**2020-09 Clinical Reasoning**

Short Description: Continue the testing and use of FHIR-based Quality Measures for use in Quality Measurement programs, including CMS and Clinical Decision Support (CDS) Use Cases.

Long Description: By hosting the clinical reasoning track, we hope to achieve the following objectives:

1. **Continue testing Quality Measurement use cases.**
   a. Evaluate FHIR-based eCQMs written with CQL.
   b. Test eCQM structure, packaging, and reference libraries from draft MAT on FHIR export packages.
   c. Test and validate the use of the QI-Core model in CQL authoring.
   d. Test supplemental data use cases for eCQMs.
   e. Test continuous variable and stratified eCQMs.
2. **Test the use of FHIR resources in alignment with FHIR R4 Implementation Guides (IG).**
   a. QI-Core IG.
   b. Quality Measure IG.
   c. Data Exchange for Quality Measures (DEQM) IG.
3. **Test FHIR Clinical Guidelines example content (in coordination with the Care Planning and Public Health tracks).**
4. **Test the new ‘order-select’ hook using CDC Opioid Prescribing (in coordination with the CDS Hooks track).**
5. **Coordinate with the DaVinci DEQM Gaps in Care Track to examine end-to-end testing.**
6. **Continue investigation of bulk import support.**
7. **Test the ExecutableLibrary profile.**
8. **Test the following CMS Measures for R4**

<table>
<thead>
<tr>
<th>Eligible Professional (EP)/Eligible Clinician (EC) Measures</th>
<th>Eligible Hospital (EH)/Critical Access Hospital (CAH) Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019 Reporting Measures</td>
<td>2020 Reporting Measures</td>
</tr>
<tr>
<td>• CMS130v7: Colorectal Cancer Screening</td>
<td>• CMS165v8: Controlling High Blood Pressure</td>
</tr>
<tr>
<td>• CMS125v7: Breast Cancer Screening</td>
<td>• CMS349v2: HIV Screening</td>
</tr>
<tr>
<td>• CMS124v8: Cervical Cancer Screening</td>
<td>• CMS149v9: Dementia: Cognitive Assessment</td>
</tr>
<tr>
<td></td>
<td>• CMS347v4: Statin Therapy for the Prevention and Treatment of Cardiovascular Disease</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eligible Hospital (EH)/Critical Access Hospital (CAH) Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020 Reporting Measures</td>
</tr>
<tr>
<td>• CMS104v8: Discharged on Antithrombotic Therapy</td>
</tr>
<tr>
<td>• CMS105v8: Discharged on Statin Medication</td>
</tr>
<tr>
<td>• CMS108v8: Venous Thromboembolism Prophylaxis</td>
</tr>
<tr>
<td>• CMS106v2: Safe use of opioids - concurrent prescribing (Pre rule for 2020 reporting)</td>
</tr>
</tbody>
</table>

Type of Track: Testing an Implementation Guide

Submitting WG/Project/Implementer Group: CDS/CQI/DaVinci Project

FHIR Version: R4

Specifications and Artifacts of Focus:

- Implementation Guides:
  - QI-Core IG (QI-Core Implementation Guide: STU 4 for FHIR 4.0.1)
  - Quality Measure IG (Quality Measure STU2 for FHIR R4)
  - Data Exchange for Quality Measures (DEQM) IG (Data Exchange For Quality Measures STU2 for FHIR R4)

- FHIR Resources:

Clinical Input Requested (if any): Clinical review of the proposed workflows for the data exchange scenarios, as well as clinical input on the question of whether there is potential value in the data exchange scenarios for a measure with such a short window of opportunity for intervention like VTE-1 (CMS Measure-Venous Thromboembolism Prophylaxis) would be valuable.
Patient Input Requested (if any): N/A

Related Tracks: Care Planning, Public Health, CDS Hooks, DaVinci DEQM Gaps in Care and PACIO/eLTSS

Track Lead: Bryn Rhodes, bryn@databaseconsultinggroup.com

Expected Participants

Alara Imaging, Inc
American Academy of Neurology
Belose Technologies
Commure, Inc
DCG
Dynamic Health IT
EBSCO (via EBM-on-FHIR)
eHealth NSW
Epic (via CDS Hooks)
ESAC, Inc
Flexion, Inc
HRSA
IMPAQ International, LLC
Indicina, LLC
iParsimony, LLC
Lantana Consulting Group
Mathematica
Medisolv, Inc
NCQA
Optum
Oregon Urology Institute and Large Urology Group Practice Association
Philips Healthcare
PJM Consulting, LLC
SAMHSA
SemanticBits
Telligen
The Joint Commission
The MITRE Corporation
UPMC Enterprises
Yale-Center for Outcomes Research and Evaluation

Zulip Stream: https://chat.fhir.org/#narrow/stream/179207-connectathon-mgmt/topic/Clinical.20Reasoning.20Track

Track Orientation:

- Orientation Slide Presentation and Meeting Recording (password: bSTQnP4$)
- Planning Meetings: August 18, 25, September 1, 8 at 10 AM ET

Getting Started:

- Getting Started with Clinical Quality Language: Getting Started with CQL.pptx
We'll be using CQL 1.5, which is included in the Atom language-cql plugin version 2.7.0. This version of the plugin requires Java 11 (recommended supporting Java install: https://adoptopenjdk.net/?variant=openjdk11&jvmVariant=openj9).

- Connectathon Repo/GitHub: https://github.com/dbcg/connectathon (access measure bundles and reference libraries)
- Quick Start: https://github.com/DBCOnetwork/draft-measures/wiki/Quickstart (setup a test system and access links to the tooling)
- Atom User Guide: https://github.com/cqframework/draft-measures/wiki/Atom-User-Instructions (access the Text Editor for CQL Authoring)
- Test Data Repo (MITRE/Synthea): https://github.com/projecttacoma/hir-patient-generator
- MAT on FHIR (Measure Authoring Tool)
  - Environment: The MAT on FHIR Sandbox environment will be used during Connectathon. This environment can be accessed here: https://www.emeasuretool.cms.gov/sbx/MeasureAuthoringTool/Login.html
  - User Access to MAT on FHIR: Information on how to obtain access to the MAT on FHIR Sandbox to create and package FHIR measures is located here.
  - Measure Owners: To convert and edit measures in MAT on FHIR you will need to be the measure owner. Any changes in measure ownership will need to be approved by both the current measure owner. Requests for measure ownership changes can be submitted to sb-mat-help@semanticbits.com
  - User Guide: MAT User Guide v6.0 (Beta).pdf for measure developers that will be working in the MAT on FHIR sandbox during Connectathon
  - Assistance: If you encounter issues during the Connectathon, please send a priority email to sb-mat-help@semanticbits.com as the MAT team will be actively monitoring this email to assist and triage user reported questions
- Synthae Module
  - Building a Synthae Module: Vimeo Recording
  - Introduction to Synthae: Presentation

**Artifacts During Connectathon:**
- Accessing Zoom via the Whova App: 2020-09 Connectathon 25 and Connectathon Participants FAQs
- Clinical Reasoning Track Kickoff 9-10-2020: Presentation
- Clinical Reasoning Track Highlights 9-11-2020: Presentation
- Track Schedule: https://drive.google.com/file/d/1JEfe8VFcZT3fRsoDPxsx3XTW0zOqIcy/view?usp=sharing
- Track Running Notes: https://docs.google.com/document/d/1eFntshlNhNM-yfVX5Y6bH4yJlnIDCmxjvJrNhwpRmmAU/edit?usp=sharing
- Connectathon Report-Out: https://docs.google.com/document/d/17aJM7h9I5PRC9GW4imiGPAxK_JWIRxURWuLAEFYui4/edit?usp=sharing

**System Roles (Quality Reporting):**
- **Producer** - System of record for clinical information such as an EHR
- **Consumer** - A system that aggregates data from multiple sites related to reporting quality measures such as a payer, HIE, reporting vendor or public health registry
- **Reporter** - A system that sends quality reporting data and results
- **Receiver** - A system that receives quality reporting data and results

Systems capable of playing these roles should implement the exchange and reporting scenarios as described in the Data Exchange for Quality Measures implementation guide.

The [CQF Ruler](http://cqm-sandbox.alphora.com/), a reference implementation of FHIR Clinical Reasoning based on the HAPI FHIR Server is available to either play the Consumer, Receiver, and CDS Service roles, or to help guide and test implementations in preparation for the track.

A test instance of the CQF Ruler is available here: http://cqm-sandbox.alphora.com/

**Data Exchange Scenarios**

For these scenarios, the Producer and Consumer exchange the data-of-interest for a quality measure, either by push or pull.

This is the EHR Reference Implementation server endpoint for the Medication Reconciliation Post Discharge use case to test the DEQM $submit-data operation - https://api-v8-stu3.hspsconsortium.org/DaVinciMRPPayer/open

This is the Payer Reference Implementation server endpoint for this use case - https://api-v8-stu3.hspsconsortium.org/DaVinciMRPProvider/open

**Individual Exchange Scenarios**

**Push Scenario ($submit-data)**
- **Action:** An EHR playing the role of the Producer uses the $submit-data operation to report the data-of-interest for an MRP measure
- **Precondition:** The EHR has appropriate data to produce the data-of-interest for the measure, either based on the test data, or by walking through a simulated workflow that produces the data required
- **Success Criteria:** The Consumer receives the data and successfully processes the data
- **Bonus Point:** Run the operation multiple times throughout a simulated measurement period to feed incremental data of interest for the measure to the Consumer

**Pull Scenario ($collect-data)**
- **Action:** A Consumer uses the $collect-data operation to gather the data-of-interest for an MRP
- **Precondition:** The EHR has appropriate data to produce the data-of-interest for the measure, either based on the test data, or by walking through a simulated workflow that produces the data required
- **Success Criteria:** The Producer responds to the $collect-data and the Consumer is able to successfully process the response
- **Bonus Point:** Run the operation multiple times throughout a simulated measurement period to collect incremental data of interest for the measure
Group Exchange Scenarios

For the Group Exchange scenarios, we focus on the need for payers to track status of members for a screening measure, a Colorectal Cancer Screening measure in this case. The scenarios are based on the case where a payer sends a request to a provider for the screening information for a group of covered patients.

These scenarios will attempt to use the Bulk Data API as specified in the FHIR specification. In particular:

- $collect-data will use bulk data to communicate the response
- $submit-data will use an implementation of bulk data import to communicate the payload of the request

Push Scenario ($submit-data)

In the push scenario, the provider - through some interface in their system - gathers the screening information for the set of patients and submits it:

- **Action:** An EHR playing the role of the Producer uses a batch of $submit-data interactions to report the data-of-interest for the COL measure for the set of patients
- **Precondition:** The EHR has appropriate data to produce the data-of-interest for the measure, either based on the test data, or by walking through a simulated workflow that produces the data required
- **Success Criteria:** The Consumer receives the data and successfully processes the data
- **Bonus Point:** The provider system uses the Bulk Data format to send the information

Pull Scenario ($collect-data)

In the pull scenario, the payer uses the $collect-data operation to request through the provider's API:

- **Action:** A Consumer uses a batch of $collect-data interactions to gather the data-of-interest for a COL measure for a set of patients
- **Precondition:** The EHR has appropriate data to produce the data-of-interest for the measure, either based on the test data, or by walking through a simulated workflow that produces the data required
- **Success Criteria:** The Producer responds to the $collect-data batch and the Consumer is able to successfully process the responses
- **Bonus Point:** The payer system uses the Bulk Data format to request the information

Reporting Scenarios

For these scenarios, a Reporter and Receiver exchange the data and results of a quality measure.

Individual Report Scenario

- **Action:** A Reporter reports the data and results for an Individual MRP, COL, or VTE-1 measure to a Receiver
- **Precondition:** The Reporter has appropriate data to produce the individual MeasureReport for the measure
- **Success Criteria:** The Receiver receives a completed MeasureReport and verifies that it has the correct data and the calculated result is correct for the individual
- **Bonus Point:** Use a subscription to notify the Receiver when the report is ready for retrieval

Summary Report Scenario

- **Action:** A Reporter reports the results for a Summary MRP, COL, or VTE-1 measure to a Receiver
- **Precondition:** The Reporter has appropriate data to produce the summary MeasureReport for the measure
- **Success Criteria:** The Receiver receives a completed MeasureReport and verifies that it has the expected result for the population
- **Bonus Point:** Use a subscription to notify the Receiver when the report is ready for retrieval

Calculation Scenarios

For these scenarios, a Receiver requests the calculation of a quality measure by a Reporting system.

Individual Report Scenario

- **Action:** A Receiver uses $evaluate-measure to request the data and results for an Individual MRP, COL, or VTE-1 measure from a Reporter
- **Precondition:** The Reporter has appropriate data to produce the individual MeasureReport for the measure
- **Success Criteria:** The Receiver receives a completed MeasureReport and verifies that it has the correct data and the calculated result is correct for the individual
- **Bonus Point:** Use asynchronous result calculation (MeasureReport status = in-progress)

Summary Report Scenario

- **Action:** A Receiver uses $evaluate-measure to request the results for a Summary MRP, COL, or VTE-1 measure from a Reporter
- **Precondition:** The Reporter has appropriate data to produce the summary MeasureReport for the measure
- **Success Criteria:** The Receiver receives a completed MeasureReport and verifies that it has the expected result for the population
- **Bonus Point:** Use asynchronous result calculation (MeasureReport status = in-progress)
Public Health Reporting Scenario

System Roles (PHR)

- **Clinical System**: A system that deals with health data and potentially reportable events
- **Reporting Application**: A system that focuses on identifying and submitting potentially reportable events
- **Receiving System**: A system that receives potentially reportable events

Negative Chlamydia Screening Report Scenario

- **Action**: A Reporting Application is notified by a Clinical System of a potentially reportable event, and uses the eRSD specification to:
  - Determine the jurisdiction of residence and jurisdiction of care for the event
  - Determine whether the event is potentially reportable, given condition-specific value sets and jurisdiction-specific criteria as specified in the rule filter portion of the eRSD specification
  - If the event is potentially reportable, submit a mock eICR to the receiving system
- **Precondition**: The Clinical System has appropriate data representing a negative chlamydia screening result
- **Success Criteria**: The receiving system is notified of and receives a potentially reportable eICR for a negative chlamydia screening result
- **Bonus Point**: Demonstrate the pattern is effective for other conditions that exhibit similar potential to reduce the number of potentially reportable events submitted through jurisdiction-specific and condition-specific configuration

Decision Support Scenarios

System Roles (CDS)

- **CDS Service**: A system that provides decision support guidance via the CDS Hooks API
- **CDS Client**: A system that consumes decision support via the CDS Hooks API

Opioid Decision Support

The Centers for Disease Control and Prevention (CDC) have issued guidelines relating to the prescription of opioids:
https://www.cdc.gov/drugoverdose/prescribing/guideline.html

The Opioid Prescribing Support Implementation Guide represents several recommendations of this guideline as computable artifacts using the FHIR Clinical Reasoning Module:
http://build.fhir.org/ig/cqframework/opioid-cds/

This scenario will focus on testing usage with the new order-select hook for recommendations #5, #10, and #11

- **Action**: The chart is opened for a patient that is currently prescribed opioids and has not had the recommended urine drug screening, so the recommendation for a urine drug screening is displayed
- **Success Criteria**: An EHR user is provided appropriate guidance when viewing a patient that is currently prescribed opioids
- **Bonus Point**: The logic accesses an extension as a first-class element of the model

For the purposes of this scenario, long-term opioid therapy is defined as use of opioids on most days for > 3 months, and the patient does not have metastatic cancer. To determine these, the CDS Service will need to access:

- Current Medication List
- Problem List
- Encounter Diagnoses within 12 months

For communicating medications, the service will expect information in a MedicationRequest or MedicationStatement, with at least the following supplied:

- Medication as an RxNorm code
- Dosage
- Frequency

The implementation guide provides computable artifacts describing the calculations for MME based on the CDC Guidance. The CDS Service can use these representations to provide the functionality described for this scenario.

**TestScript(s)**: All testing materials can be accessed from the Connectathon GitHub Repository: https://github.com/dbcg/connectathon

**Security and Privacy Considerations**: The scenarios and reference implementations here run using open (i.e. unsecured) connections. Systems SHALL NOT use PHI in any form, or data derived directly from PHI.

Track Report Out
Summary: The Clinical Reasoning Track continued the testing and use of FHIR-based Quality Measures for use in Quality Measurement programs, including CMS and Clinical Decision Support (CDS) Use Cases. The Track also tested the following implementation guides (IG):

- QI-Core IG
- Quality Measure IG
- Data Exchange for Quality Measures IG
- Clinical Practice Guidelines IG

Participants:

<table>
<thead>
<tr>
<th>American Academy of Neurology</th>
<th>Dynamic Health IT</th>
<th>Epic (via CDS Hooks)</th>
<th>i Parsimony, LLC</th>
<th>Medisolv, Inc</th>
<th>NCOA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bellesa Technologies</strong></td>
<td>Yale-Center for Outcomes Research and Evaluation</td>
<td>Indocina, LLC</td>
<td>Lantana Consulting Group</td>
<td>Telligen</td>
<td>The Joint Commission</td>
</tr>
<tr>
<td>Commure, Inc</td>
<td>eHealth NSW</td>
<td>ESAC, Inc</td>
<td>Mathematica</td>
<td>Oregon Urology Institute and Large Urology Group Practice Association</td>
<td>IMPAQ International, LLC</td>
</tr>
<tr>
<td>Philips Healthcare</td>
<td>PJM Consulting, LLC</td>
<td>DCG</td>
<td>HRSA</td>
<td>Optum</td>
<td>The MITRE Corporation</td>
</tr>
<tr>
<td>SAMHSA</td>
<td>UPMC Enterprises</td>
<td>EBSCO (via EBM-on-FHIR)</td>
<td>Flexion, Inc</td>
<td>SemanticBits</td>
<td>Alara Imaging, Inc.</td>
</tr>
</tbody>
</table>

Systems which have implemented the IG, Profile, or Resource:

- MAT-on-FHIR: Quality Measure IG, ~80% (shareable, executable, computable for library, measure, and artifact bundles, still working on publishable for library and measure, also implements measure-specific profiles for proportion and continuous variable)
- Commure: Quality Measure IG ~80% (continuous-variable, cohort, and proportion measures, don’t yet support ratio measures, don’t have complete stratification support or supplemental data)
- Data Exchange for Quality Measure IG ~80% ($evaluate-measure, $data-requirements, $collect-data, successfully tested at least 50% of the connectathon tests)
- CQF-Ruler (reference implementation): Quality Measure IG: ~80% (continuous-variable (ish), cohort, and proportion, ratio, supplemental data, don’t yet support stratification)
- Data Exchange for Quality Measures: ~80% ($evaluate-measure, $submit-data, $collect-data, successfully tested 99% of the connectathon tests)
- Dynamic Health IT: Progress with measure 506, integrating FHIR Server and Quality Tools with $evaluate-measure, testing focused on 506, but robust CQL implementation will likely support other measures as well

Notable Achievements:

- Successfully exported measure packages from MAT-on-FHIR and imported (mostly) those measures. Found and reported several issues that are currently being worked on
- Progress with testing hospital stroke measure on PACIO data, encountering evaluation failures, but working through them
- Progress with testing continuous variable measures, found and fixed several issues, more outstanding are still being worked
- Gaps-in-Care end-to-end test with GIC track, used a test patient from Clinical Reasoning, got an “open gap” report, posted a submit-data with closing data and got a “closed gap” report, as well as a summary. Uncovered some issues with $collect-data and $evaluate-measure (summary), those issues are being worked on
- Successful testing with supplemental data for multiple hospital and provider measures--124, 125, 111, 104, 108, 529

Screenshots of Implementations/Achievements:
3.4.3 Care Gaps Operation

A client, such as a provider, will use the care gaps operation to request a Colorectal Cancer Screening measure gaps-in-care report for his/her patients from the server, such as a payer. The provider receives the report from the server system and notices that the report identifies one of the patients as having an open gap. The provider looks at the chart and sees that a colonoscopy was done recently for that patient. He/she then submits a CDCN Data Exchange Measure Report and the referenced resources received as supporting evidence for the Colorectal Cancer Screening measure to the server. Later, the provider requests the care gaps operation for Colorectal Cancer Screening to ensure the open gaps is now closed for that patient.

The Figure 3-12 shows the workflow for gaps-in-care.

Figure 3-12 Gaps in Care Workflow

3.4.4 Gaps in Care Report

This section contains an example that begins with a provider requesting a gaps-in-care report for his/her patients from the server. The provider receives the report, notices then submits additional data to the server for the patient that was identified as having open gaps in the report. He/she then later requests a gaps-in-care report for these patients again from the server.

3.4.4.1 Step 1: Initial Run for a Gaps in Care Report

The response graph below represents the structure of the resources returned from the first care gaps operation. Figure 3-13 shows the patient, Care Record(F), has an open gap because there were no resources in the payer system that would pull for it in numerator or denominator calculation of the Colorectal Cancer Screening measure.
Discovered Issues/Questions:
https://github.com/cqframework/clinical_quality_language/issues/564
https://github.com/DBCG/cqf-ruler/issues/250
https://github.com/DBCG/cql_engine/pull/396
https://github.com/DBCG/cqf-ruler/issues/246
https://github.com/DBCG/cqf-ruler/issues/251
https://github.com/DBCG/cql-evaluator/pull/21

- Reference implementation of $collect-data does not include all data, only the data collection report
- Reference implementation of summary $evaluate-measure includes too much data, should only be the aggregate result
- Found and fixed several library resolution errors in the reference implementation, which raised the larger question about whether the use of underscores in library names should be allowed or should be added as a convention

Now What?

- Complete continuous variable implementation
- Stratification results
- Multiple-population measure testing
- Additional QI-Core Authoring support/testing
- Composite measures
Supporting the September 2020 Virtual Connectathon...