This program is designed to be interactive.

» Ask questions through the chat box during our Q&A session

» When slides are posted, visit the URLs for additional reference and educational content

THE WEBINAR REPLAY AND THE PDF OF THE SLIDEDECK WILL BE AVAILABLE ON THE ECQI RESOURCE CENTER WEBSITE AND AN EMAIL WILL BE SENT TO ALL THAT REGISTERED WITH THE LOCATION ONCE THEY ARE POSTED.

At the end of this session, participants will be able to:

- Understand basic concepts about the new Clinical Quality Language (CQL) eCQM logic expression language

- Prepare for implementation of the CQL logic expression language for the 2019 eCQM performance period

- Know where to find additional resources and ask questions about eCQMs and CQL logic

Disclosure Statement

These staff and speakers have disclosed that neither they nor their spouses/partners have any financial arrangements or affiliations with corporate organizations that either provide educational grants to this program or may be referenced in this activity:

» Bryn Rhodes, ESAC, Inc. (ESAC, Inc. is a Centers for Medicare & Medicaid Services subcontractor)

Background

» CQL is a Health Level Seven International (HL7) standard designed to unify the expression of logic for electronic clinical quality measures (eCQMs) and Clinical Decision Support (CDS).

» CQL provides the ability to better express logic defining measure populations to improve the accuracy and clarity of eCQMs.

» Benefits of CQL:

- Improved expressivity

- More precise/unambiguous

- Can share logic between measures

- Can share logic with decision support

- Can be used with multiple information data models (e.g., Quality Data Model [QDM], Fast Healthcare Interoperability Resources [FHIR])

- Simplifies calculation engine implementation

CQL Transition

» eCQMs transitioned to use the CQL standard for logic expression beginning with the CY 2019 reporting period for Eligible Hospitals and Critical Access Hospitals (CAHs), and CY 2019 performance period for Eligible Professionals (EPs) and Eligible Clinicians for the following programs:

   – Hospital Inpatient Quality Reporting (IQR) Program

   – Medicare and Medicaid Promoting Interoperability Programs (previously known as the Medicare and Medicaid Electronic Electronic Health Record Incentive Programs)

   – Quality Payment Program: The Merit-based Incentive Payment System (MIPS) and Alternative Payment Models

   – Comprehensive Primary Care Plus

» To support the transition, CMS published CQL-based eCQMs in Spring 2018

WHAT IS CQL?

Quality Measurement

» What is a quality measure?
  – Quantitative tool to assess performance related to a specific clinical process, structure, or outcome

» What is an electronic Clinical Quality Measure (eCQM)?
  – Electronic representation of a quality measure with the goal of enabling the measure to be evaluated as automatically as possible

CMS 68 – Description

Percentage of visits for patients aged 18 years and older for which the eligible professional attests to documenting a list of current medications using all immediate resources available on the date of the encounter. This list must include ALL known prescriptions, over-the-counters, herbals, and vitamin/mineral/dietary (nutritional) supplements AND must contain the medications' name, dosage, frequency and route of administration.

Questions "about" the description:
- Who said it?
- When did they say it?
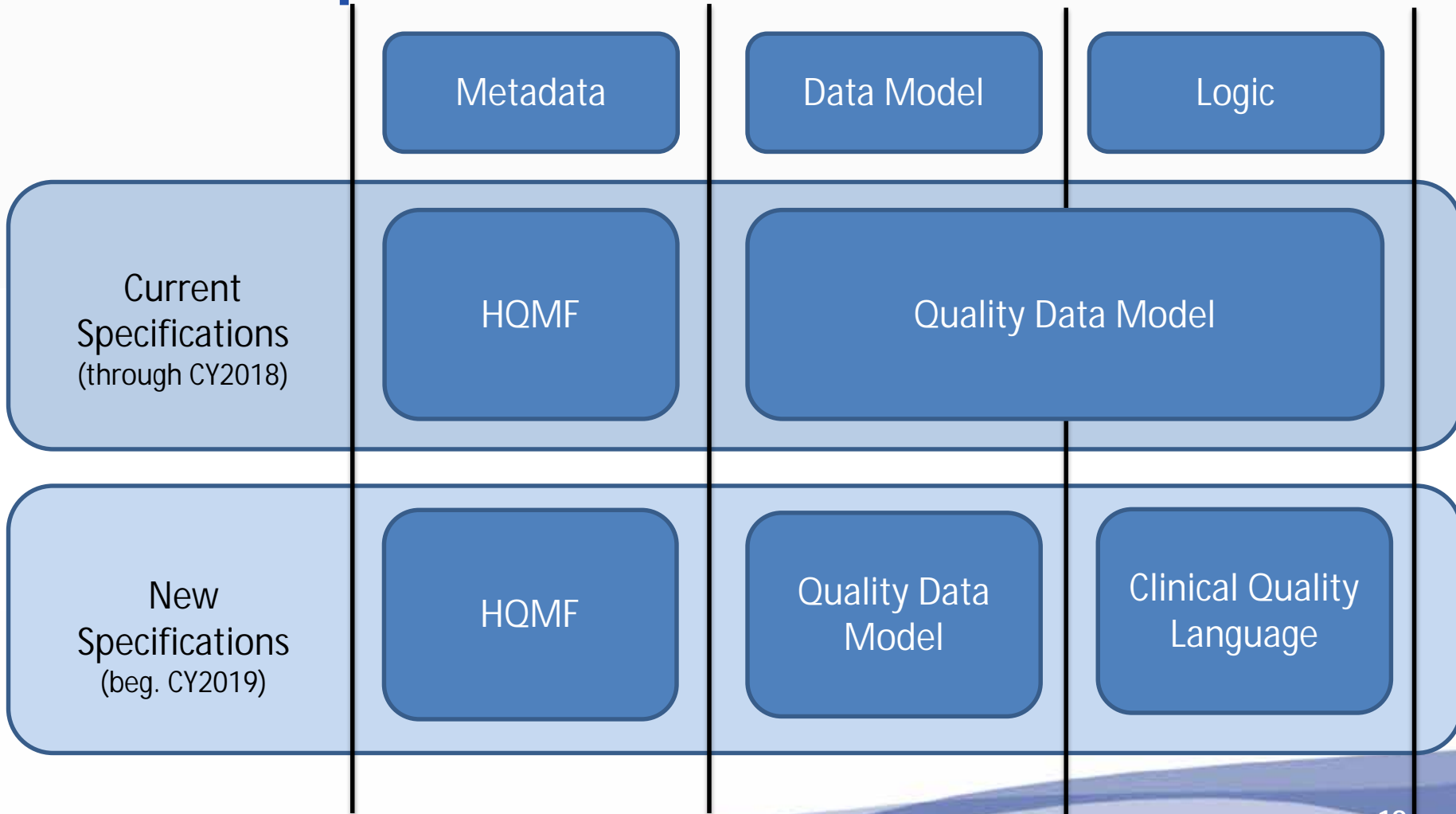- What evidence supports it?
- How should I use it?

Questions about the content of the description:
- What kinds of "things" does it talk about?
- What do those "things" look like?
- What are the relationships between them?
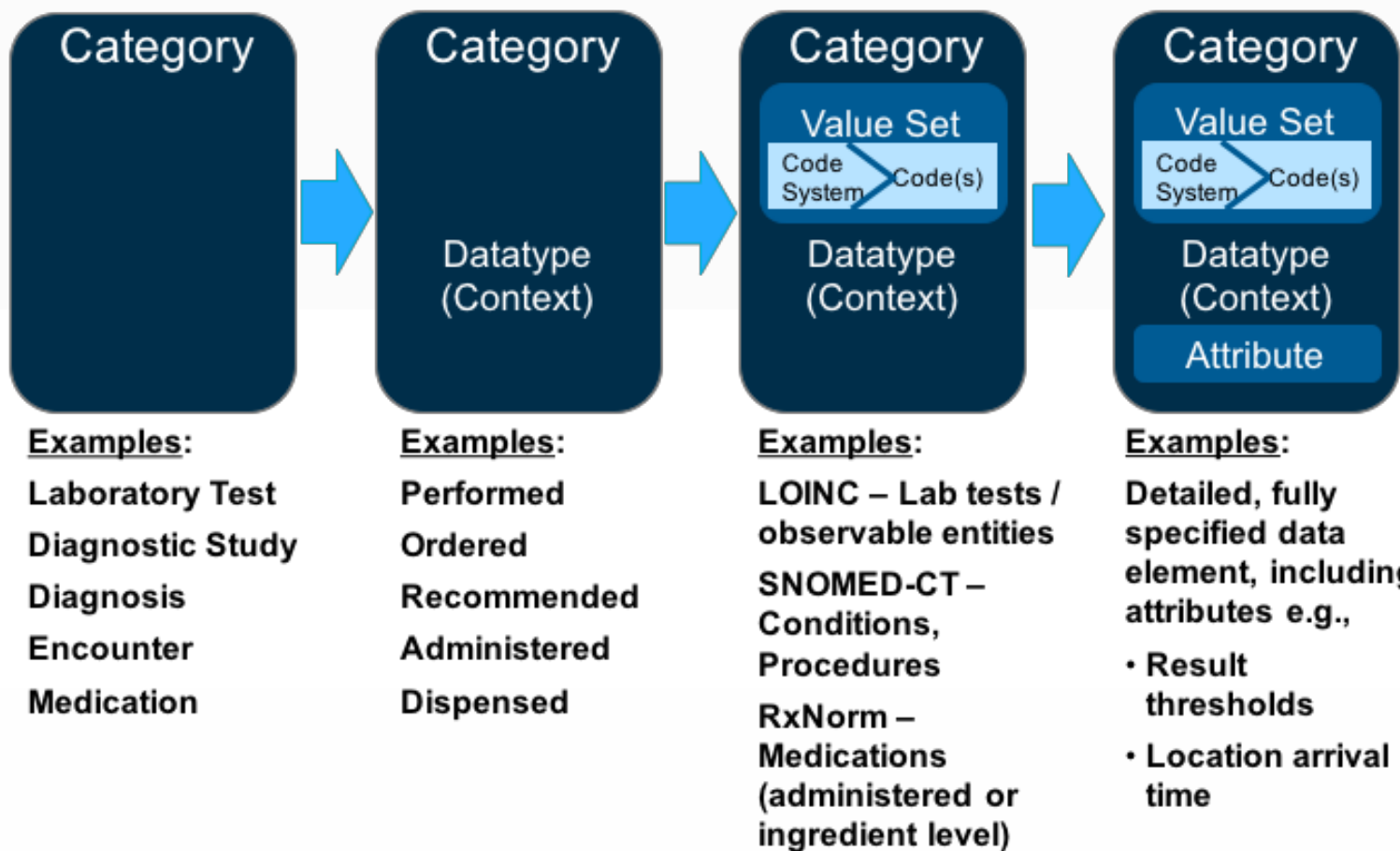- What are the criteria that apply to them?

Metadata

Data Model

Logic

eCQM Representation

	Metadata	Data Model	Logic
Current Specifications (through CY2018)	HQMF	Quality Data Model	
New Specifications (beg. CY2019)	HQMF	Quality Data Model	Clinical Quality Language

QDM Data Types

Category

Examples:

Laboratory Test

Diagnostic Study

Diagnosis

Encounter

Medication

Category

Datatype (Context)

Examples:

Performed

Ordered

Recommended

Administered

Dispensed

Category

Value Set

Code System > Code(s)

Datatype (Context)

Examples:

LOINC – Lab tests / observable entities

SNOMED-CT – Conditions, Procedures

RxNorm – Medications (administered or ingredient level)

Category

Value Set

Code System > Code(s)

Datatype (Context)

Attribute

Examples:

Detailed, fully specified data element, including attributes e.g.,

· Result thresholds

· Location arrival time

Encounter, Performed

» Data elements that meet criteria using this datatype should document that the encounter indicated by the QDM category and its corresponding value set is in progress or has been completed.

» Encounter, Performed has the following attributes:
- Id
- Code
- Relevant Period
- Admission Source
- Diagnoses
- Discharge Disposition
- Length of Stay
- Negation Rationale
- Principal Diagnosis
- Author Datetime
- Facility Locations

Components of Sharing Logic

Logic — Value > 100

Model — Encounter, Medication, Assessment …

Terms — SNOMED CT, LOINC, RxNorm …
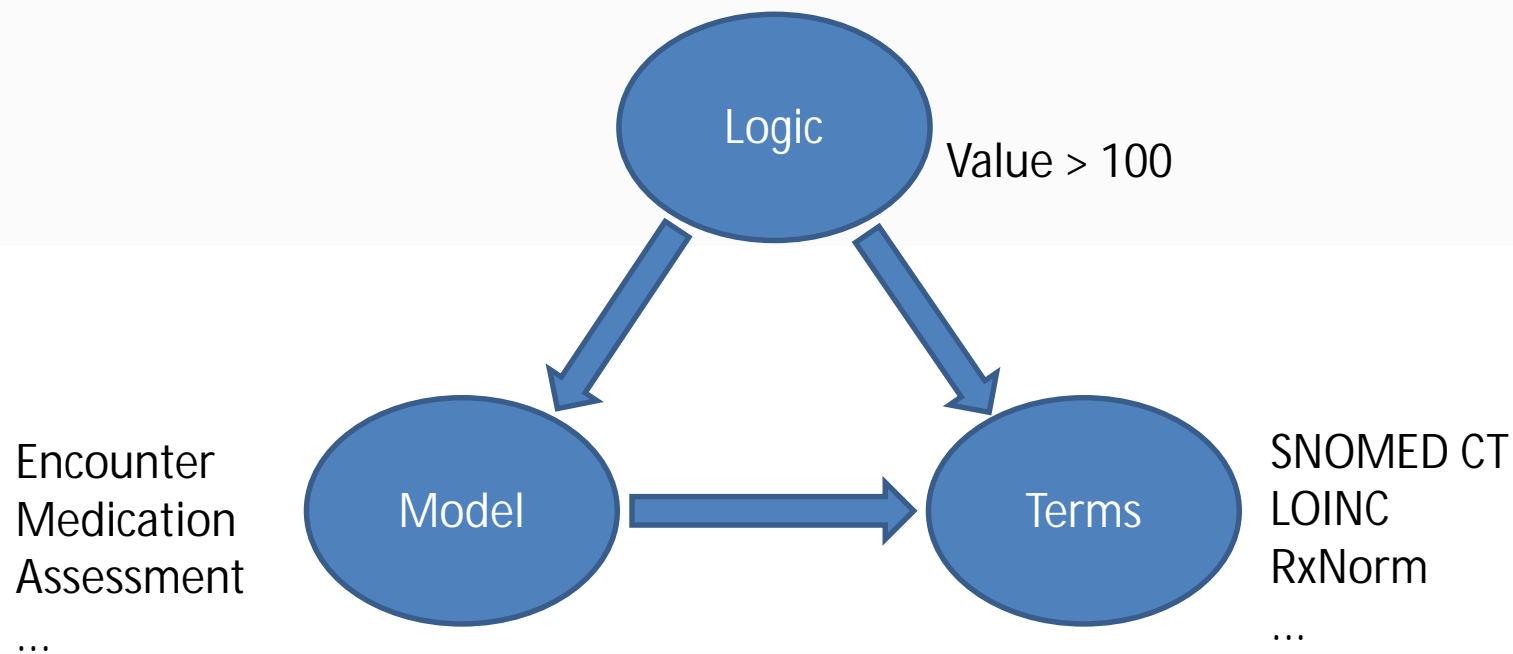
What is CQL?

» A standard language for expressing clinical knowledge that is
  - Readable
  - Shareable
  - Computable

CQL TOUR

Population Criteria — CMS 68

Population Criteria

▲ **Initial Population**

"Qualifying Encounters During Measurement Period" QualifyingEncounter
where "Patient Age 18 or Older at Start of Measurement Period"

▲ **Denominator**

"Initial Population"

▲ **Denominator Exclusions**

None

▲ **Numerator**

"Medications Documented During Qualifying Encounter"

▲ **Numerator Exclusions**

None

▲ **Denominator Exceptions**

"Qualifying Encounters During Measurement Period" EncounterDuringMeasurementPeriod
with "Medications Not Documented for Medical Reason" MedicationsNotDocumented
such that MedicationsNotDocumented.authorDatetime during EncounterDuringMeasurementPeriod.relevantPeriod

▲ **Stratification**

None

Definitions

C = B and Medications Documented

B = A and Age

A = Encounters

Constrain
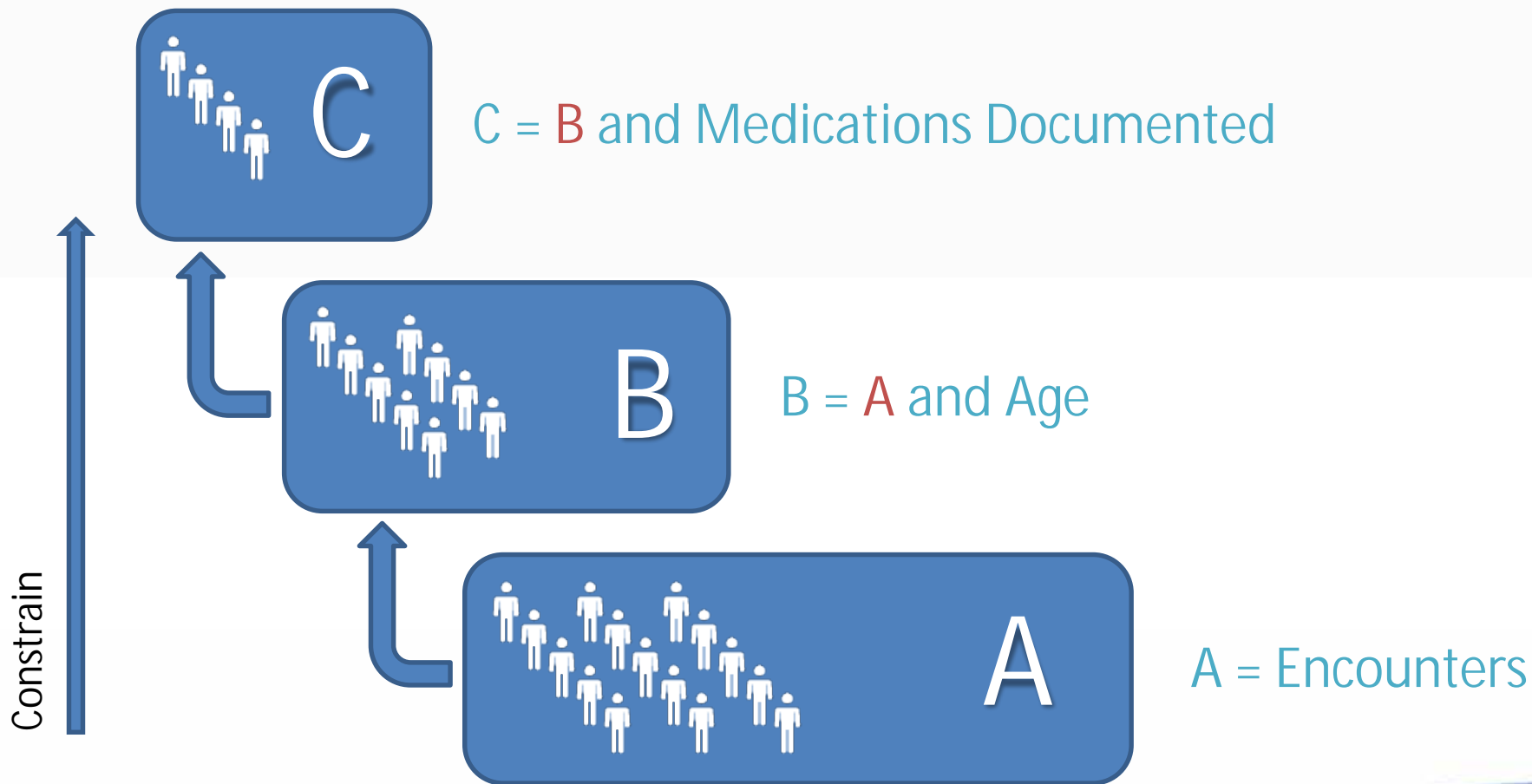
Definitions – CMS 68

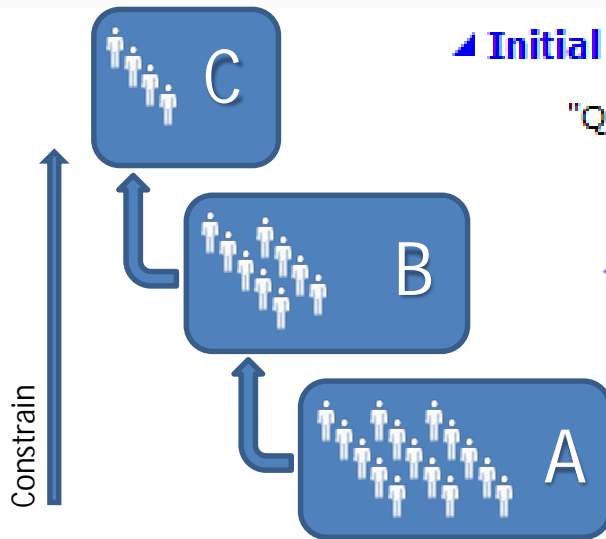## Medications Documented During Qualifying Encounter

"Qualifying Encounters During Measurement Period" QualifyingEncounterDuringMeasurementPeriod
    with ["Procedure, Performed": "Documentation of current medications (procedure)"] MedicationsDocumented
        such that MedicationsDocumented.relevantPeriod during QualifyingEncounterDuringMeasurementPeriod.relevantPeriod

Initial Population

"Qualifying Encounters During Measurement Period" QualifyingEncounter
    where "Patient Age 18 or Older at Start of Measurement Period"

Qualifying Encounters During Measurement Period

["Encounter, Performed": "Medications Encounter Code Set"] QualifyingEncounter
    where QualifyingEncounter.relevantPeriod during "Measurement Period"

C

B

A

Constrain

Definitions – Anatomy

Definitions are made up of:

Name

["Encounter, Performed": "Medications Encounter Code Set"] QualifyingEncounter
where QualifyingEncounter.relevantPeriod during "Measurement Period"

▲ Qualifying Encounters During Measurement Period

Expression

Expressions

Identifier

["Encounter, Performed": "Medications Encounter Code Set"] QualifyingEncounter
where QualifyingEncounter.relevantPeriod during "Measurement Period"

Operator

Queries

Source   Alias

↓   ↓

["Encounter, Performed": "Medications Encounter Code Set"] QualifyingEncounter
where QualifyingEncounter.relevantPeriod during "Measurement Period"

Retrieve (square brackets)

Type   Value Set

["Encounter, Performed": "Medications Encounter Code Set"]

Terminology

Terminology

- codesystem "SNOMEDCT" using "2.16.840.1.113883.6.96 version 2017-09"
- code "Documentation of current medications (procedure)" using "SNOMEDCT version 2017-09 Code (428191000124101)"
- valueset "Ethnicity" using "2.16.840.1.114222.4.11.837"
- valueset "Medical or Other reason not done" using "2.16.840.1.113883.3.600.1.1502"
- valueset "Medications Encounter Code Set" using "2.16.840.1.113883.3.600.1.1834"
- valueset "ONC Administrative Sex" using "2.16.840.1.113762.1.4.1"
- valueset "Payer" using "2.16.840.1.114222.4.11.3591"
- valueset "Race" using "2.16.840.1.114222.4.11.836"

- Includes all terminologies referenced by the measure
- This may include direct-reference codes, rather than only valuesets

Value Set Authority Center (VSAC)

Negation in Quality Data Model (QDM)

Negated Type

Terminology

Negation Rationale

Terminology

```
["Procedure, Not Performed": "Documentation of current medications (procedure)"] NotPerformed
    where NotPerformed.negationRationale in "Medical or Other reason not done"
```

Value Set Downloads

Terminology and Attributes

```
["Procedure, Not Performed": "Documentation of current medications (procedure)"] NotPerformed
    where NotPerformed.negationRationale in "Medical or Other reason not done"
```

CMS ID	NQF Number	Value Set Name	Value Set OID	QDM Category
CMS68v8	0419	Medical or Other reason not done	2.16.840.1.113883.3.600.1.1502	
CMS68v8	0419	Medical or Other reason not done	2.16.840.1.113883.3.600.1.1502	
CMS68v8	0419	Medical or Other reason not done	2.16.840.1.113883.3.600.1.1502	
CMS68v8	0419	Medical or Other reason not done	2.16.840.1.113883.3.600.1.1502	

Direct-Reference Codes

1. Direct-reference code in a retrieve

["Procedure, Not Performed": "Documentation of current medications (procedure)"] NotPerformed

Terminology

- codesystem "SNOMEDCT" using "2.16.840.1.113883.6.96 version 2017-09"
- code "Documentation of current medications (procedure)" using "SNOMEDCT version 2017-09 Code (428191000124101)"

Data Criteria (QDM Data Elements)

- "Procedure, Performed: Documentation of current medications (procedure)" using "Documentation of current medications (procedure) (SNOMEDCT version 2017-09 Code 428191000124101)"

2. Direct-reference code in a comparison

DischargeHospice.dischargeDisposition as Code ~ "Discharge to home for hospice care (procedure)"

Terminology

- codesystem "SNOMEDCT" using "2.16.840.1.113883.6.96 version 2017-09"
- code "Discharge to home for hospice care (procedure)" using "SNOMEDCT version 2017-09 Code (428361000124107)"

Direct-Reference Code Downloads

▾ September 2018 Release eCQM Value Sets Publication Date: September 17, 2018

Expansion Version: eCQM Update 2018-09-17

Available Downloads	Sorted by CMS ID*	Sorted by Value Set Name*	Sorted by Quality Data Model Category*
eCQM Value Sets for Eligible Hospitals Published September 17, 2018	Excel (xlsx) SVS (xml)	Excel (xlsx) SVS (xml) SVS (text)	Excel (xlsx)
eCQM Value Sets for Eligible Professionals and Eligible Clinicians Published September 17, 2018	Excel (xlsx) SVS (xml)	Excel (xlsx) SVS (xml) SVS (text)	Excel (xlsx)
All eCQM Value Sets (Eligible Professionals, Clinicians and Hospitals) Published September 17, 2018	Excel (xlsx) SVS (xml)	Excel (xlsx) SVS (xml) SVS (text)	Excel (xlsx)
Binding Parameter Specification for eCQM Value Sets Published September 17, 2018 ⑦	Excel (xlsx)		
Retired/Legacy Codes Currently in eCQM Value Sets Published September 17, 2018 ⑦	Excel (xlsx)		
Code System Versions Currently in eCQM Value Sets Published September 17, 2018 ⑦	Excel (xlsx)		
Direct Reference Codes Specified within eCQM HQMF files, Publication Date: September 17, 2018 ⑦	Excel (xlsx)		

Direct Reference Code Contents

	A	B	C	D	E	F
1	Code	Description	Code System	Code System OID	eCQM Type	eCQM Title
9	428351000124105	Severe dementia (disorder)	SNOMEDCT_US	2.16.840.1.113883.6.96	Eligible Professionals/Eligib	Functional Status Assessment for Total Knee Replacement
0	428361000124107	Discharge to home for hospice care (procedure)	SNOMEDCT_US	2.16.840.1.113883.6.96	Eligible Professionals/Eligib	Childhood Immunization Status
31	428361000124107	Discharge to home for hospice care (procedure)	SNOMEDCT_US	2.16.840.1.113883.6.96	Eligible Professionals/Eligib	Diabetes: Hemoglobin A1c (HbA1c) Poor Control (> 9%)
32	428361000124107	Discharge to home for hospice care (procedure)	SNOMEDCT_US	2.16.840.1.113883.6.96	Eligible Professionals/Eligib	Diabetes: Foot Exam
33	428361000124107	Discharge to home for hospice care (procedure)	SNOMEDCT_US	2.16.840.1.113883.6.96	Eligible Professionals/Eligib	Cervical Cancer Screening
34	428361000124107	Discharge to home for hospice care (procedure)	SNOMEDCT_US	2.16.840.1.113883.6.96	Eligible Professionals/Eligib	Breast Cancer Screening
35	428361000124107	Discharge to home for hospice care (procedure)	SNOMEDCT_US	2.16.840.1.113883.6.96	Eligible Professionals/Eligib	Pneumococcal Vaccination Status for Older Adults
36	428361000124107	Discharge to home for hospice care (procedure)	SNOMEDCT_US	2.16.840.1.113883.6.96	Eligible Professionals/Eligib	Anti-depressant Medication Management
37	428361000124107	Discharge to home for hospice care (procedure)	SNOMEDCT_US	2.16.840.1.113883.6.96	Eligible Professionals/Eligib	Colorectal Cancer Screening
38	428361000124107	Discharge to home for hospice care (procedure)	SNOMEDCT_US	2.16.840.1.113883.6.96	Eligible Professionals/Eligib	Diabetes: Eye Exam
39	428361000124107	Discharge to home for hospice care (procedure)	SNOMEDCT_US	2.16.840.1.113883.6.96	Eligible Professionals/Eligib	Diabetes: Medical Attention for Nephropathy

Filtering with Where

Alias   Attribute

where QualifyingEncounter.relevantPeriod during "Measurement Period"

Intervals

Timing Relationships

1. Comparing two date/time values

```
Encounter.authorDatetime < assessment.authorDatetime
```

2. Comparing a date/time value with an interval (period)

```
assessment.authorDatetime during Encounter.relevantPeriod
```

3. Comparing an interval with a date/time value

```
Encounter.relevantPeriod includes assessment.authorDatetime
```

4. Comparing two intervals

```
Encounter.relevantPeriod during "Measurement Period"
```

Intervals and Timing Phrases

1. Other interval operators

HospicePerformed.relevantPeriod overlaps "Measurement Period"

2. Timing phrases using *starts* and *ends*

Hypertension.prevalencePeriod starts before start of QualifyingEncounter.relevantPeriod

PalliativeCareOrder.authorDatetime on or before end of QualifyingEncounter.relevantPeriod

3. Timing phrases with offsets

PCPProphylaxis.authorDatetime 3 months or less after end of CD4Under200.relevantPeriod

OnAntiDepressant.relevantPeriod starts 105 days or less before AntidepressantDispensed.authorDatetime

4. Timing phrases with precision

HipAssessment.authorDatetime 365 days or less after day of end of TotalHip.relevantPeriod

AssessSuicideRisk.relevantPeriod starts same day as PositiveAdultScreen.authorDatetime

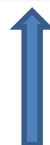# Relationships

Primary Source

Related Alias

With

Relationship

```
"Qualifying Encounters During Measurement Period" QualifyingEncounterDuringMeasurementPeriod
    with ["Procedure, Performed": "Documentation of current medications (procedure)"] MedicationsDocumented
        such that MedicationsDocumented.relevantPeriod during QualifyingEncounterDuringMeasurementPeriod.relevantPeriod
```

Multiple Relationships

▲ **Newborn Fed Breast Milk Only Since Birth**

"Single Live Birth Encounter With Gestational Age 37 Weeks or More" QualifyingEncounter
    with ["Substance, Administered": "Breast Milk"] BreastMilkFeeding
        such that BreastMilkFeeding.relevantPeriod starts during QualifyingEncounter.relevantPeriod
    without ["Substance, Administered": "Dietary Intake Other than Breast Milk"] OtherFeeding
        such that OtherFeeding.relevantPeriod starts during QualifyingEncounter.relevantPeriod

With

Without

Alternative Relationships

Alternative 1

```
( "Index Behavioral Health Outpatient Encounter" IndexEncounter
        with ["Encounter, Performed": "BH Outpatient Psychotherapy"] Psychotherapy
            such that IndexEncounter.relevantPeriod starts 42 days or less on or before start of Psychotherapy.relevantPeriod
                and IndexEncounter !~ Psychotherapy
)
    union ( "Index Behavioral Health Outpatient Encounter" IndexEncounter
            with "Treatments" Treatment
                such that IndexEncounter.relevantPeriod starts 42 days or less on or before Treatment.authorDatetime
    )
```

Union

Alternative 2

Multiple Sources

From

CD4 Count Under 200 With Current PCP Treatment

from

1 → "CD4 Count Under 200" CD4CountUnder200,

2 → ["Medication, Order": "Dapsone 100 MG / Pyrimethamine 12.5 MG Oral Tablet"] DapsoneOrder,

3 → ["Medication, Order": "Leucovorin"] LeucovorinOrder

where DapsoneOrder.authorDatetime occurs 3 months or less after end CD4CountUnder200.relevantPeriod
and LeucovorinOrder.authorDatetime occurs 3 months or less after end CD4CountUnder200.relevantPeriod
and DapsoneOrder.authorDatetime same day as LeucovorinOrder.authorDatetime

return CD4CountUnder200

Return

Combining Lists

Diagnosis

```
["Diagnosis": "Unilateral Amputation Below or Above Knee, Unspecified Laterality"]
    union ["Procedure, Performed": "Unilateral Amputation Procedure Below or Above Knee, Unspecified Laterality"]
```

Procedure

Coalesce – Return the first present value in a list of expressions

```
Coalesce(LeftLowerAmputation.prevalencePeriod, LeftLowerAmputation.relevantPeriod)
```

Using Return to Shape Results

Procedure, Order

```
( "Depression Treatment Procedure Ordered" ProcedureOrdered
        union ( "Depression Treatment Procedure Performed" ProceduresPerformed
                return "Procedure, Order" { authorDatetime: start of ProceduresPerformed.relevantPeriod }
        )
        union ( "Antidepressant or Mood Stabilizer Ordered" MedicationsOrdered
                return "Procedure, Order" { authorDatetime: MedicationsOrdered.authorDatetime }
        )
)
```

Constructed Procedure, Order

Intersect and Except

3 → "VTE Prophylaxis Received on Day of or Day After Admission or Procedure"
3 → union ("Medication Oral Factor Xa Inhibitor Administered on Day of or Day After Admission or Procedure"
2 → intersect ("Encounter With Prior or Present Diagnosis of Atrial Fibrillation or VTE"
1 → union "Encounter With Prior or Present Procedure of Hip or Knee Replacement Surgery"
)
)
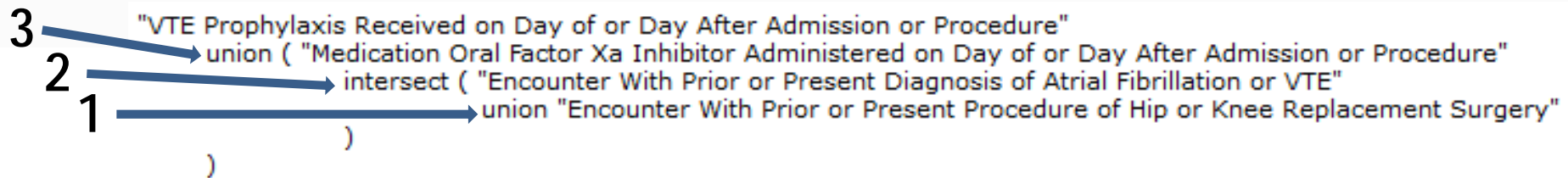
Local Definitions Using Let

Local Definition

```
from
    ["Physical Exam, Performed": "Heart rate"] HeartRate,
    "Heart Failure Outpatient Encounter with Moderate or Severe LVSD" ModerateOrSevereLVSDHFOutpatientEncounter
    let PriorHeartRate: Last(["Physical Exam, Performed": "Heart rate"] MostRecentPriorHeartRate
                where MostRecentPriorHeartRate.relevantPeriod during ModerateOrSevereLVSDHFOutpatientEncounter.relevantPeriod
                    and MostRecentPriorHeartRate.relevantPeriod starts before start of HeartRate.relevantPeriod
                sort by start of relevantPeriod
    )
    where HeartRate.relevantPeriod during ModerateOrSevereLVSDHFOutpatientEncounter.relevantPeriod
        and HeartRate.result < 50 '{Beats}/min'
        and PriorHeartRate.result < 50 '{Beats}/min'
```

Available Tools and Resources

» CQL Specification - CQL Release 1, Standard for Trial Use (STU) 2
  – http://www.hl7.org/implement/standards/product_brief.cfm?product_id=400
  – http://cql.hl7.org/STU2/index.html

» CQL-Based HQMF IG – Release 1, STU 2.1
  – http://www.hl7.org/implement/standards/product_brief.cfm?product_id=405

» eCQI Resource Center
  – CQL Space, including the QDM v5.3 and v5.3 Annotated
    • https://ecqi.healthit.gov/cql
  – Check the eCQI Resource Center Events page and CQL Educational Resources page for more information
    • https://ecqi.healthit.gov/ecqi/ecqi-events
    • https://ecqi.healthit.gov/cql/cql-educational-resources

» Value Set Authority Center (VSAC)

  – https://vsac.nlm.nih.gov/

Available Tools and Resources (Cont'd)

» CQL Formatting and Usage Wiki
  – https://github.com/esacinc/CQL-Formatting-and-Usage-Wiki/wiki
» CQL GitHub Tools Repository
  – https://github.com/cqframework/clinical_quality_language
» Measure Authoring Tool
  – https://www.emeasuretool.cms.gov/
» Bonnie Testing Tool
  – https://bonnie.healthit.gov/
» To submit an issues ticket for CQL, please visit the ONC JIRA site
  – https://oncprojectracking.healthit.gov/support/projects/CQLIT

Questions?

Slides and all Q&As will be posted to:

- eCQI Resource Center - https://ecqi.healthit.gov

- Additional Questions may be submitted to: **Electronic Clinical Quality Measure (eCQM) Issue Tracker in JIRA:** https://oncprojectracking.healthit.gov/support/projects/CQM/summary

Thank you!

The next EP Webinar, Preventive Care and Screening Measures, will be held January 15, 2019 from 1:00 – 2:00PM EST.

Appendix

Comparing Intervals

Key — 1st interval (X), 2nd interval (Y)

before	
meets before	
overlaps before	
includes	
starts	
same as (=)	
ends	
included in (during)	
overlaps after	
meets after	
after	

48

Key | 1st interval (X)
    | 2nd interval (Y)

Timing Phrases

CQL also supports timing phrases that make it easier to express precise relationships between intervals using natural language.

The *before* and *after* operators can have a prefix of *starts* or *ends*, and a suffix of *start* or *end*. For example,


```
IntervalX starts before start IntervalY
```
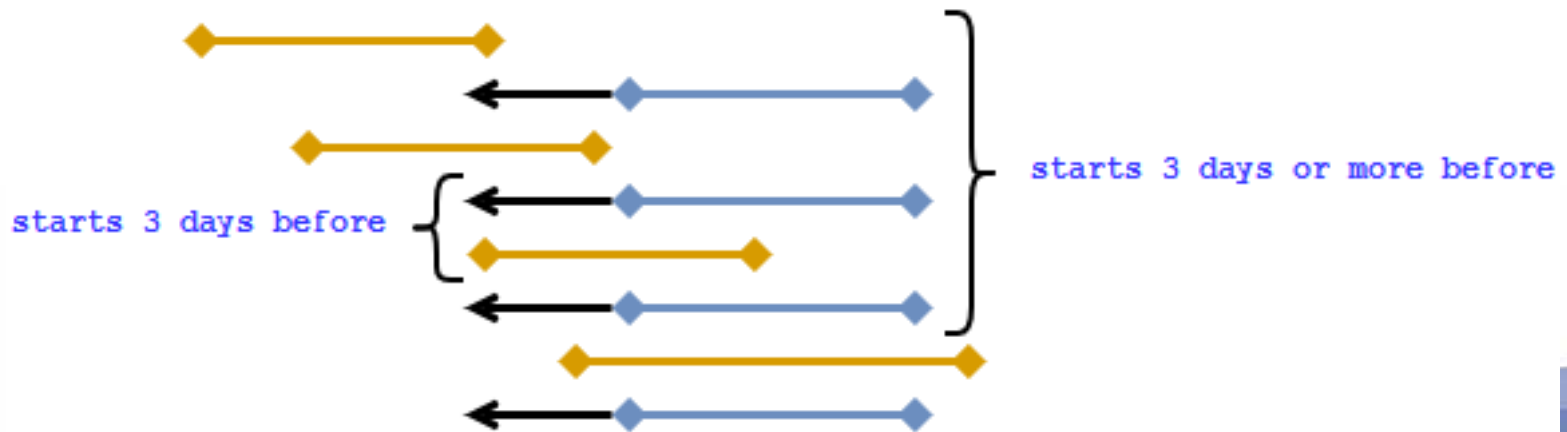
Timing Phrases (cont.)

The *before* and *after* operators can also take an offset that indicates how far away a given relationship should be.

This offset can be absolute, indicating that the boundary of the interval must be on the offset, or it can be relative, indicating that the boundary must be at least on the offset.

IntervalX starts 3 days before start IntervalY
IntervalX starts 3 days or more before start IntervalY

Key | 1st interval (X) / 2nd interval (Y)

Timing Phrases (cont.)

You can also specify a range for the boundary relationship using the *within..of* operator.

```
IntervalX starts within 3 days of start IntervalY
```


starts within 3 days of