eCQM 101 - Getting Started with Electronic Clinical Quality Measures for Quality Reporting Programs

Introduction

February 2022
eCQM 101 Overview

• What is an electronic clinical quality measure (eCQM)?
• Where do I find eCQMs?
• What is included in an eCQM specification?
What is an eCQM?
eCQMs

- eCQMs use data electronically extracted from electronic health records and/or health information technology systems to measure the quality of health care provided.
- CMS uses eCQMs in a variety of quality reporting and incentive programs.
- Eligible Clinicians, Eligible Hospitals (EHs), and Critical Access Hospitals (CAHs) report eCQMs to CMS.
Building an eCQM

- Data Model - What data to look for in the patient’s medical record to capture and report
- Expression Logic - How to calculate the results of the data captured in order to measure that the ‘right’ care was provided
- Structure - metadata, numerator, denominator, exclusions, exceptions
The QDM is an information model that defines relationships between patients and clinical concepts in a standardized format to enable electronic quality performance measurement.

The QDM is the current structure for electronically representing quality measure concepts in eCQM development and reporting.

QDM Data Element structure
eCQM Data Element

• **QDM Category** - Consists of a single clinical concept identified by a value set. A category is the highest level of definition for a QDM element. QDM versions 5.5 and 5.6 contain 22 categories.
  ▪ Examples: Medication, Procedure, Condition/Diagnosis/Problem, and Encounter

• **QDM Datatype** - The context in which each category is used to describe a part of the clinical care process. Examples of QDM datatypes include “Medication, Active” and “Medication, Administered” as applied to the QDM Medication category.
  ▪ Examples: “Laboratory Test, Order”, “Laboratory Test, Performed”

• **QDM Attribute** - Provides specific details about a QDM datatype. QDM attributes represent metadata, or information about each QDM datatype that might be used in eCQM expressions to provide necessary details for calculation.
  ▪ Example: “Laboratory Test, Performed: (result)”
The eCQM DERep provides all the data elements associated with published and tested eCQMs for use in CMS quality reporting programs including definitions and clinical focus for each data element.

Health Quality Measure Format (HQMF) and Expression Logic Clinical Quality Language (CQL)

- The HQMF is the basic electronic specification for the measure. It provides the metadata and population structure. The QDM provides the data model and CQL represents the logic used in the HQMF.
- The HQMF header includes descriptions of the measure populations, any stratifications, the measure steward, measure type, identifiers, rationale, scoring, and other details. The HQMF body includes the population criteria and the data criteria.
- CQL is a Health Level Seven International® (HL7®) authoring language standard that is human readable. CQL is the expression logic used with Health Quality Measure Format (HQMF) for eCQMs implemented beginning with calendar year 2019 reporting.
Benefits of CQL

• Expresses measure logic that is easily human readable yet structured enough for processing a query electronically
• Provides for measure logic that can be shared between measures
• Harmonizes the standards used for eCQMs and Clinical Decision Support (CDS)
• Simplifies calculation engine implementation
• Can be used with multiple information data models, e.g., QDM, Fast Healthcare Interoperability Resources® (FHIR®)
Where do I find eCQMs?
Different ways to get to eCQMs

https://ecqi.healthit.gov/
Example: Finding Eligible Hospital/Critical Access Hospital Implementation Resources

https://ecqi.healthit.gov/eh-cah?qt-tabs_eh=0&globalyearfilter=2022
Example: Finding Eligible Hospital/Critical Access Hospital eCQMs

https://ecqi.healthit.gov/eh-cah?qt-tabs_eh=1
Example: Finding Eligible Hospital/Critical Access Hospital Individual eCQM Specifications – General Information

https://ecqi.healthit.gov/ecqm/eh/2022/cms104v10
Example: Finding Eligible Hospital/Critical Access Hospital Individual eCQM Specifications, Data Element Repository and Value Set Links

Discharged on Antithrombotic Therapy

Specifications

<table>
<thead>
<tr>
<th>Attachment</th>
<th>Size</th>
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<tbody>
<tr>
<td>CMS104v10.html</td>
<td>92.75 KB</td>
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<tr>
<td>CMS104v10.zip (ZIP)</td>
<td>76.45 KB</td>
</tr>
<tr>
<td>CMS104v10-TRN.xlsx (Excel)</td>
<td>18.68 KB</td>
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</tbody>
</table>

Data Element Repository

- Data Elements contained within CMS104v10

Value Sets

- Value Sets to be used with CMS104v10

https://ecqi.healthit.gov/ecqm/eh/2022/cms104v10?qt-tabs_measure=1
# Hybrid Measures In Use and Pre-Rulemaking

This is a voluntary hybrid measure and does not count toward eCQM submission.

<table>
<thead>
<tr>
<th>Measure Name</th>
<th>Short Name</th>
<th>CMS eCQM ID</th>
<th>NQF ID</th>
<th>Meaningful Measure Area</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Core Clinical Data Elements for the Hybrid Hospital-Wide (All-Clinician, All-Procedures) Risk-Standardized Mortality Measure (HwM)</td>
<td>Hybrid HwM</td>
<td>CMS844v2</td>
<td>3002</td>
<td>Risk Adjusted Mortality</td>
<td>This measure is not in the Data Element Repository at this time and is expected to be included in the Spring of 2022.</td>
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<td>Core Clinical Data Elements for the Hybrid Hospital-Wide Readmission (HwR) Measure with Claims and Electronic Health Record Data</td>
<td>Hybrid HwR</td>
<td>CMS829v2</td>
<td>2879</td>
<td>Admissions and Readmissions to Hospitals</td>
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## 2022 Reporting Period Eligible Hospitals / Critical Access Hospital Resources

<table>
<thead>
<tr>
<th>For Use</th>
<th>Implementation Resources</th>
<th>Published</th>
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<tr>
<td>2022 01-04</td>
<td>Implementation Checklist eCQM Annual Update</td>
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<td>2014 Voluntary Reporting Key Dates and Resources: Hybrid HwR and Hybrid HwM Measures (PDF)</td>
<td>Jan 2022</td>
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Finding Eligible Clinician eCQMs

https://ecqi.healthit.gov/ep-ec?qt-tabs_ep=0&globalyearfilter=2022
Finding Eligible Clinician eCQMs (cont.)

Layout of tabs essentially the same as Eligible Hospital/Critical Access Hospital eCQMs less the Hybrid Measures tab.
Example: Individual eCQM - Data Element Repository

Discharged on Antithrombotic Therapy (STK-2)

CMS Measure ID: CMS104v10  Performance/Reporting Period: 2022  Version: 10  NQF Number: Not Applicable

Description:
Ischemic stroke patients prescribed or continuing to take antithrombotic therapy at hospital discharge

Data Elements and coded QDM Attributes contained within the eCQM

- ["Diagnoses": "Hemorrhagic Stroke"]
- ["Diagnoses": "Ischemic Stroke"]
- ["Discharge Disposition": "Discharge To Acute Care Facility"]
- ["Discharge Disposition": "Discharged To Health Care Facility For Hospice Care"]
- ["Discharge Disposition": "Discharged To Home For Hospice Care"]
- ["Discharge Disposition": "Left Against Medical Advice"]

Data Element and Details

["Diagnoses": "Hemorrhagic Stroke"]

Value Set Description from VSAC

**Clinical Focus:** The purpose of this value set is to identify concepts for diagnoses of hemorrhagic stroke.

**Data Element Scope:** This value set may use a model element related to Diagnosis.

**Inclusion Criteria:** Includes concepts that represent a diagnosis of hemorrhagic stroke.

**Exclusion Criteria:** No exclusions.

Constrained to codes in the Diagnoses: Hemorrhagic Stroke value set (2.16.840.1.113883.3.496.1.10.2.12)

QDM Attribute and Definition (QDM Version 5.5 Guidance Update)

diagnoses

Coded diagnoses/problems addressed during the encounter. The diagnoses attribute has three components:

- diagnosis (code)
- presentOnAdmissionIndicator (code)
- rank (positive integer)

To reference an encounter diagnosis, the expression must include the diagnosis code component. The other components are optional. The expression should only include the presentOnAdmissionIndicator if it is necessary to reference present on admission and should only include the rank if it is necessary to reference principal diagnosis.

The "Encounter, Performed" diagnosis attribute is intended to capture ALL diagnoses, including the principal diagnosis, i.e., all diagnoses addressed during the encounter represented by the diagnosis (code) used in the expression. The presentOnAdmissionIndicator (code) allows the eCQM developer to include criteria about whether each specific "Encounter, Performed" diagnosis was present at the time of admission (an indicator used to evaluate patient safety and adverse events). See presentOnAdmissionIndicator attribute definition for information about using the "Encounter, Performed" diagnosis attribute.

The "Encounter, Performed" diagnosis (rank) replaces the principal diagnosis attribute. To reference a principal diagnosis, eCQM developers should express the "Encounter, Performed" diagnosis with a diagnosis (code) and a rank of 1. See definition of rank attribute.
Data Elements - Used By

Get to the same data element specifics including “eCQMs using this data element” by going directly to the data element.

Reference an encounter diagnosis, the expression must include the diagnosis code component. The other components are optional. The expression should only include the presentOnAdmissionIndicator if it is necessary to reference present on admission and should only include the rank if it is necessary to reference principal diagnosis.

The “Encounter, Performed” diagnosis attribute is intended to capture ALL diagnoses, including the principal diagnosis. I.e., all diagnoses addressed during the “Encounter, Performed” diagnosis attribute definition for information about using the “Encounter, Performed” diagnosis attribute.

The “Encounter, Performed” diagnosis attribute replaces the principal diagnosis attribute. To reference a principal diagnosis, eCQM developers should express the “Encounter, Performed” diagnosis with a diagnosis code and a rank of 1. See definition of rank attribute.

With an “Encounter, Performed” diagnosis, there is no dependency on the timing of the diagnosis in relation to the encounter.

- Use of the “Encounter, Performed” diagnoses component syntax is preferred.

- Referencing the same diagnosis using “Encounter, Performed” (diagnoses component) and “Diagnosis” (datatype) should only occur if the measure must define a specified length of a prevalencePeriod, e.g.,
  - The measure must assure that the diagnoses have been present for at least some defined time period before the encounter and
  - were addressed during the “Encounter, Performed”

**eCQMs using this data element:**
- CMS05v10 - Discharged on Statin Medication
- CMS07v11 - Anticoagulation Therapy for Atrial Fibrillation/Flutter
- CMS07v10 - Antithrombotic Therapy By End of Hospital Day 2
- CMS04v10 - Discharged on Antithrombotic Therapy
- CMS09v10 - Venous Thromboembolism Prophylaxis

**eCQMs that use this data element**

Last Updated: Jul 08, 2021
What is included within an eCQM specification?
**eCQM Components**

- Human readable Hyper Text Markup Language (HTML) file
- Machine readable
  - HQMF XML file
    - The header identifies and classifies the document and provides important metadata about the measure
    - The body contains eCQM sections (e.g., definitions, population criteria, supplemental data elements)
  - CQL Shared Libraries (.cql, .xml, .json)
    - CQL file provides the formal description of the computable content in the measure and organized into libraries for reusing or sharing between measures and other artifacts
    - Expression Logical Model (ELM) XML is the machine-readable representation of the eCQM's logic in XML.
    - ELM JavaScript Object Notation (JSON) file is the ELM file in JavaScript Notation, as opposed to XML.

Note: Value sets and direct reference codes in the eCQM specifications are found in the [Value Set Authority Center (VSAC)](https://www.vsac.org) and require a free [Unified Medical Language System (UMLS)](https://www.umls.info) license to access.
The measure header in the human readable file includes:

- Measure Developer
- Measure Steward
- Brief description of the measure
- Rationale for the measure and evidence it is based on
- What relevant clinical guidelines exist
- What copyright restrictions exist
- What the measure type is
- How the measure is scored
- Who has endorsed the measure
- Any additional guidance
- A summary of the different fields/criteria

The measure header alone **cannot** be used to calculate the measure!
Population Criteria

- **Initial Population**
  TJC."Encounter with Principal Diagnosis and Age"

- **Denominator**
  TJC."Ischemic Stroke Encounter"

- **Denominator Exclusions**
  TJC."Ischemic Stroke Encounters with Discharge Disposition" union TJC."Encounter with Comfort Measures during Hospitalization"

- **Numerator**
  TJC."Ischemic Stroke Encounter" IschemicStrokeEncounter with "Antithrombotic Therapy at Discharge" DischargeAntithrombotic such that DischargeAntithrombotic.authorDateTime during IschemicStrokeEncounter.relevantPeriod

- **Numerator Exclusions**
  None

- **Denominator Exceptions**
  "Encounter With No Antithrombotic At Discharge" union "Encounter With Pharmacological Contraindications for Antithrombotic Therapy at Discharge"

- **Stratification**
  None

Definitions

Think of the measure logic as an equation – it relates different pieces of information together and calculates a measure result.

Human Readable: Body- Definitions Snippet

**Definitions**

- **Antithrombotic Not Given at Discharge**
  
  
  "["Medication, Not Discharged": "Antithrombotic Therapy"]

- **Antithrombotic Therapy at Discharge**
  
  "["Medication, Discharge": "Antithrombotic Therapy"]"

- **Denominator**
  
  TIC: "Ischemic Stroke Encounter"

- **Denominator Exceptions**
  
  "Encounter With No Antithrombotic At Discharge"
  union "Encounter With Pharmacological Contraindications for Antithrombotic Therapy at Discharge"

- **Denominator Exclusions**
  
  TIC: "Ischemic Stroke Encounters with Discharge Disposition"
  union TIC: "Encounter with Comfort Measures during Hospitalization"

- **Encounter With No Antithrombotic At Discharge**
  
  TIC: "Ischemic Stroke Encounter" IschemicStrokeEncounter
  with "Antithrombotic Not Given at Discharge"
  nobDischargeAntithrombotic
  such that nobDischargeAntithrombotic.authorDatetime during IschemicStrokeEncounter.relevantPeriod

- **Encounter With Pharmacological Contraindications for Antithrombotic Therapy at Discharge**
  
  TIC: "Ischemic Stroke Encounter" IschemicStrokeEncounter
  with ["Medication, Discharge": "Pharmacological Contraindications For Antithrombotic Therapy"]
  Pharmacological
  such that Pharmacological.authorDatetime during IschemicStrokeEncounter.relevantPeriod

- **Initial Population**
  
  TIC: "Encounter with Principal Diagnosis and Age"

- **Numerator**
  
  TIC: "Ischemic Stroke Encounter" IschemicStrokeEncounter
  with ["Antithrombotic Therapy at Discharge" DischargeAntithrombotic
  such that DischargeAntithrombotic.authorDatetime during IschemicStrokeEncounter.relevantPeriod

- **SDE Ethnicity**
  
  ["Patient Characteristic Ethnicity": "Ethnicity"]
Human Readable: Body- Functions

Functions

Global.CalendrAgeInYearsAt(BirthDateTime DateTime, AsOf DateTime)
  years between ToDate(BirthDateTime) and ToDate(AsOf)

Global.HospitalizationWithObservation(Encounter "Encounter, Performed")
  Encounter Visit
  let ObsVisit: Last([["Encounter, Performed": "Observation Services"] LastObs
    where LastObs.relevantPeriod ends 1 hour or less on or before start of Visit.relevantPeriod
    sort by end of relevantPeriod
  );
  VisitStart: Coalesce(start of ObsVisit.relevantPeriod, start of Visit.relevantPeriod);
  EDVisit: Last([["Encounter, Performed": "Emergency Department Visit"] LastED
    where LastED.relevantPeriod ends 1 hour or less on or before VisitStart
    sort by end of relevantPeriod
  );
  return Interval[Coalesce(start of EDVisit.relevantPeriod, VisitStart),
    end of Visit.relevantPeriod]

Global.LengthInDays(Value Interval<DateTime>)
  difference in days between start of Value and end of Value

Global.NormalizeInterval(pointInTime DateTime, period Interval<DateTime>)
  if pointInTime is not null then Interval[pointInTime, pointInTime]
  else if period is not null then period
  else null as Interval<DateTime>

GlobalToDate(Value DateTime)
  DateTime(year from Value, month from Value, day from Value, 0, 0, 0, timezoneoffset from Value)

Terminology
Human Readable: Body- Terminology, Data Criteria, and Supplemental Data Elements

**Terminology**
- code "birth date" ("LOINC Code 21112-8")
- valuedset "Antithrombotic Therapy" (2.16.840.1.113762.1.4.1110.62)
- valuedset "Comfort Measures" (1.3.6.1.4.1.33895.1.3.0.45)
- valuedset "Discharged To Acute Care Facility" (2.16.840.1.113762.3.117.1.7.1.67)
- valuedset "Discharged To Health Care Facility for Hospice Care" (2.16.840.1.113893.3.117.1.7.1.207)
- valuedset "Discharged To Home for Hospice Care" (2.16.840.1.113893.3.117.1.7.1.209)
- valuedset "Emergency Department Visit" (2.16.840.1.113893.3.117.1.7.1.292)
- valuedset "Ethnicity" (2.16.840.1.114222.4.11.837)
- valuedset "Hemorrhagic Stroke" (2.16.840.1.112883.3.117.1.7.2.112)
- valuedset "Ischemic Stroke" (2.16.840.1.113883.3.117.1.7.1.247)
- valuedset "Left Against Medical Advice" (2.16.840.1.113883.3.117.1.7.1.308)
- valuedset "Medical Reason" (2.16.840.1.113883.3.117.1.7.1.473)
- valuedset "Non-Elective Inpatient Encounter" (2.16.840.1.113883.3.117.1.7.1.424)
- valuedset "Observation Services" (2.16.840.1.113762.1.4.1111.143)
- valuedset "ONC Administrative Sex" (2.16.840.1.113762.1.4.1.1)
- valuedset "Patient Expired" (2.16.840.1.113883.3.117.1.7.1.329)
- valuedset "Patient Refusal" (2.16.840.1.113883.3.117.1.7.1.93)
- valuedset "Payer" (2.16.840.1.114222.4.11.3951)
- valuedset "Pharmacological Contraindications For Antithrombotic Therapy" (2.16.840.1.113762.1.4.1110.52)
- valuedset "Race" (2.16.840.1.114222.4.11.836)

**Data Criteria (QDM Data Elements)**
- "Encounter, Performed: Emergency Department Visit" using "Emergency Department Visit" (2.16.840.1.113893.3.117.1.7.1.292)
- "Encounter, Performed: Non-Elective Inpatient Encounter" using "Non-Elective Inpatient Encounter" (2.16.840.1.113883.3.117.1.7.1.424)
- "Encounter, Performed: Observation Services" using "Observation Services" (2.16.840.1.113762.1.4.1131.143)
- "Intervention, Performed: Comfort Measures" using "Comfort Measures" (1.3.6.1.4.1.33895.1.3.0.45)
- "Intervention, Performed: Comfort Measures" using "Comfort Measures" (1.3.6.1.4.1.33895.1.3.0.45)
- "Medication, Discharge: Antithrombotic Therapy" using "Antithrombotic Therapy" (2.16.840.1.113762.1.4.1110.62)
- "Medication, Discharge: Antithrombotic Therapy" using "Antithrombotic Therapy" (2.16.840.1.113762.1.4.1110.62)
- "Medication, Not Discharged: Antithrombotic Therapy" using "Antithrombotic Therapy" (2.16.840.1.113762.1.4.1110.62)
- "Patient Characteristic Birthdate: Birth date" using "Birth date (LOINC Code 21112-8)"
- "Patient Characteristic Ethnicity: Ethnicity" using "Ethnicity" (2.16.840.1.114222.4.11.837)
- "Patient Characteristic Payer: Payer" using "Payer" (2.16.840.1.114222.4.11.3951)
- "Patient Characteristic Race: Race" using "Race" (2.16.840.1.114222.4.11.836)
- "Patient Characteristic Sex: ONC Administrative Sex" using "ONC Administrative Sex" (2.16.840.1.113762.1.4.1.1)

**Supplemental Data Elements**
- SDE Ethnicity
  - ["Patient Characteristic Ethnicity": "Ethnicity"]
- SDE Payer
  - ["Patient Characteristic Payer": "Payer"]
- SDE Race
Machine Readable XML: Measure Header and Logic - Snipet

The HQMF is an xml-based standard that shows the measure content, both machine-readable logic and the human-readable header, in a way that a machine can parse the content into sections and perform calculations.

While it does take some investment to create a tool that "reads" the HQMF, it can be used to import the measure and generate the measure results automatically.

Snippet from the eCQM Specification on the eCQI Resource Center:
https://ecqi.healthit.gov/sites/default/files/ecqm/measures/CMS104v10.zip
Companion eCQM 101 Presentations

• Find additional eCQM presentations on the eCQM Resources page of the eCQI Resource Center

• Email the eCQI Resource Center to ask questions or provide website feedback
## Acronyms

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<th>Acronym</th>
<th>Definition</th>
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<tr>
<td>CMS</td>
<td>Centers for Medicare &amp; Medicaid Services</td>
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<tr>
<td>CQL</td>
<td>Clinical Quality Language</td>
</tr>
<tr>
<td>CAH</td>
<td>Critical Access Hospital</td>
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<td>DERep</td>
<td>Data Element Repository</td>
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<tr>
<td>DRC</td>
<td>Direct Reference Code</td>
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<td>eCQI</td>
<td>Electronic Clinical Quality Improvement</td>
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<td>eCQM</td>
<td>Electronic Clinical Quality Measure</td>
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<td>EH</td>
<td>Eligible Hospital</td>
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<tr>
<td>ELM</td>
<td>Expression Logical Model</td>
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## Acronyms (Cont’d)

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<tr>
<th>Acronym</th>
<th>Definition</th>
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<td>FHIR</td>
<td>Fast Healthcare Interoperability Resources</td>
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<td>HL7</td>
<td>Health Level Seven International®</td>
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<td>JavaScript Object Notation</td>
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<td>LOINC</td>
<td>Logical Observation Identifiers, Names, and Codes</td>
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<td>Quality Data Model</td>
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<td>Unified Medical Language System</td>
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