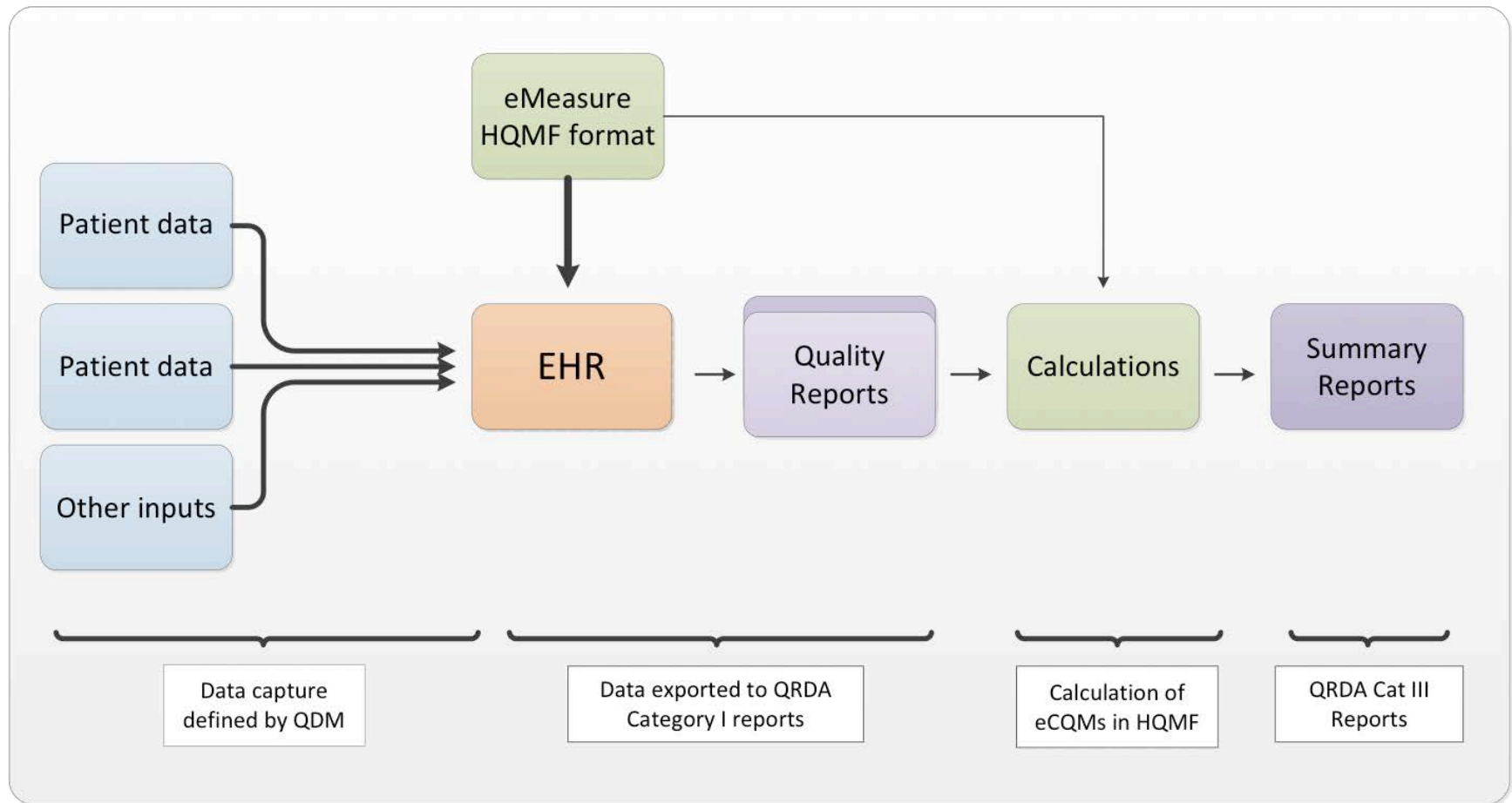


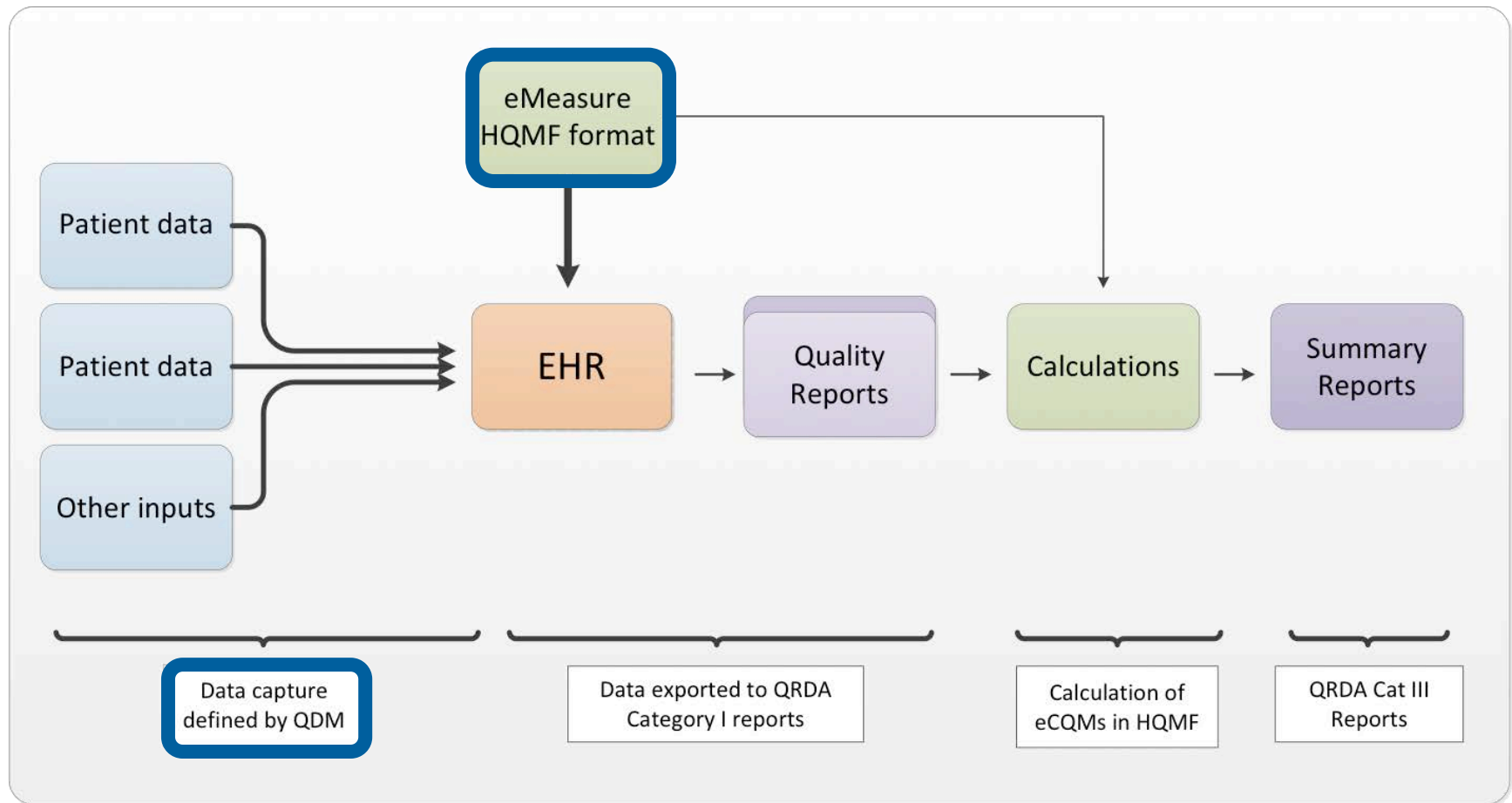
eCQI 101: Standards for Representing eCQMs

Chris Moesel, The MITRE Corporation

Overview of eCQM Standards



Overview of eCQM Standards



eCQI Standards on the eCQI Resource Center

eCQI Resource Center

The one-stop shop for the most current resources to support electronic clinical quality improvement.



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eCQI

eCQI Standards



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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

Public

[Request space membership](#)

There is no content in this space.

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 \geq 5 mg)”

QDM Categories

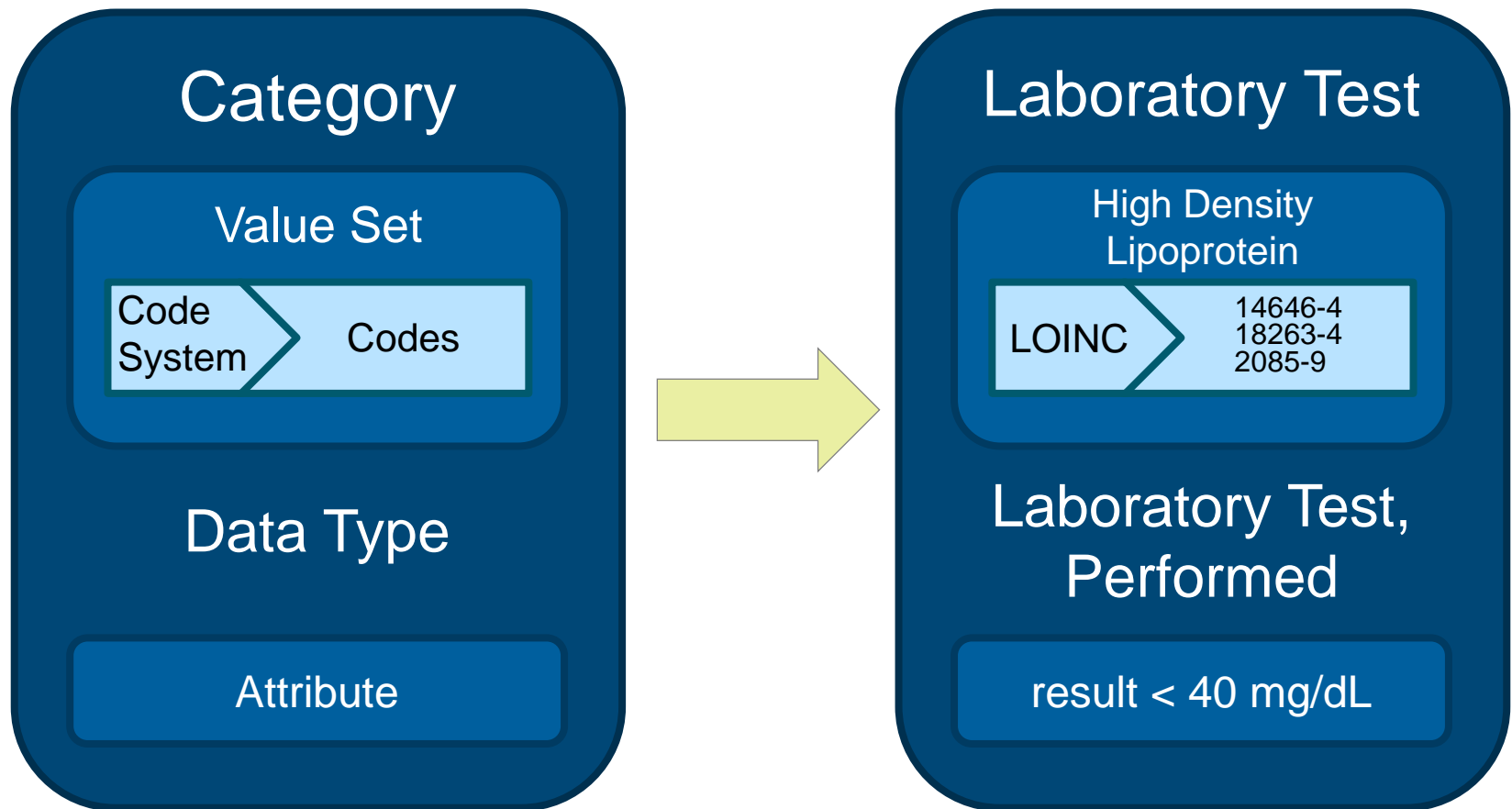
- Care Experience
- Care Goal
- Communication
- Condition/Diagnosis/Problem
- Device
- Diagnostic Study
- Encounter
- Functional Status
- Immunization
- Individual Characteristic
- Intervention
- Laboratory Test
- Medication
- Physical Exam
- Procedure
- Risk Category/Assessment
- Substance
- Symptom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

Laboratory Test Data Types and Attributes

Datatype	Definition	Attributes
Laboratory Test, Adverse Event	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.	<ul style="list-style-type: none"> • Reaction • Start Datetime • Stop Datetime
Laboratory Test, Intolerance	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.	<ul style="list-style-type: none"> • Reaction • Start Datetime • Stop Datetime
Laboratory Test, Order	<p>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.</p> <p>NOTE: 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.</p>	<ul style="list-style-type: none"> • Method • Negation Rationale • Reason • Start Datetime • Stop Datetime
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.	<ul style="list-style-type: none"> • Method • Negation Rationale • Reason • Reference Range High • Reference Range Low • Result • Start Datetime • Status • Stop Datetime
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.	<ul style="list-style-type: none"> • Method • Negation Rationale • Reason • Start Datetime • Stop Datetime

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

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

■ 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"

Denominator	Equals Initial Population
--------------------	---------------------------

■ 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/calendar>
 - Registration: <https://www4.gotomeeting.com/register/303510935>
- **QDM Jira Issue Tracker**
 - <https://jira.oncprojectracking.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

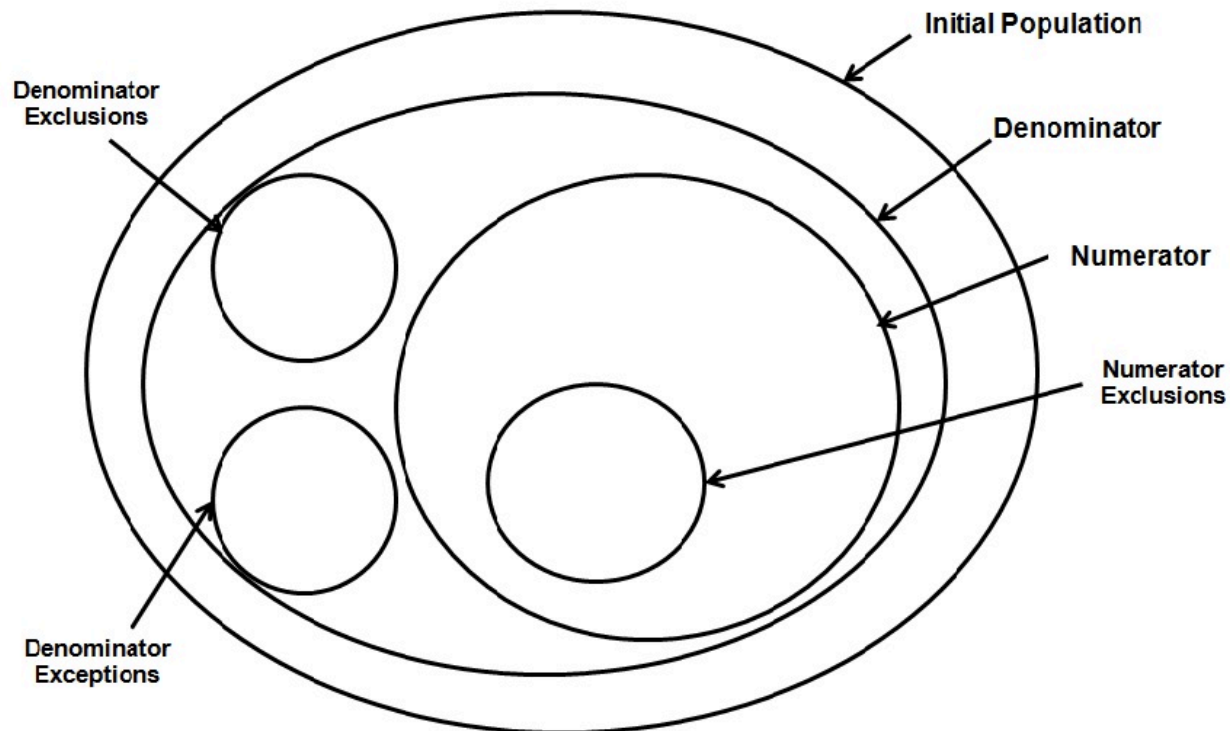
- **Patient-based (longitudinal care)**

- 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)**

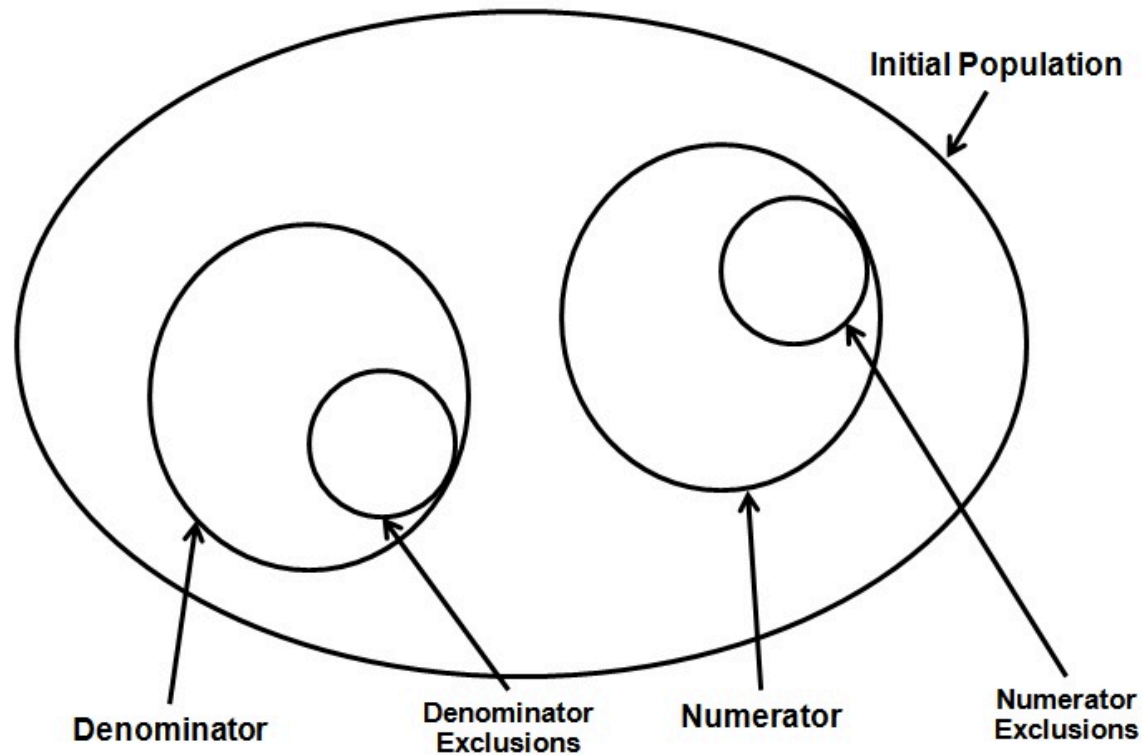
- Assess each distinct ‘encounter’ between a patient and a provider, during a measurement period.
- Use HQMF’s “ITMCNT” to identify encounters of interest
- Examples:
 - Were heart attack patients discharged with an Rx for Aspirin?

HQMF: Proportion Measures



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

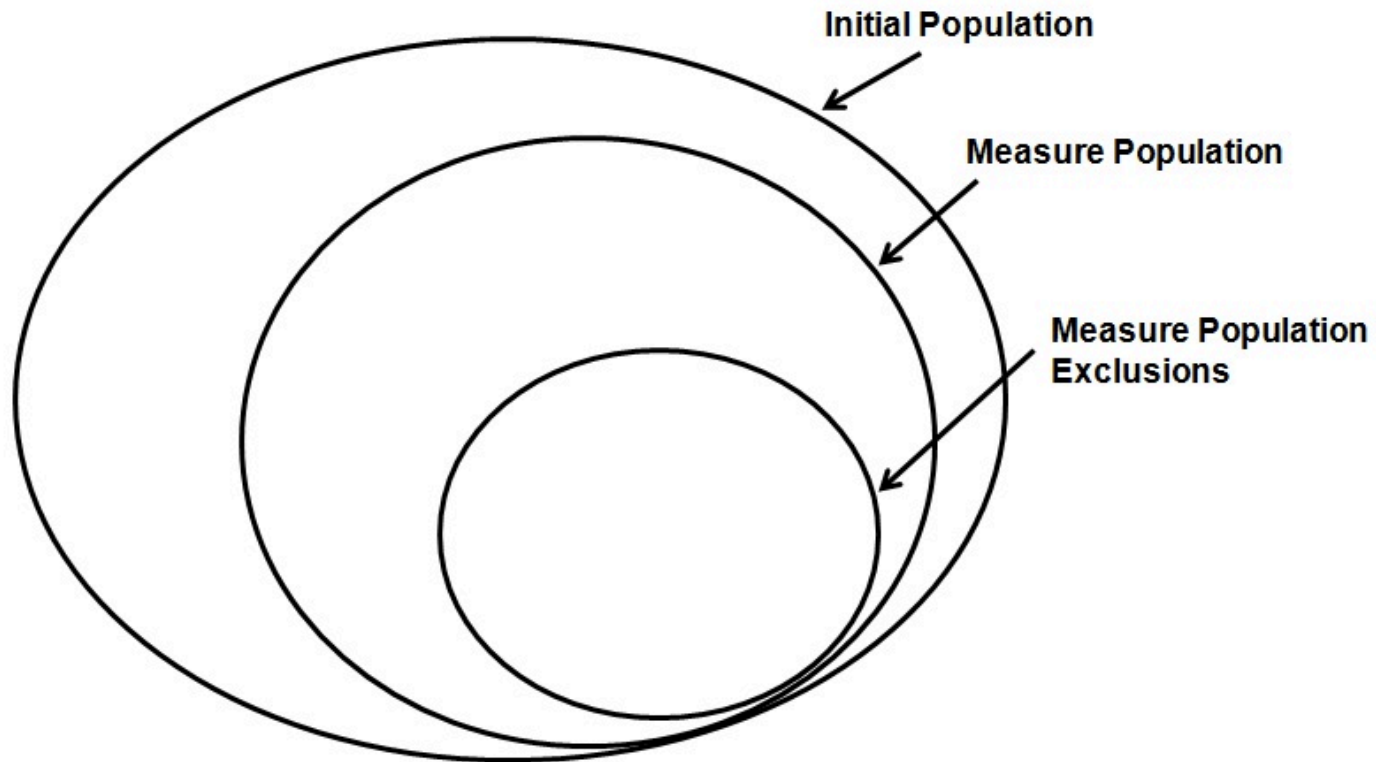
HQMF: Ratio Measures



Score:

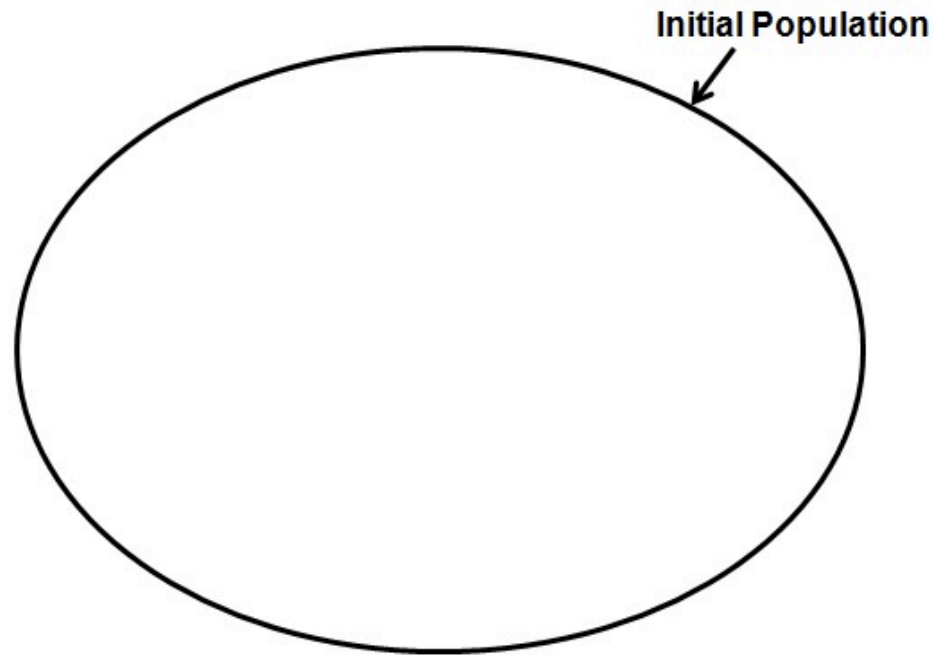
$$\frac{\text{Numerator} - \text{Numerator Exclusions}}{\text{Denominator} - \text{Denominator Exclusions}}$$

HQMF: Continuous Variable Measures



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

HQMF: Cohort Measures



Score: **Count (Initial Population)**

HQMF Measure Scores and Populations

Measure Score	Initial Population	Denominator	Denominator Exclusion	Denominator Exception	Numerator	Numerator Exclusion	Measure Population	Measure Population Exclusion
Proportion	R	R	O	O	R	O	NP	NP
Ratio	R*	R	O	NP	R	O	NP	NP
Continuous Variable	R	NP	NP	NP	NP	NP	R	O
Cohort	R	NP	NP	NP	NP	NP	NP	NP

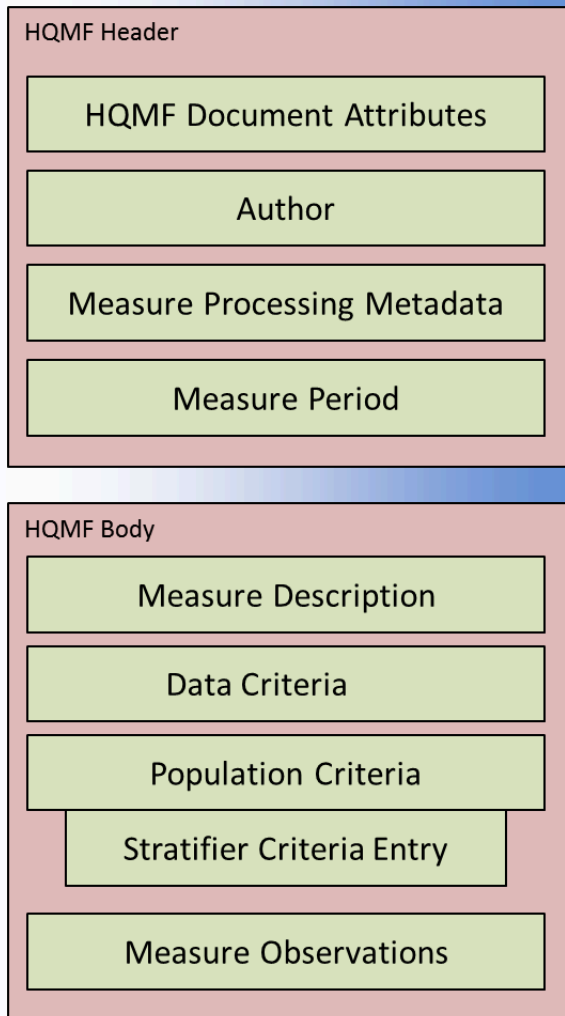
* Ratio measures may have *two* Initial Populations (one for Numerator and one for Denominator)

■ Key

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

HQMF Structure

HQMF Document Structure



```

<?xml version="1.0" encoding="utf-16"?>
<QualityMeasureDocument xmlns="urn:h17-org:v3" xmlns:qdm="urn:hhs-qdm:hqmf-r2-extensions:v1"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <!-- document attributes go here -->
  <author>
    <!-- authors go here -->
  </author>
  <controlVariable>
    <measurePeriod>
      <!-- measure period goes here -->
    </measurePeriod>
  </controlVariable>
  <subjectOf>
    <measureAttribute>
      <!-- measure attribute goes here -->
    </measureAttribute>
  </subjectOf>
  <!-- more measure attributes go here -->
  <component>
    <dataCriteriaSection>
      <!-- data criteria goes here -->
    </dataCriteriaSection>
  </component>
  <component>
    <populationCriteriaSection>
      <!-- population criteria metadata goes here -->
      <component typeCode="COMP">
        <initialPopulationCriteria classCode="OBS" moodCode="EVN">
          <!-- initial population criteria goes here -->
        </initialPopulationCriteria>
      </component>
      <component typeCode="COMP">
        <denominatorCriteria classCode="OBS" moodCode="EVN">
          <!-- denominator criteria goes here -->
        </denominatorCriteria>
      </component>
      <component typeCode="COMP">
        <denominatorExclusionCriteria classCode="OBS" moodCode="EVN">
          <!-- denominator exclusion criteria goes here -->
        </denominatorExclusionCriteria>
      </component>
      <component typeCode="COMP">
        <numeratorCriteria classCode="OBS" moodCode="EVN">
          <!-- numerator criteria goes here -->
        </numeratorCriteria>
      </component>
      <component typeCode="COMP">
        <stratifierCriteria>
          <!-- stratifier criteria goes here -->
        </stratifierCriteria>
      </component>
      <!-- more stratifiers go here -->
    </populationCriteriaSection>
  </component>
</QualityMeasureDocument>
  
```

Data Criteria

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

```

<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="measureperiod" root="40280381-3d61-56a7-013e-5d11abfb68f6"/>
      </criteriaReference>
    </temporallyRelatedInformation>
  </observationCriteria>
</entry>

```

Data Criteria: Data Type → Template

Diagnosis, Active Diabetes" overlaps "Measurement Period"

```
<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="measureperiod" root="40280381-3d61-56a7-013e-5d11abfb68f6"/>
      </criteriaReference>
    </temporallyRelatedInformation>
  </observationCriteria>
</entry>
```

Data Criteria: Value Set

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

```
<entry typeCode="DRIV">
  <localVariableName value="localVar_Overlaps_7C817374-14BB-4A24-9767-AA15E157DC7D"/>
  <observationCriteria classCode="OBS" moodCode="EVN">
    <templateId>
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    </templateId>
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      root="AF8D3EE2-AEFC-443F-8AA1-8EB1CB72F234"/>
    <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: Overlaps

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

```
<entry typeCode="DRIV">
  <localVariableName value="localVar_Overlaps_7C817374-14BB-4A24-9767-AA15E157DC7D"/>
  <observationCriteria classCode="OBS" moodCode="EVN">
    <templateId>
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    </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, Active: Diabetes" />
    </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: Measurement Period

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

```
<entry typeCode="DRIV">
  <localVariableName value="localVar_Overlaps_7C817374-14BB-4A24-9767-AA15E157DC7D"/>
  <observationCriteria classCode="OBS" moodCode="EVN">
    <templateId>
      <item extension="2014-11-24" root="2.16.840.1.113883.10.2.2.28.3.1"/>
    </templateId>
    <id extension="Overlaps_7C817374-14BB-4A24-9767-AA15E157DC7D"
      root="AF8D3EE2-AEFC-443F-8AA8-8EB1CB72F234"/>
    <code code="282291009" codeSystem="2.16.840.1.113883.6.93" 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>
      </temporalInformation>
    </temporallyRelatedInformation>
  </observationCriteria>
</entry>
```


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"

```
<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-F3CF9CBBEB20" root="0CC97519-3B09-4E62-AFA6-92D64D1BE2AA"/>
    </criteriaReference>
  </precondition>
  <precondition typeCode="PRCN">
    <criteriaReference classCode="OBS" moodCode="EVN">
      <id extension="During_3BE8DA2A-E34E-49A1-B512-9552E42C4162" root="E1024B64-48BC-40CB-AF74-407886A47875"/>
    </criteriaReference>
  </precondition>
  <precondition typeCode="PRCN">
    <criteriaReference classCode="OBS" moodCode="EVN">
      <id extension="During_ABB22D06-5DB8-43D3-B36B-4A4957E371B9" root="C8E150B3-B07C-479F-8887-8A3B2B7F8EE4"/>
    </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"

```
<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-F3CF9CBBEB20" root="0CC97519-3B09-4E62-AFA6-92D64D1BE2AA"/>
    </criteriaReference>
  </precondition>
  <precondition typeCode="PRCN">
    <criteriaReference classCode="OBS" moodCode="EVN">
      <id extension="During_3BE8DA2A-E34E-49A1-B512-9552E42C4162" root="E1024B64-48BC-40CB-AF74-407886A47875"/>
    </criteriaReference>
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    </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"

```

<numeratorCriteria classCode="OBS" moodCode="EVN">
  <id extension="numerator" root="0E69D381-A7E7-4063-BA85-C859B7B3A12"/>
  <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-F3C9CBBEB20" root="0CC97519-3B09-4E62-AFA6-92D64D1BE2AA"/>
    </criteriaReference>
  </precondition>
  <precondition typeCode="PRCN">
    <criteriaReference classCode="OBS" moodCode="EVN">
      <id extension="During_3BE8DA2A-E34E-49A1-B512-9552E42C4162" root="E1024B64-48BC-40CB-AF74-407886A47875"/>
    </criteriaReference>
  </precondition>
  <precondition typeCode="PRCN">
    <criteriaReference classCode="OBS" moodCode="EVN">
      <id extension="During_ABB22D06-5DB8-43D3-B36B-4A4957E371B9" root="C8E150B3-B07C-479F-8887-8A3B2B7F8EE4"/>
    </criteriaReference>
  </precondition>
</numeratorCriteria>

```

Human Readable (HTML) View

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

eMeasure Title	Diabetes: Foot Exam		
eMeasure Identifier (Measure Authoring Tool)	123	eMeasure Version number	4.0.000
NQF Number	0056	GUID	c0d72444-7c26-4863-9b51-8080f8928a85
Measurement Period	January 1, 20XX through December 31, 20XX		
Measure Steward	National Committee for Quality Assurance		
Measure Developer	National Committee for Quality Assurance		
Endorsed By	National Quality Forum		
Description	Percentage of patients aged 18-75 years of age with diabetes who had a foot exam during the measurement period.		

- Measure logic represented as bulleted QDM logic

Population Criteria

- **Initial Population =**
 - AND: "Diagnosis, Active: Diabetes" overlaps "Measurement Period"
 - AND: Age \geq 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 AdministrativeGender Value Set (2.16.840.1.113762.1.4.1)"

HQMF Resources

- **HQMF Specification**

- http://www.hl7.org/implement/standards/product_brief.cfm?product_id=97

- **QDM-based HQMF Implementation Guide**

- http://www.hl7.org/implement/standards/product_brief.cfm?product_id=346

- **HQMF on the eCQI Resource Center**

- <https://ecqi.healthit.gov/hqmf>

- **eCQM on the eCQI Resource Center**

- <https://ecqi.healthit.gov/ecqm>

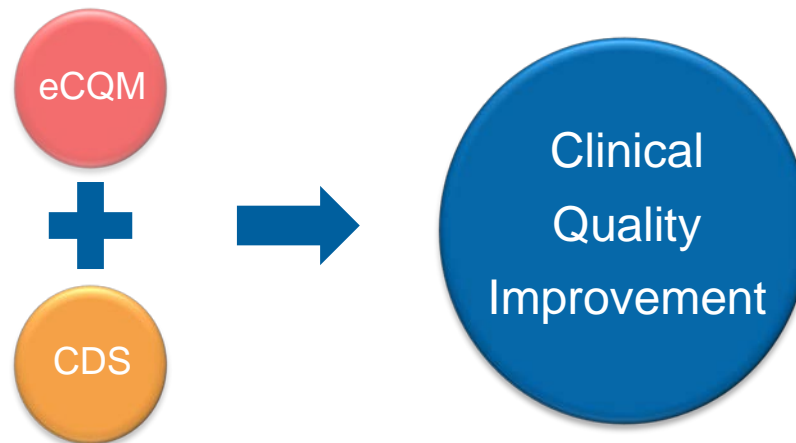
- **HL7 CQI Work Group**

- <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

	References to Patient Data	Expression Logic	Exchangeable Artifacts
CDS	Virtual Medical Record (VMR)	CDS Knowledge Artifact (HeD)	CDS Knowledge Artifact (HeD)
eCQM	Quality Data Model (QDM)	Quality Data Model (QDM)	QRDA I & III, HQMF

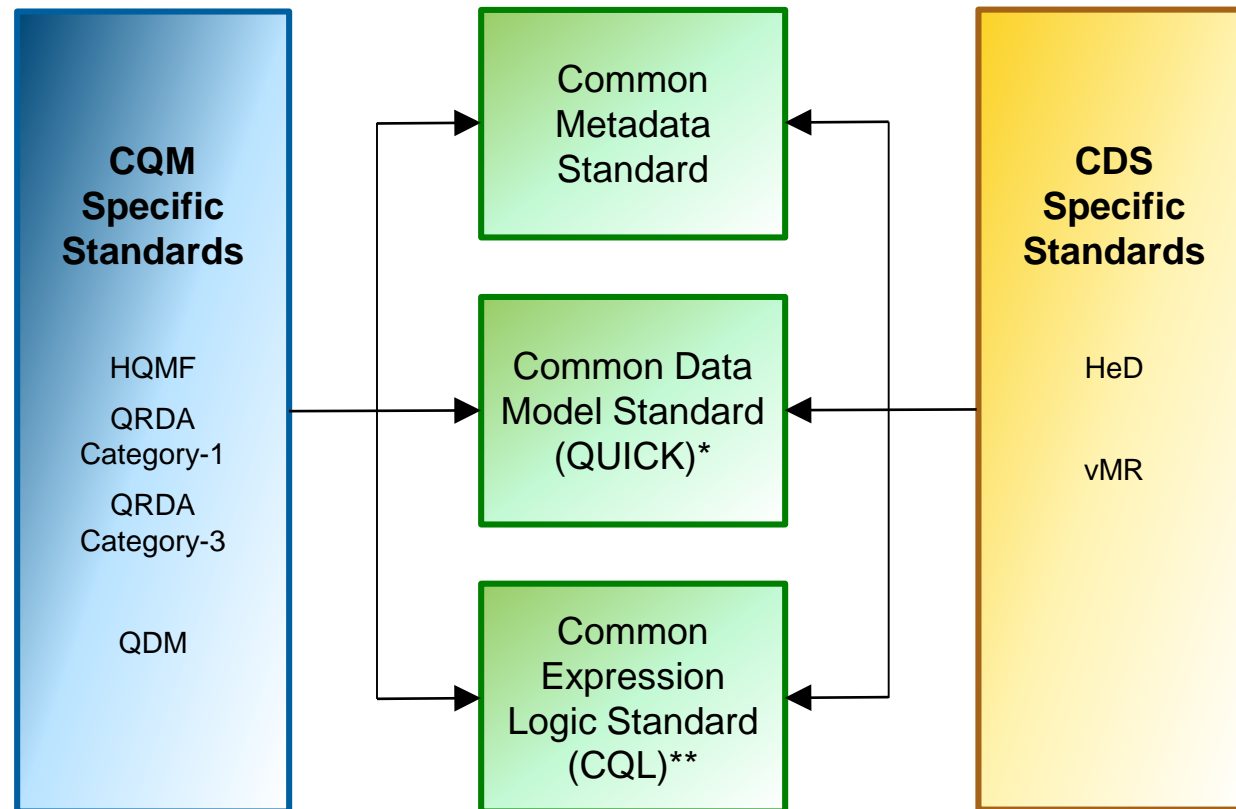
- **EHR vendors and homegrown systems *must***

- 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



* 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?

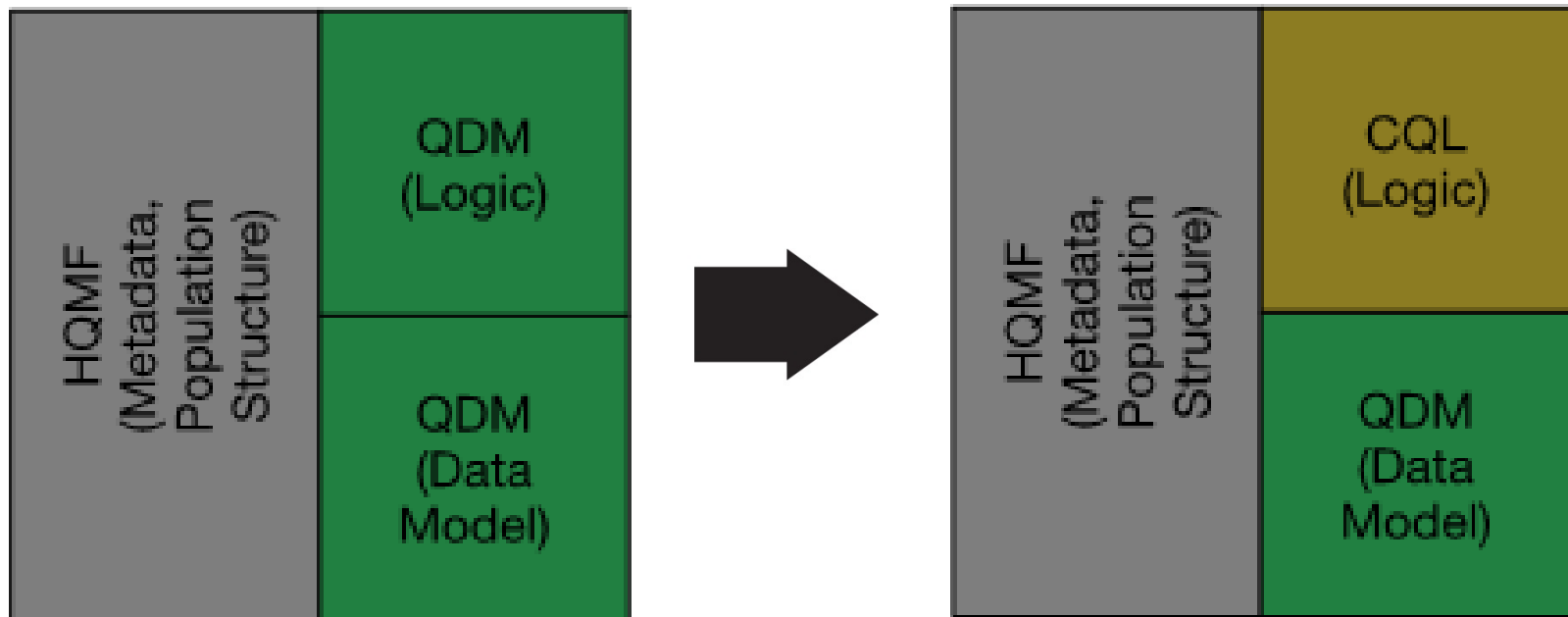
“The Clinical Quality Language Specification defines a representation for the expression of clinical knowledge that can be used within both the Clinical Decision Support (CDS) and Clinical Quality Measurement (CQM) domains.”

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
---------------------------	--

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)
```

define ValidEncounters:

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

Denominator	Equals Initial Population
--------------------	---------------------------

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

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

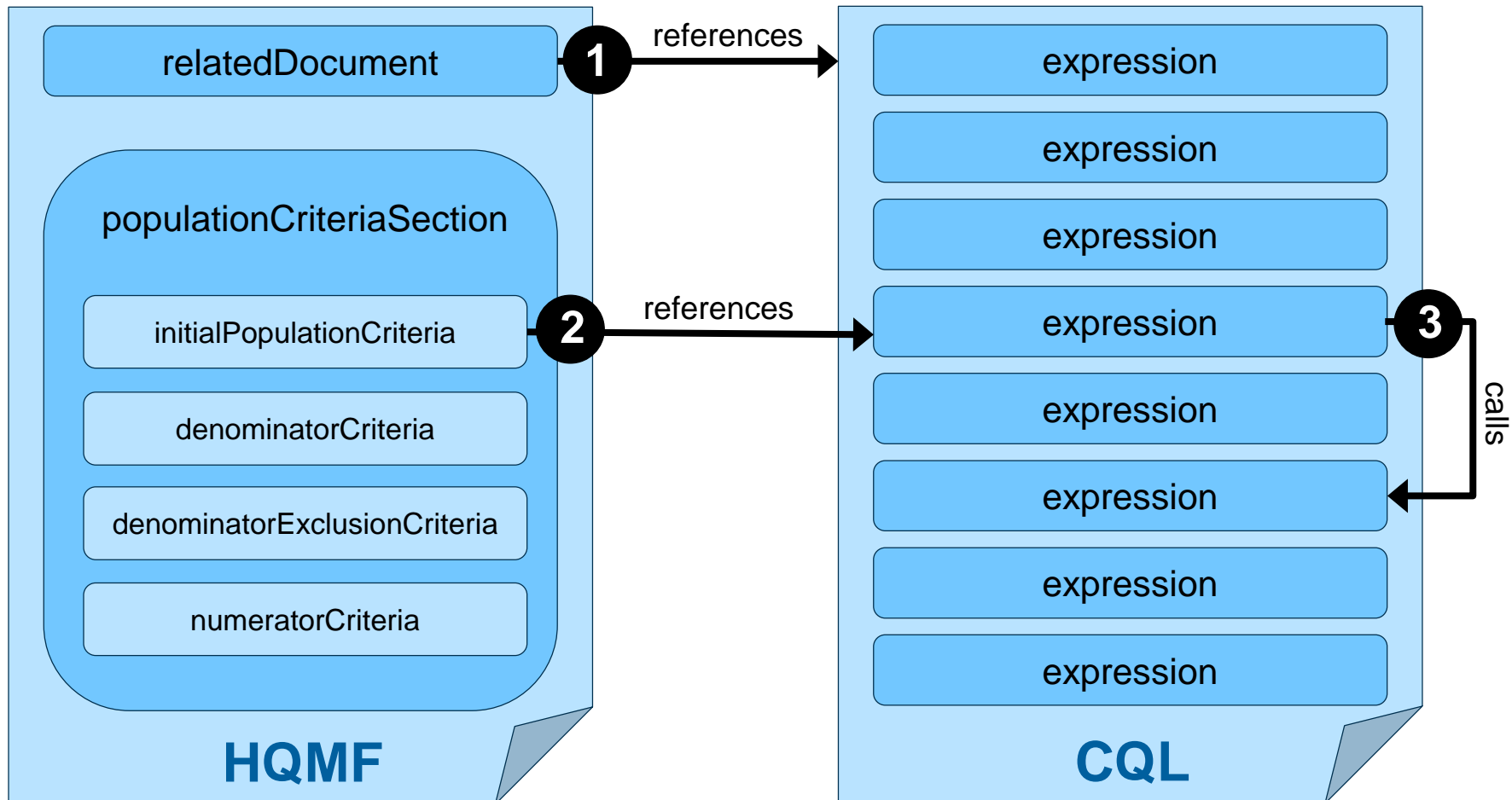
Numerator

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

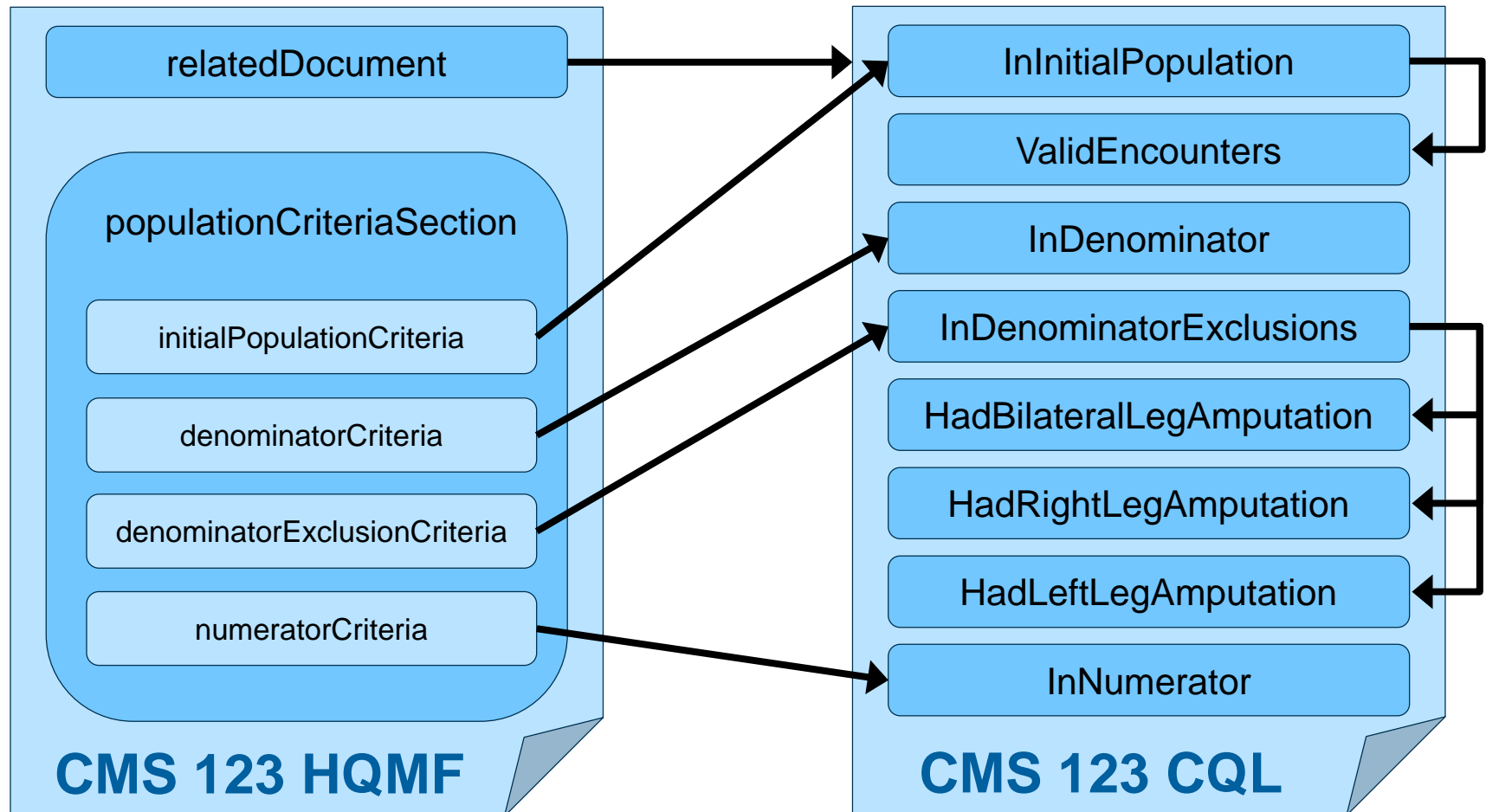
define InNumerator:

```
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)
```

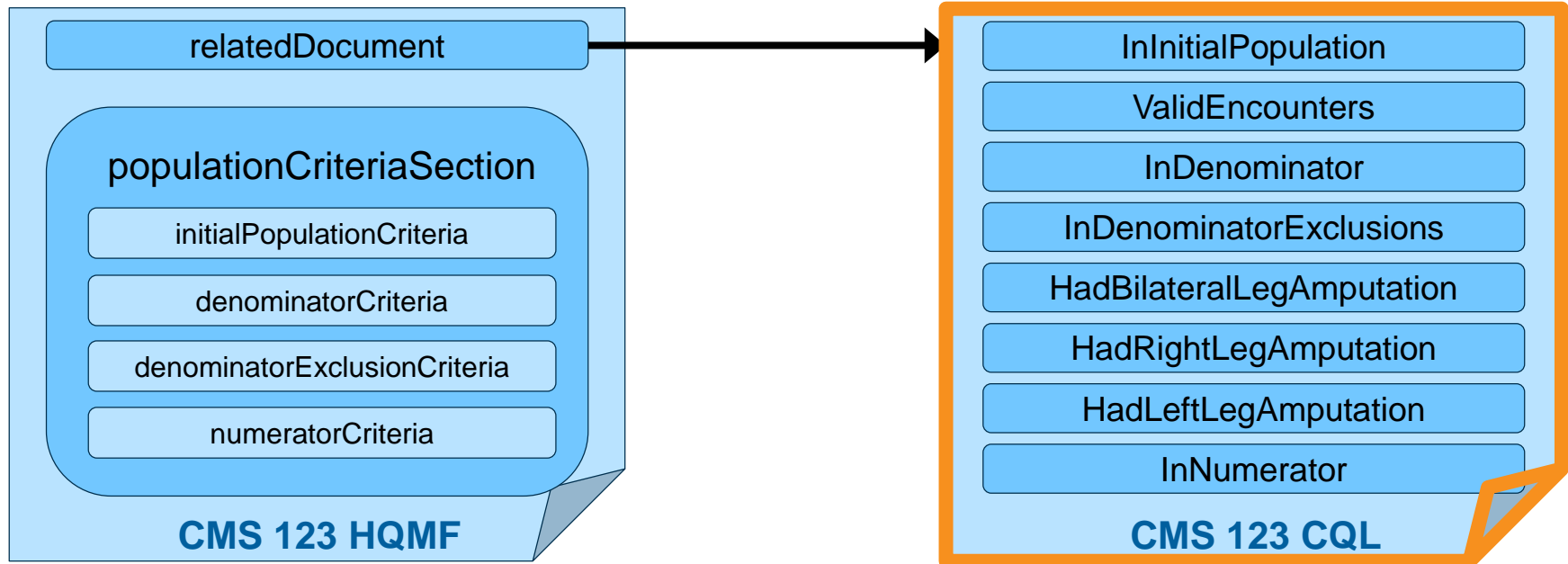

CQL-based HQMF



CQL-based HQMF for CMS 123

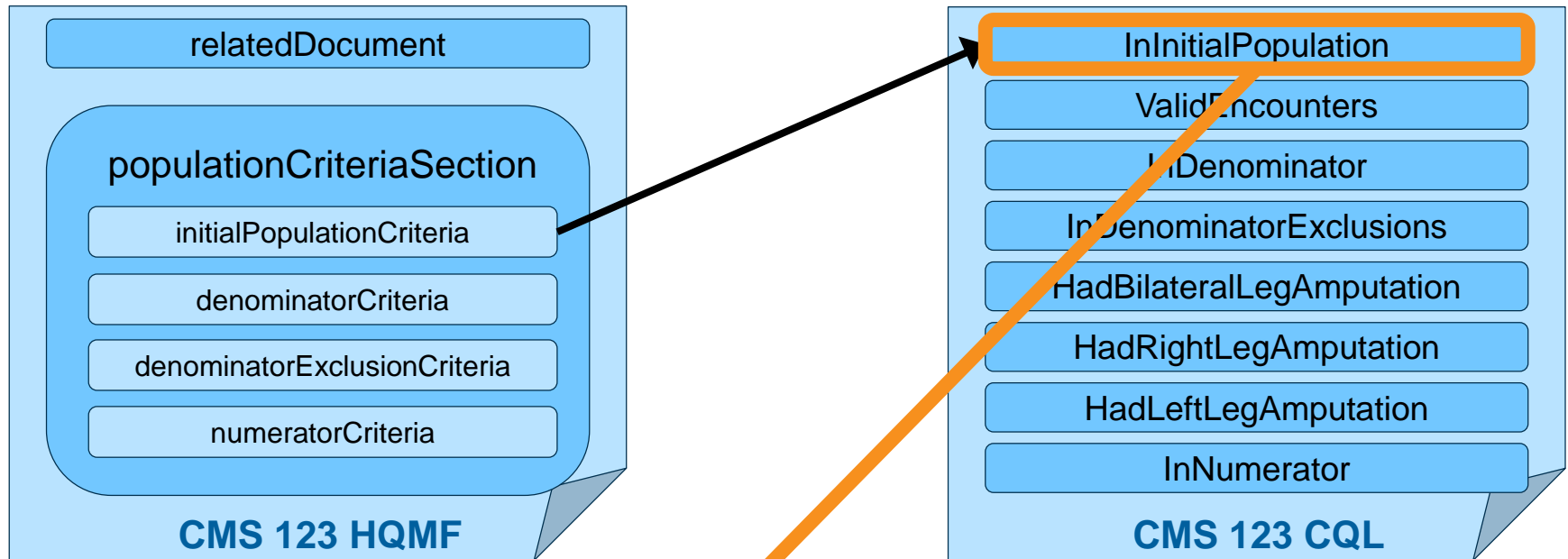


CQL-based HQMF: Related Document



```
<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**
 - http://www.hl7.org/implement/standards/product_brief.cfm?product_id=400
- **CQL-based HQMF Implementation Guide**
 - http://www.hl7.org/implement/standards/product_brief.cfm?product_id=405
- **CDS/eCQM Harmonization on the eCQI Resource Center**
 - <https://ecqi.healthit.gov/cdsecqm-harmonization>
- **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

Acronyms

CDS	Clinical Decision Support
CIMI	Clinical Information Modeling Initiative
CMS	Centers for Medicare & Medicaid Services
CQF	Clinical Quality Framework
CQI	Clinical Quality Improvement
CQL	Clinical Quality Language
CQM	Clinical Quality Measure
DAF	Data Access Framework
DEN	Denominator
DSTU	Draft Standards for Trial Use
eCQI	Electronic Clinical Quality Improvement
eCQM	Electronic Clinical Quality Measure
EH	Eligible Hospital
EHR	Electronic Health Record
EP	Eligible Provider
FHIR	Fast Healthcare Interoperability Resources
HeD	Health eDecisions
HL7	Health Level Seven International
HQMF	Health Quality Measure Format

HSPC	Healthcare Services Platform Consortium
IG	Implementation Guide
MU	Meaningful Use
MU2	Meaningful Use Stage 2
MU3	Meaningful Use Stage 3
NUM	Numerator
ONC	Office of the National Coordinator for Health Information Technology
QDM	Quality Data Model
QRDA	Quality Reporting Data Standards
QUICK	Quality Improvement and Clinical Knowledge
RIM	Reference Information Model
S&I	Standards and Interoperability
SDC	Structured Data Capture
UML	Unified Modeling Language
USHIK	United States Health Information Knowledgebase
vMR	Virtual Medical Record
VSAC	Value Set Authority Center
XML	Extensible Markup Language