

CQL Testing Feedback Response

<https://oncprojectracking.healthit.gov/support/browse/CQLIT-39>

Vendor Feedback

We have reviewed the human readable HTML (HRH) as a participant in the EHR vendor support for CQL testing. Our overall assessment of the HRH is that it is not adequate to convey the logic of the measure in simple enough terms to affect a basic understanding of the measure or to conduct reviews of measures during development. The HRH artifacts associated with the CQL implementation are significantly less readable than similar artifacts from the current version of the MAT 4.x. We made this assessment by reviewing the fairly simple CMS 68 and the more complex measure CMS 22 in both the current MAT 4.x and CQL implementations.

Our company has been capable of fully executing the Simple Logic XML from the current MAT version 4.x for several years now. We have supported real time evaluation of eCQM measures at the point of care in our product for 2015, 2016 and 2017 logic for MU2 and 2017 QPP. We have also implemented about 60 additional former PQRS measures (now QPP) that are not currently implemented as eCQMs using MAT 4.x and we intend to implement the remaining QPP measures within the next few quarters (all 272 QPP measures in total). During measure development using MAT 4.x we frequently conduct in house reviews of measure logic using primarily the human readable HTML (HRH) in conjunction with the QPP measure documents (PDFs). Thus we are very familiar with the measure development process, the level of effort and expertise required of implementers, and the difficulties in creating error-free measure logic. The current MAT 4.x artifacts are very readable, particularly the HRH and Simple Logic XML.

The HRH artifacts associated with the CQL testing measures are nearly impossible to use as a review tool. The two main problems are:

1. The logic expressions are not intuitive, possibly because they are not fully declarative and because the logic does not read sequentially. This results in an artifact that is very difficult to parse by reviewers and measure developers alike.

The CQL rendering in the human readable will be significantly updated in an upcoming release of the MAT. The collapse/expand functionality was simplified, and references to expressions defined in population criteria are now listed only once in a new Expressions and Functions section.

2. The readable logic is more than twice the length of the existing MAT 4.x HRH, possibly because the underlying CQL/ELM is more complex than necessary for the development of eCQMs.

In contrast, the current MAT 4.x HRH is compact and relatively easy to understand.

For some cases, QDM 4.x does provide a compact representation. However, it's not precise enough in what it communicates, particularly around timing relationships, order of operations processing, and other subtle nuances that lead to misunderstandings and misinterpretation.

Consider a simple comparison between CQL HRH and MAT 4.x HRH using CMS 68 and 22 as examples:

1. CMS 68 is a very simple measure, which in MAT 4.x HRH takes 16 lines to express, and most of those lines are merely AND/OR statements or population headers. The CQL HRH for this measure is at least 36 lines (when not expanding sub-expression references or counting empty lines). The MAT 4.x HRH expressions read sequentially for the most part whereas the CQL HRH is very difficult to parse. Our reviews typically involve measure developers, clinicians, knowledge-base developers, and user-interface design personnel. The subject of measure logic development and review using highly-readable MAT 4.x is already very difficult and requires a specialized skill set. With the current CQL HRH it would be very difficult to conduct effective reviews.

Thank you for this important feedback. Part of the additional length of the representation of this measure in CQL is the use of separate statements to represent specific concepts. For example, the "Numerator" is:

```
define "Numerator":  
  "Medications Documented"
```

This could be expressed as just a reference to the encounters with medications documented procedures:

```
define "Numerator":  
  "Encounters during Measurement Period" Encounter  
  with ["Procedure, Performed": "Current Medications Document SNMD"] Procedure  
  such that Procedure.relevantPeriod during Encounter.relevantPeriod
```

But doing so would no longer communicate the intent of the statement in the way that the name "Medications Documented" does.

2. CMS 22 has a very complex numerator. The MAT 4.x HRH logic can be expressed in a compact, readable, sequential 83 lines of which 20 are AND/OR statements or population headers. The CQL HRH for this measure clocks in at 185 lines and spans several pages and this without expanding sub-expressions or counting empty lines. Further it does not read in a sequential fashion due to the underlying nature of the CQL (e.g., the many alias "defines").

It would be possible to express the CQL more compactly by removing all the defines and in-lining every expression, but doing so would remove one of the most important tools of abstraction that CQL provides, the ability to indicate by the name of an expression, the intent of that piece of logic. With this measure in particular, the intent of the numerator in QDM is obscured by the QDM rendering, whereas with CQL, the intent of the numerator is clearly and simply stated:

define "Numerator":

- "Most Recent BP normal"
- or "prehypertensive with intervention"
- or "First hypertensive with interventions"
- or "Second high BP with interventions"

Proposals

As it stands, with this unnecessary complexity in the logic model and the human readable rendering, the MAT 5/CQL logic will require higher maintenance and result in a consequent higher level of errors in authored measures. This will likely result in increased maintenance cost to all parties involved from authoring to execution. Currently the HRH artifact is unusable for logic review, which leaves the CQL (the ELM is just too difficult to read). The problem with the CQL as a review artifact is it is a full-blown programming language, and therefore not suitable for review by non-developers, which leaves out many clinicians, knowledge-base and terminology specialists, content developers and so on. CQL would not be a viable alternative for our review meetings.

What can be done to fix this? I'm not sure anything can solve this as long as CQL/ELM is the basis. If the CQL/ELM can be expressed in a readable fashion then the underlying structure of CQL could easily be simplified as well, something we would highly recommend. As an alternative, we may have to develop our own simple declarative language and re-author the eCQMs, which would be regrettable. In our opinion, for the current purposes of the eCQMs and the current set of 172 QPP measures, the simple logic merely lacks a few enhancements that currently hamper development (e.g., set complement function, assignment, etc.). For those purposes (i.e., QPP measure development) the CQL is not well suited.

CQL was developed in partnership with current measure developers from Mathematica Policy Research, The Joint Commission, PCPI, NCQA, and others. Measure developers were consulted at every step of the language design process. The syntax and language design also draws heavily from QDM 4.x, specifically so it would be as familiar as possible to users of the current QDM 4.x artifacts.

Based on the feedback provided here, and from other vendors, we have been working on improvements to the human readable and the measure expressions, including:

- Simplified presentation of the logic within the Human Readable. Referenced expressions within population criteria are no longer presented in the same section, but are all added to a new Expressions and Definitions section, similar to the QDM Variables section in current HQMF documents.*
- A new Terminology section in the Human Readable that gathers all terminology referenced by the CQL (as opposed to the previous approach which only included terminology referenced by the data criteria).*
- Automated formatting of the output CQL to provide consistent application of CQL style guidelines and improve readability of the resulting CQL.*
- Improved alias-naming conventions in measure authoring to provide more consistent use of names within and across measures.*

A concern with the approach discussed here of “developing a simple declarative language” is that it would end up repeating the work already undertaken by the CQL transition effort. The goal of eCQM development and distribution has always been to automate as much as possible the communication of the semantics of the measure to enable evaluation and calculation without requiring manual development or intervention.

If there are other specific recommendations you would make as far as syntax and semantics of CQL and ELM, we would welcome that discussion.