Health Level Seven International (HL7) Fast Healthcare Interoperability Resources (FHIR®)

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Agenda

» Components of an electronic clinical quality measure (eCQM)
» Introduction and walkthrough FHIR specification
» Use of Profiles
» Quality Data Model (QDM) and Quality Improvement Core (QI-Core) mappings
» Introduction to Quality Improvement Clinical Knowledge (QUICK)
» FHIR measure conversion
» Tools to help with conversion
» Using the FHIR eCQM Repository
» Conversion examples
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
Goal is to align quality measurement standards for eCQM development and reporting using FHIR
- QI-Core/QUICK replaces QDM for clinical data
- FHIR Measure replaces HQMF for eCQM Structure
- FHIR Measure Report Individual and Summary replaces QRDA I and III

HQMFF – Health Quality Measure Format
QRDA – Quality Reporting Document Architecture
FHIR 101 - Using CQL and FHIR for eCQMs

What Is 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 Application Programming Interfaces (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 Data Exchange for Quality Measures (DEQM) and Quality Measure 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 eCQMs

*Note HL7 no longer uses Draft for naming conventions*
How is FHIR used?

- FHIR is organized into five 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](http://hl7.org/FHIR)
- Basic navigation of the specification
- Build vs. production sites
- FHIR Maturity Model
- Review a basic Resource - Encounter
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 changed for a specific use case
  - Profiles are published in an implementation guide
  - Conformance ensures both sender and receiver agree on the structure of data

» Implementation guides for quality measurement
  - **QI-Core/QUICK** - The data model for eCQMs
  - **FHIR Quality Measure** - Structure of an eCQM
  - **Data Exchange for Quality Measures (DEQM)** - How quality data are to be exchanged
What is Profiling?

» Adapts the FHIR standard for specific uses
» Can both restrict and extend APIs, Resources, Terminology
» Required elements and Must Support
» Specify a value set
» Extensions and Statuses
HEDIS – National Committee for Quality Assurance’s (NCQA’s) Healthcare Effectiveness Data and Information Set
Using QI-Core

- September 2019 ballot updates QI-Core to FHIR R4
- Bi-directional mapping of QDM and QI-Core
  - QI-Core to QDM
  - QDM to QI-Core
- QUICK- A conceptual view of QI-Core for authoring included in the QI-Core Implementation Guide
FHIR Clinical Reasoning

- FHIR Measure Resource
  - eCQM metadata and structure
  - FHIR Quality Measure Implementation Guide
    http://hl7.org/fhir/us/cqfmeasures/
- FHIR Measure Report
  - Supports Individual, List, and Summary
  - DEQM Implementation Guide
    http://hl7.org/fhir/us/davinci-deqm/
- Implementation Guides are currently based on FHIR STU 3
  - Updates for R4 planned for Feb 2020 ballot cycle
Converting eCQMs to FHIR

» CMS began converting QDM-based eCQMs to use FHIR in spring of 2019

» Developed a prioritized list based on program needs
  – Initial conversions used FHIR STU 3
  – In July of 2019, began using FHIR R4

» Intent of conversion is to
  – Identify gaps in emerging standards
  – Perform initial testing of FHIR eCQMs
  – Training for measure developers
Tools to support eCQM Conversion

» Atom Text Editor
  – [https://atom.io/](https://atom.io/)
  – Provides a basic editor for authoring measures
  – Language-CQL package shows CQL highlighting and FHIR data model validation

» Measure Repository
  – For work-in-progress eCQMs and example expressions
    [https://github.com/cqframework/draft-measures/tree/master/pages/cql](https://github.com/cqframework/draft-measures/tree/master/pages/cql)
Example - ED Encounter

QDM

```cql
29  define "Initial Population" :
30  » "Inpatient Encounter" Encounter
31  » » with ["Encounter, Performed" : "Emergency Department Visit"] ED
32  » » » such that ED.relevantPeriod ends 1 hour or less before start of Encounter.relevantPeriod
```

FHIR

```cql
26  define "Initial Population" :
27   "Inpatient Encounter" Encounter
28   » with ["Encounter" : "Emergency Department Visit"] ED
29   » » such that ED.status = 'finished'
30   » » » and ED.period ends 1 hour or less before start of Encounter.period
```
Example- Lab Test Performed

QDM

```cql
48 define "Pap Test with Results":
49  "["Laboratory Test, Performed": "Pap Test"] PapTest
50  where PapTest.result is not null
51
52 define "Pap Test Within 3 Years":
53  "Pap Test with Results" PapTest
54  where PapTest.relevantPeriod 3 years or less before end of "Measurement Period"
```

FHIR

```cql
58 define "Pap Test with Results":
59  [Observation: "Pap Test"] PapTest
60  where PapTest.value is not null
61  and PapTest.status in { 'final', 'amended', 'corrected', 'preliminary' }
62
63 define "Pap Test Within 3 Years":
64  "Pap Test with Results" PapTest
65  where PapTest.effective 3 years or less before end of "Measurement Period"
```
Example - Procedure Performed

QDM

define "Flexible Sigmoidoscopy Performed":
  ["Procedure, Performed": "Flexible Sigmoidoscopy"] FlexibleSigmoidoscopy
  where FlexibleSigmoidoscopy.relevantPeriod ends 5 years or less on or before end of "Measurement Period"

define "CT Colonography Performed":
  ["Procedure, Performed": "CT Colonography"] Colonography
  where Colonography.relevantPeriod ends 5 years or less on or before end of "Measurement Period"

FHIR

define "Flexible Sigmoidoscopy Performed":
  [Procedure: "Flexible Sigmoidoscopy"] FlexibleSigmoidoscopy
  where FlexibleSigmoidoscopy.status = 'completed'
  and FlexibleSigmoidoscopy.performed ends 5 years or less on or before end of "Measurement Period"

define "CT Colonography Performed":
  [Procedure: "CT Colonography"] Colonography
  where Colonography.status = 'completed'
  and Colonography.performed ends 5 years or less on or before end of "Measurement Period"
Resources

» More Examples: https://github.com/cqframework/draft-measures/tree/master/pages/cql

» 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 Implementation Guide (Feb 2020)

» FHIR STU 3 Standards and Implementation Guides
More Resources

» CQL-to-Expression Logical Model (ELM) Translator

» Java Script (JS) CQL Execution Engine
  – https://github.com/cqframework/cql-execution

» Java CQL Execution
  – https://github.com/dbcg/cql_engine

» Clinical Quality Framework (CQF) Ruler
  – https://github.com/DBCG/cqf-ruler
Questions?
Thank You!

» Implementers should continue to use specifications and resources posted to: https://ecqi.healthit.gov/

» Comments or questions can be directed to: fhir-esac@esacinc.com