

Introducing Health Level 7 (HL7) Fast Healthcare Interoperability Resources (FHIR®) for Implementers

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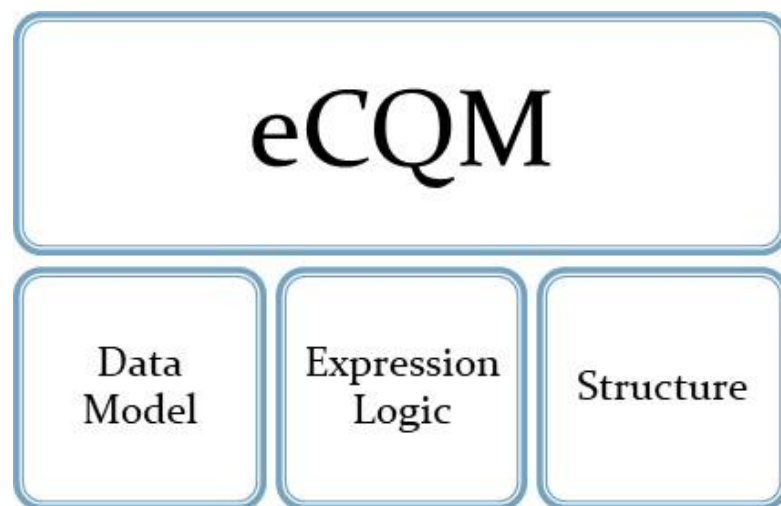
January 22, 2020
12:00 PM ET



Agenda

- » Components of an electronic Clinical Quality Measure (eCQM)
- » FHIR Specification Introduction and Walkthrough
- » Use of Profiles and Implementation Guides (IGs)
- » QI-Core and mappings from Quality Data Model (QDM)
- » Quality Measure IG
- » Data Exchange for Quality Measures
- » Introduction to FHIR Operations
- » Current Activities Update

Parts of an eCQM

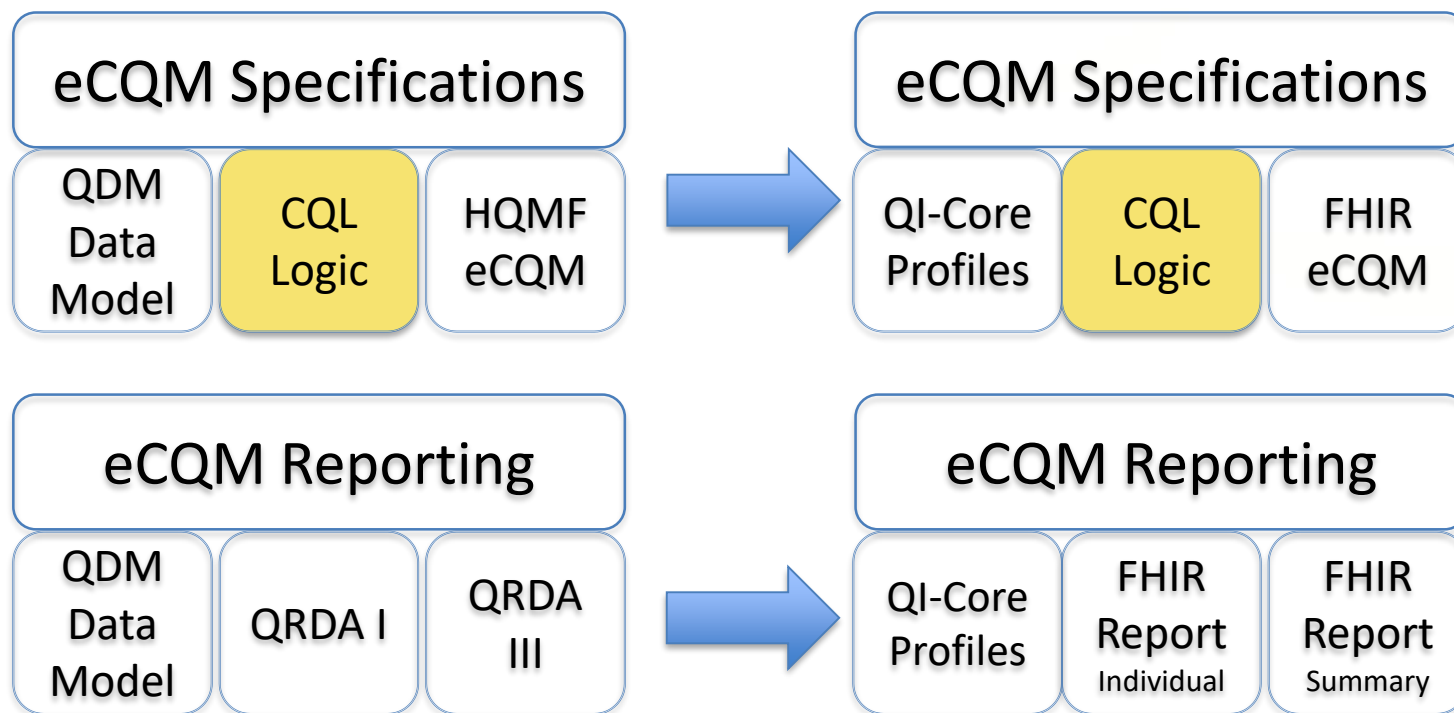


Data Model: What data to look for in the Patient's medical record

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

Structure: Metadata, Numerator, Denominator, Exclusions, Exceptions

FHIR® Standards for Quality Measurement



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

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

What Is FHIR?

- » FHIR – Fast Healthcare Interoperability Resources
 - <http://hl7.org/fhir>
- » 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 APIs
- » FHIR uses latest technologies to be developer friendly

FHIR - A Brief History

FHIR DSTU 2*

- Balloted in early 2015
- Initial version of FHIR focused on core data set and exchange using APIs
- Focus of the Argonaut project and ONC Common Clinical Data Set

FHIR STU 3

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

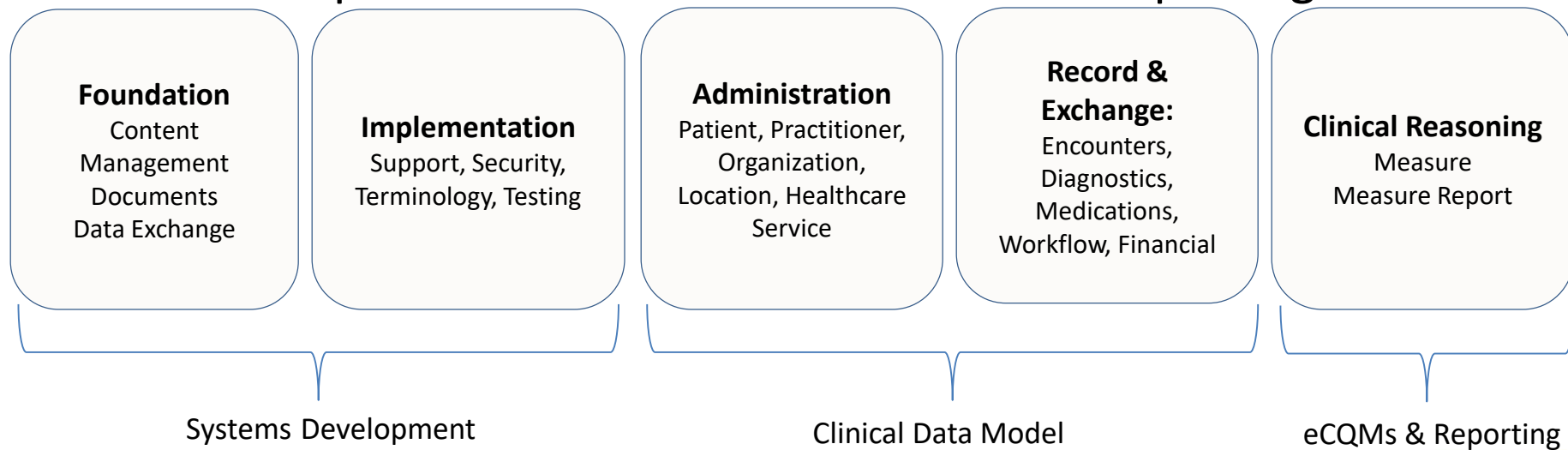
FHIR R4

- Published 12/2018
- First version to contain 'Normative' resources
- Target implementation for many EHR Vendors
- Current version used for converting test eQMs

*Note HL7 no longer uses 'Draft' for naming conventions

How is FHIR Used?

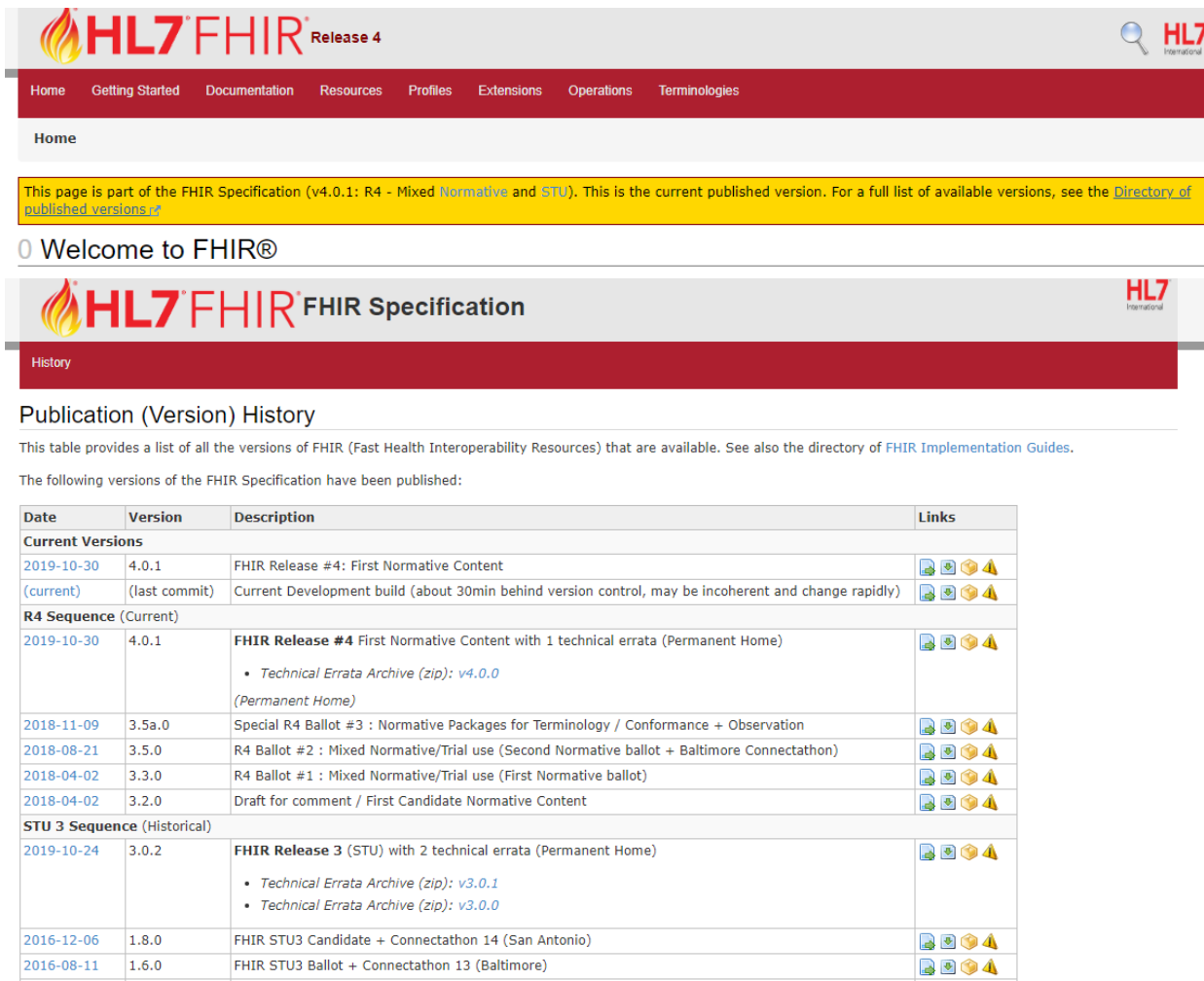
- FHIR is organized into 5 levels for easy navigation
- Levels I and II give implementers a basis for exchanging data
- Levels III and IV are used to represent data in eCQMs
- Level V provides structure for eCQMs and Reporting



Walkthrough of FHIR

- » <http://hl7.org/fhir>
- » Basic Navigation of the specification
- » Build vs. Production sites and FHIR versions
 - build.fhir.org: Latest specification, changes often
 - fhir.hl7.org: Latest published version
 - Implementation guides also have build and production sites
- » Review of a basic Resource 'Encounter'

FHIR Versions



HL7 FHIR® Release 4

Home Getting Started Documentation Resources Profiles Extensions Operations Terminologies

Home

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.r4](#)

Welcome to FHIR®































HL7 FHIR® FHIR Specification

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](#).

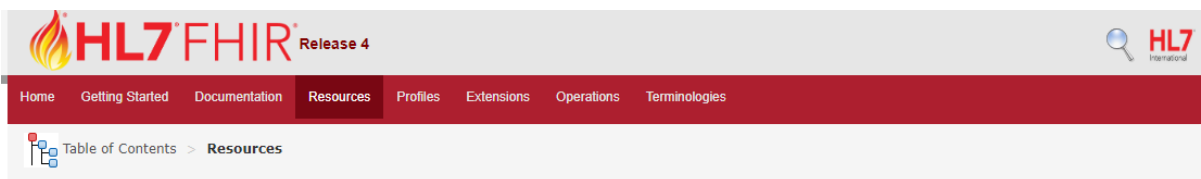
The following versions of the FHIR Specification have been published:

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)	  
R4 Sequence (Current)			
2019-10-30	4.0.1	FHIR Release #4 First Normative Content with 1 technical errata (Permanent Home) <ul style="list-style-type: none"> 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	  
STU 3 Sequence (Historical)			
2019-10-24	3.0.2	FHIR Release 3 (STU) with 2 technical errata (Permanent Home) <ul style="list-style-type: none"> Technical Errata Archive (zip): v3.0.1 Technical Errata Archive (zip): v3.0.0 	  
2016-12-06	1.8.0	FHIR STU3 Candidate + Connectathon 14 (San Antonio)	  
2016-08-11	1.6.0	FHIR STU3 Ballot + Connectathon 13 (Baltimore)	  

- 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

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](#) of

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](#).

Categorized		Alphabetical		R2 Layout		By Maturity		Security Category		By Standards Status		By Committee			
Foundation <															

- Multiple views of resources are available
- Categorized
- Alphabetical
- By Maturity, security category, etc.

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

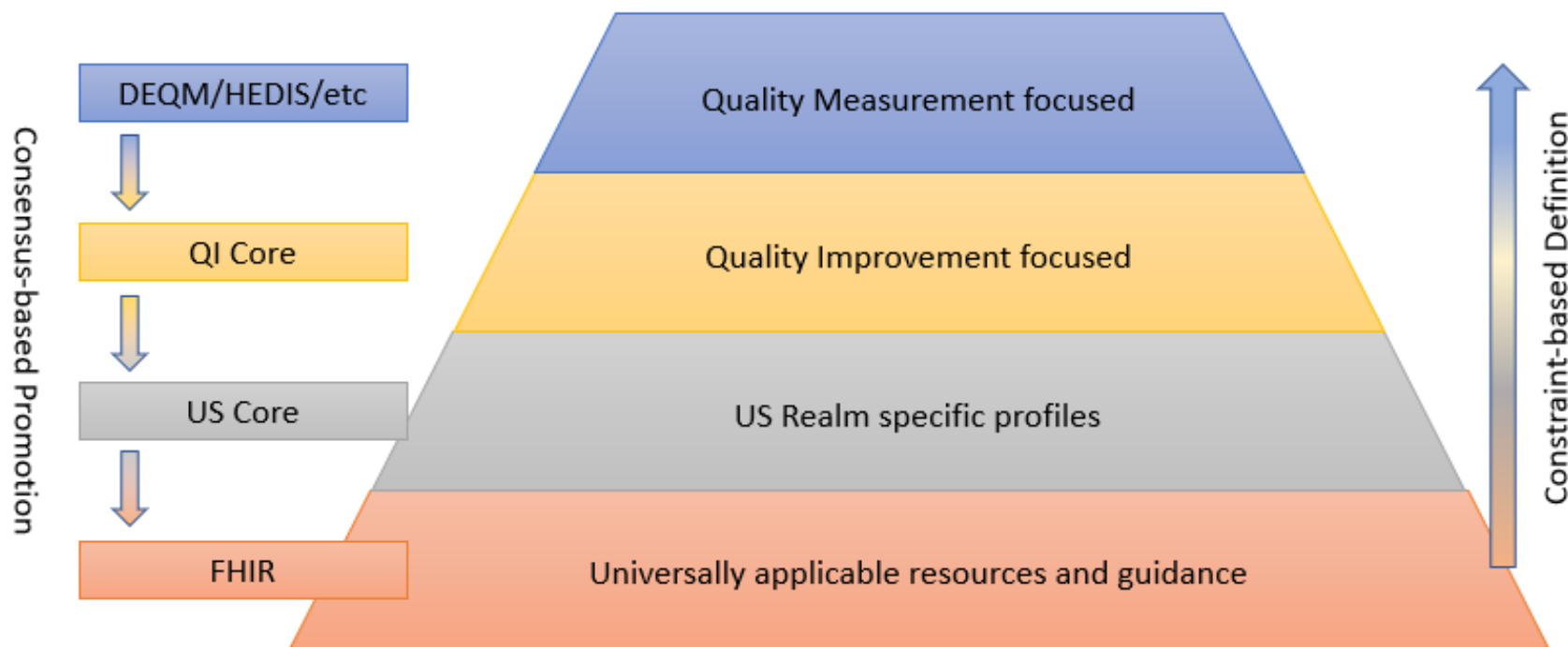
Structure	UML	XML	JSON	Turtle	R3 Diff	All
Structure						
Name	Flags	Card.	Type	Description & Constraints		
Encounter	TU		DomainResource	An interaction during which services are provided to the patient Elements defined in Ancestors: id , meta , implicitRules , language , text , contained , extension , 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 is to be structured and exchanged
 - Intended to be generic to fit a wide range of use cases
- » Profiles are Resources that have been changed for a specific use case
 - Can both restrict and extend APIs, Resources, Terminology
 - Required elements (cardinality) and 'Must Support'
 - Specify a value set
 - Profiles are typically published in an Implementation Guide

HL7 FHIR Standards for Quality



DEQM – Data Exchange for Quality Measures (HL7 Standard)

HEDIS – Healthcare Effectiveness Data and Information Set (National Committee for Quality Assurance (NCQA))

Implementation Guides for Quality Measurement

» QI-Core

QI-Core is the data model built on top of FHIR Resources (US Core and base FHIR resources)

A set of profiles for eCQMs, Quality Reporting, and CDS

- Based on FHIR and US Core

» FHIR Quality Measure

Structure of an eCQM (metadata, populations)

- Based on FHIR Measure Resource

» Data Exchange for Quality Measures (DEQM)

How quality data is to be exchanged

- Based on FHIR Measure Report Resource

Using QI-Core

- » September 2019 Ballot updates QI-Core to FHIR R4
 - <http://hl7.org/fhir/us/qicore/>
- » Includes mapping of Quality Data Model (QDM) to QI-Core
- » QUICK- A conceptual view of QI-Core for authoring included in IG

Using QI-Core

1.8 Contents

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
QICore-AdverseEvent		AdverseEvent
QICore-AllergyIntolerance	USCore-AllergyIntolerance	AllergyIntolerance
QICore-BodyStructure		BodyStructure
QICore-Claim		Claim
QICore-Communication		Communication
QICore-CommunicationRequest		CommunicationRequest
QICore-Condition	USCore-Condition	Condition
QICore-Coverage		Coverage
QICore-Device	USCore-Device	Device
QICore-DeviceRequest		DeviceRequest
QICore-DeviceUseStatement		DeviceUseStatement
QICore-DiagnosticReportLab	USCore-DiagnosticReportLab	DiagnosticReport
QICore-DiagnosticReportNote	USCore-DiagnosticReportNote	DiagnosticReport
QICore-Encounter	USCore-Encounter	Encounter
QICore-FamilyMemberHistory		FamilyMemberHistory
QICore-Flag		Flag
QICore-Goal	USCore-Goal	Goal
QICore-ImagingStudy		ImagingStudy

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

QI-Core Profile Example

Description of Profiles, Differentials, and Snapshots.

<div> Text Summary Differential Table Snapshot Table All </div>				
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)
qicore-encounter-procedure	S	0..*	(Complex)	Encounter Procedure Extension URL: http://hl7.org/fhir/us/qicore/StructureDefinition/qicore-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

7.10.3 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
Diagnosis		
Diagnosis (code)	Encounter.diagnosis.condition	can be used for coded diagnoses
PresentOnAdmissionIndicator (code)		
Rank (Integer)	Encounter.diagnosis.rank	for each diagnosis role
Procedures		Currently referenced as Procedure.priority in QDM 5.5. Principal procedures are more appropriately managed as Encounter.procedures; Elective procedures are more appropriately managed using Encounter.priority = elective with Encounter.procedure.rank = 1.
	Encounter.procedure.code	
	Encounter.procedure.sequence	Extension for Procedure.sequence to be consistent with the FHIR Claim resource includes a Claim.procedure.sequence used to uniquely identify procedure entries. Claim.procedure.type provides a relative ranking with two example concepts - primary (the first procedure in a series to produce an overall patient outcome) and secondary (the second procedure in a series required to produce an overall patient outcome). However, type refers to procedures within a series for which one is first. Such a sequence does not assure that the first procedure is the principal procedure for an encounter.

Shows Quality Data Model datatypes, mapping to QI-Core profile and additional notes and implementer guidance

Converting eCQMs to FHIR

- » CMS began converting QDM based eCQMs to use FHIR in Spring of 2019
- » Intent of conversion is to
 - Identify gaps in emerging standards
 - Perform initial testing of FHIR eCQMs
 - Training for measure developers
- » Measure Repository
 - For work-in-progress eCQMs and example expressions

<http://build.FHIR.org/ig/cqframework/draft-measures/examples.html>

FHIR® Clinical Reasoning Module

- » FHIR Measure Resource
 - Defines eCQM metadata and structure
 - FHIR Measure Implementation Guide
 - <http://hl7.org/fhir/us/cqfmeasures/2020Feb/index.html>
 - » FHIR MeasureReport Resource
 - Supports Individual, List, and Summary
 - DEQM Implementation Guide
 - <http://hl7.org/fhir/us/davinci-deqm/2020FEB/>
- Guides are currently based on FHIR STU 3**
- Updates for R4 planned for Feb 2020 ballot cycle

Quality Measure Implementation Guide


- » Introductory and Overview Information required for creating eCQMs
 - Describes the meta data required
 - Guidance for using CQL with FHIR measures
 - Defines parameters, use of terminology, and measure population descriptions
- » CQF Measure and other profiles define requirements for several measure types
- » Includes examples of eCQMs, libraries, and value sets

Quality Measure IG (Cont'd)



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

Quality Measure Implementation Guide

This page is part of the Quality Measure STU1 for FHIR STU3 Implementation Guide (v0.1.0: [STU1 Ballot 1](#)) based on [FHIR R3](#). The current version which supercedes this version is [1.0.0](#). For a full list of available versions, see the [Directory of published versions](#) 

4.0.0 Profiles

- [CQFMCohortMeasure](#)
- [CQFMContinuousVariableMeasure](#)
- [CQFMLibrary](#)
- [CQFMMeasure](#)
- [CQFMProportionMeasure](#)
- [CQFMRatioMeasure](#)

Profiles describe several measure types and structure of measure library

<http://hl7.org/fhir/us/cqfmeasures/2019May/profiles.html>

Data Exchange for Quality Measures (DEQM)

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

Data Exchange for Quality Measures (DEQM)

Home Framework ▾ Example Use Cases ▾ FHIR Artifacts ▾ Examples Downloads

Table of Contents **Home > Framework > General Guidance**

Data Exchange For Quality Measures STU1 for FHIR STU3, published by HL7 International - Clinical Quality Information Work Group. This is not an authorized publication; it is the continuous build for version 1.0.0). This version is based on the current content of <https://github.com/HL7/davinci-deqm/> and changes regularly. See the [Directory of published versions](#).

2.1.1 General Guidance and Definitions

Contents:

- [Introduction](#)
- [Preconditions and Assumptions](#)
- [DEQM MeasureReport Profiles](#)
 - [Data Exchange](#)
 - [Measure Reporting](#)
- [Other Profiles Used in the Evaluation of a Measure](#)
- [Negation Patterns for Quality Measures](#)
- [Must Support](#)

2.1.2 Introduction

Clinical Quality Measures are a common tool used throughout healthcare to help evaluate and understand the impact and quality of the care being provided to an individual or population.

The Data Exchange for Quality Measures (DEQM) Implementation Guide defines the interactions for two purposes in the Quality Measure Ecosystem. The

<https://build.fhir.org/ig/HL7/davinci-deqm/guidance.html>

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
- » Allows systems to describe general operations

FHIR Operations (Cont'd)

- » Clinical Reasoning defines \$evaluate-measure
 - Allows a client system to request a particular quality measure be evaluated
 - Uses input parameters (i.e. periodStart, periodEnd, measure, etc.)
 - Output is a MeasureReport Resource
- » Other operations used in Quality Reporting
 - \$collect-data
 - \$submit-data
 - \$data-requirements

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

Clinical Quality Framework (CQF) Ruler

- » CQF Ruler is a reference implementation of the FHIR Clinical Reasoning module
 - Includes CQL-to-ELM Translation and Measure Evaluation service
 - Open source Java implementation
 - <https://github.com/DBCG/cqf-ruler>
- » Quick Start Guide has been developed to aid in 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
- » Quality Measure and DEQM Implementation Guides R4 Ballot update
- » Connectathons
 - CMS January (completed)
 - HL7 February Connectathon (Sydney)
 - HL7 May Connectathon (San Antonio)
- » See us at 2020 CMS Quality Conference

Thank You!

- » Implementers can use specifications and resources posted to the eCQI Resource Center:
<https://ecqi.healthit.gov/fhir>
- » Comments or questions can be directed to the eCQI Resource Center to ecqi-resource-center@hhs.gov

Resources

- » More Examples: <http://build.fhir.org/ig/cqframework/draft-measures/examples.html>
- » FHIR R4 Standards and Implementation Guides
 - <http://hl7.org/fhir/> (Current Version)
 - <http://build.fhir.org/> (Current build- will change)
 - <http://hl7.org/fhir/us/core/> (US Core R4 version)
 - Data Exchange for Quality Measures (Feb 2020)
 - Quality Measures IG (Feb 2020)
- » FHIR STU 3 Standards and Implementation Guides
 - <http://hl7.org/fhir/STU3/>
 - <http://hl7.org/fhir/us/davinci-deqm/2019May/STU3/>
 - <http://hl7.org/fhir/us/cqfmeasures/2019May/>

QUESTIONS?