dispensed	Author dateTime Relevant dateTime* Relevant Period (validity period)
Medication, Order	No change
Participation	*No change*
Physical Exam, Performed	Author dateTime Relevant dateTime* Relevant Period
Procedure, Performed	Author dateTime Relevant dateTime* Relevant Period
Substance, Administered	Author dateTime Relevant dateTime* Relevant Period
Substance, Order	Author dateTime Relevant Period (validity period)*
Symptom	*No change*

† QDM datatypes not listed have no timing changes
‡ Numbers in parentheses = number of instances in 2018 program measures
* Starred items are new in QDM 5.5

QDM 5.5 – Immunization, Administered

- QDM 5.5 – Add *Relevant dateTime* attribute to:
  - Immunization, Administered

- Timing:
  - The **relevant dateTime** references the point in time the immunization is **administered**.
  - The **author dateTime** references the point in time the immunization is entered into the clinical software (documented).
  - The **author dateTime** is used when documenting vaccine was Immunization, Not Administered via Negation Rationale.

* In most clinical scenarios, the relevant dateTime is the clinically significant time to determine effectiveness and timeliness of an immunization. Author dateTIme is appropriate for determining negation rationale.

QDM 5.5 – Negation Rationale

- QDM 5.5 – clarification based on Known Issue in 5.4:
  - 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 Relevant Period.

QDM 5.5 – Negation Rationale

In QDM, negation rationale addresses only whether a clinician indicated a reason for not performing an action. Following are CQL expressions indicating presence (a) or absence (b) of an action. The CQL expression (c) uses negation rationale to describe an action that did not occur for a reason.

(a) presence of evidence of an action:

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“
```

QDM 5.5 – Negation Rationale

In QDM, negation rationale addresses only whether a clinician indicated a reason for not performing an action. Following are CQL expressions indicating presence (a) or absence (b) of an action. The CQL expression (c) uses negation rationale to describe an action that did not occur for a reason.

(b) absence of evidence of an action:

No evidence that “Antithrombotic Therapy" medication was administered:

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

QDM 5.5 – Negation Rationale

In QDM, negation rationale addresses only whether a clinician indicated a reason for not performing an action. Following are CQL expressions indicating presence (a) or absence (b) of an action. The CQL expression (c) uses negation rationale to describe an action that did not occur for a reason.

(c) negation rationale for not performing an action (using a value set, "Medical Reason" for the rationale):

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

QDM 5.5 – Changes from 5.4

- Removed all QDM data flow attributes source, recorder, health record
- 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: sender, recipient, prescriber and dispenser existed in QDM 5.4]

QDM 5.5 – Changes from 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, *present on admission indicator.*
- Clarified timing statement for Encounter, Performed *diagnosis* attribute.

QDM 5.5 – Changes from 5.4

- Changed Immunization, Administered timing attribute to *Relevant dateTime* and retained *author dateTime* for *negation rationale*.
- Clarified description of timing for *negation rationale* attributes.
- Removed the *ordinality* and *principal diagnosis* attributes; added Encounter, Performed *diagnosis components: code, rank and presentOnAdmission indicator;* and to Procedure, Performed, Order and Recommended a rank attribute, represented as an integer
  - defines the principal diagnosis as the encounter diagnosis code with a rank of 1
  - defines a principal procedure as a procedure code with a rank of 1 – Note: to indicate a principal procedure requires that the expression connects the procedure to an encounter.

QDM 5.5 – Changes from 5.4

- Modify timing options:
  - Add Relevant Period 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

QDM 5.5 – Implementation-based Edits

- Removed Medication, Order from Relevant dateTime table.
- 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 USCore R4 and FHIR R4 *expressedBy* attribute.

QDM 5.5 – Implementation-based Edits

- Changed the Family History table on page 34 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