eCQI 101: Standards for Representing eCQMs

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Overview of eCQM Standards

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eCQI Standards on the eCQI Resource Center

eCQI Standards

About electronic Clinical Quality Improvement standards

Standards are critical to data consistency, validity and interoperability. Their use makes it easier to:

- Share information
- Develop software
- Integrate data
- Implement systems

Standards constantly improve so that more sophisticated data can be captured, used and analyzed.

While eCQI is made up of eCQMs and Clinical Decision Support (CDS), you’d think both use the same standards, but they don’t. It’s important to understand the difference.

Current eCQM standards

- **QDM**
  - Quality Data Model

- **HQMF**
  - Health Quality Measures Format

- **QRDA**
  - Quality Reporting Document Architecture

https://ecqi.healthit.gov/ecqi-standards
Quality Data Model (QDM)
What is the Quality Data Model?

“The Quality Data Model (QDM) is an information model that defines relationships between patients and clinical concepts in a standardized format to enable electronic quality performance measurement. It provides the concepts and logic that measure authors use to build eCQMs in the Measure Authoring Tool.”

Introduction to the Quality Data Model

https://ecqi.healthit.gov/qdm
QDM Data Model

- **Category**
  - Broad clinical concept
  - e.g., “Medication”, “Procedure”, “Encounter”

- **Data Type**
  - Provides context within a category
  - e.g., “Medication, Administered”, “Medication, Order”

- **Value Set**
  - The set of codes to look for in the patient record
  - e.g., “Medication, Administered: Warfarin”

- **Attribute**
  - Specific detail within a data type
  - e.g., “Medication, Administered: Warfarin (dose >= 5 mg)”
QDM Categories

- Care Experience
- Care Goal
- Communication
- Condition/Diagnosis/Problem
- Device
- Diagnostic Study
- Encounter
- Functional Status
- Immunization
- Individual Characteristic
- Intervention
- Laboratory Test
- Medication
- Physical Exam
- Procedure
- Risk Category/Assessment
- Substance
- Symptom
- Transfer of Care
## Laboratory Test Data Types and Attributes

<table>
<thead>
<tr>
<th>Datatype</th>
<th>Definition</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory Test, Adverse Event</td>
<td>Data elements that meet criteria using this datatype should document an unexpected or dangerous reaction to the laboratory test indicated by the QDM category and its corresponding value set.</td>
<td>• Reaction • Start Datetime • Stop Datetime</td>
</tr>
<tr>
<td>Laboratory Test, Intolerance</td>
<td>Data elements that meet criteria using this datatype should document a reaction in specific patients representing a low threshold to the normal reported or expected reactions of the laboratory test indicated by the QDM category and its corresponding value set.</td>
<td>• Reaction • Start Datetime • Stop Datetime</td>
</tr>
<tr>
<td>Laboratory Test, Order</td>
<td>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.</td>
<td>• Method • Negation Rationale • Reason • Start Datetime • Stop Datetime</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE:</strong> The start and stop datetime of Laboratory Test, Order reflects the “author time” of the record in QRDA. This corresponds to when the order was signed.</td>
<td></td>
</tr>
<tr>
<td>Laboratory Test, Performed</td>
<td>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.</td>
<td>• Method • Negation Rationale • Reason • Reference Range High • Reference Range Low • Result • Start Datetime • Status • Stop Datetime</td>
</tr>
<tr>
<td>Laboratory Test, Recommended</td>
<td>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.</td>
<td>• Method • Negation Rationale • Reason • Start Datetime • Stop Datetime</td>
</tr>
</tbody>
</table>
QDM Elements

Laboratory Test, Performed: High Density Lipoprotein (result < 40 mg/dL)
QDM Logic

- **Temporal Relationships**
  - Filter elements based on their timing relative to other elements
  - *starts before start, ends before start, during, overlaps, etc.*

- **Attribute Filters**
  - Filter elements based on their attribute values
  - *(route: ‘Oral’), (result < 40 mg/dL), (result is present), etc.*

- **Subset Operators**
  - Constrain or expand sets of elements
  - ***first, most recent, union of, intersection of, satisfies all, etc.***
QDM Logic (Continued)

- **Functions**
  - Compute a value for a set of elements
  - *min, max, median, average, count, sum, age at, etc.*

- **Variables**
  - Label re-usable chunks of logic for easy reference
  - *$EncounterInpatient = “Encounter, Performed: Inpatient”*…

- **Logical Operators**
  - Apply boolean logic to one or more expressions
  - *and, or, not*
Example: CMS 123v4 – Diabetes: Foot Exam

<table>
<thead>
<tr>
<th>Initial Population</th>
<th>Patients 18-75 years of age with diabetes with a visit during the measurement period</th>
</tr>
</thead>
</table>

- **Initial Population =**
  - **AND:** "Diagnosis, Active: Diabetes" **overlaps** "Measurement Period"
  - **AND:** Age >= 18 year(s) **at:** "Measurement Period"
  - **AND:** Age < 75 year(s) **at:** "Measurement Period"
  - **AND:** Union of:
    - "Encounter, Performed: Office Visit"
    - "Encounter, Performed: Face-to-Face Interaction"
    - "Encounter, Performed: Preventive Care Services - Established Office Visit, 18 and Up"
    - "Encounter, Performed: Preventive Care Services-Initial Office Visit, 18 and Up"
    - "Encounter, Performed: Home Healthcare Services"
    - "Encounter, Performed: Annual Wellness Visit"
    - **during** "Measurement Period”

<table>
<thead>
<tr>
<th>Denominator</th>
<th>Equals Initial Population</th>
</tr>
</thead>
</table>

- **Denominator =**
  - **AND:** Initial Population
Example: CMS 123v4 – Diabetes: Foot Exam

| Denominator Exclusions | Patients who have had either a bilateral amputation above or below the knee, or both a left and right amputation above or below the knee before or during the measurement period |

- **Denominator Exclusions =**
  - **OR:** "Diagnosis, Active: Bilateral amputation of leg below or above knee" **starts before end of** "Measurement Period"
  - **OR:**
    - **AND:** **Union of:**
      - "Diagnosis, Active: Right Unilateral Amputation Above or Below Knee"
      - "Diagnosis, Active: Unilateral Amputation Below or Above Knee, Unspecified Laterality (laterality: Right)"
    - **starts before end of** "Measurement Period"
  - **AND:** **Union of:**
    - "Diagnosis, Active: Left Unilateral Amputation Above or Below Knee"
    - "Diagnosis, Active: Unilateral Amputation Below or Above Knee, Unspecified Laterality (laterality: Left)"
    - **starts before end of** "Measurement Period"
Example: CMS 123v4 – Diabetes: Foot Exam

| Numerator                  | Patients who received visual, pulse and sensory foot examinations during the measurement period |

- **Numerator =**
  - **AND:** "Physical Exam, Performed: Visual Exam of Foot" during "Measurement Period"
  - **AND:** "Physical Exam, Performed: Sensory Exam of Foot" during "Measurement Period"
  - **AND:** "Physical Exam, Performed: Pulse Exam of Foot" during "Measurement Period"
QDM Resources

- QDM on the eCQI Resource Center
  - https://ecqi.healthit.gov/qdm

- eCQM on the eCQI Resource Center
  - https://ecqi.healthit.gov/ecqm

- Monthly QDM User Group Meetings
  - Calendar: https://ecqi.healthit.gov/qdm/qdm-events
  - Registration: https://www4.gotomeeting.com/register/303510935

- QDM Jira Issue Tracker
  - https://jira.oncprojecttracking.org/browse/QDM
Health Quality Measure Format (HQMF)
What is the Health Quality Measure Format?

“The Health Quality Measures Format (HQMF) is a standard for representing a health quality measure as an electronic document... Through standardization of a measure's structure, metadata, definitions, and logic, the HQMF provides measure consistency and unambiguous interpretation. A health measure encoded in the HQMF is referred to as an ‘eMeasure’.”

HL7 Version 3 Standard: Representation of the Health Quality Measures Format (eMeasure), DSTU Release 2.1
HQMF: Key Points

- HQMF is XML
  - Base is defined by XML Schema document
  - QDM-based HQMF Implementation Guide constrains it further

- HQMF is based on the HL7 Reference Implementation Model

- HQMF is intended to be fully machine-executable
  - Authors can iterate on their measures with automated tests
  - Vendors can maintain a single body of execution code
  - Providers can execute against arbitrary or updated measures

- HQMF is a Health Level 7 (HL7) Draft Standard for Trial Use (DSTU)

- HQMF can be built from measures authored with QDM
Types of Clinical Quality Measures

- **Patient-based (longitudinal care)**
  - Take into account complete patient record with focus on a ‘measurement period’
  - Examples:
    - Have patients who turned 2 years old during the measurement period received all required vaccinations on schedule?

- **Episode of Care (encounter or admission)**
  - Assess each distinct ‘encounter’ between a patient and a provider, during a measurement period.
  - Use HQMF’s “ITMCNT” to identify encounters of interest
  - Examples:
    - Were heart attack patients discharged with an Rx for Aspirin?
HQMIF: Proportion Measures

Score: \[
\frac{\text{Numerator} - \text{Numerator Exclusions}}{\text{Denominator} - \text{Denominator Exclusions} - \text{Denominator Exceptions}}
\]

Graphic: HL7 Version 3 Standard: Representation of the Health Quality Measures Format (eMeasure), DSTU Release 2.1
Score:

\[
\frac{\text{Numerator} - \text{Numerator Exclusions}}{\text{Denominator} - \text{Denominator Exclusions}}
\]
HQMIF: Continuous Variable Measures

Score: $f(x)$ where $x = \text{Measure Population} - \text{Measure Population Exclusions}$

Graphic: HL7 Version 3 Standard: Representation of the Health Quality Measures Format (eMeasure), DSTU Release 2.1
HQMF: Cohort Measures

Score: Count (Initial Population)
HQMFM Measure Scores and Populations

<table>
<thead>
<tr>
<th>Measure Score</th>
<th>Initial Population</th>
<th>Denominator</th>
<th>Denominator Exclusion</th>
<th>Denominator Exception</th>
<th>Numerator</th>
<th>Numerator Exclusion</th>
<th>Measure Population</th>
<th>Measure Population Exclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion</td>
<td>R</td>
<td>R</td>
<td>O</td>
<td>O</td>
<td>R</td>
<td>O</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td>Ratio</td>
<td>R*</td>
<td>R</td>
<td>O</td>
<td>NP</td>
<td>R</td>
<td>O</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td>Continuous Variable</td>
<td>R</td>
<td>NP</td>
<td>NP</td>
<td>NP</td>
<td>NP</td>
<td>NP</td>
<td>NP</td>
<td>R</td>
</tr>
<tr>
<td>Cohort</td>
<td>R</td>
<td>NP</td>
<td>NP</td>
<td>NP</td>
<td>NP</td>
<td>NP</td>
<td>NP</td>
<td>NP</td>
</tr>
</tbody>
</table>

* Ratio measures may have two Initial Populations (one for Numerator and one for Denominator)

- **Key**
  - R = Required
  - O = Optional
  - NP = Not Permitted

Table: HL7 Version 3 Standard: Representation of the Health Quality Measures Format (eMeasure), DSTU Release 2.1
HQMF Structure

HQMF Document Structure

- HQMF Header
- HQMF Document Attributes
- Author
- Measure Processing Metadata
- Measure Period

HQMF Body

- Measure Description
- Data Criteria
- Population Criteria
- Stratifier Criteria Entry
- Measure Observations

Example XML Code:

```xml

   <!-- document attributes go here -->
   <author>
     <!-- authors go here -->
   </author>
   <controlVariable>
     <!-- measure period goes here -->
   </controlVariable>
   <subject0>
     <!-- measure attribute goes here -->
   </subject0>
   <!-- more measure attributes go here -->
   <component>
     <!-- data criteria goes here -->
   </dataCriteriaSection>
   <component>
     <!-- population criteria metadata goes here -->
     <component typeCode="COMP">
       <initialPopulationCriteria classCode="OBS5" moodCode="EVN">
         <!-- initial population criteria goes here -->
       </initialPopulationCriteria>
     </component>
     <!-- denominator criteria goes here -->
     <denominatorCriteria>
       <component typeCode="COMP">
         <denominatorExclusionCriteria classCode="OBS5" moodCode="EVN">
           <!-- denominator exclusion criteria goes here -->
         </denominatorExclusionCriteria>
       </component>
       <component typeCode="COMP">
         <numeratorCriteria classCode="OBS5" moodCode="EVN">
           <!-- numerator criteria goes here -->
         </numeratorCriteria>
       </component>
       <component typeCode="COMP">
         <stratifierCriteria>
           <!-- stratifier criteria goes here -->
         </stratifierCriteria>
       </component>
     </denominatorCriteria>
     <!-- more stratifiers go here -->
   </component>
</QualityMeasureDocument>
```
"Diagnosis, Active: Diabetes" overlaps "Measurement Period"

```xml
<entry typeCode="DRIE">
  <localVariableName value="localVar_Overlaps_7C817374-14BB-4A24-9767-AA15E157DC7D"/>
  <observationCriteria classCode="OBS" moodCode="EVN">
    <templateId>
      <item extension="2014-11-24" root="2.16.840.1.113883.10.20.28.3.1"/>
    </templateId>
    <id extension="Overlaps_7C817374-14BB-4A24-9767-AA15E157DC7D" root="AF8D3EE2-AEFC-443F-8AA8-8EB1CB72F234"/>
    <code code="282291009" codeSystem="2.16.840.1.113883.6.96" codeSystemName="SNOMED CT">
      <displayName value="Diagnosis"/>
    </code>
    <title value="Diagnosis, Active"/>
    <statusCode code="COMPLETED"/>
    <value valueSet="2.16.840.1.113883.3.464.1003.103.12.1001" type="CD">
      <displayName value="Diabetes Grouping Value Set"/>
    </value>
    <temporallyRelatedInformation typeCode="OVERLAP">
      <temporalInformation precisionUnit="min"/>
      <criteriaReference classCode="OBS" moodCode="EVN">
        <id extension="measureperiod" root="40280381-3d61-56a7-013e-5d11abfb68f6"/>
      </criteriaReference>
    </temporallyRelatedInformation>
  </observationCriteria>
</entry>
```
Data Criteria: Data Type ➔ Template

"Diagnosis, Active: Diabetes" overlaps "Measurement Period"

```xml
<entry typeCode="DRIV">
  <localVariableName value="localVar_Overlaps_7C817374-14BB-4A24-9767-AA15E157DC7D"/>
  <observationCriteria classCode="OBS" moodCode="EVN">
    <templateId>
      <item extension="2014-11-24" root="2.16.840.1.113883.10.20.28.3.1"/>
    </templateId>
  </observationCriteria>
  <id extension="Overlaps_7C817374-14BB-4A24-9767-AA15E157DC7D" root="AF8D3EE2-AEFC-443F-8AA8-8EB1CB72F234"/>
  <code code="282291009" codeSystem="2.16.840.1.113883.6.96" codeSystemName="SNOMED CT">
    <displayName value="Diagnosis"/>
  </code>
  <title value="Diagnosis, Active"/>
  <statusCode code="COMPLETED"/>
  <value valueSet="2.16.840.1.113883.3.464.1003.103.12.1.1001" type="CD">
    <displayName value="Diabetes Grouping Value Set"/>
  </value>
  <temporallyRelatedInformation typeCode="OVERLAP">
    <temporalInformation precisionUnit="min"/>
    <criteriaReference classCode="OBS" moodCode="EVN">
      <id extension="measureperiod" root="40280381-3d61-56a7-013e-5d11abfbd68f6"/>
    </criteriaReference>
  </temporallyRelatedInformation>
</entry>
```
"Diagnosis, Active: Diabetes" overlaps "Measurement Period"

```xml
<entry typeCode="DRIV">
  <localVariableName value="localVar1Overlaps_7C817374-14BB-4A24-9767-AA15E157DC7D"/>
  <observationCriteria classCode="OB" moodCode="EVN">
    <templateId>
      <item extension="2014-11-24" root="2.16.840.1.113883.10.20.28.3.1"/>
    </templateId>
    <id extension="Overlaps_7C817374-14BB-4A24-9767-AA15E157DC7D" root="AF8D3EE2-AEFC-443F-8AA8-8EB1CB72F234"/>
    <code code="282291009" codeSystem="2.16.840.1.113883.6.96" codeSystemName="SNOMED CT">
      <displayName value="Diagnosis"/>
    </code>
    <title value="Diagnosis, Active"/>
    <statusCode code="COMPLETED"/>
    <value valueSet="2.16.840.1.113883.3.464.1003.103.12.1001" type="CD">
      <displayName value="Diabetes Grouping Value Set"/>
    </value>
    <temporallyRelatedInformation typeCode="OVERLAP">
      <temporalInformation precisionUnit="min"/>
      <criteriaReference classCode="OBS" moodCode="EVN">
        <id extension="measureperiod" root="40280381-3d61-56a7-013e-5d11abf68f6"/>
      </criteriaReference>
    </temporallyRelatedInformation>
  </observationCriteria>
</entry>
```
Data Criteria: Overlaps

"Diagnosis, Active: Diabetes" overlaps "Measurement Period"

XML Code Snippet:

```xml
<entry typeCode="DRIV">
  <localVariableName value="localVar_Overlaps_7C817374-14BB-4A24-9767-AA15E157DC7D"/>
  <observationCriteria classCode="OBS" moodCode="Evn">
    <templateId>
      <item extension="2014-11-24" root="2.16.840.1.113883.10.20.28.3.1"/>
    </templateId>
    <id extension="Overlaps_7C817374-14BB-4A24-9767-AA15E157DC7D"
         root="AF8D3EE2-AEFC-443F-8AA8-8EB1CB72F234"/>
    <code code="282291009" codeSystem="2.16.840.1.113883.6.96" codeSystemName="SNOMED CT">
      <displayName value="Diagnosis"/>
    </code>
    <title value="Diagnosis, Active"/>
    <statusCode code="COMPLETED"/>
    <value valueSet="2.16.840.1.113883.3.464.1003.103.12.1001" type="CD">
      <displayName value="Diabetes Grouping Value Set"/>
    </value>
    <temporallyRelatedInformation typeCode="OVERLAP">
      <temporalInformation precisionUnit="min"/>
      <criteriaReference classCode="OBS" moodCode="Evn">
        <id extension="measurementPeriod" root="40280381-3d61-56a7-013e-5d11abfb68f6"/>
      </criteriaReference>
    </temporallyRelatedInformation>
  </observationCriteria>
</entry>
```
Data Criteria: Measurement Period

"Diagnosis, Active: Diabetes" overlaps "Measurement Period"
Numerator

- **Numerator** =
  - **AND**: "Physical Exam, Performed: Visual Exam of Foot" **during** "Measurement Period"
  - **AND**: "Physical Exam, Performed: Sensory Exam of Foot" **during** "Measurement Period"
  - **AND**: "Physical Exam, Performed: Pulse Exam of Foot" **during** "Measurement Period"

```xml
<numeratorCriteria classCode="OBS" moodCode="EVN">
  <id extension="numerator" root="0E69D381-A7E7-4063-BA85-C5859B7B3A12"/>
  <code code="NUMER" codeSystem="2.16.840.1.113883.5.1063" codeSystemName="HL7 Observation Value">
    <displayName value="numerator"/>
  </code>
  <precondition typeCode="PRCN">
    <criteriaReference classCode="OBS" moodCode="EVN">
      <id extension="During_4EBCF616-00D6-4CF9-A0B4-F3CF9CB9EB20" root="0CC97519-3B09-4E62-AFA6-92D64D1BE2AA"/>
    </criteriaReference>
  </precondition>
  <precondition typeCode="PRCN">
    <criteriaReference classCode="OBS" moodCode="EVN">
    </criteriaReference>
  </precondition>
  <precondition typeCode="PRCN">
    <criteriaReference classCode="OBS" moodCode="EVN">
      <id extension="During_ABB22D06-5DB8-43D3-B36B-4A4957E371B9" root="C8E150B3-B07C-479F-8887-8A3B287F8EE4"/>
    </criteriaReference>
  </precondition>
</numeratorCriteria>
```
Numerator

- **AND:** "Physical Exam, Performed: Visual Exam of Foot" **during** "Measurement Period"
- **AND:** "Physical Exam, Performed: Sensory Exam of Foot" **during** "Measurement Period"
- **AND:** "Physical Exam, Performed: Pulse Exam of Foot" **during** "Measurement Period"

```xml
<numeratorCriteria classCode="OBS" moodCode="EVN">
    <id extension="numerator" root="0E69D381-A7E7-4063-BA85-C5859B7B3A12"/>
    <code code="NUMER" codeSystem="2.16.840.1.113883.5.1063" codeSystemName="HL7 Observation Value">
        <displayName value="numerator"/>
    </code>
    <precondition typeCode="PRCN">
        <criteriaReference classCode="OBS" moodCode="EVN">
            <id extension="During_4EBCF616-00D6-4CF9-A0B4-F3CF9CBBE2B0" root="0CC97519-3B09-4E62-AFA6-92D64D1BE2AA"/>
        </criteriaReference>
    </precondition>
    <precondition typeCode="PRCN">
        <criteriaReference classCode="OBS" moodCode="EVN">
        </criteriaReference>
    </precondition>
    <precondition typeCode="PRCN">
        <criteriaReference classCode="OBS" moodCode="EVN">
            <id extension="During_ABB22D06-5DB8-43D3-B368-4A4957E371B9" root="C8E150B3-B07C-479F-8887-8A3B287F8EE4"/>
        </criteriaReference>
    </precondition>
</numeratorCriteria>
```
Numerator

- **Numerator =**
  - AND: "Physical Exam, Performed: Visual Exam of Foot" **during** "Measurement Period"
  - AND: "Physical Exam, Performed: Sensory Exam of Foot" **during** "Measurement Period"
  - AND: "Physical Exam, Performed: Pulse Exam of Foot" **during** "Measurement Period"

```xml
<numeratorCriteria classCode="OBX" moodCode="EVN">
  <id extension="numerator" root="0E69D381-A7E7-4063-BA85-C6859B7B3A12"/>
  <code codeSystem="2.16.840.1.113883.5.1063" codeSystemName="HL7 Observation Value">
    <displayName value="numerator"/>
  </code>
  <precondition typeCode="PRCN">
    <criteriaReference classCode="OBS" moodCode="EVN">
      <id extension="During_4EBCF616-00D6-4CF9-A0B4-F3C9CB8EB280" root="0CC9751B-3B09-4E62-AFA6-92D64D1BE2AA"/>
    </criteriaReference>
    <precondition typeCode="PRCN">
      <criteriaReference classCode="OBS" moodCode="EVN">
      </criteriaReference>
      <precondition typeCode="PRCN">
        <criteriaReference classCode="OBS" moodCode="EVN">
          <id extension="During_ABB22D06-5DB8-43D3-B36B-4A4957E371B9" root="C8E150B3-B07C-479F-8887-8A3B2B7F8EE4"/>
        </criteriaReference>
      </precondition>
    </precondition>
  </precondition>
</numeratorCriteria>
```
Human Readable (HTML) View

- HQMF XML can be transformed to HTML
- Measure metadata represented in a table

<table>
<thead>
<tr>
<th>eMeasure Title</th>
<th>Diabetes: Foot Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>eMeasure Identifier</td>
<td>123</td>
</tr>
<tr>
<td>(Measure Authoring</td>
<td></td>
</tr>
<tr>
<td>Tool)</td>
<td></td>
</tr>
<tr>
<td>NQF Number</td>
<td>0056</td>
</tr>
<tr>
<td>eMeasure Version</td>
<td>4.0.000</td>
</tr>
<tr>
<td>number</td>
<td></td>
</tr>
<tr>
<td>GUID</td>
<td>c0d724d4-7c26-4863-9b51-8080f8928a85</td>
</tr>
<tr>
<td>Measurement Period</td>
<td>January 1, 20XX through December 31, 20XX</td>
</tr>
<tr>
<td>Measure Steward</td>
<td>National Committee for Quality Assurance</td>
</tr>
<tr>
<td>Measure Developer</td>
<td>National Committee for Quality Assurance</td>
</tr>
<tr>
<td>Endorsed By</td>
<td>National Quality Forum</td>
</tr>
<tr>
<td>Description</td>
<td>Percentage of patients aged 18-75 years of age with diabetes who had a foot exam during the measurement period.</td>
</tr>
</tbody>
</table>

- Measure logic represented as bulleted QDM logic

**Population Criteria**

- Initial Population =
  - AND: "Diagnosis, Active: Diabetes" overlaps "Measurement Period"
  - AND: Age >= 18 year(s) at: "Measurement Period"
  - AND: Age < 75 year(s) at: "Measurement Period"
  - AND: Union of:
    - "Encounter, Performed: Office Visit"
    - "Encounter, Performed: Face-to-Face Interaction"
Human Readable (HTML) View

- Data criteria listed with value set identifiers

  **Data Criteria (QDM Data Elements)**
  
  - "Diagnosis, Active: Bilateral amputation of leg below or above knee" using "Bilateral amputation of leg below or above knee Grouping Value Set (2.16.840.1.113883.3.464.1003.113.12.1056)"
  - "Diagnosis, Active: Diabetes" using "Diabetes Grouping Value Set (2.16.840.1.113883.3.464.1003.103.12.1001)"
  - "Diagnosis, Active: Left Unilateral Amputation Above or Below Knee" using "Left Unilateral Amputation Above or Below Knee Grouping Value Set (2.16.840.1.113883.3.464.1003.113.12.1058)"
  - "Diagnosis, Active: Right Unilateral Amputation Above or Below Knee" using "Right Unilateral Amputation Above or Below Knee Grouping Value Set (2.16.840.1.113883.3.464.1003.113.12.1057)"

- Supplemental data elements listed with value set identifiers

  **Supplemental Data Elements**
  
  - "Patient Characteristic Ethnicity: Ethnicity" using "Ethnicity CDCREC Value Set (2.16.840.1.114222.4.11.837)"
  - "Patient Characteristic Payer: Payer" using "Payer SOP Value Set (2.16.840.1.114222.4.11.3591)"
  - "Patient Characteristic Race: Race" using "Race CDCREC Value Set (2.16.840.1.114222.4.11.836)"
  - "Patient Characteristic Sex: ONC Administrative Sex" using "ONC Administrative Sex Administrative Gender Value Set (2.16.840.1.113762.1.4.1)"
HQMF Resources

- **HQMF Specification**

- **QDM-based HQMF Implementation Guide**

- **HQMF on the eCQI Resource Center**
  - [https://ecqi.healthit.gov/hqmf](https://ecqi.healthit.gov/hqmf)

- **eCQM on the eCQI Resource Center**
  - [https://ecqi.healthit.gov/ecqm](https://ecqi.healthit.gov/ecqm)

- **HL7 CQI Work Group**
  - [http://www.hl7.org/special/committees/CQI/index.cfm](http://www.hl7.org/special/committees/CQI/index.cfm)
eCQM and CDS Standards Harmonization
Background

- Clinical Decision Support (CDS) and electronic Clinical Quality Measurement (eCQM) are closely related, share many common requirements, and both support improving health care quality.
  - CDS guides a clinician to follow a standard plan of care
  - eCQM measures adherence to a standard plan of care

- **Shared needs:**
  - Define patient cohorts (sub-populations)
  - Standard ways to reference patient data in EHR
The Challenge

- **Current eCQM and CDS standards**
  - were not developed together
  - use different approaches to patient data
  - use different approaches to expression logic

<table>
<thead>
<tr>
<th>References to Patient Data</th>
<th>Expression Logic</th>
<th>Exchangeable Artifacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDS</td>
<td>Virtual Medical Record (VMR)</td>
<td>CDS Knowledge Artifact (HeD)</td>
</tr>
<tr>
<td>eCQM</td>
<td>Quality Data Model (QDM)</td>
<td>Quality Data Model (QDM)</td>
</tr>
</tbody>
</table>

- **EHR vendors and homegrown systems must**
  - Map their data to two different data model standards
  - Implement computation of two different logic standards
  - Interpret and implement text “guidance”

- **eCQM and CDS rule authors cannot**
  - Share or reuse logic between measures and rules
  - Ensure consistency between matching measures and rules
  - Adequately express all of their requirements
The Goal: Shared Standards

- **CQM Specific Standards**
  - HQMF
  - QRDA Category-1
  - QRDA Category-3
  - QDM

- **Common Metadata Standard**

- **Common Data Model Standard (QUICK)**

- **Common Expression Logic Standard (CQL)**

- **CDS Specific Standards**
  - HeD
  - vMR

---

*Quality Improvement and Clinical Knowledge*

**Clinical Quality Language**
Standards Harmonization Impact

- Improves efficiency and reduces cost
  - eCQM / CDS system implementation
  - eCQM / CDS rule authoring and maintenance

- Improves consistency and accuracy
  - Shared logic between measures and rules
  - Reduce or eliminate need for “guidance”

- Improves quality of standards
  - Leverage past lessons learned from eCQM & CDS
  - Community effort from larger, more diverse community

- Promotes integration of CQM and CDS domains

Bottom Line: Improves the Quality of Care Patients Receive
What is the Clinical Quality Language?

“The Clinical Quality Language Specification defines a representation for the expression of clinical knowledge that can be used within both the Clinical Decision Support (CDS) and Clinical Quality Measurement (CQM) domains.”

*HL7 Standard: Clinical Quality Language Specification, DSTU Release 1*
CQL Key Points

- The CQL specification defines two components:
  - **Clinical Quality Language**: Author-friendly domain specific language
  - **Expression Logical Model**: Computable XML

- CQL leverages best practices and lessons learned from:
  - **Quality Data Model**: Focus on ease of authoring
  - **Health eDecisions**: Focus on modularity and computability
  - **eCQM & CDS Communities**: HL7 Work Groups and S&I Framework

- CQL is designed to work with any data model

- CQL is much more expressive and robust than QDM logic

- CQL is a Health Level 7 (HL7) Draft Standard for Trial Use (DSTU)
Proposed Standards Evolution for eCQM
Example: CMS 123 – Diabetes: Foot Exam

**Initial Population**

Patients 18-75 years of age with diabetes with a visit during the measurement period

```plaintext
define InInitialPopulation:
    AgeInYearsAt (start of MeasurementPeriod) >= 18
    and AgeInYearsAt (start of MeasurementPeriod) < 75
    and exists ("Diagnosis": "Diabetes") D where D.period overlaps MeasurementPeriod
    and exists (ValidEncounters E where E.period during MeasurementPeriod)
```

**Valid Encounters**

- "Encounter, Performed": "Office Visit"
- "Encounter, Performed": "Face-to-Face Interaction"
- "Encounter, Performed": "Preventive Care Services Established Office Visit"
- "Encounter, Performed": "Preventive Care Services Initial Office Visit"
- "Encounter, Performed": "Home Healthcare Services"
- "Encounter, Performed": "Annual Wellness Visit"

**Denominator**

Equals Initial Population

```plaintext
define InDenominator:
    InInitialPopulation
```
Example: CMS 123 – Diabetes: Foot Exam

| Denominator Exclusions | Patients who have had either a bilateral amputation above or below the knee, or both a left and right amputation above or below the knee before or during the measurement period |

```plaintext
define InDenominatorExclusions:
    HadBilateralLegAmputation or (HadRightLegAmputation and HadLeftLegAmputation)

define HadBilateralLegAmputation:
    exists (["Diagnosis": "Bilateral amputation of leg below or above knee"] B
        where B.period starts before end of MeasurementPeriod)

define HadRightLegAmputation:
    exists (["Diagnosis": "Right Unilateral Amputation Above or Below Knee"] R
        where R.period starts before end of MeasurementPeriod)

define HadLeftLegAmputation:
    exists (["Diagnosis": "Left Unilateral Amputation Above or Below Knee"] L
        where L.period starts before end of MeasurementPeriod)
```
### Example: CMS 123 – Diabetes: Foot Exam

| Numerator | Patients who received visual, pulse and sensory foot examinations during the measurement period |

**define** InNumerator:

- **exists** (["Procedure, Performed": "Visual Exam of Foot"] P where P.period **during** MeasurementPeriod)
- **and** **exists** (["Procedure, Performed": "Sensory Exam of Foot"] P where P.period **during** MeasurementPeriod)
- **and** **exists** (["Procedure, Performed": "Pulse Exam of Foot"] P where P.period **during** MeasurementPeriod)
CQL-based HQMF

HQMF

relatedDocument

populationCriteriaSection

initialPopulationCriteria
denominatorCriteria
denominatorExclusionCriteria
numeratorCriteria

CQL

expression
expression
expression
calls

references

references

1

2

3
CQL-based HQMF for CMS 123

CMS 123 HQMF

relatedDocument

populationCriteriaSection

initialPopulationCriteria
denominatorCriteria
denominatorExclusionCriteria
numeratorCriteria

CMS 123 CQL

InInitialPopulation
ValidEncounters
InDenominator
InDenominatorExclusions
HadBilateralLegAmputation
HadRightLegAmputation
HadLeftLegAmputation
InNumerator
CQL-based HQMF: Related Document

CMS 123 HQMF

CMS 123 CQL

<relatedDocument typeCode="COMP">
  <expressionDocument>
    <id root="22688A59-B73C-4276-9E83-778214E1CA3C"/>
    <text mediaType="application/cql">
      <reference value="CMS123.cql"/>
    </text>
  </expressionDocument>
</relatedDocument>
CQL-based HQMF: Population Criteria

<precondition typeCode="PRCN">
  <criteriaReference moodCode="EVN" classCode="OBS">
    <id root="22688A59-B73C-4276-9E83-778214E1CA3C" extension="CMS123.InInitialPopulation"/>
  </criteriaReference>
</precondition>
CQL Resources

- CQL Specification

- CQL-based HQMF Implementation Guide

- CDS/eCQM Harmonization on the eCQI Resource Center
  - https://ecqi.healthit.gov/cdsecqm-harmonization

- S&I Clinical Quality Framework Initiative

- HL7 CQI Work Group
  - http://www.hl7.org/special/committees/CQI/index.cfm

- HL7 CDS Work Group
  - https://www.hl7.org/Special/committees/dss/index.cfm
Backup Slides
<table>
<thead>
<tr>
<th>Acronyms</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDS</td>
<td>Clinical Decision Support</td>
</tr>
<tr>
<td>CIMI</td>
<td>Clinical Information Modeling Initiative</td>
</tr>
<tr>
<td>CMS</td>
<td>Centers for Medicare &amp; Medicaid Services</td>
</tr>
<tr>
<td>CQF</td>
<td>Clinical Quality Framework</td>
</tr>
<tr>
<td>CQI</td>
<td>Clinical Quality Improvement</td>
</tr>
<tr>
<td>CQL</td>
<td>Clinical Quality Language</td>
</tr>
<tr>
<td>CQM</td>
<td>Clinical Quality Measure</td>
</tr>
<tr>
<td>DAF</td>
<td>Data Access Framework</td>
</tr>
<tr>
<td>DEN</td>
<td>Denominator</td>
</tr>
<tr>
<td>DSTU</td>
<td>Draft Standards for Trial Use</td>
</tr>
<tr>
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<td>Electronic Clinical Quality Improvement</td>
</tr>
<tr>
<td>eCQM</td>
<td>Electronic Clinical Quality Measure</td>
</tr>
<tr>
<td>EH</td>
<td>Eligible Hospital</td>
</tr>
<tr>
<td>EHR</td>
<td>Electronic Health Record</td>
</tr>
<tr>
<td>EP</td>
<td>Eligible Provider</td>
</tr>
<tr>
<td>FHIR</td>
<td>Fast Healthcare Interoperability Resources</td>
</tr>
<tr>
<td>HeD</td>
<td>Health eDecisions</td>
</tr>
<tr>
<td>HL7</td>
<td>Health Level Seven International</td>
</tr>
<tr>
<td>HQMF</td>
<td>Health Quality Measure Format</td>
</tr>
<tr>
<td>HSPC</td>
<td>Healthcare Services Platform Consortium</td>
</tr>
<tr>
<td>IG</td>
<td>Implementation Guide</td>
</tr>
<tr>
<td>MU</td>
<td>Meaningful Use</td>
</tr>
<tr>
<td>MU2</td>
<td>Meaningful Use Stage 2</td>
</tr>
<tr>
<td>MU3</td>
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<tr>
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<td>Office of the National Coordinator for Health Information Technology</td>
</tr>
<tr>
<td>QDM</td>
<td>Quality Data Model</td>
</tr>
<tr>
<td>QRDA</td>
<td>Quality Reporting Data Standards</td>
</tr>
<tr>
<td>QUICK</td>
<td>Quality Improvement and Clinical Knowledge</td>
</tr>
<tr>
<td>RIM</td>
<td>Reference Information Model</td>
</tr>
<tr>
<td>S&amp;I</td>
<td>Standards and Interoperability</td>
</tr>
<tr>
<td>SDC</td>
<td>Structured Data Capture</td>
</tr>
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<tr>
<td>UML</td>
<td>Unified Modeling Language</td>
</tr>
<tr>
<td>USHIK</td>
<td>United States Health Information Knowledgebase</td>
</tr>
<tr>
<td>vMR</td>
<td>Virtual Medical Record</td>
</tr>
<tr>
<td>VSAC</td>
<td>Value Set Authority Center</td>
</tr>
<tr>
<td>XML</td>
<td>Extensible Markup Language</td>
</tr>
</tbody>
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