

Introducing Health Level Seven® (HL7) Fast Healthcare Interoperability Resources (FHIR®) for Electronic Clinical Quality Measure (eCQM) Reporting

February 3, 2021
3:00 PM ET

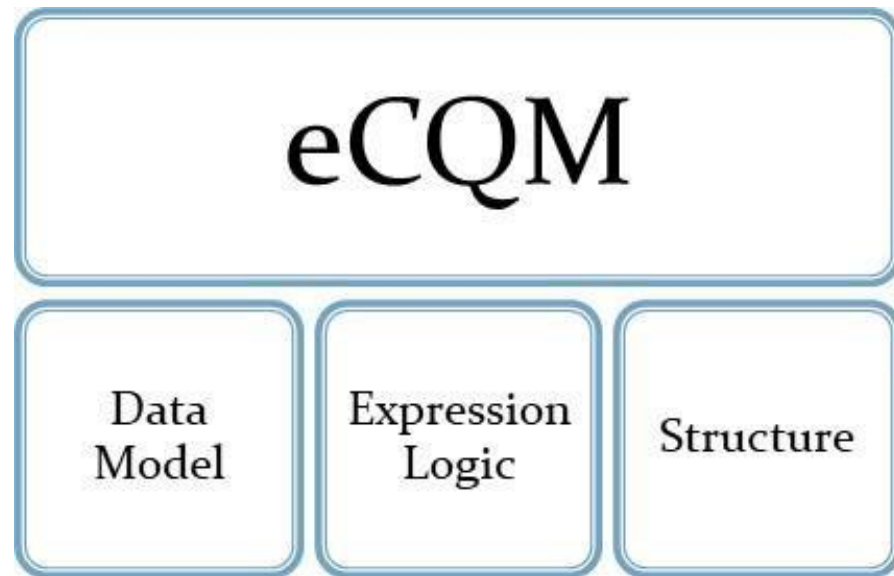
Shanna Hartman, CMS
Rob Samples, ESAC
Michael Holck, ESAC



Agenda

- Components of an electronic clinical quality measure (eCQM)
- Fast Healthcare Interoperability Resources (FHIR) specification introduction and walkthrough
- Use of profiles and implementation guides (IGs)
- Quality Improvement (QI)-Core and mappings from Quality Data Model (QDM)
- Quality Measure (QM) IG
- Data Exchange for Quality Measures (DEQM)
- Introduction to FHIR operations
- Current activities update

Components of an eCQM



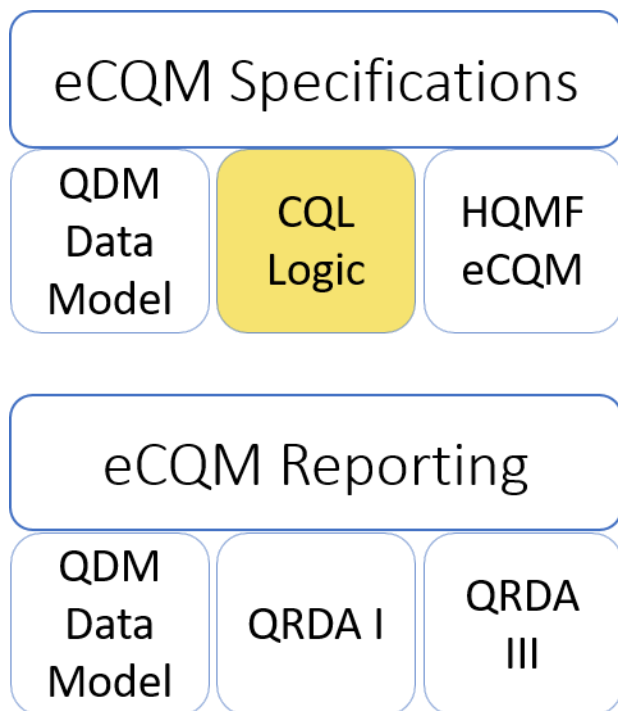
Data Model: What data to look for in the patient's medical record

Expression Logic: How to calculate the result, evaluate the "right" care was provided

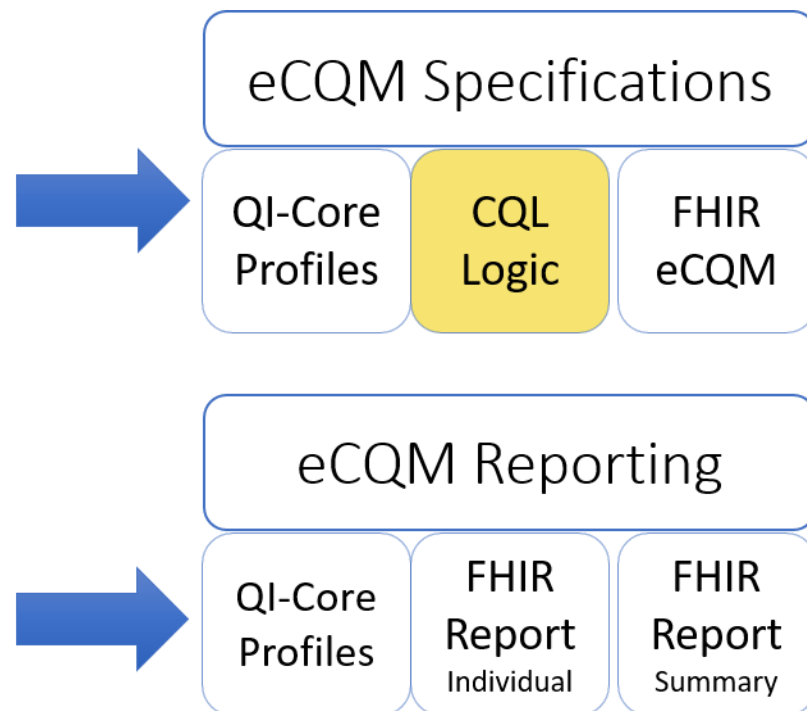
Structure: Metadata, numerator, denominator, exclusions, and exceptions

FHIR Standards for Quality Measurement

Current



Emerging



Goal is to align quality measurement standards for eCQM development and reporting using FHIR

- QI-Core replaces QDM for clinical data elements representation
- FHIR Measure replaces HQMF for eCQM structure
- FHIR Measure Report Individual and Summary replaces QRDA I and III

CQL – Clinical Quality Language | HQMF- Health Quality Measure Format | QRDA- Quality Reporting Document Architecture

What is FHIR?

- FHIR – [Fast Healthcare Interoperability Resources](#)
- FHIR is a next-generation standards framework created by HL7
- Provides an interoperable platform for healthcare
 - Defines a common way to structure health data known as ‘Resources’
 - Enables automated data exchange through application programming interfaces (APIs)
- FHIR uses latest technologies to be developer friendly

FHIR Versions

FHIR STU 3

- Released in 2017
- First version to contain 'Clinical Reasoning' module
- Basis for initial eCQM conversion and DEQM and QM IGs

FHIR R4

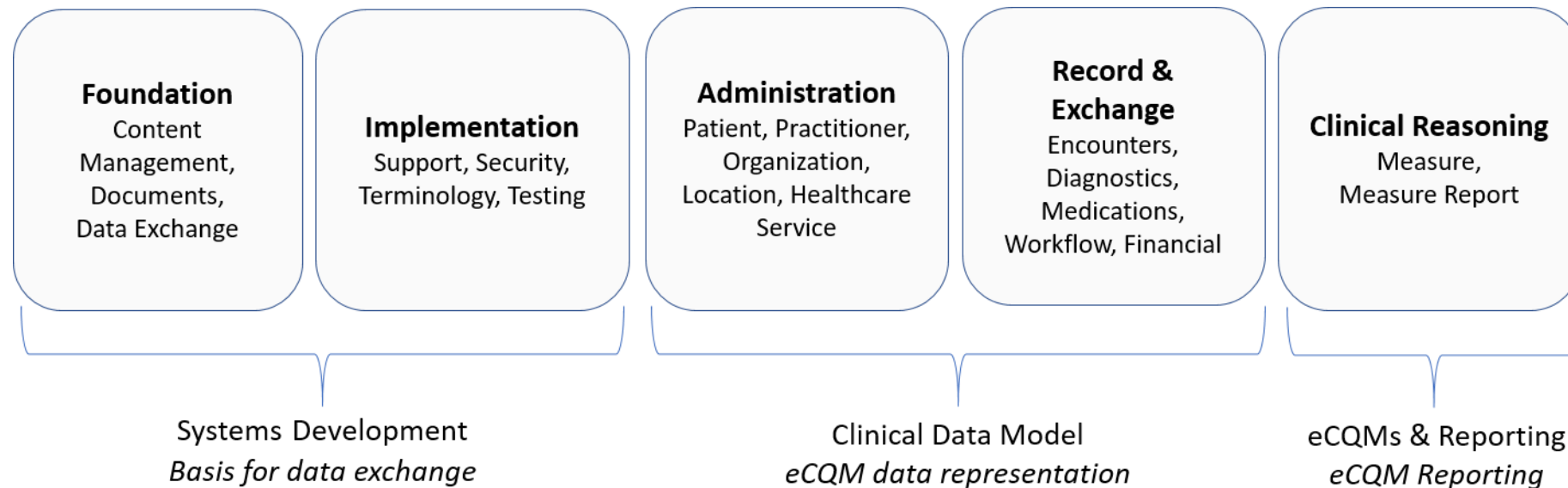
- Released 12/2018
- First version to contain 'Normative' resources
- Current version used for converting test eCQMs

FHIR R4B and R5

- R4B is a potential interim release currently in planning-critical changes only
- R5 is the next major release potentially for ballot in 2021- includes enhancements and new profiles

How is FHIR Used?

- FHIR is organized into 5 levels for easy navigation
- Levels I and II give implementers a basis for exchanging data
- Levels III and IV are used to represent data in eCQMs
- Level V provides structure for eCQMs and reporting



Why use FHIR for Quality Measurement?

- Align with other clinical data sharing efforts by supporting a broad range of use cases
- Standardize approaches and specifications to promote sharing between systems and applications.
- Improve flexibility and extensibility to meet multiple uses without compromising base specification

Walkthrough of FHIR

- Provide a basic navigation of the specification - <http://hl7.org/fhir>
- Show build vs production sites and FHIR versions
 - <http://build.fhir.org> - Latest build version which changes often
 - <http://hl7.org/fhir> - Latest published version
 - Implementation guides also have build and production sites
- Review a basic Resource ‘Encounter’

FHIR Versions





















































History

Publication (Version) History

This table provides a list of all the versions of FHIR (Fast Health Interoperability Resources) that are available. See also the directory of [FHIR Implementation Guides](#).

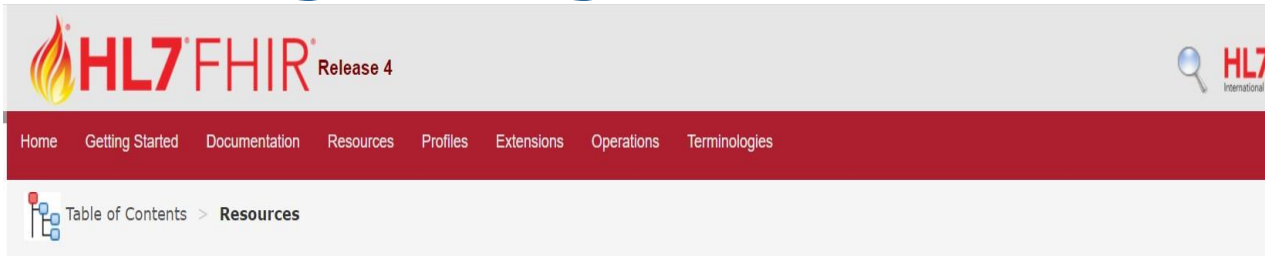
The following versions of the FHIR Specification have been published:

Date	Version	Description	Links
Current Versions			
2019-10-30	4.0.1	FHIR Release #4: First Normative Content	      
(current)	(last commit)	Current Development build (about 30min behind version control, may be incoherent and change rapidly)	   
R5 Sequence (Work in Progress)			
2020-08-20	4.5.0	FHIR Release #5: Preview #3	    
2020-05-04	4.4.0	FHIR Release #5: Preview #2	    
2019-12-31	4.2.0	FHIR Release #5: Preview #1	    
R4 Sequence (Current)			
2019-10-30	4.0.1	FHIR Release #4 First Normative Content with 1 technical errata (Permanent Home) • Technical Errata Archive (zip): v4.0.0 (Permanent Home)	      
2018-11-09	3.5a.0	Special R4 Ballot #3 : Normative Packages for Terminology / Conformance + Observation	   
2018-08-21	3.5.0	R4 Ballot #2 : Mixed Normative/Trial use (Second Normative ballot + Baltimore Connectathon)	   
2018-04-02	3.3.0	R4 Ballot #1 : Mixed Normative/Trial use (First Normative ballot)	    
2018-04-02	3.2.0	Draft for comment / First Candidate Normative Content	   

- Ribbon included at top for ‘directory of published versions’
- Version History page shows previous version sequences
- Options for download and helpful links
- (Current): Link to the ‘build’ site which is unpublished draft, changes often

<http://hl7.org/fhir/directory.html>

Navigating Resources



This page is part of the FHIR Specification (v4.0.1: R4 - Mixed Normative and STU). This is the current published version. For a full list of available versions, see the [Directory of published versions](#).

1.2 Resource Index

FHIR Infrastructure Work Group	Maturity Level: N/A	Standards Status: Informative
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This page is provided to help find resources quickly. There is also a more detailed classification, ontology, and description. For background to the layout on the layers in this page, see the [Architect's Overview](#). See also the abstract Base Resources [Resource](#) and [DomainResource](#).

Navigation tabs: **Categorized**, Alphabetical, R2 Layout, **By Maturity**, Security Category, By Standards Status, By Committee

Conformance	Terminology	Security	Documents	Other
<ul style="list-style-type: none">• CapabilityStatement N• StructureDefinition N• ImplementationGuide 1• SearchParameter 3• MessageDefinition 1• OperationDefinition N• CompartmentDefinition 1	<ul style="list-style-type: none">• CodeSystem N• ValueSet N• ConceptMap 3• NamingSystem 1• TerminologyCapabilities 0	<ul style="list-style-type: none">• Provenance 3• AuditEvent 3• Consent 2	<ul style="list-style-type: none">• Composition 2• DocumentManifest 2• DocumentReference 3• CatalogEntry 0	<ul style="list-style-type: none">• Basic 1• Binary N• Bundle N• Linkage 0• MessageHeader 4• OperationOutcome N• Parameters N• Subscription 3

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- Multiple views of resources are available
 - Categorized
 - Alphabetical
 - By Maturity
 - Security Category, etc.

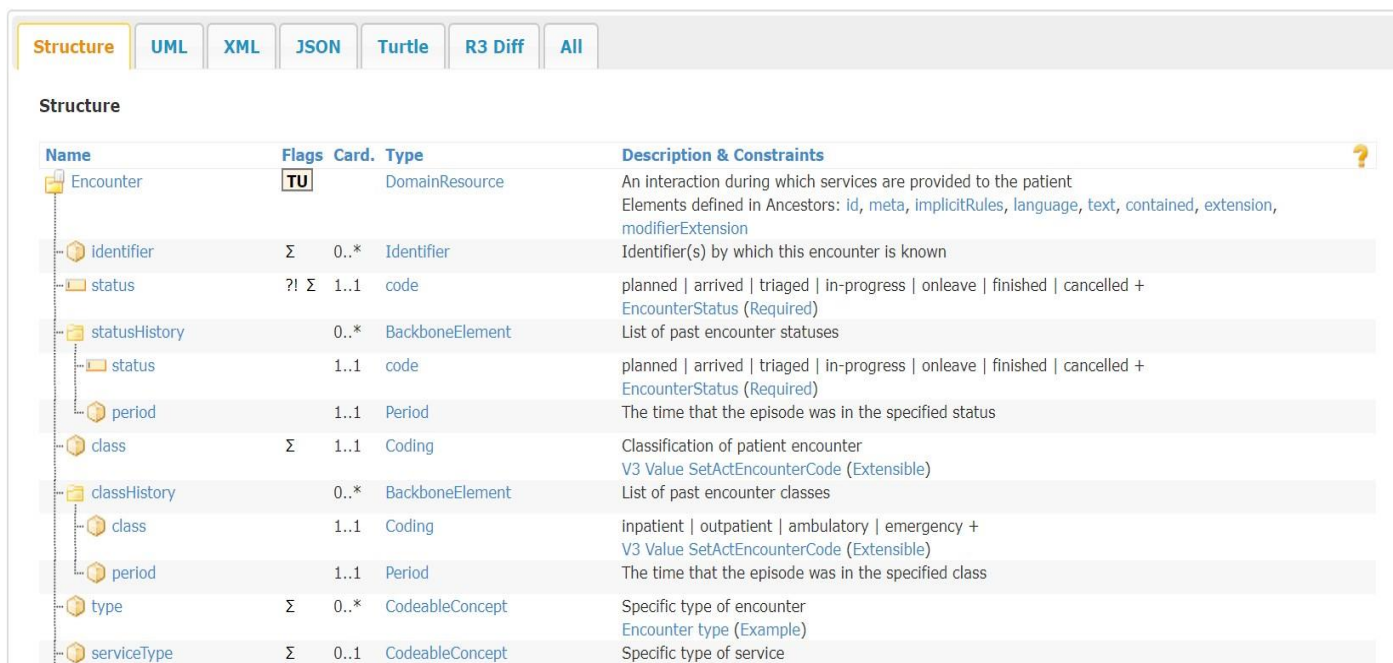
<http://hl7.org/fhir/resourcelist.html>

Resource Structure

This extension should be used to reference an encounter where there is no property that already defines this association on the resource.

This resource is referenced by [AdverseEvent](#), [AllergyIntolerance](#), [CarePlan](#), [CareTeam](#), [ChargeItem](#), [Claim](#), [ClinicalImpression](#), [Communication](#), [CommunicationRequest](#), [Composition](#), [Condition](#), [Contract](#), [DeviceRequest](#), [DiagnosticReport](#), [DocumentReference](#), [itself](#), [ExplanationOfBenefit](#), [Flag](#), [GuidanceResponse](#), [ImagingStudy](#), [Immunization](#), [List](#), [Media](#), [MedicationAdministration](#), [MedicationDispense](#), [MedicationRequest](#), [MedicationStatement](#), [NutritionOrder](#), [Observation](#), [Procedure](#), [QuestionnaireResponse](#), [RequestGroup](#), [RiskAssessment](#), [ServiceRequest](#), [Task](#) and [VisionPrescription](#)

8.11.3 Resource Content



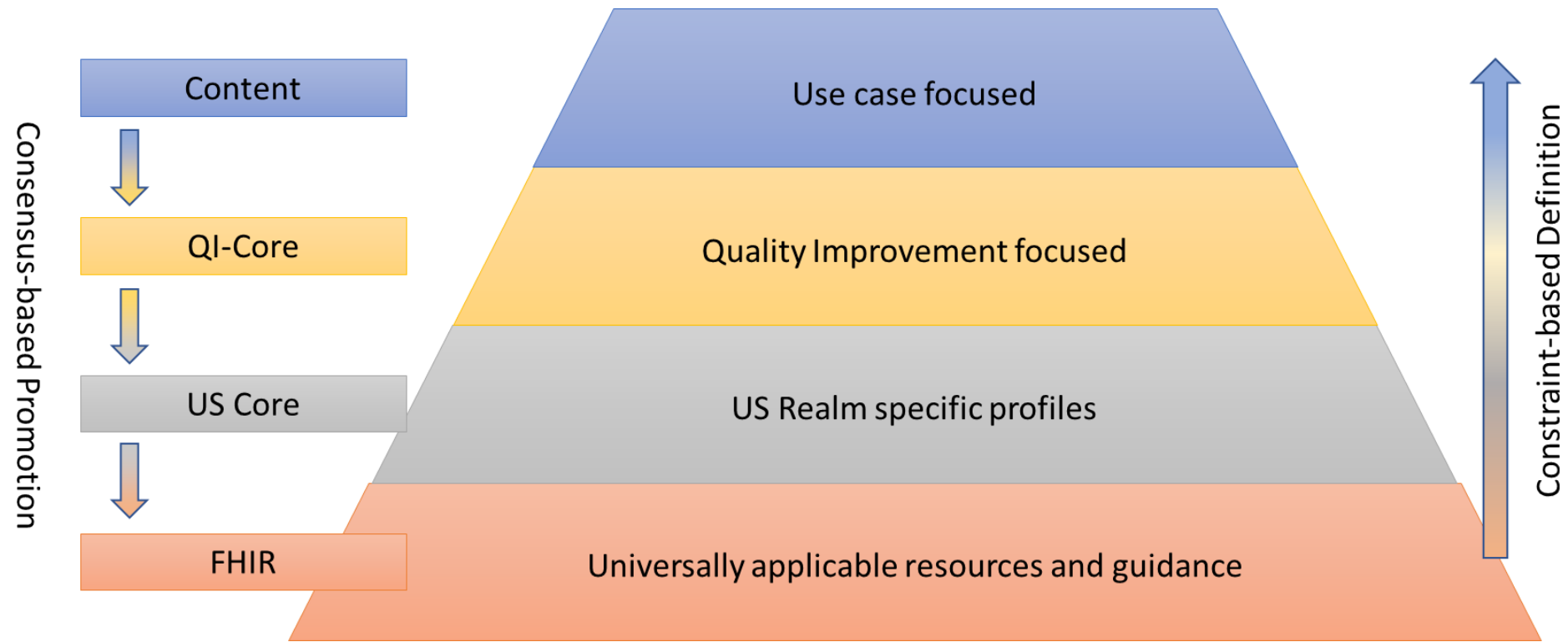
Name	Flags	Card.	Type	Description & Constraints
Encounter	TU		DomainResource	An interaction during which services are provided to the patient Elements defined in Ancestors: id, meta, implicitRules, language, text, contained, extension, modifierExtension
Identifier		Σ 0..*	Identifier	Identifier(s) by which this encounter is known
status	?! Σ	1..1	code	planned arrived triaged in-progress onleave finished cancelled + EncounterStatus (Required)
statusHistory		0..*	BackboneElement	List of past encounter statuses
status		1..1	code	planned arrived triaged in-progress onleave finished cancelled + EncounterStatus (Required)
period		1..1	Period	The time that the episode was in the specified status
class	Σ	1..1	Coding	Classification of patient encounter V3 Value SetActEncounterCode (Extensible)
classHistory		0..*	BackboneElement	List of past encounter classes
class		1..1	Coding	inpatient outpatient ambulatory emergency + V3 Value SetActEncounterCode (Extensible)
period		1..1	Period	The time that the episode was in the specified class
type	Σ	0..*	CodeableConcept	Specific type of encounter Encounter type (Example)
serviceType	Σ	0..1	CodeableConcept	Specific type of service

- Selecting a resource brings up its content
- Provides detail around structure for use
- Hyperlinks to descriptions, types, value sets, etc.

Resources vs Profiles

- **Resources** are the basic building block of the FHIR Specification
 - Defines how data are to be structured and exchanged
 - Intended to be generic to fit a wide range of use cases
- **Profiles** are Resources that have been modified to meet the needs of a specific use case
 - Restrict or extend APIs, Resources, Terminology
 - Indicate required elements (cardinality) and 'Must Support'
 - Specify a value set
 - Publish- Profiles are typically published in an IG

HL7 FHIR Standards for Quality



FHIR Clinical Reasoning Module

- FHIR Measure Resource
 - Defines eCQM metadata and structure
 - Further defined in Quality Measure Implementation Guide
- FHIR MeasureReport Resource
 - Supports Individual, Subject List, Summary, and Data Collection report types
 - Further defined by Data Exchange for Quality Measure Implementation Guide

Implementation Guides for Quality Measurement

- **QI-Core**
 - QI-Core is a model IG using profiles based on US Core and base FHIR resources
 - Used for eCQMs, Quality Reporting, and clinical decision support (CDS)
- **FHIR Quality Measure**
 - Specification IG detailing how eCQMs are structured
 - Based on FHIR Measure Resource
- **DEQM**
 - How quality data is to be exchanged
 - Based on FHIR Measure Report Resource

Using QI-Core

- September 2019 Ballot updated QI-Core to FHIR R4
 - <http://hl7.org/fhir/us/qicore/>
- Includes mapping of QDM to QI-Core
- QI-Core enables a simplified view that may be used by authors to write expressions
 - <http://hl7.org/fhir/us/qicore/quick/QUICK-index.html>
 - Detailed overview and examples will be included in future training sessions

Using QI-Core

2 QI-Core Profiles

The following table lists the QI-Core profiles that are part of the IG, which USCore profile they are derived from, if any, and the underlying FHIR resources:

QI-Core Profile	USCore Profile	Base Resource
QICoreAdverseEvent		AdverseEvent
QICoreAllergyIntolerance	USCoreAllergyIntolerance	AllergyIntolerance
QICoreBodyStructure		BodyStructure
QICoreCarePlan	USCoreCarePlan	CarePlan
QICoreCareTeam	USCoreCareTeam	CareTeam
QICoreClaim		Claim
QICoreCommunication		Communication
QICoreCommunicationNotDone		Communication
QICoreCommunicationRequest		CommunicationRequest
QICoreCondition	USCoreCondition	Condition
QICoreCoverage		Coverage
QICoreDevice		Device
QICoreDeviceNotRequested		DeviceRequest
QICoreDeviceRequest		DeviceRequest
QICoreDeviceUseStatement		DeviceUseStatement
QICoreDiagnosticReportLab	USCoreDiagnosticReportLab	DiagnosticReport
QICoreDiagnosticReportNote	USCoreDiagnosticReportNote	DiagnosticReport
QICoreEncounter	USCoreEncounter	Encounter
QICoreFamilyMemberHistory		FamilyMemberHistory

Contents show profile, US Core Profile, and Base FHIR Resource

QI-Core Profile Example

Description of Profiles, Differentials, and Snapshots.

Name	Flags	Card.	Type	Description & Constraints
Encounter		0..*		
id		0..1	id	
encounter-reasonCancelled		0..1	CodeableConcept	Explanation for cancellation URL: http://hl7.org/fhir/StructureDefinition/encounter-reasonCancelled Binding: Reasons for canceled or refused encounter codes (example)
qicare-encounter-procedure	S	0..*	(Complex)	Encounter Procedure Extension URL: http://hl7.org/fhir/us/qicare/StructureDefinition/qicare-encounter-procedure
status		1..1	code	
class	S	1..1	Coding	
type	S	1..*	CodeableConcept	
priority		0..1	CodeableConcept	Binding: SNOMED CT Priorities Codes (preferred)
subject	S	1..1	Reference(QICorePatient)	
basedOn		0..*	Reference(QICoreServiceRequest)	

Differential view based on US Core Encounter. Adds 'Must Support' and binds to terminology.

QDM to QI-Core Mapping Example

8.11.4 Encounter, Performed

QDM Context	QI-Core R4	Comments
Encounter, Performed	Encounter	
	Encounter.status	consider constraint to - arrived, triaged, in-progress, on-leave, finished
	Encounter.type	type of service by CPT
QDM Attribute		
Code	Encounter.class	ambulatory, ED, inpatient, etc.
id	Encounter.id	
Relevant Period	Encounter.period	start and end time of encounter
Diagnoses		
Diagnosis (code)	Encounter.diagnosis.condition	can be used for coded diagnoses
PresentOnAdmissionIndicator (code)		
Rank (Integer)	Encounter.diagnosis.rank	for each diagnosis role
Procedures	qicore-encounter-procedure	QIcore-encounter-procedure
	Encounter.extension.procedure.value[x]	References the procedure code
	Encounter.extension:rank.value[x]:valuePositiveInt	References the rank; for principal procedure, the rank =1
	Encounter.procedure.procedure	A reference to the procedure that was performed
Length of Stay	Encounter.length	
Negation Rationale	Not Addressed	There is no current use case for an eCQM to request a reason for failure to perform an encounter.
Author dateTime	Not Addressed	

Shows QDM datatypes, mapping to QI-Core profile, additional notes, and implementer guidance.

Quality Measure IG

- Defines a standard approach for representing eCQM content
 - Describes the required metadata
 - Provides guidance for using CQL with FHIR measures
 - Defines parameters, use of terminology, and measure population descriptions
- Profiles define requirements for various measure scoring types (continuous variable, proportion, etc.)
- Includes examples of eCQMs, libraries, and value sets

Quality Measure IG (Cont'd)



Quality Measure STU2 for FHIR R4 Implementation Guide



[Home](#) [Introduction](#) [eQMs](#) [Using CQL](#) [Packaging](#) [Examples](#) [Profiles](#) [Extensions](#) [Terminology](#) [Glossary](#) [Downloads](#) [Version History](#)

Quality Measure Implementation Guide

This page is part of the Quality Measure STU2 for FHIR R4 Implementation Guide (v2.0.0: STU 2) based on FHIR R4. This is the current published version. For a full list of available versions, see the [Directory of published versions](#)

1 Quality Measure Implementation Guide

1.1 Summary

The Fast Healthcare Interoperability Resource (FHIR) Quality Measure Implementation Guide (this IG) describes an approach to representing electronic Clinical Quality Measures (eQMs) using the FHIR Clinical Reasoning Module and Clinical Quality Language (CQL) in the US Realm. However, this Implementation Guide can be usable for multiple use cases across domains, and much of the content is likely to be usable outside the US Realm.

The implementation guide is based upon the previous generation of eCQM representation standards, the HL7 V3-based Health Quality Measure Format (HQMF) and accompanying implementation guides. As an HL7 FHIR Implementation Guide, changes to this specification are managed by the sponsoring Clinical Quality Information Work Group and are incorporated as part of the standard balloting process.

1.1.1 Examples

Refer to the [QI-Core implementation guide](#) for examples of how to represent data involved in calculation of quality measures.

1.2 How to read this Guide

This Guide is divided into several pages which are listed at the top of each page in the menu bar:

Contents

- 1 Quality Measure Implementation Guide
 - 1.1 Summary
 - 1.1.1 Examples
 - 1.2 How to read this Guide
 - 1.3 Background
 - 1.3.1 Quality Improvement Ecosystem
 - 1.3.2 Quality Measurement Standards Landscape
 - 1.3.2.1 Fast Healthcare Interoperability Resources (FHIR)
 - 1.3.2.2 Clinical Quality Language (CQL)
 - 1.3.2.3 FHIR

Profiles describe several measure types and structure of measure library.

DEQM IG

- Specifies a framework for exchanging quality measure data
 - Data Exchange
 - Individual Measure Report
 - Summary Measure Report
- Specifies profiles and extensions necessary for data exchange and reporting
- Defines operations for exchanging and evaluating measures

DEQM IG (Cont'd)

HL7 DA VINCI International **HL7 FHIR** **Data Exchange For Quality Measures STU3 for FHIR R4** 2.1.0 - Ballot **HL7 FHIR**

Home Framework Example Use Cases FHIR Artifacts Examples Downloads Change Notes

Table of Contents > Home

This page is part of the Da Vinci Data Exchange for Quality Measures (DEQM) FHIR IG (v2.1.0: STU 3) based on FHIR R4. The current version which supercedes this version is 2.0.0. For a full list of available versions, see the Directory of published versions.

1 Home

Note To Balloters
ONLY the new content for Gaps in Care is in the scope for ballot for the September, 2020 Ballot Cycle.

1.1 Introduction

The purpose of this implementation guide is to support value based care data exchange in the US Realm. However, this Implementation Guide can be usable for multiple use cases across domains, and much of the content is likely to be usable outside the US Realm.

Interoperability challenges have limited many stakeholders in the healthcare community from achieving better care at lower cost. The dual challenges of data standardization and easy information access are compromising the ability of both payers and providers to create efficient care delivery solutions and effective care management models. To promote interoperability across value-based care stakeholders and to guide the development and deployment of interoperable solutions on a national scale, the industry needs common information models and data exchange standards. The intent of the framework defined in this guide is to enable automatic data collection and submission limiting the need for manual processing and intervention. Ultimately, a national standard based on FHIR for data structure and exchange will reduce the burden on clinicians of transforming data between systems.

This Implementation Guide is supported by the Da Vinci initiative which is a private effort to accelerate the adoption of Health Level Seven International Fast Healthcare Interoperability Resources (HL7® FHIR®) as the standard to support and integrate value-based care (VBC) data exchange across communities. Like all Da Vinci Implementation Guides, it follows the HL7 Da Vinci Guiding Principles for exchange of patient health information. The

- Introduction
- How to read this Guide
- Background
- Quality Improvement Ecosystem
- Quality Measurement Standards Landscape
- Data Model Standards Landscape
- Quality Reporting

in-what-are-y...jpg Show

Converting eCQMs to FHIR

- CMS began converting QDM-based eCQMs to use FHIR in spring of 2019
- CMS program measures continue to be tested at HL7 Connectathons
- Measure Authoring Tool (MAT) and Bonnie have been updated with FHIR functionality
- Created a measure repository
 - For work-in-progress eCQMs and example expressions
 - <https://github.com/cqframework/ecqm-content-r4>

FHIR operations

- FHIR specifications describe how health data should be structured for exchange
- Operations in FHIR describe the interactions used to exchange that data
- Basic operations include CRUD (Create, Read, Update, Delete)
 - Enables storage, search, and retrieval
- Allow systems to describe general operations
 - Displays as an action preceded by a dollar sign (e.g., \$evaluate-measure)

FHIR Operations (Cont'd)

- Clinical Reasoning defines \$evaluate-measure
 - Allows a client system to request a particular quality measure be evaluated
 - Uses input parameters (e.g., periodStart, periodEnd, measure)
 - Output is a MeasureReport Resource
- Other operations used in Quality Reporting
 - \$collect-data- a request to collect data for a measure
 - \$submit-data- submission of data of interest for a measure
 - \$data-requirements- returns parameters and required data for a measure

eCQM Reference Implementation

- FHIR reference implementations are used to test specifications
- Allows implementers to test systems against known results
- Provides an environment for use in Connectathons
- eCQM Reference Implementation evaluates measures and creates measure reports

CQF Ruler

- CQF Ruler is a reference implementation of the FHIR Clinical Reasoning module
 - Reference implementations are used to test an IG
 - CQF Ruler includes CQL-to-Expression Logical Model (ELM) Translation and Measure Evaluation service
 - Open source Java implementation
 - <https://github.com/DBCG/cqf-ruler>
- Quick Start Guide has been developed to aid set-up
<https://github.com/DBCG/connectathon/wiki/Quickstart>

Tools for Implementers

- CQL-to-ELM Translator
 - https://github.com/cqframework/clinical_quality_language/blob/master/Src/java/cql-to-elm/OVERVIEW.md
- JS CQL Execution Engine
 - <https://github.com/cqframework/cql-execution>
- Java CQL Execution
 - https://github.com/dbcg/cql_engine

Current Activities

- eCQM conversion of 2020 CMS program measures to FHIR is ongoing using MAT on FHIR
- Planning for ballots and updates
 - DEQM was balloted September 2020, applying updates
 - QM IG May 2021- ballot
 - QI Core based on US Core Fall 2021- planned update
- Connectathons are held three times per year
 - CMS January 2020 (completed)
 - HL7 May Connectathon
 - HL7 September Connectathon
- See our poster at the CMS Quality Conference March 2-3, 2021

Thank You!

- Implementers can access links to IGs, training, and other resources on the Electronic Clinical Quality Improvement (eCQI) Resource Center
<https://ecqi.healthit.gov/fhir>
- Direct comments or questions to fhir@esacinc.com

Resources

- Current FHIR Measures
 - <https://github.com/cqframework/ecqm-content-r4>
- FHIR R4 Standards and IGs
 - <http://hl7.org/fhir/> (Current Version R4.0.1)
 - <http://build.fhir.org/> (Current build- will change)
 - <http://hl7.org/fhir/us/core/> (US Core R4 version)
 - [DEQM](#) (Current version published Aug 2020)
 - [QM IG](#) (Current version published Feb 2020)

Questions?