The Clinical Quality Framework Initiative to Harmonize Decision Support and Quality Measurement Standards

Defined Standards, Pilot Results, and Moving Beyond Quality Improvement

Panel Members

Panelist	Title	Initiative Role
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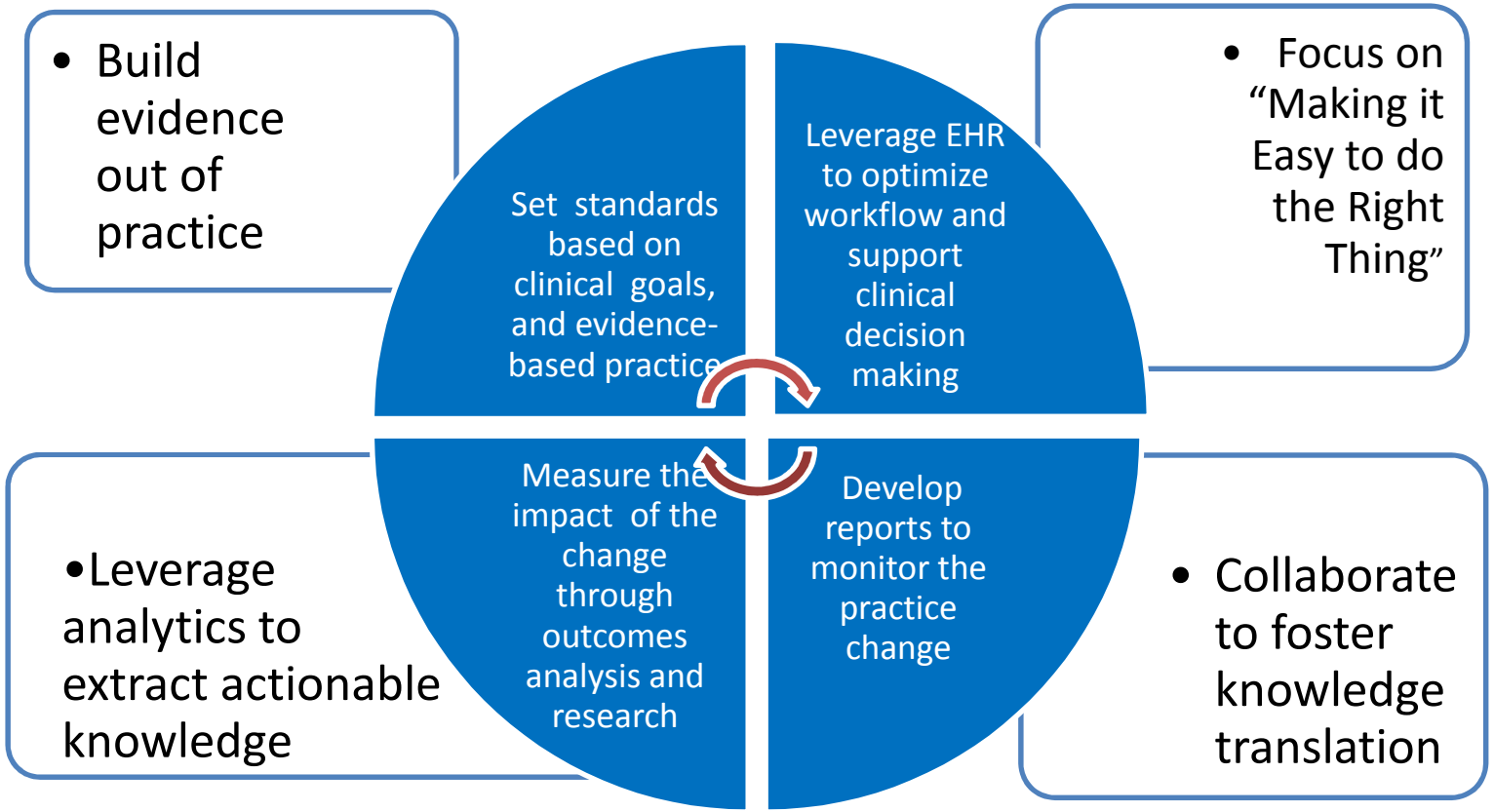
Julia Skapik

CQF MOTIVATION AND GOALS

The Learning Healthcare System



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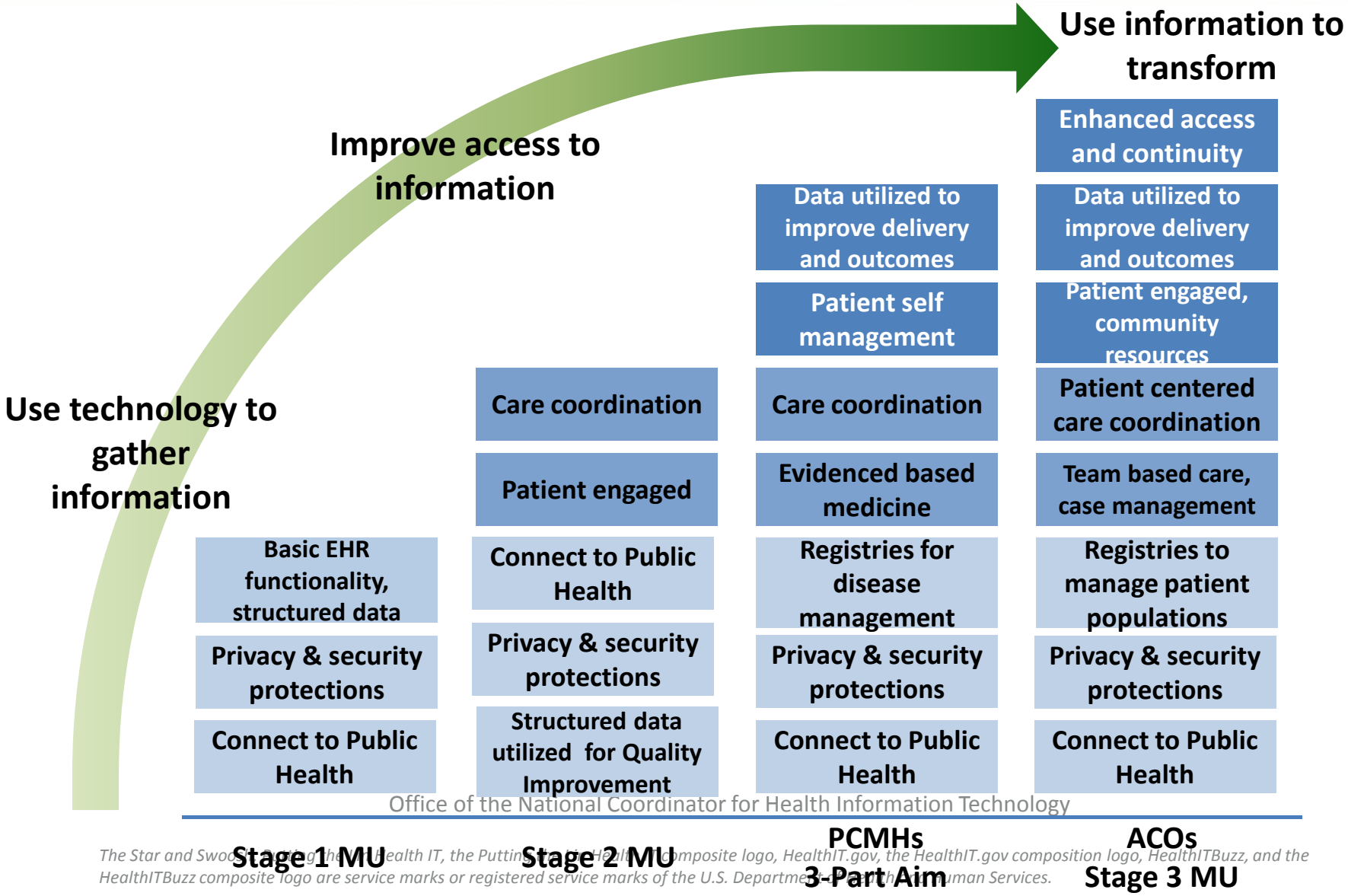
Meaningful Use is a Building Block



2015 Edition Specific Health IT Goals

HealthIT.gov

- Improve Interoperability
- Facilitate Data Access and Exchange
- Ensure Privacy and Security Capabilities
- Improve Patient Safety
- Reduce Health Disparities
- Improve the Reliability and Transparency of Certified Health IT
- Use the ONC Health IT Certification Program to Support the Care Continuum
- Support Stage 3 of the EHR Incentive Programs

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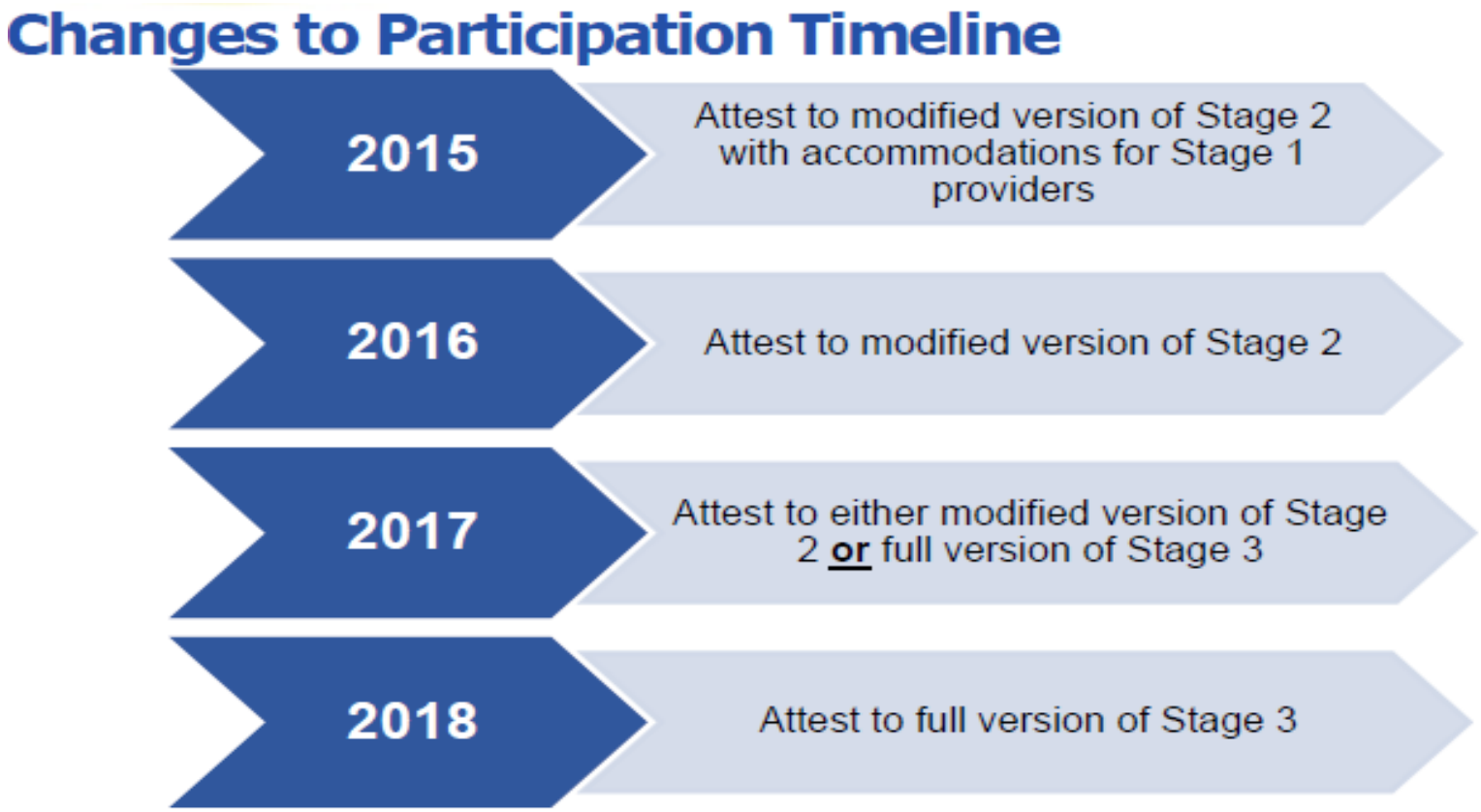
CMS MU Stage 3 Proposed Rule Reporting and Participation

Reporting Period

- Full calendar year reporting period beginning in 2017
- CQM reporting in coordination with quality reporting programs



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Improving Medicare Post-Acute Care Transformation (IMPACT) Act of 2014

- IMPACT Act added new section 1899(B) to Title XVIII of the Social Security Act (SSA)
- Post-Acute Care (PAC) providers must report:
  - Standardized assessment data
  - **Data on quality measures**
  - Data on resource use and other measures
- The data must be standardized and interoperable to allow for the:
  - **Exchange of data using common standards and definitions**
  - Facilitation of care coordination
  - Improvement of Medicare beneficiary outcomes
- PAC assessment instruments must be modified to:
  - Enable the submission of standardized data
  - Compare data across all applicable providers

IMPACT ACT: Quality Measure Domains

- **Requirements:**
  - Measures must be uniform/standardized across the 4 settings
  - Measures will be risk adjusted, as determined appropriate by the Secretary
- **Domains:**
  - Functional status, cognitive function, and changes in function and cognitive function
  - Skin integrity and changes in skin integrity
  - Medication reconciliation
  - Incidence of major falls
  - Communicating the existence of and providing for the transfer of health information and care preferences

Appropriate Use Criteria for Advanced Diagnostic Imaging Services

- Section 218(b) of the PAMA amended Title XVIII of the Act, to establish a program to promote the use of appropriate use criteria (AUC) for advanced imaging services.
- The legislation requires in 2018 that every claim for advanced radiologic studies would include both:
  - Evidence that the user had utilized some form of approved clinical decision support that supported "appropriate use" of the advanced radiologic study
  - Evidence as to whether the user adhered to that advice or not

Appropriate Use Criteria for Advanced Diagnostic Imaging Services

- The goal of the PAMA legislation is to curb the ordering of unnecessary advanced radiologic studies, which make up billions of dollars of Medicare and Medicaid spending
- "Advanced radiologic studies" includes CT, MRI, fMRI, SPECT, PET and other nuclear studies but not traditional X-rays

Appropriate Use Criteria for Advanced Diagnostic Imaging Services

- CMS is currently establishing criteria for clinical "appropriate use"
- In 2016 they will establish how users can technically demonstrate the use of "appropriate use"
- In 2019 Congress mandated that CMS start to require preauthorization of radiologic studies for entities and individuals found to be regularly ordering studies deemed "inappropriate" according to the established "appropriate use" criteria

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CMS quality reporting and performance programs

HealthIT.gov

Hospital Quality	Physician Quality Reporting	PAC and Other Setting Quality Reporting	Payment Model Reporting	"Population" Quality Reporting
• Medicare and Medicaid EHR Incentive Program	• Medicare and Medicaid EHR Incentive Program	• Inpatient Rehabilitation Facility	• Medicare Shared Savings Program	• Medicaid Adult Quality Reporting*
• PPS-Exempt Cancer Hospitals	• PQRS	• Nursing Home Compare Measures	• Hospital Value-based Purchasing	• CHIPRA Quality Reporting*
• Inpatient Psychiatric Facilities	• eRx quality reporting	• LTCH Quality Reporting	• Physician Feedback/ Value-based Modifier*	• Health Insurance Exchange Quality Reporting*
• Inpatient Quality Reporting		• Hospice Quality Reporting	• ESRD QIP	• Medicare Part C*
• HAC reduction program		• Home Health Quality Reporting		• Medicare Part D*
• Readmission reduction program				
• Outpatient Quality Reporting				
• Ambulatory Surgical Centers				

** Denotes that the program did not meet the statutory inclusion criteria for pre-rulemaking, but was included to foster alignment of program measures.*

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Mandated coordination across agencies and programs:
HHS Measurement Alignment

current

EHR as primary reporting platform, with secondary reporting from registry, claims

MACRA: Medicare Access and CHIP Reauthorization Act of 2015

Beginning in 2019, all current Medicare payment, including incentive programs, will be combined into one Merit-Based Incentive Payment System (MIPS), **replacing all Medicare reimbursement for eligible professionals.**

The MIPS program will use four performance measures to determine reimbursement, which will begin in 2019:

- Quality;
- Resource use;
- Clinical practice improvement activities; and
- Meaningful use of certified EHR technology.

Privacy and security including HIPAA are also requirements and failure to adhere to required standards results in penalties

APMs & MIPS

Paying for Performance

HealthIT.gov

Alternative Payment Model (APM)

Clinicians who receive a substantial portion of their revenues (at least 25% of Medicare revenue in 2018-2019 but threshold will increase over time) from ***qualifying*** alternative payment mechanisms will not be subject to MIPS.

While the definition of a qualifying APM has yet to be determined, MACRA outlines criteria which includes but is not limited to:

Quality Measures	*Use of certified EHR technology*
Risk-sharing	

Merit-Based Incentive Payment System (MIPS)

Adjustments based on the **composite performance score** of each eligible physician or other health professional on a 0-100 point scale based on the following performance measures. All scores noted below are for the first MIPS year and are subject to adjustment. Additional positive adjustment available for exceptional performance.

Quality (30% of MIPS score for first 2 years)	*Clinical Practice Improvement Activities* (15%)
Resource Use (10% 1st year)	*Meaningful Use of certified HER* (15%)

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MIPS-Eligible Professionals (EP)
Notable Dates

July 1, 2017
CMS must make available timely confidential feedback reports to each MIPS EP

Qualifying EPs 2019-20
- Physicians
- PAs
- Certified RN Anesthetists
- NPs
- Clinical Nurse Specialists
- Groups that include such professionals

July 1, 2018
CMS must make available to each MIPS EP information about items and services furnished to the EP's patients by other providers and suppliers for which payment is made under Medicare

2021 & Onward
Secretary can add EPs to MIPS

MACRA: Medicare Access and CHIP Reauthorization Act of 2015

Failing to perform to the program minimums results in payment penalties:

- 2019- 4% maximum penalty
- 2020- 5% maximum penalty
- 2021- 7% maximum penalty
- 2022- 9% maximum penalty

Eligible professionals with higher performance scores receive an incentive up to **three times the annual cap for negative payment adjustments**

Nationwide interoperability is a requirement by December 31, 2018*

What's the connection to the Clinical Quality Framework?

- Current and Stage 3 MU rules require the use of CDS that supports at least 5 eCQMs
- Yet, the current eCQM constructs do not support CDS
- Future HHS programs will increasingly reference eCQMs and/or CDS
- Current standards are too complex and not computable enough
- New standards are emerging in the industry

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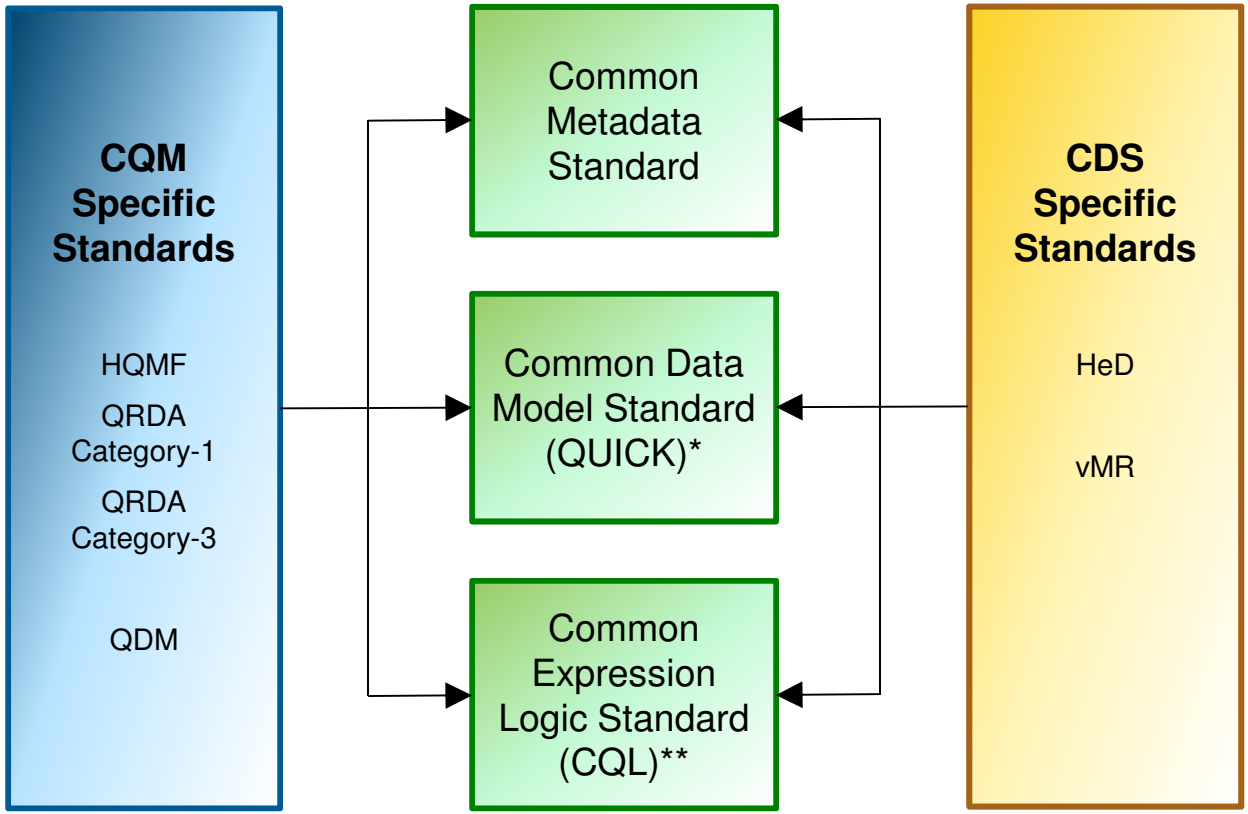
Standards improvement and harmonization:
Clinical Quality Measurement and Clinical Decision Support



** Quality Improvement and Clinical Knowledge*
*** Clinical Quality Language*

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The Current State vs the Future Vision

Current State

- CQMs and CDS are separate
- Each vendor develops their own CDS artifacts
- CQMs are focused on retrospective data
- CDS is an afterthought

Future Vision

- CDS drives care activities
- Performance is consistently improved through CDS
- CQM data capture is automatic
- CQMs are available with paired optional CDS artifacts

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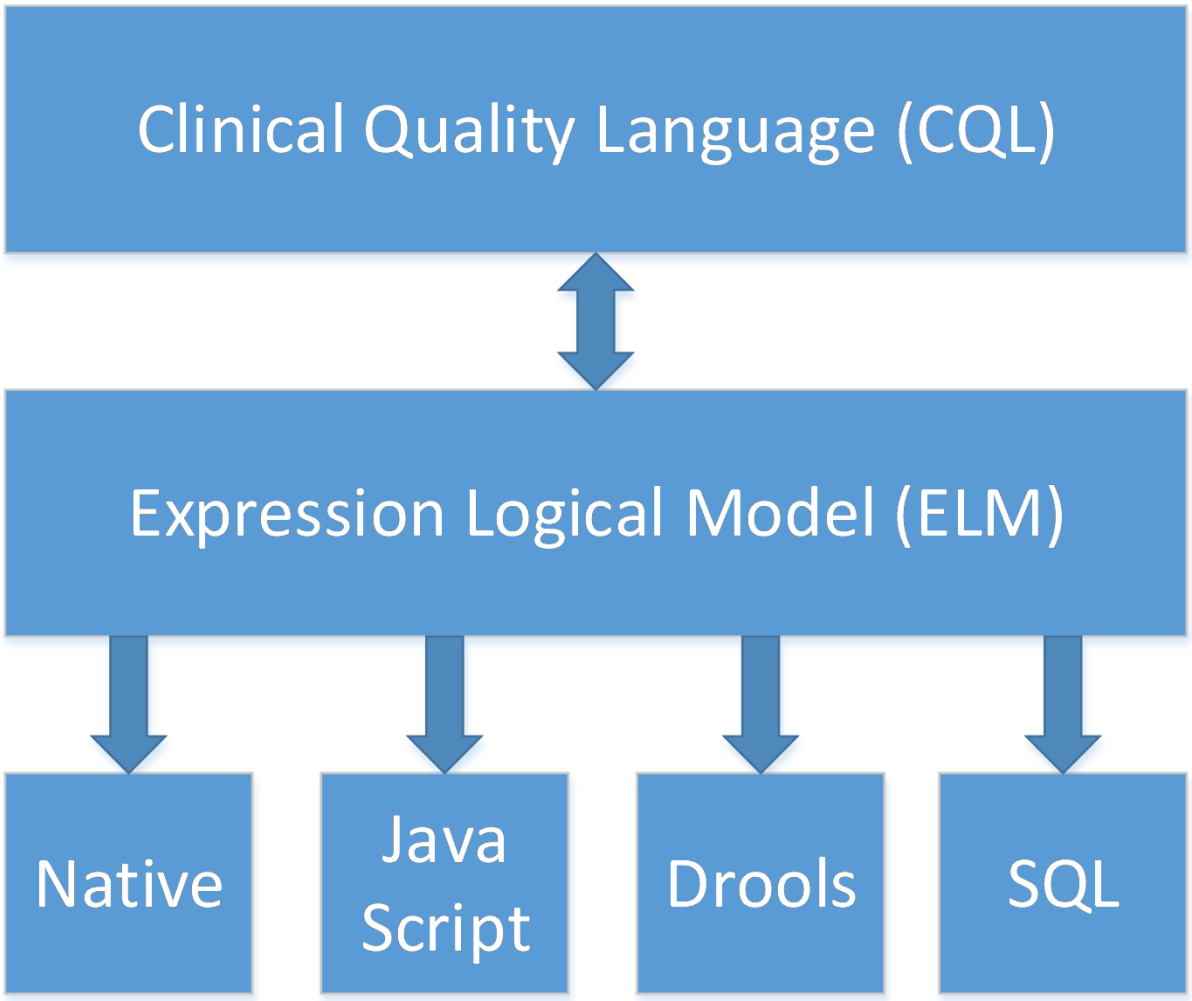
Future Standards Need to be Interoperable to Each Other to Allow Flexibility



Authors use CQL to produce libraries containing human-readable yet precise logic.

ELM XML documents contain machine-friendly rendering of the CQL logic. This is the intended mechanism for distribution of libraries.

Implementation environments will either directly execute the ELM, or perform translation from ELM to their target environment language.

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Moving Towards Next Generation Standards

- Staged approach to introduction of harmonized content starting with the Clinical Quality Language (CQL-based HQMF)
- Future HHS programs could allow optional FHIR reporting before requiring a transition
- Use of APIs and maps could facilitate consistent translation from one standard to another without loss of meaning

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The Future Vision: Seamless Decision Support that Autogenerates Quality Data

- Uses clearly defined, well-investigated data elements for capture at the point of care
- Allows patient-generated data to be integrated into measures and CDS
- Clinicians take no additional workflow steps to document quality metrics
- Decision support is educational, interactive, and facilitated by sophisticated data modeling

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The Electronic Clinical Quality Improvement (eCQI) Resource Center

ecqi.healthit.gov

What is the eCQI Resource Center?

- The Resource Center is designed to act as a central hub for storing and collating resources surrounding the eCQMs and CDS standards, measures, tools, and guidance.
- It is cosponsored by CMS and ONC
- It will continue to add functionality and additional related content over time
- We welcome your feedback!

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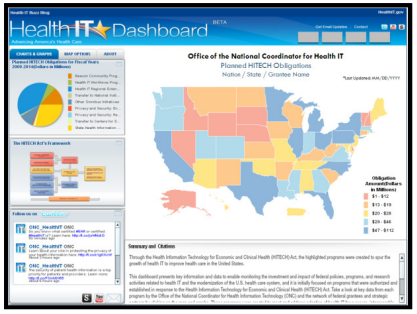

Health IT Buzz Blog

- **Visit the ONC Newsroom for news and announcements**

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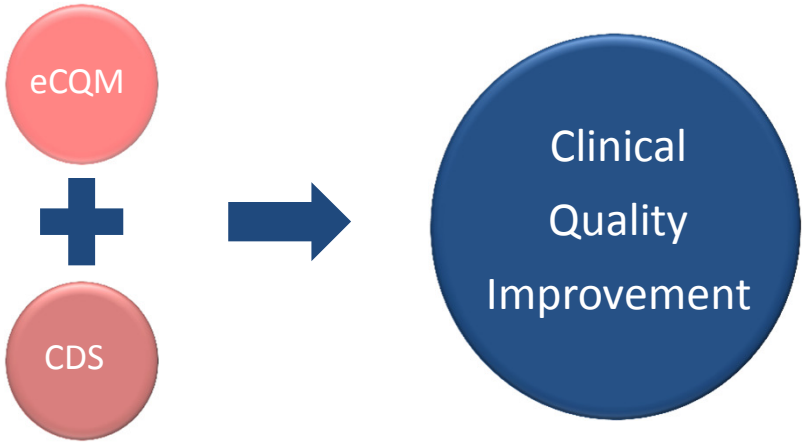
Marc Hadley

CQF STANDARDS

Background

- Clinical Decision Support (CDS) and electronic Clinical Quality Measurement (eCQM) are closely related, share many common requirements, and both support improving health care quality.
  - CDS guides a clinician to follow a standard plan of care
  - eCQM measures adherence to a standard plan of care
- Shared needs:
  - Define patient cohorts (sub-populations)
  - Standard ways to reference patient data in EHR



The Challenge

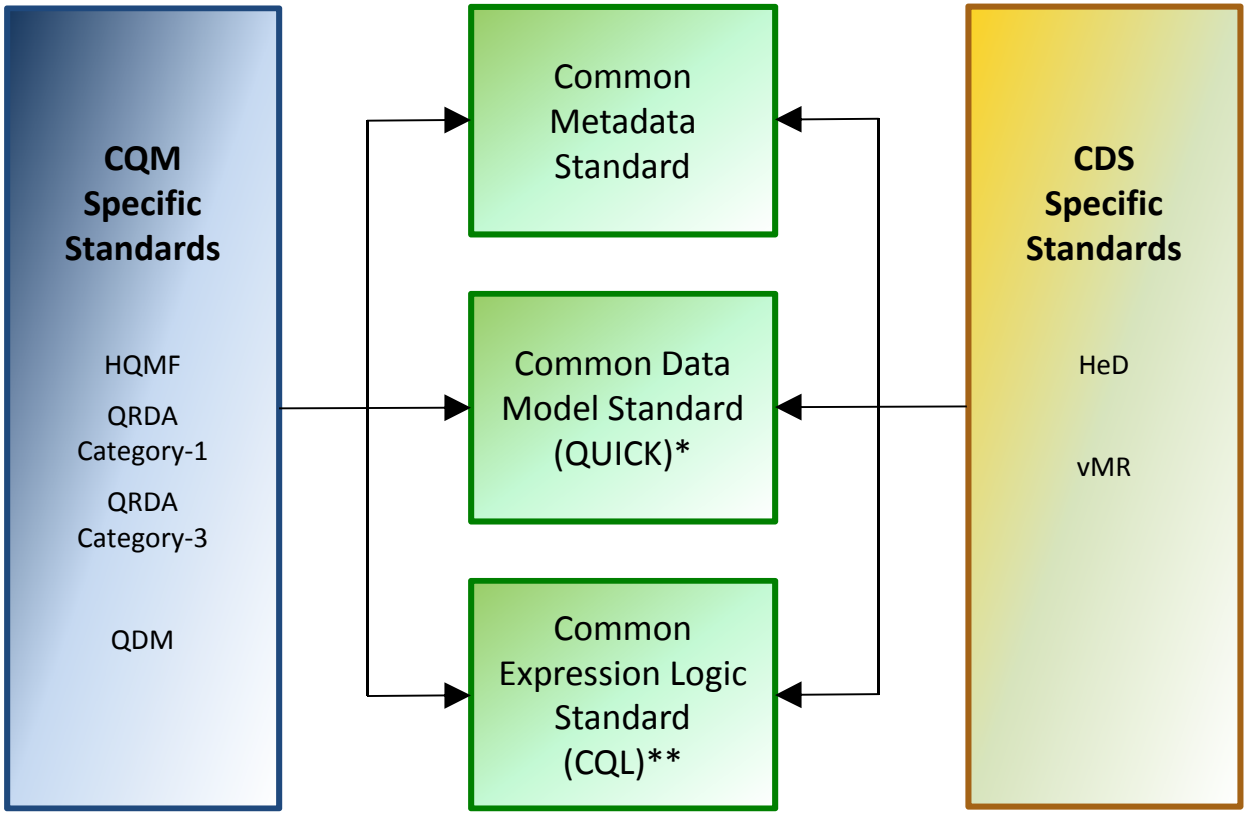
- Current eCQM and CDS standards
  - were not developed together
  - use different approaches to patient data
  - use different approaches to expression logic

	References to Patient Data	Expression Logic	Exchangeable Artifacts
CDS	Virtual Medical Record (VMR)	CDS Knowledge Artifact (HeD)	CDS Knowledge Artifact (HeD)
eCQM	Quality Data Model (QDM)	Quality Data Model (QDM)	QRDA I & III, HQMF

- **EHR vendors and homegrown systems *must***
  - Map their data to two different data model standards
  - Implement computation of two different logic standards
  - Interpret and implement text “guidance”

- **eCQM and CDS rule authors *cannot***
  - Share or reuse logic between measures and rules
  - Ensure consistency between matching measures and rules
  - Adequately express all of their requirements

The Goal: Shared Standards



** Quality Improvement and Clinical Knowledge*
*** Clinical Quality Language*

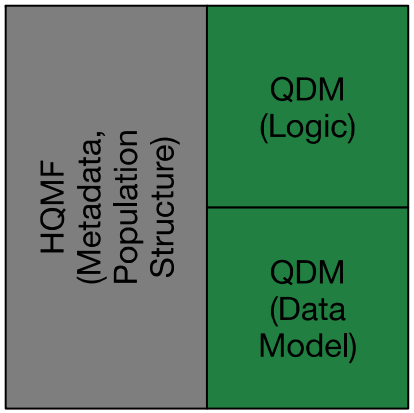
Standards Harmonization Impact

- Improves efficiency and reduces cost
  - eCQM / CDS system implementation
  - eCQM / CDS rule authoring and maintenance
- Improves consistency and accuracy
  - Shared logic between measures and rules
  - Reduce or eliminate need for “guidance”
- Improves quality of standards
  - Leverage past lessons learned from eCQM & CDS
  - Community effort from larger, more diverse community
- Promotes integration of CQM and CDS domains

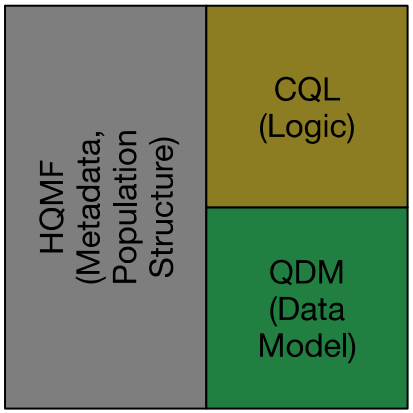
Bottom Line: Improves the Quality of Care Patients Receive

Evolving eCQM Standards

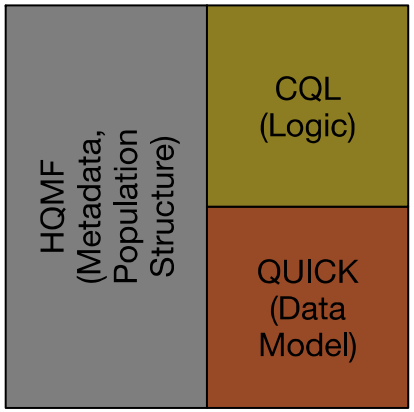
Today



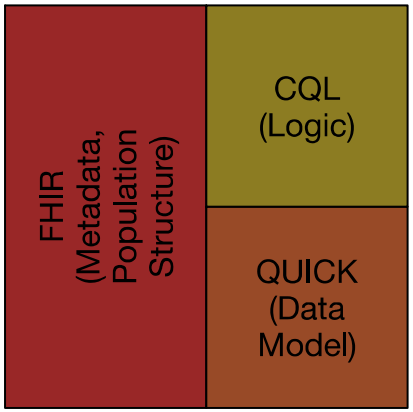
Near term solution



Rejected



Long term solution



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A shared expression language for eCQM and CDS

CLINICAL QUALITY LANGUAGE

What is the Clinical Quality Language?

"The Clinical Quality Language Specification defines a representation for the expression of clinical knowledge that can be used within both the Clinical Decision Support (CDS) and Clinical Quality Measurement (CQM) domains."

HL7 Standard: Clinical Quality Language Specification, DSTU Release 1

CQL Key Points

- The CQL specification defines two components:
  - **Clinical Quality Language**: Author-friendly domain specific language
  - **Expression Logical Model**: Computable XML

- CQL leverages best practices and lessons learned from:
  - **Quality Data Model**: Focus on ease of authoring
  - **Health eDecisions**: Focus on modularity and computability
  - **eCQM & CDS Communities**: HL7 Work Groups and S&I Framework

- CQL is designed to work with any data model

- CQL is much more expressive and robust than QDM logic

- CQL is a Health Level 7 (HL7) Draft Standard for Trial Use (DSTU)

Example: CMS 123 – Diabetes: Foot Exam

Initial Population	Patients 18-75 years of age with diabetes with a visit during the measurement period

```
define InInitialPopulation:
  AgeInYearsAt (start of MeasurementPeriod) >= 18
  and AgeInYearsAt (start of MeasurementPeriod) < 75
  and exists (["Diagnosis": "Diabetes"] D where D.period overlaps MeasurementPeriod)
  and exists (ValidEncounters E where E.period during MeasurementPeriod)

define ValidEncounters:
  ["Encounter, Performed": "Office Visit"]
    union ["Encounter, Performed": "Face-to-Face Interaction"]
    union ["Encounter, Performed": "Preventive Care Services Established Office Visit"]
    union ["Encounter, Performed": "Preventive Care Services Initial Office Visit"]
    union ["Encounter, Performed": "Home Healthcare Services"]
```

Denominator	Equals Initial Population

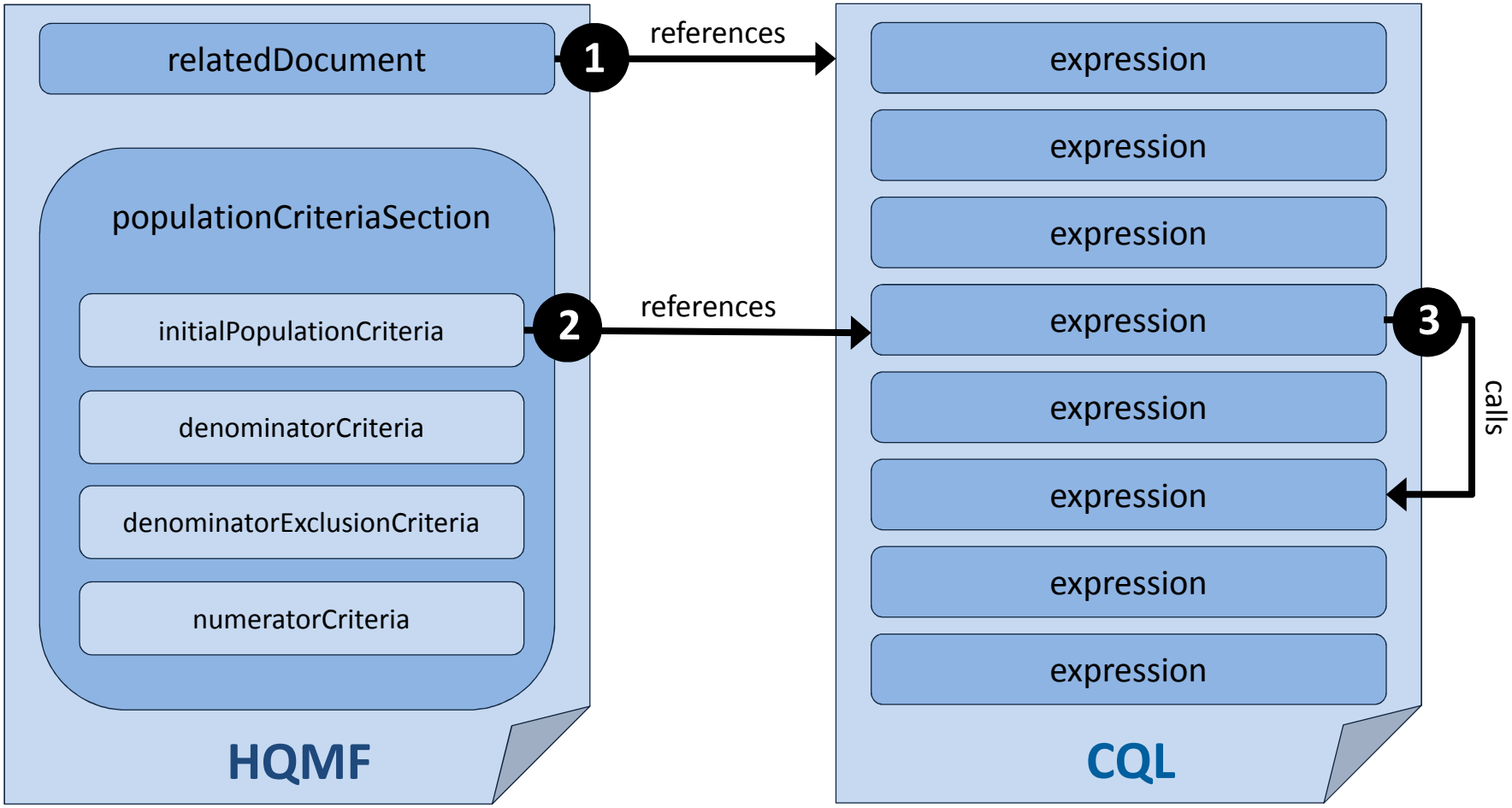
```
define InDenominator:
  InInitialPopulation
```

Example: CMS 123 – Diabetes: Foot Exam

Numerator	Patients who received visual, pulse and sensory foot examinations during the measurement period

```
define InNumerator:
  exists (["Procedure, Performed": "Visual Exam of Foot"] P
    where P.period during MeasurementPeriod)
  and exists(["Procedure, Performed": "Sensory Exam of Foot"] P
    where P.period during MeasurementPeriod)
  and exists (["Procedure, Performed": "Pulse Exam of Foot”] P
    where P.period during MeasurementPeriod)
```

CQL-based HQMF



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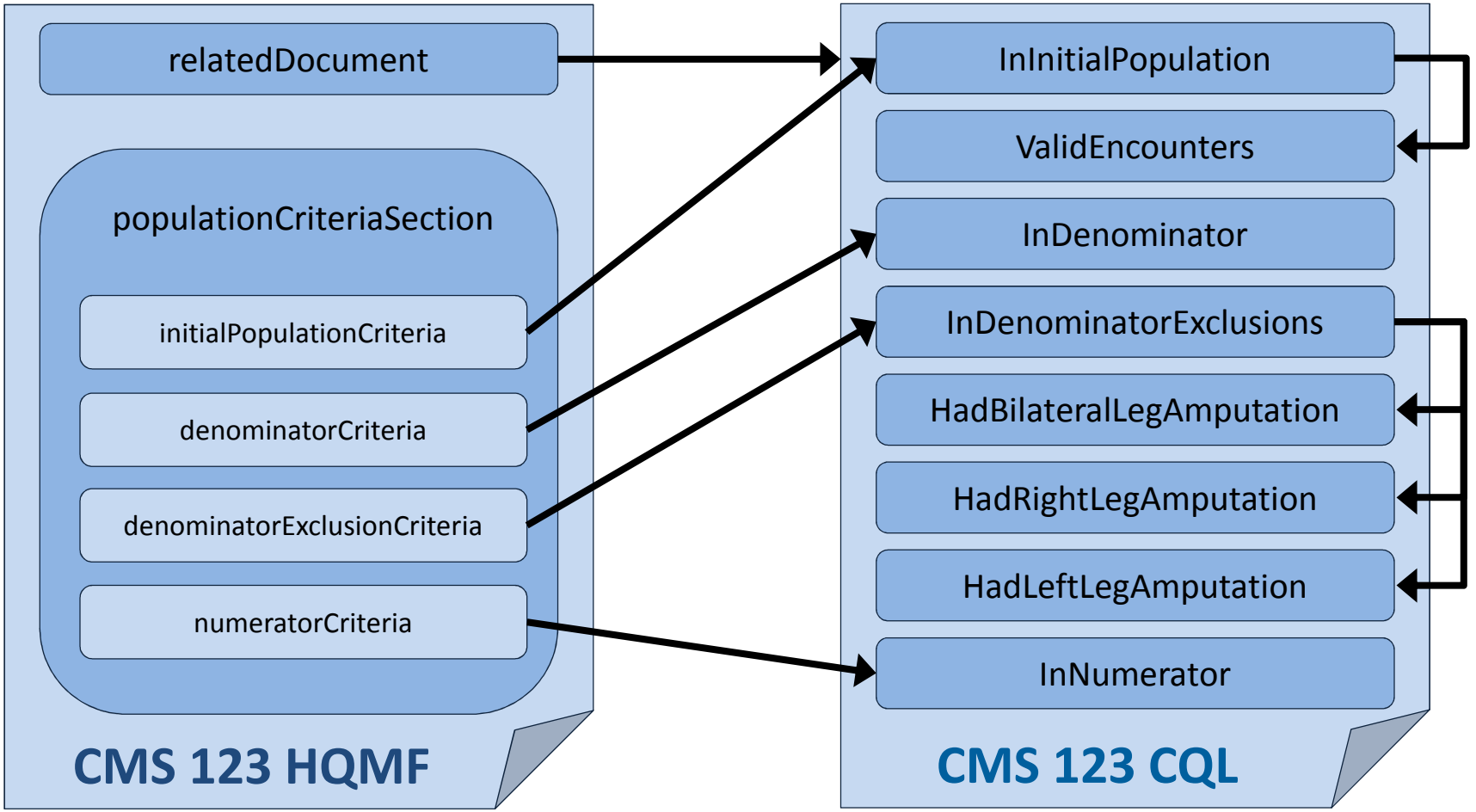
CQL-based HQMF for CMS 123



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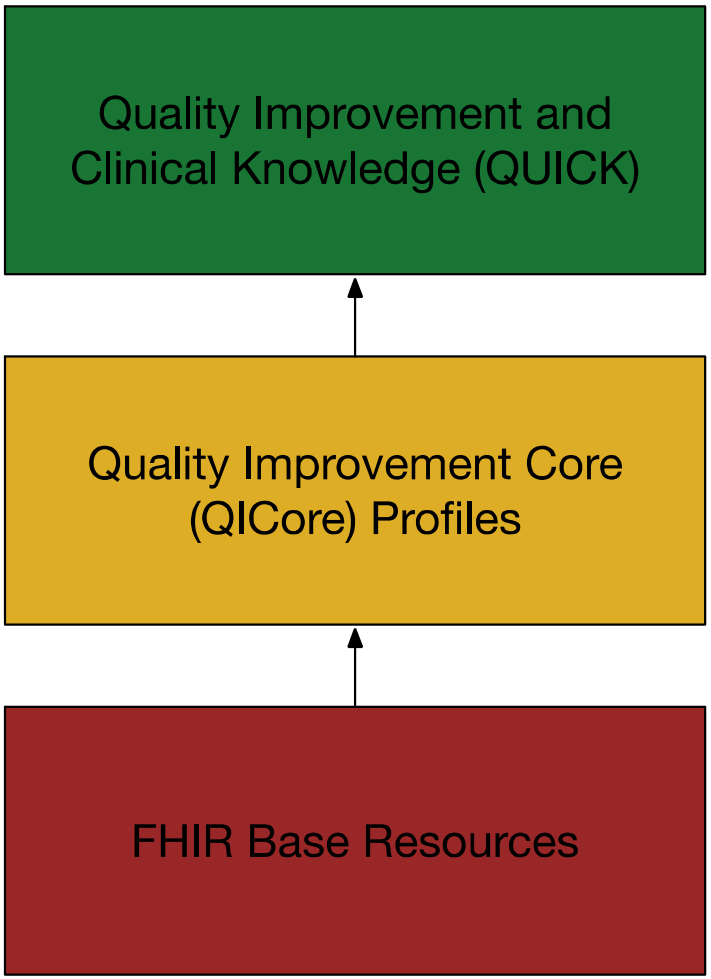
A shared data model for eCQM and CDS

QUALITY IMPROVEMENT AND CLINICAL KNOWLEDGE (QUICK)

QUICK Derivation



Auto-generated from QICore
Abstract, logical view
Author-friendly presentation

Quality-specific extensions
Must-support flags
Cardinality requirements

Base 80/20 data model
XML+JSON physical model (serialization)
Data exchange protocol

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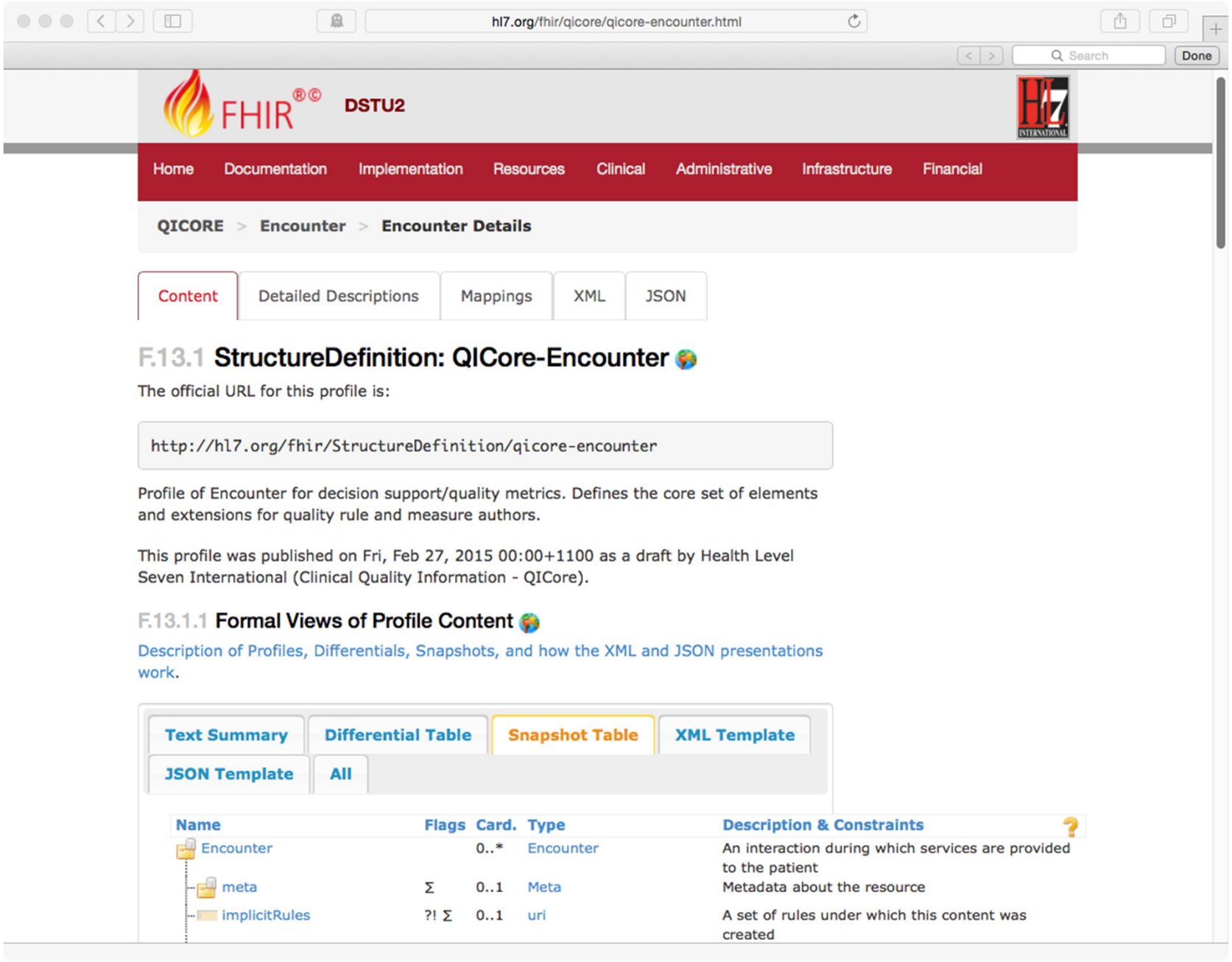
hl7.org/fhir/qicore/qicore-encounter.html
Search
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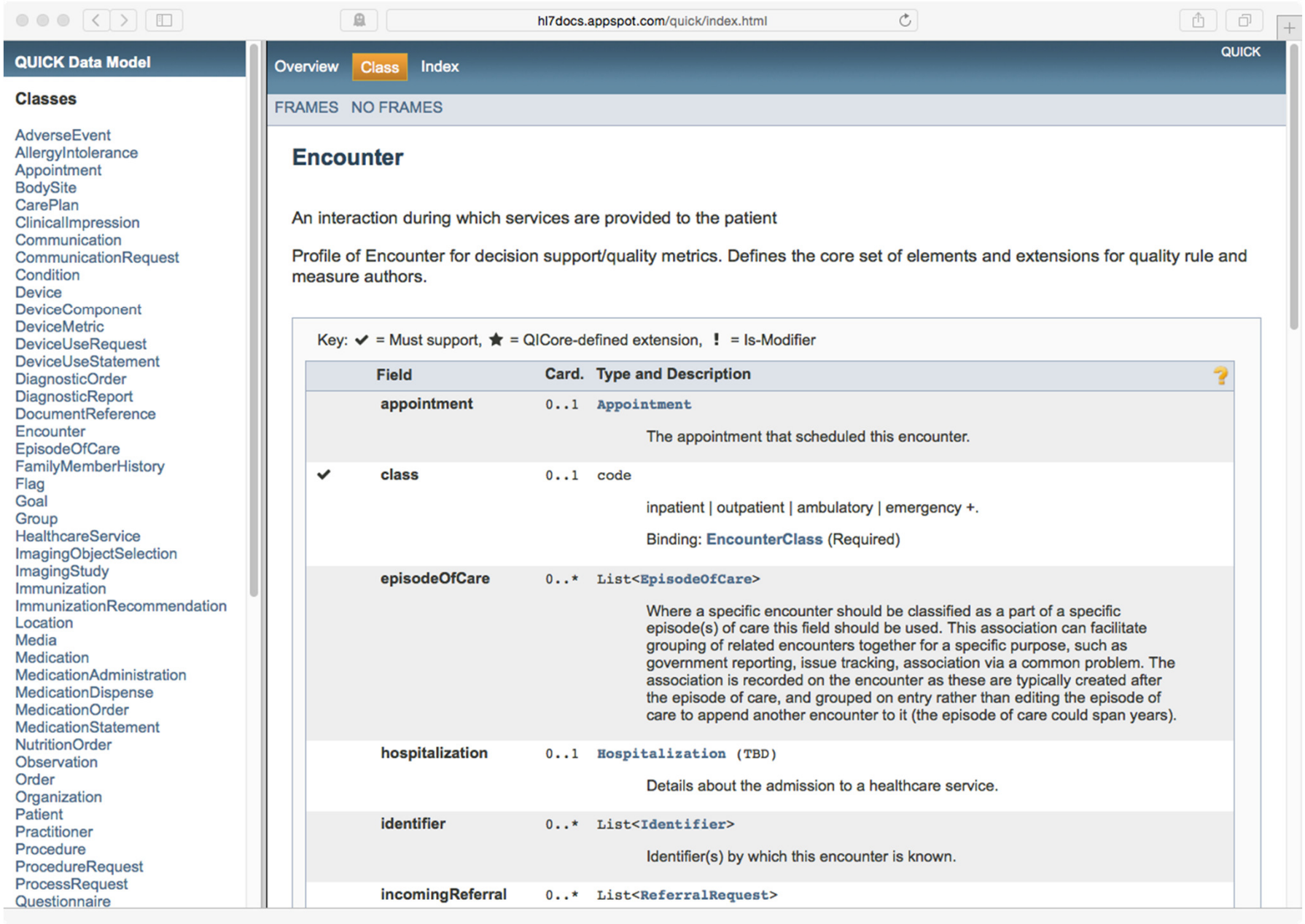
FHIR®©
DSTU2
Home
Documentation
Implementation
Resources
Clinical
Administrative
Infrastructure
Financial
QICORE > Encounter > Encounter Details
Content
Detailed Descriptions
Mappings
XML
JSON
F.13.1 StructureDefinition: QICore-Encounter
The official URL for this profile is:
http://hl7.org/fhir/StructureDefinition/qicore-encounter
Profile of Encounter for decision support/quality metrics. Defines the core set of elements and extensions for quality rule and measure authors.
This profile was published on Fri, Feb 27, 2015 00:00+1100 as a draft by Health Level Seven International (Clinical Quality Information - QICore).
F.13.1.1 Formal Views of Profile Content
Description of Profiles, Differentials, Snapshots, and how the XML and JSON presentations work.
Text Summary
Differential Table
Snapshot Table
XML Template
JSON Template
All
Name
Flags
Card.
Type
Description & Constraints
Encounter
0..*
Encounter
An interaction during which services are provided to the patient
meta
Σ
0..1
Meta
Metadata about the resource
implicitRules
?! Σ
0..1
uri
A set of rules under which this content was created



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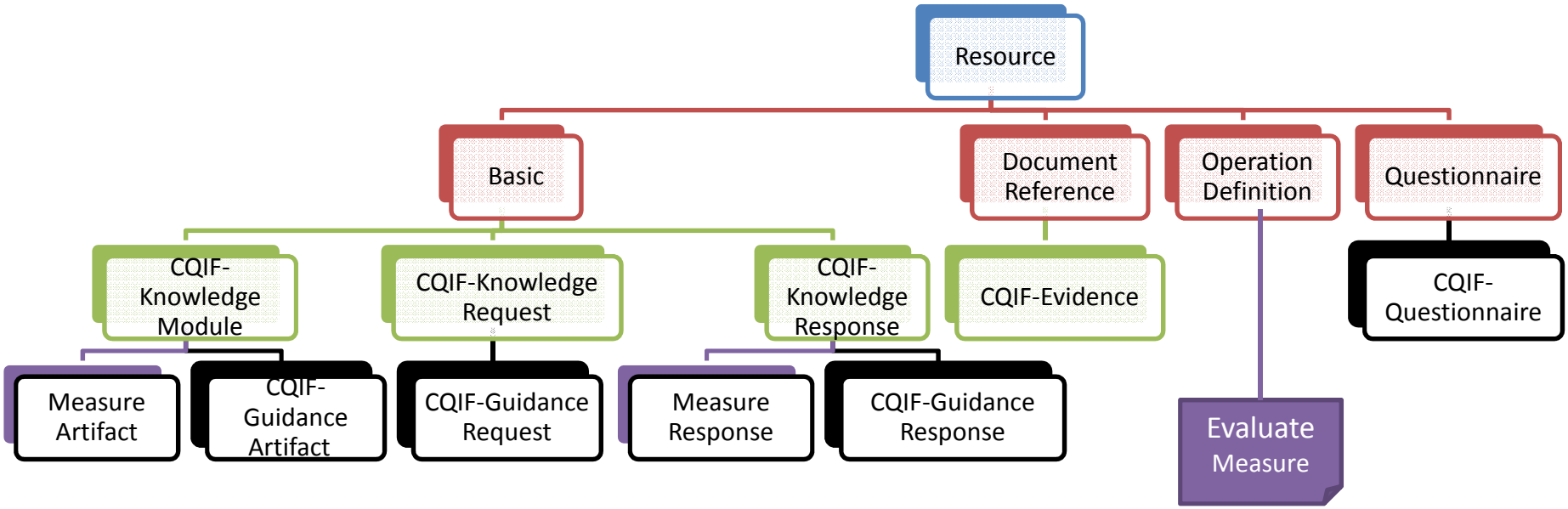
FHIR-BASED ECQMS AND CDS

eCQM and CDS Profiles



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Standards Status

- CQL
  - Draft standard at HL7
- CQL-based HQMF IG
  - Draft standard at HL7
- CQL-based Health eDecisions Knowledge Artifact HeD KA R1.3
  - Draft standard at HL7
- QICore
  - Draft standards, part of FHIR DSTU R2
- QUICK
  - To be published in a DSTU update of QICore
- CDS FHIR Profiles and eCQM FHIR Profiles
  - Balloted "for comment" in Sept HL7 ballot cycle
  - Planning for draft standard ballot in May HL7 ballot cycle

Resources

- CQL Specification
  - http://www.hl7.org/implement/standards/product_brief.cfm?product_id=400
- CQL-based HQMF Implementation Guide
  - http://www.hl7.org/implement/standards/product_brief.cfm?product_id=405
- CDS/eCQM Harmonization on the eCQI Resource Center
  - https://ecqi.healthit.gov/cdsecqm-harmonization
- S&I Clinical Quality Framework Initiative
  - http://wiki.siframework.org/Clinical+Quality+Framework+Initiative
- HL7 CQI Work Group
  - http://www.hl7.org/special/committees/CQI/index.cfm
- HL7 CDS Work Group
  - https://www.hl7.org/Special/committees/dss/index.cfm

Kensaku Kawamoto

PILOTS AND PARTNERSHIPS

Disclosures

- I am, or have been in the past, a consultant on clinical decision support to the following entities:
  - Office of the National Coordinator for Health IT (ONC)
  - Mayo Clinic
  - Partners HealthCare
  - McKesson InterQual
  - RAND Corporation
  - ARUP Laboratories
  - ESAC, Inc.
  - JBS International, Inc.
  - Clinica Software, Inc.
  - Religent, Inc.
  - Inflexxion, Inc.
  - Intelligent Automation, Inc.

CQF Pilots

Pilots	Point of Contact	Liaison SME
Breast Cancer Decision Support and Clinical Quality Measurement (CQM)	Chad Armstrong	Claude Nanjo
Cardiology Appropriateness of Use	Rachel Davis	Chris Moesel
Chlamydia Screening	Johanna Goderre-Jones	Bryn Rhodes
Immunization Decision Support Services (DSS)	Daryl Chertcoff	Claude Nanjo
Phenotype Execution and Modeling Architecture	Will Thompson	Bryn Rhodes/ Chris Moesel
Portable CDS Knowledge Artifacts	Julie Scherer	Claude Nanjo
Radiology Appropriateness of Use	Tom Conti	Bryn Rhodes
Others in Planning (e.g., Opioid Management)	TBD	TBD

CQF Pilots

Survey Results

100%

percentage of pilots that met their goal(s)

10+

artifacts and tools created as part of the pilots

2700+

hours spent by pilot teams in 4 months of pilot work

MORE EXPERTS

MORE TIME

resources that could have made pilots more successful

YES!

ALL

pilots felt they received the support they needed

8.4

average rating for overall CQF pilot experience

The project team has provided us with valuable guidance on the current state of the CQF standards, and how they will evolve moving forward. This is the kind of support we were looking for in joining as a pilot project.

…having one-on-one sessions with our pilot advisor Bryn really helped solidify/ speed up our pilot design and progress…

We see great opportunity and need for continued development of the standards…

Information is based on 5 survey responses received to date

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CQF Pilots

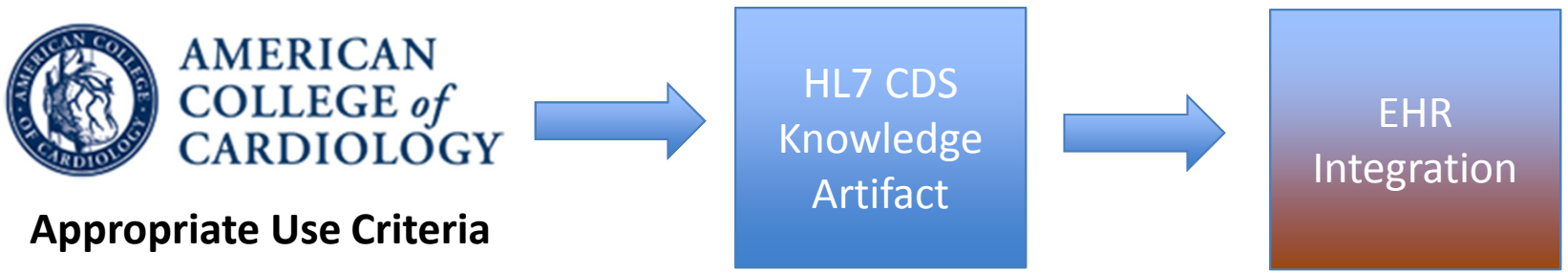
Cardiology Appropriateness of Use

Goal: Provide point-of-order guidance on appropriate diagnosis and risk assessment of stable ischemic heart disease based on American College of Cardiology (ACC) Appropriate Use Criteria

Team Member	Role
Rachel Davis, MS Director of Health Information Technology, ACC	ACC SME and Point of Contact
James Tcheng, MD Professor, Duke Univ.; Chair, ACC Digital Steering Committee	ACC SME and Pilot Lead
Dino Damalas, MBA CIO, ACC	ACC SME
Joseph Allen Director of Translating Research into Practice, ACC	ACC SME
Ganesan Srinivasan, MBA Director of Registry & BI Product Development, ACC	ACC SME
Christopher Moesel Principal Computer Science Engineer, MITRE	Liaison SME

CQF Pilots

Cardiology Appropriateness of Use



EHR=Electronic Health Record

CQF Wiki: cqframework.info

CQF Pilots

Chlamydia Screening

Goal: Support CDS and eCQM for screening, treatment, and follow-up of *chlamydia trachomatis* infection in community settings

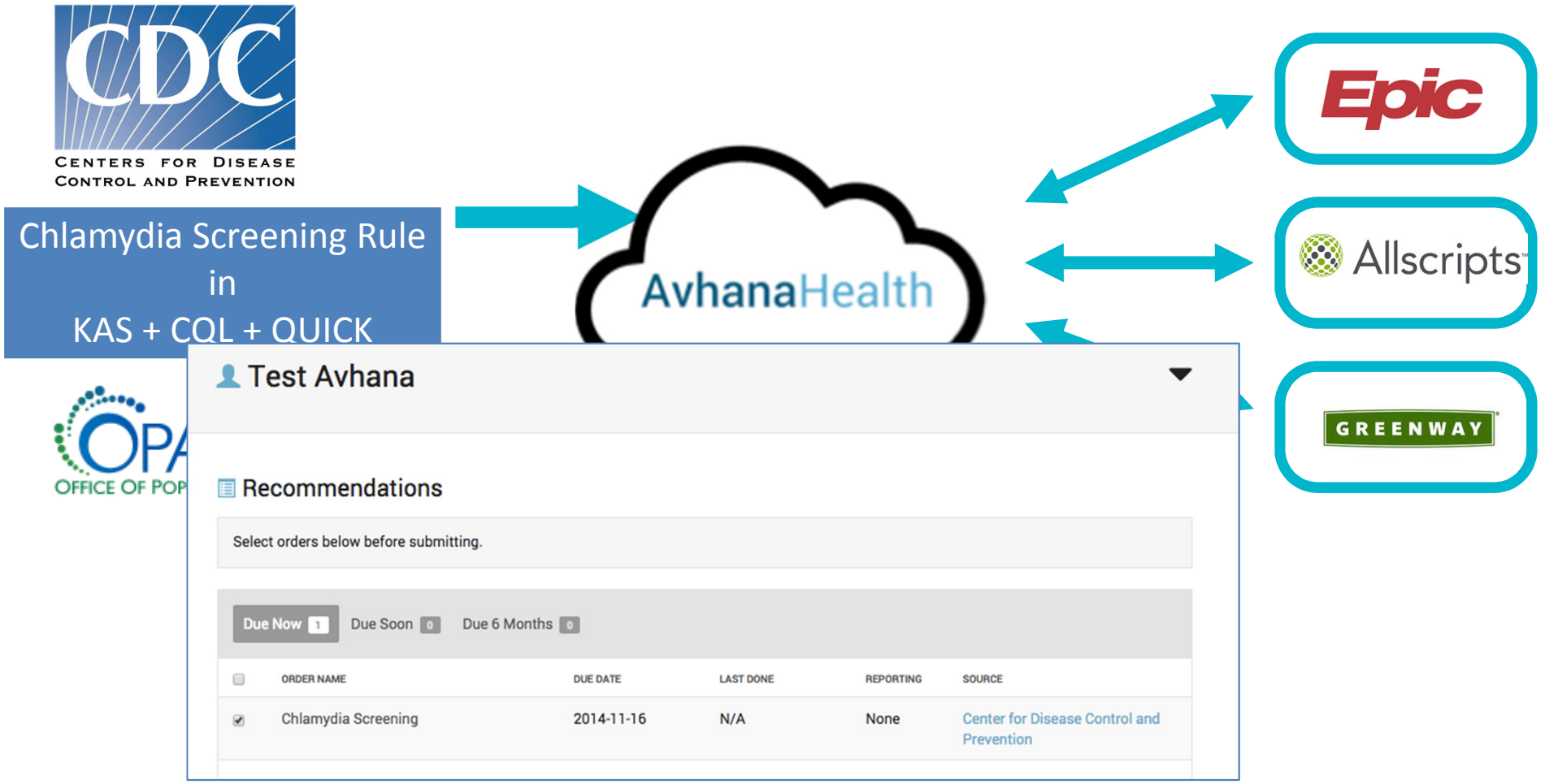
Team Member	Role
Johanna Goderre Jones, MPH Senior Health Informatics Advisor, HHS Office of Population Affairs	Pilot Lead and Point of Contact
Noah Weiner CEO and Co-Founder, Avhana Health	Technical Lead
Lorrie Gavin, PhD, MPH Health Scientist, CDC Division of Reproductive Health	CDC Advisor
Victor Lee, MD VP, Clinical Informatics, Zynx Health	SME
Bryn Rhodes Owner, Database Consulting Group LLC	Liaison SME

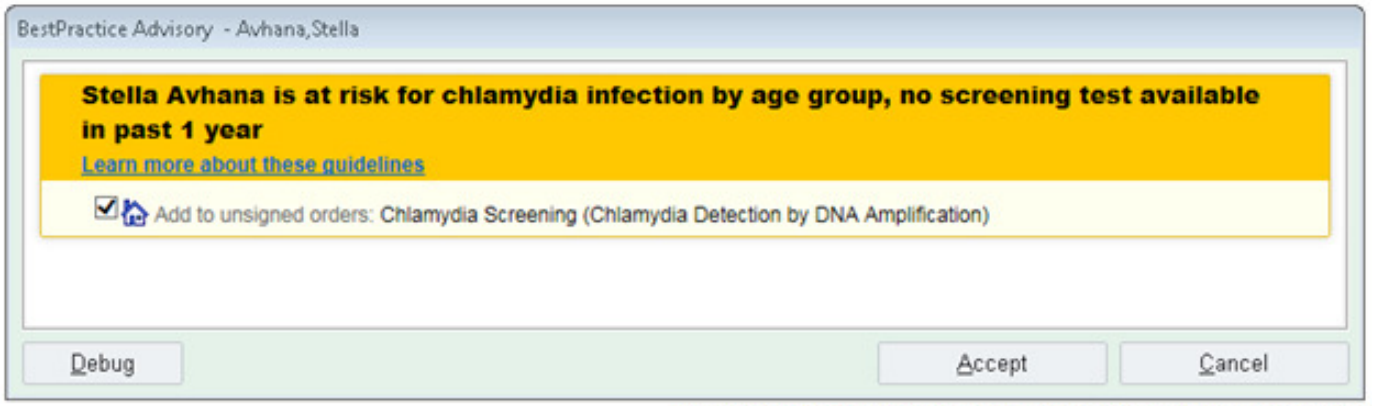
CQF Pilots

Chlamydia Screening

CQF Pilots

Chlamydia Screening





CENTERS FOR DISEASE CONTROL AND PREVENTION

Chlamydia Screening Rule
in
KAS + CQL + QUICK

OPA
OFFICE OF POPULATION AFFAIRS

AvhanaHealth

Epic

Allscripts

GREENWAY

CQF Pilots

Immunization Decision Support Service

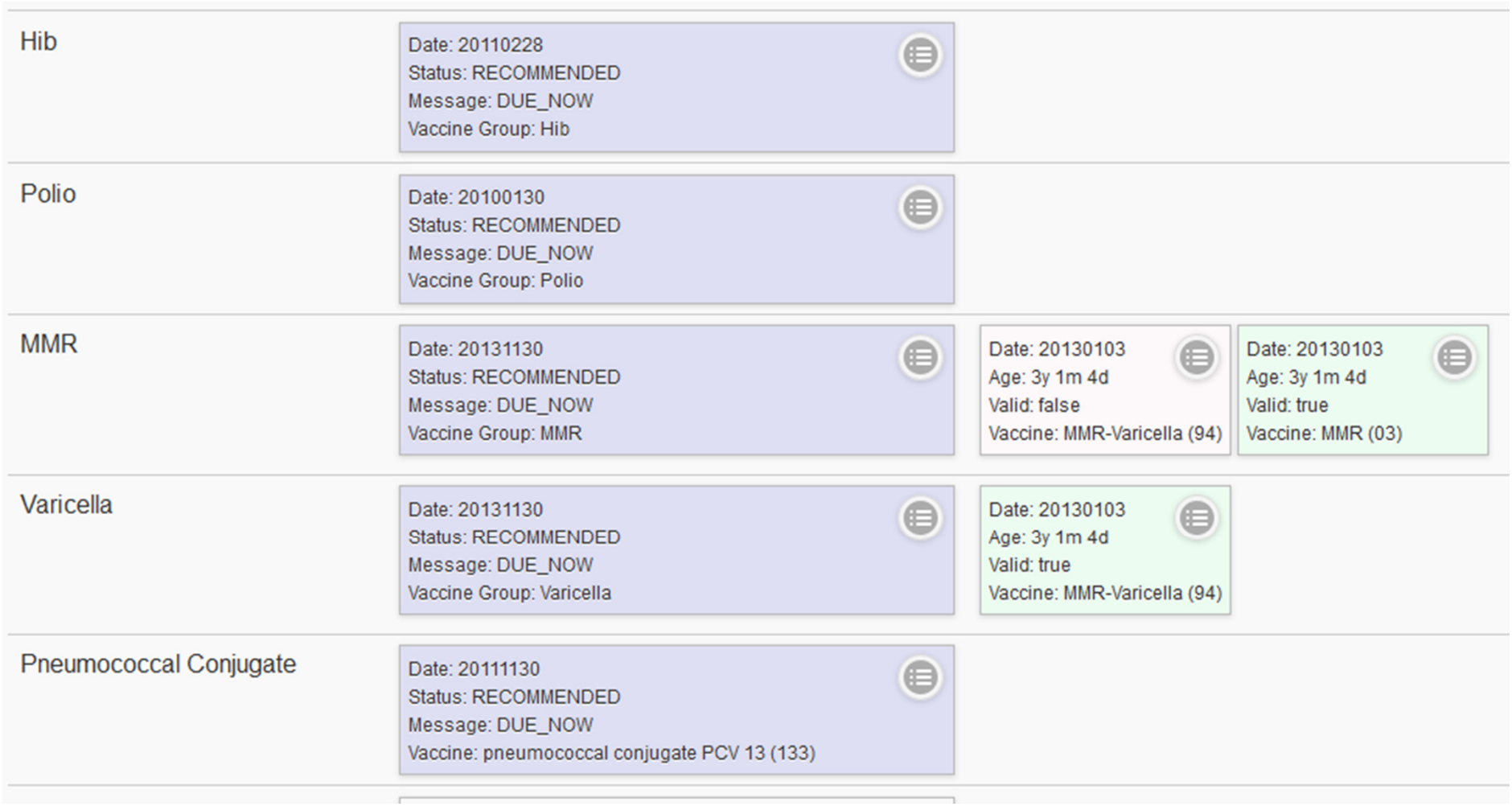
Goal: Validate how CQF standards may support and evolve Clinical Decision Support for Immunizations (CDSi)

Team Member	Role
Daryl Chertcoff Project Manager, HLN Consulting, LLC	Pilot Lead
Eric Larson American Immunization Registry Association; CDC Contractor	Pilot Participant
Nathan Bunker Senior Technical Project Manager, American Immunization Registry Association	Pilot Participant
Mario Hyland Senior Vice President, AEGIS.net, Inc.	Pilot Participant
Richard Ettema Lead Consulting, AEGIS.net, Inc.	Pilot Participant
Claude Nanjo, MPH, MAAS Chief Scientist and Senior Software Architect, Cognitive Medical Systems, Inc.	Liaison SME

CQF Pilots

Immunization Decision Support Service

Sample Immunization Forecasting User Interface



CQF Pilots

Immunization Decision Support Service

Validate CQF standards for Immunization Forecasting

Pilot accomplishments to date:

- Participated in 2 HL7 Connectathons
  - May 2014: Demonstrated immunization forecasting using CDSi logic, FHIR DSTU1 interface, and 1 immunization forecaster, with AEGIS WildFHIR serving as integration layer
  - January 2015: Demonstrated immunization forecasting using CDSi logic, FHIR DSTU2 interface, and 2 immunization forecasters
- July 2015: Shared lessons learned with CQF as feedback for development of FHIR-based update to DSS standard
- In discussions for participation in next HL7 Connectathon

CQF Pilots

Phenotype Execution and Modeling Architecture

(projectphema.org; R01 GM105688)

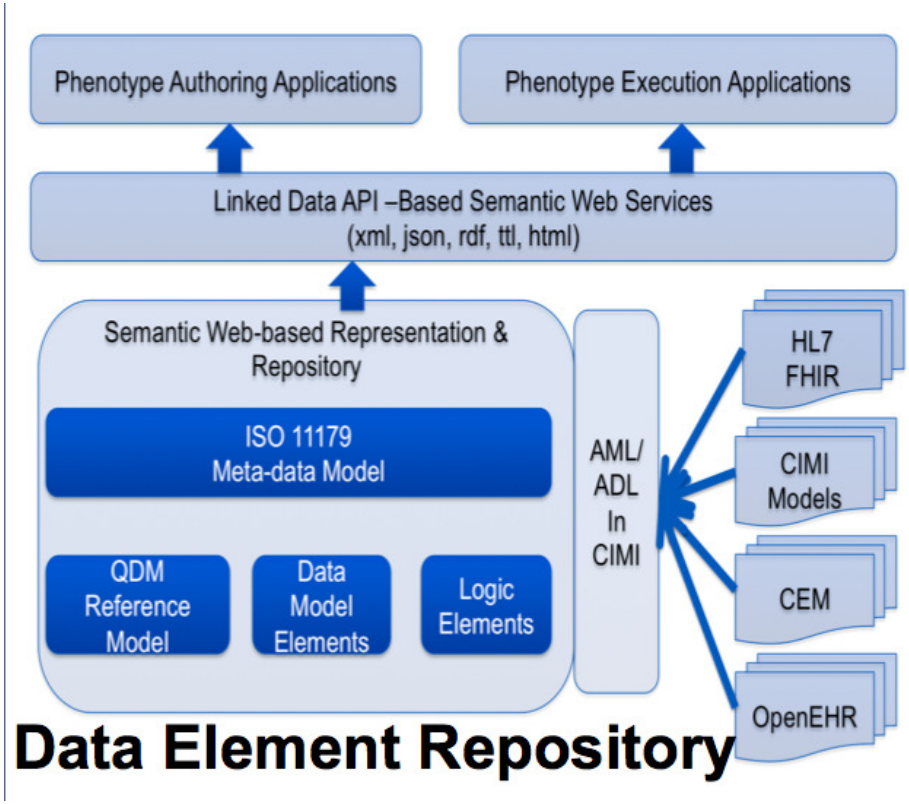
Goal: Take HQMF/QDM-based Phenotype Authoring, Execution, and Knowledge Management Platform and enable support for CQF standards

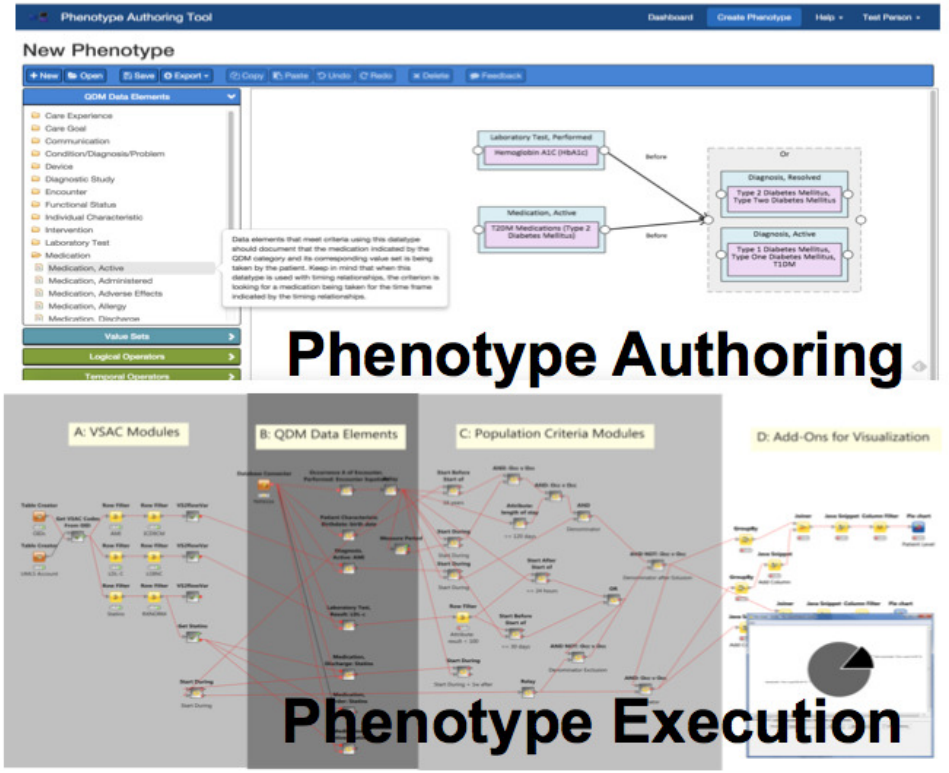
Team Member	Role
William Thompson, PhD Research Scientist and Adjunct Assistant Professor Northwestern University & NorthShore University HealthSystem	Pilot Lead and Point of Contact
Jyotishman Pathak, PhD Professor and Chief Division of Health Informatics, Weill Cornell Medical College	Pilot Co-Lead
Bryn Rhodes Owner, Database Consulting Group LLC	Liaison SME
Christopher Moesel Principal Computer Science Engineer, MITRE	Liaison SME

CQF Pilots

Phenotype Execution and Modeling Architecture

(projectphema.org; R01 GM105688)





November 16th; Session S32: PheMA Demonstration
November 17th; Session S68: PheMA Paper Presentation
November 18th; Session S92: Phenotyping Panel

CQF Wiki: cqframework.info

CQF Pilots

Breast Cancer Decision Support and CQM

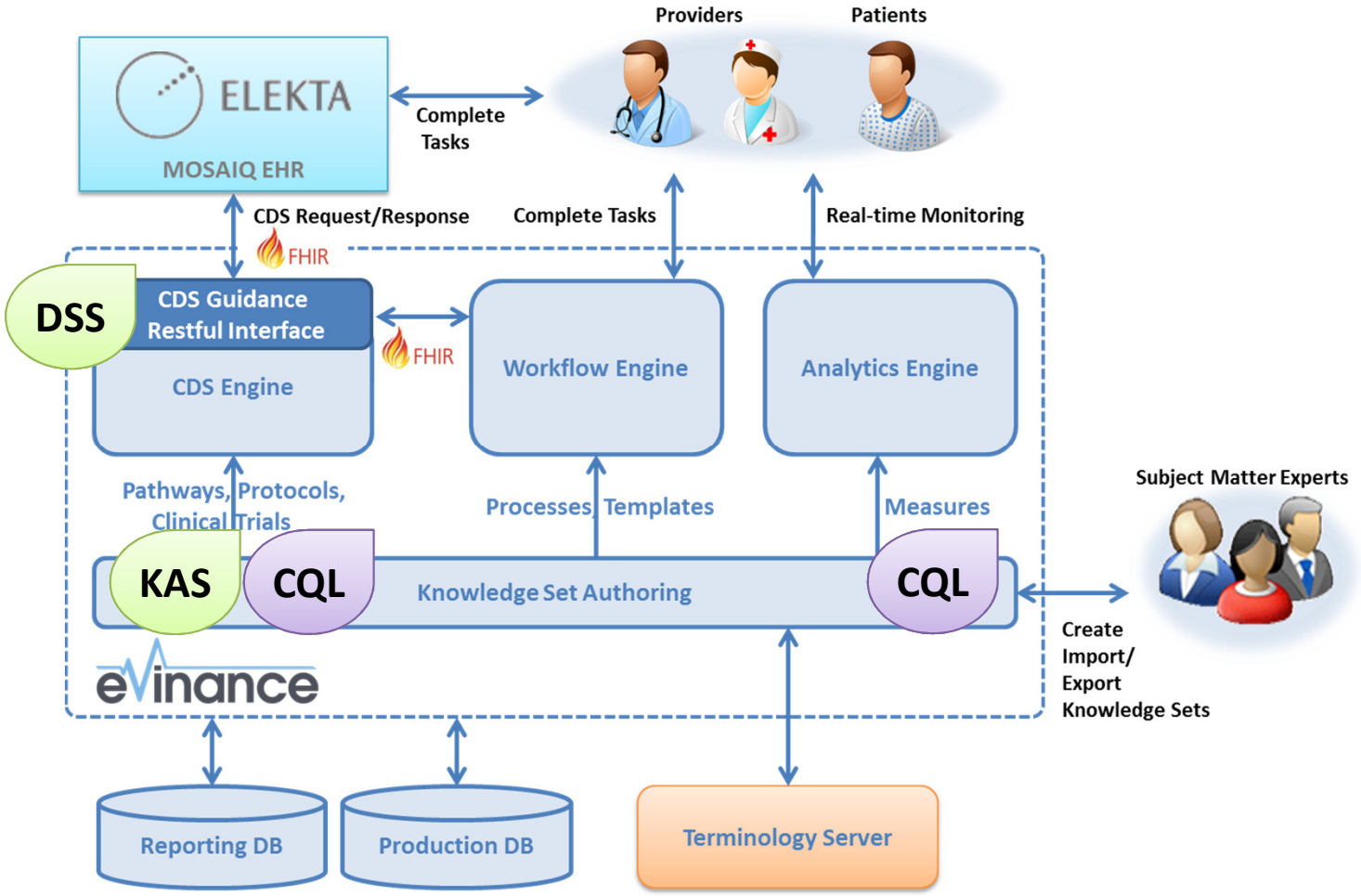
Goals:

1. Demonstrate that FHIR can be used in oncology to send patient data to a Decision Support Service, which in turn can recommend appropriate treatment plan(s) and clinical trial(s)
2. Demonstrate that oncology measures can be defined using CQL and KAS

Team Member	Role
Chad Armstrong, MBA CEO, Evinance	Pilot Lead
Claude Nanjo, MPH, MAAS Chief Scientist and Senior Software Architect, Cognitive Medical Systems, Inc.	Liaison SME
Bryn Rhodes Owner, Database Consulting Group LLC	Liaison SME

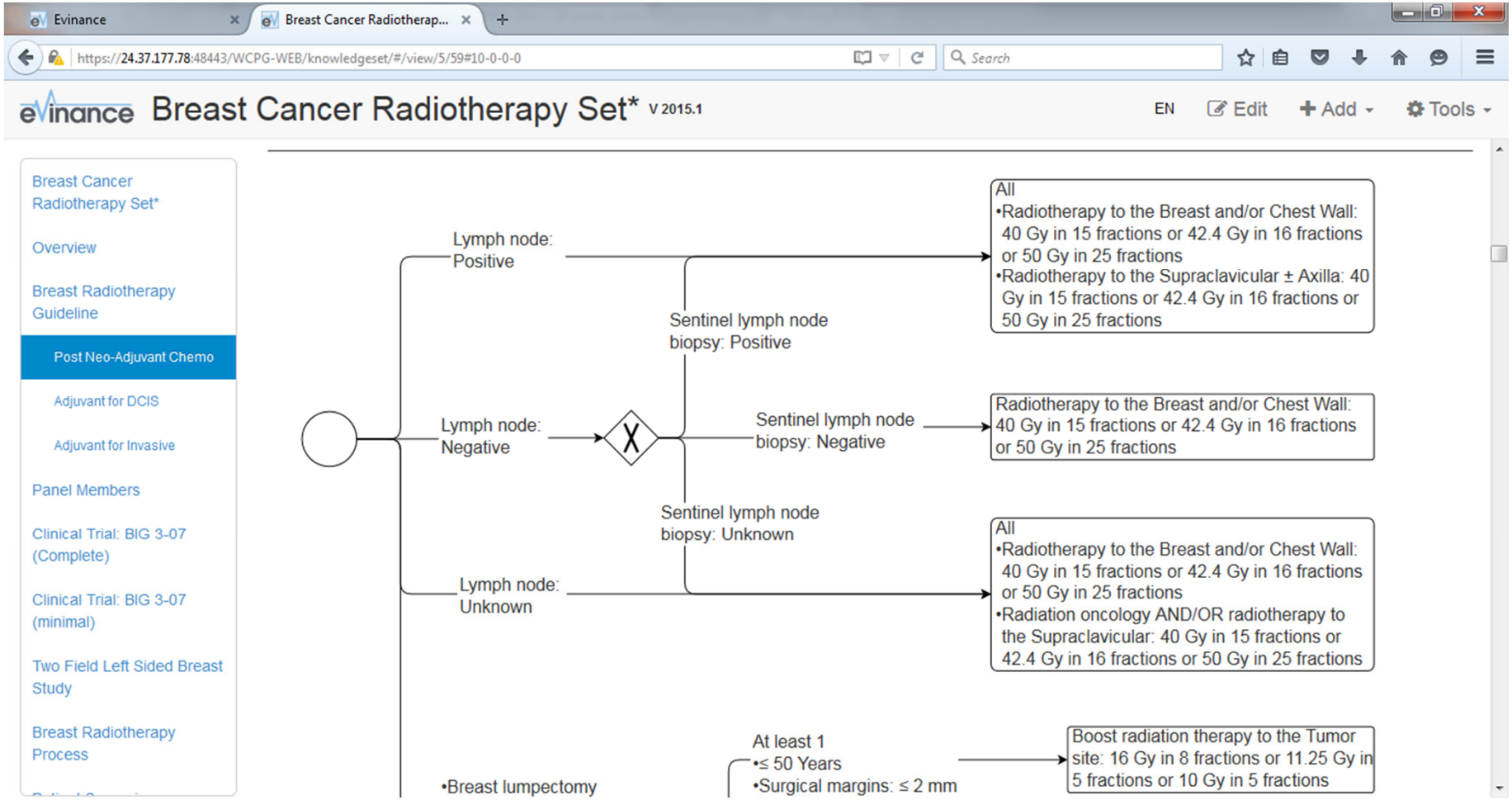
Breast Cancer Decision Support and CQM Pilot

Technology Overview



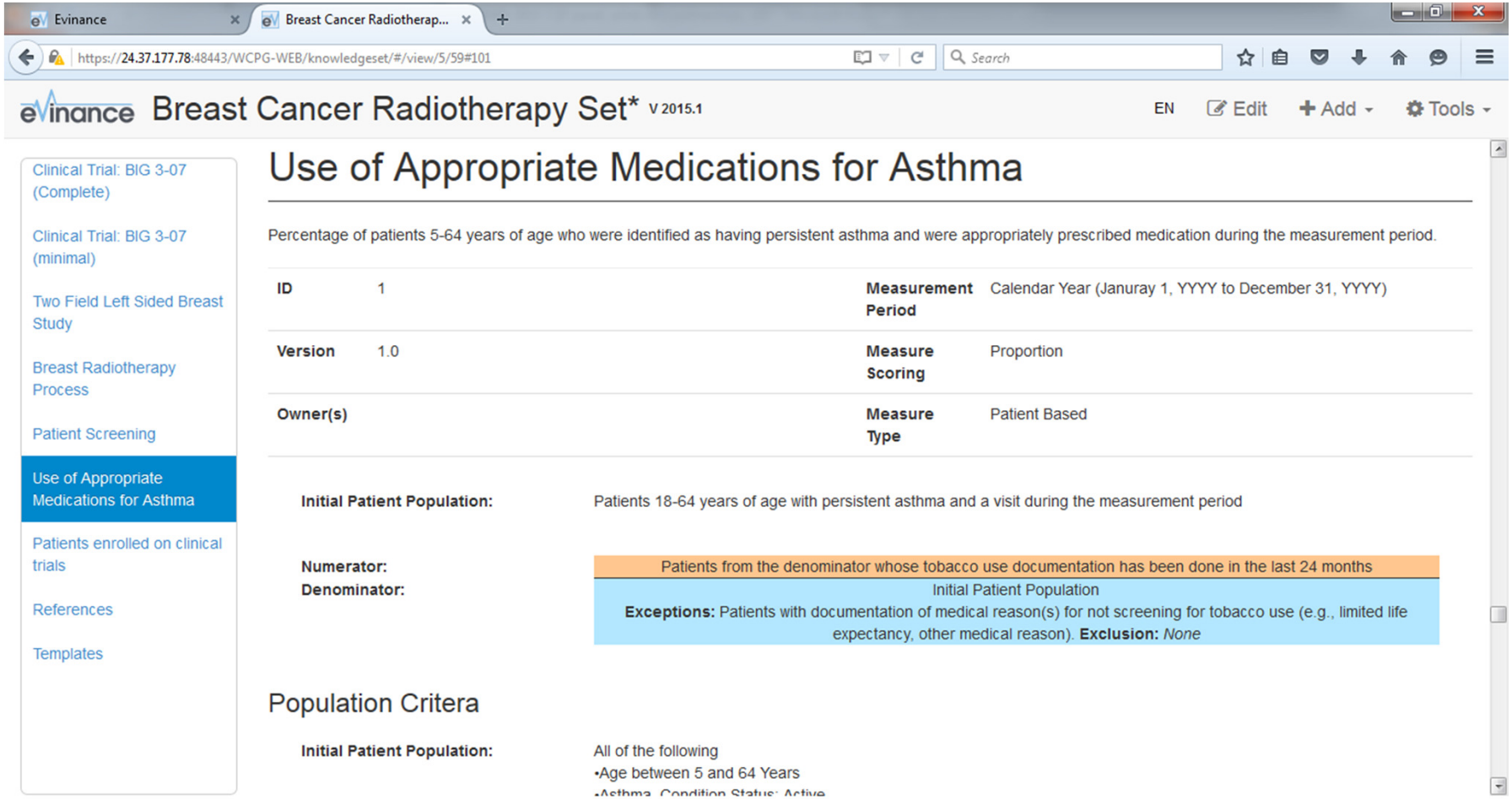
Breast Cancer Decision Support and CQM Pilot

Guideline Authoring



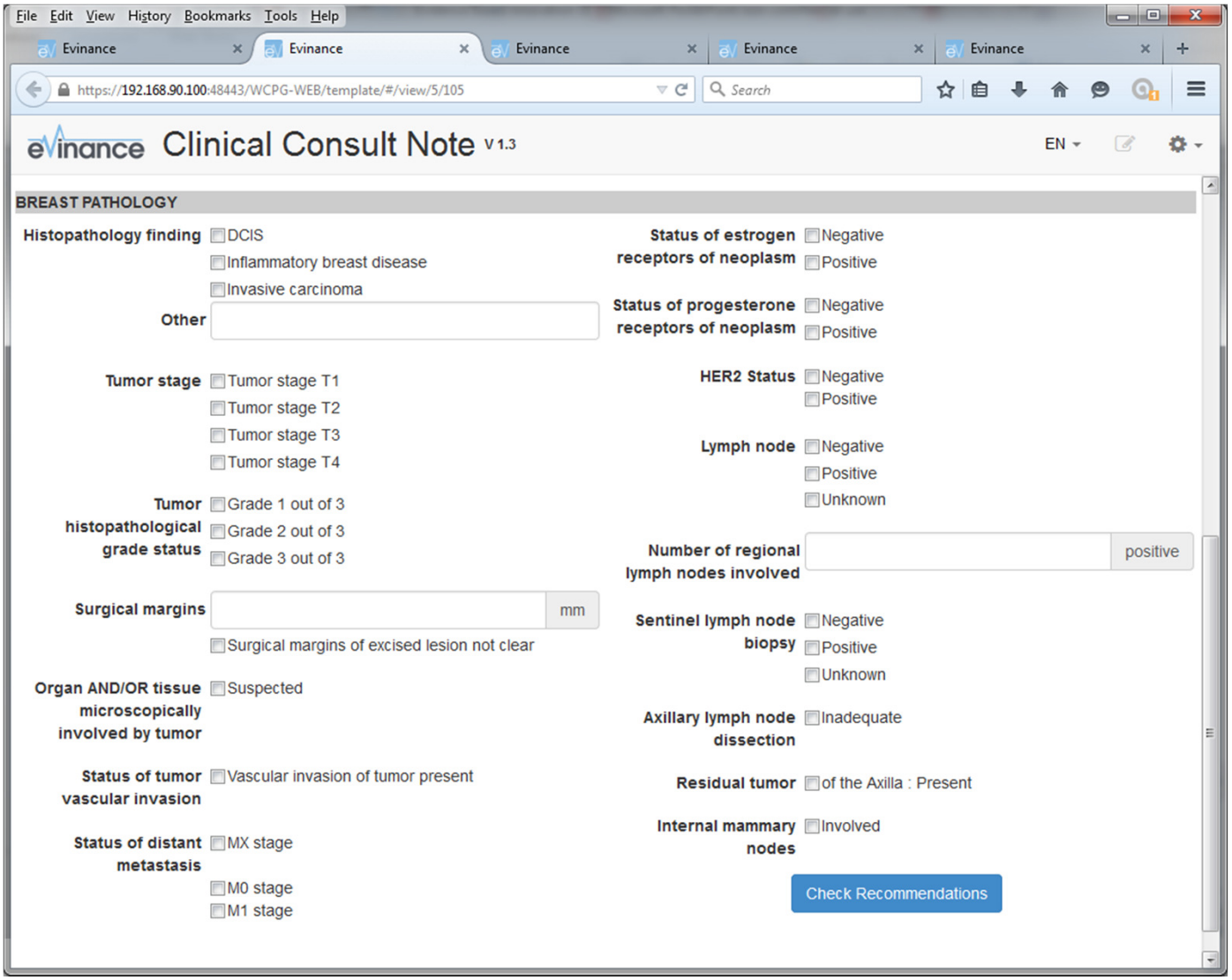
Breast Cancer Decision Support and CQM Pilot

Measure Authoring



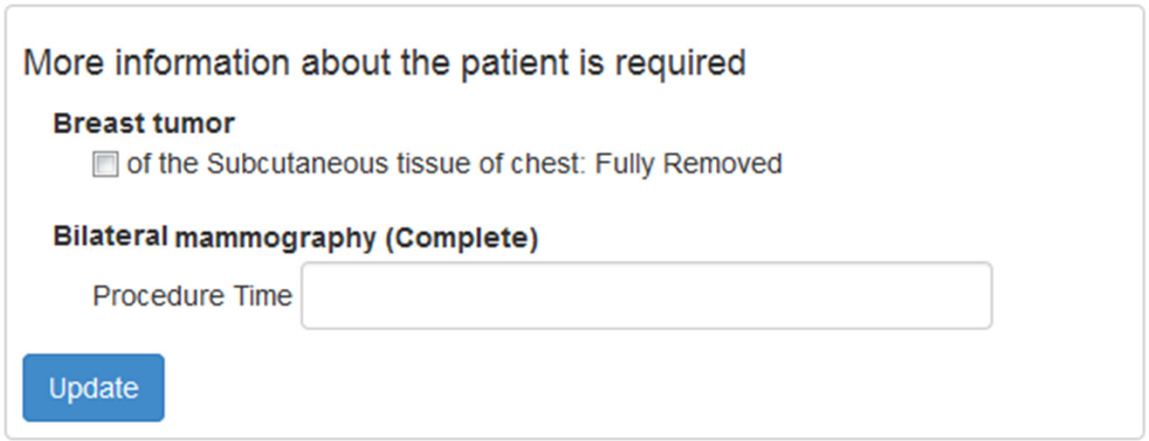
Breast Cancer Decision Support and CQM Pilot

Structured Documentation Template



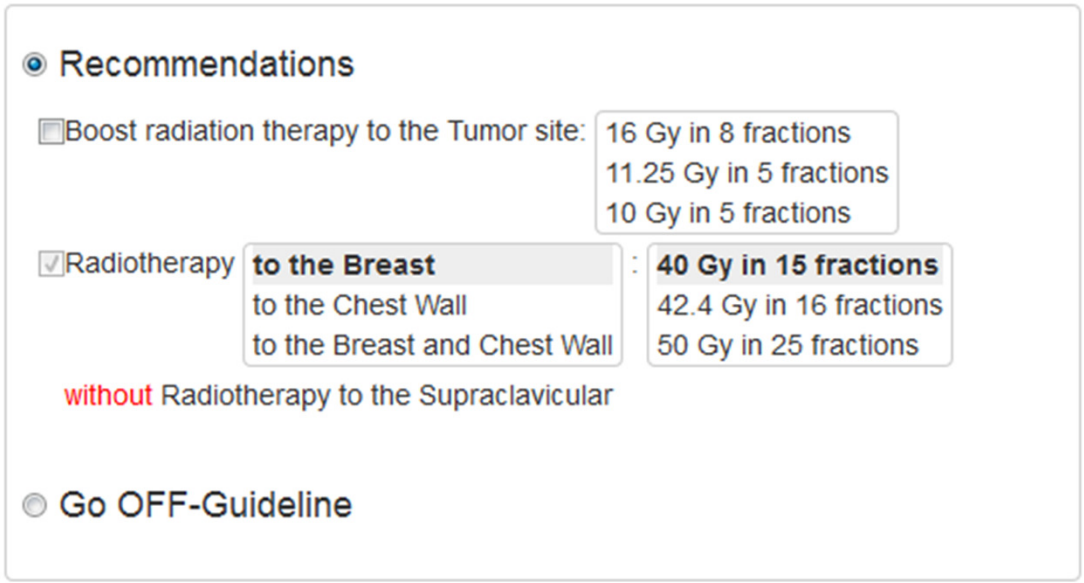
Breast Cancer Decision Support and CQM Pilot

Care Recommendations - Prompts



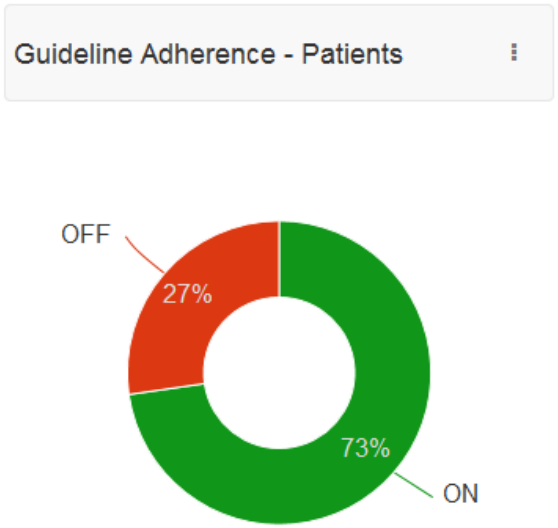
Breast Cancer Decision Support and CQM Pilot

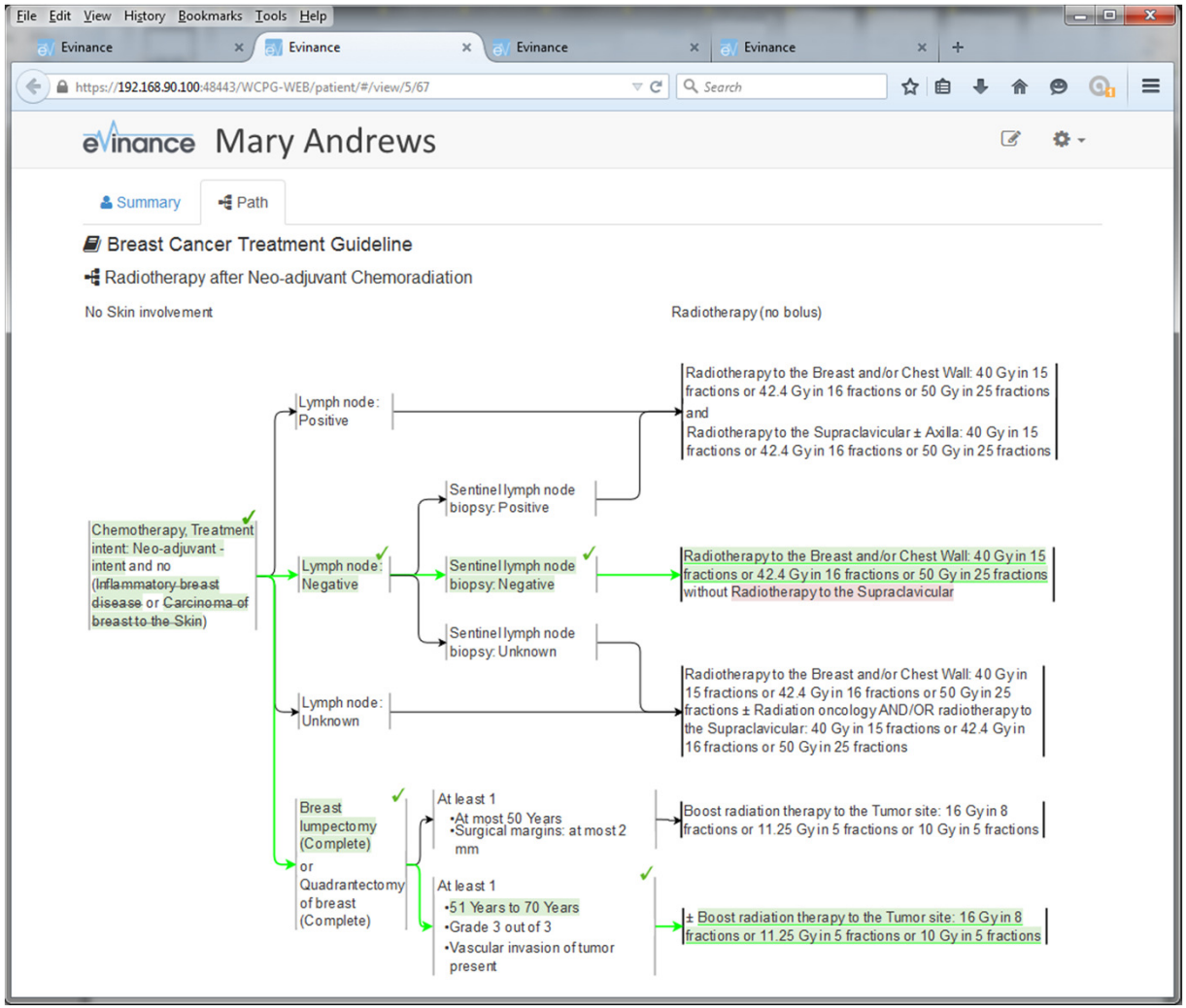
Care Recommendations



Breast Cancer Decision Support and CQM Pilot

Guideline Adherence Dashboard





CQF Wiki: cqframework.info

evinance community

evinance.com/community

CQF Pilots

Radiology Decision Support

Goal: Evaluate ability of CQF standards to support point-of-care, service-based, EHR-integrated CDS on radiology appropriateness of use in support of PAMA Section 218b provisions

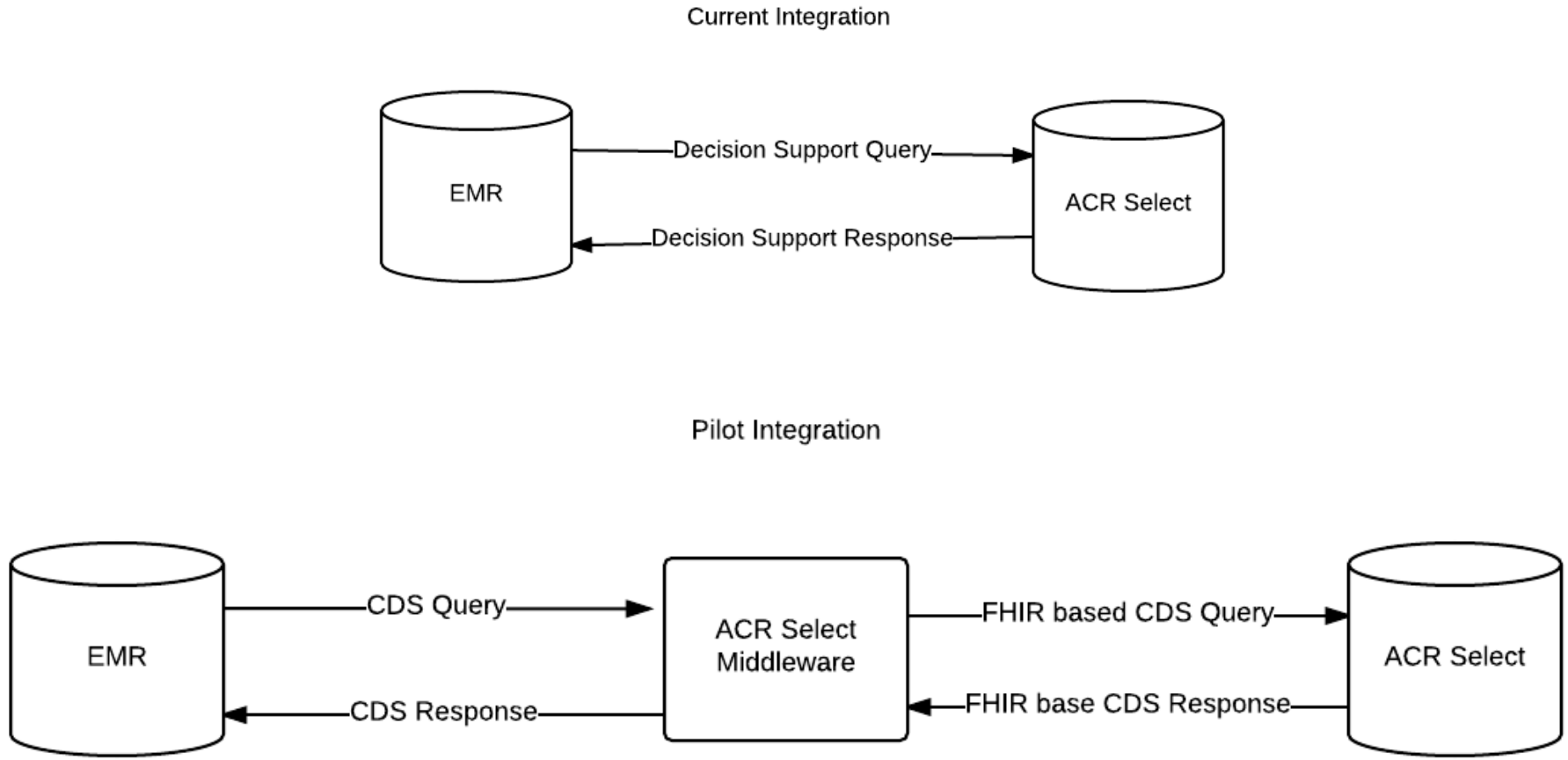
Team Member	Role
Tom Conti SVP Technical Strategy, National Decision Support Company	Pilot Co-Lead & Point of Contact
Bob Cooke VP Marketing, National Decision Support Company	Pilot Co-Lead
James Doyle R&D Product Lead, Epic	SME
Erik Abels, MBA Clinical & Diagnostic Imaging Strategist, Cerner	SME
Keith Dreyer, DO, PhD Vice Chairman and Associate Professor of Radiology, MGH/Harvard	SME
Bryn Rhodes Owner, Database Consulting Group LLC	Liaison SME

Background

- Leverage a widely deployed, commercial implementation of Radiology CDS
  - Currently process over 400,000 radiology decision support sessions per month
- Market implementations in place with Epic, Cerner, Meditech, McKesson, etc.
  - Leverage native EHR user interface for capture of structured reason for exam and display of feedback
  - All feedback is actionable (e.g., user can change/alter to more appropriate action)
- Embed transaction data within EHR including a unique Decision Support Number (DSN)

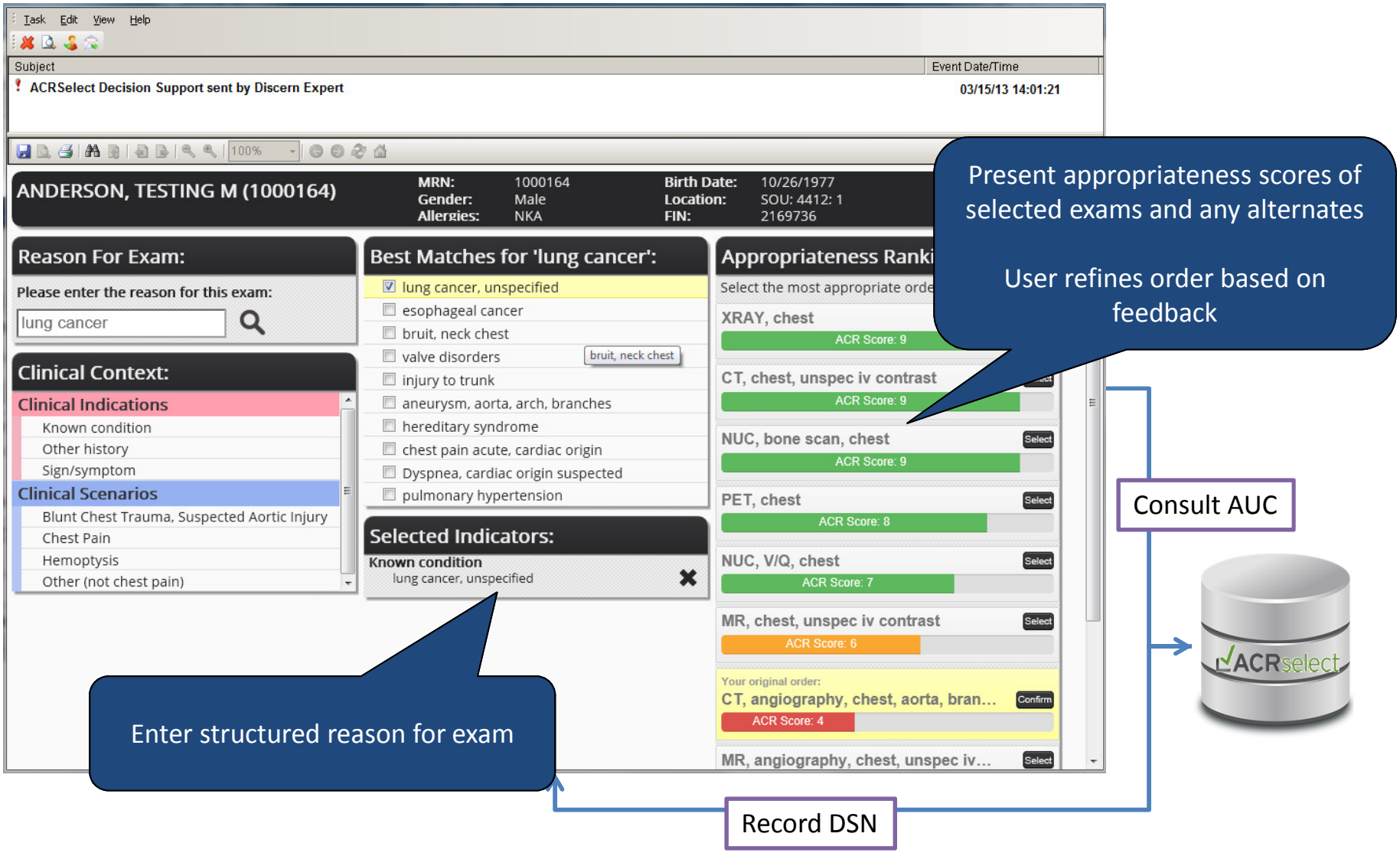
Radiology Decision Support Pilot

Pilot Architectural Diagram



Radiology Decision Support Pilot

EHR Access to CDS Knowledge at Point of Care



Pilot Status

- Leveraged FHIR messaging and data standards
  - IHE Patient Care Coordination GAO (Guideline Appropriate Ordering)
    - http://ihe.net/uploadedFiles/Documents/PCC/IHE_PCC_Suppl_GAO_Rev1.0_PC_2015-06-01.pdf
  - GAO being harmonized with CQIF standard
- Translated existing Epic integration to use this new FHIR-based integration

CQF Pilots

Portable CDS Knowledge Artifacts

Goal: Demonstrate the authoring, translation, and accurate deployment of portable CDS knowledge artifacts represented in the CQF standard

Team Member	Role
Julie Scherer, PhD Chief Data Scientist, Motive Medical Intelligence	Pilot Lead
Hanh Le, MD Director of Implementation, Motive Medical Intelligence	SME
Aziz Boxwala, MD, PhD CEO, Meliorix Inc.	Liaison SME
Claude Nanjo, MPH, MAAS Chief Scientist and Senior Software Architect, Cognitive Medical Systems, Inc.	Liaison SME
Rocky Reston, MD, PhD Chief Medical Informatics Officer, Cognitive Medical Systems, Inc.	SME

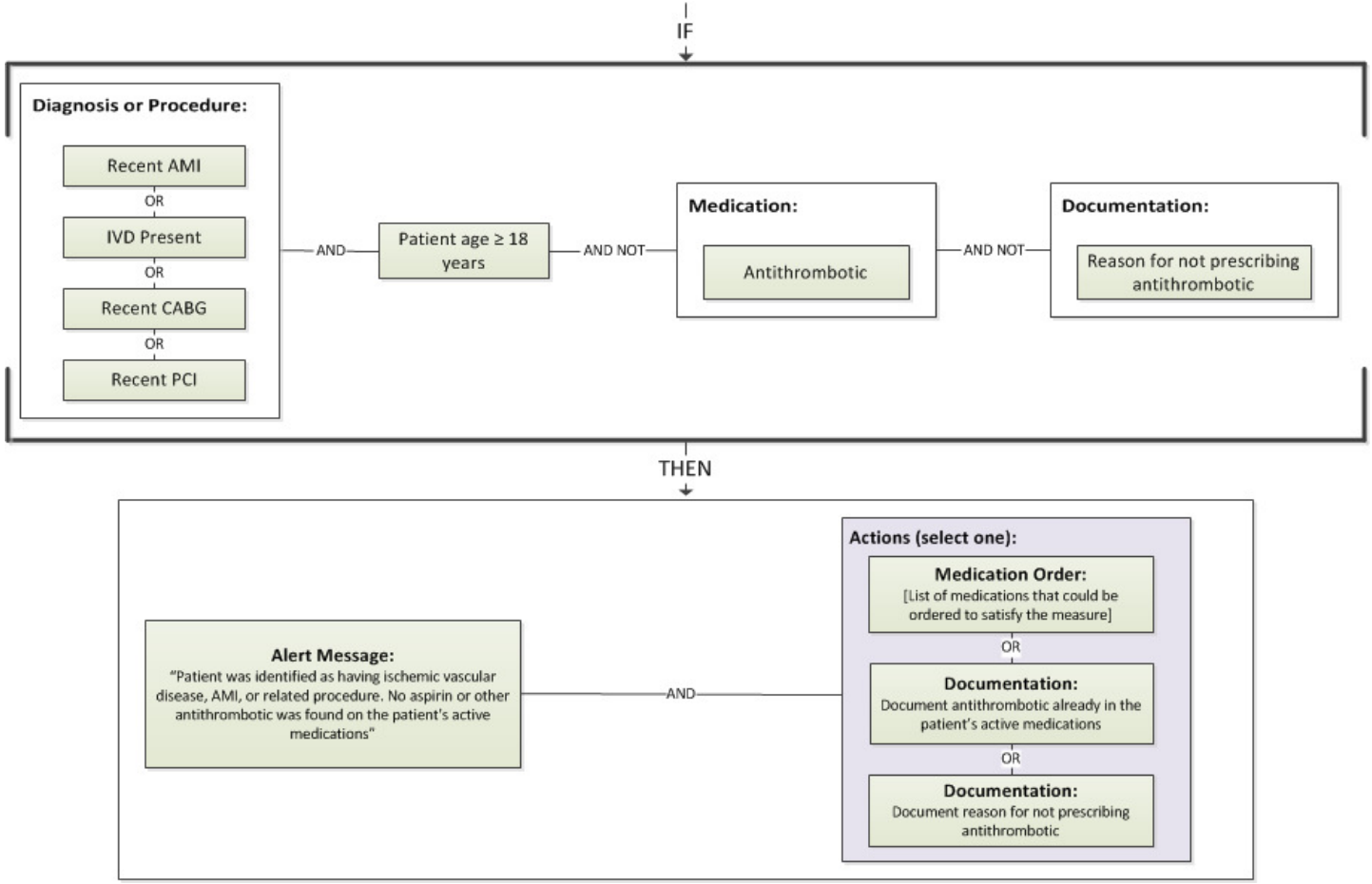
Portable CDS Knowledge Artifacts Pilot

Pilot Objectives and Scope

- Pilot objectives
  - Validate expressivity of the QUICK, QICore, and FHIR data models
  - Validate expressivity of the CQL expression language
  - Assess feasibility of artifact translation and execution
  - Evaluate retention of artifact semantics and presentation behavior during translation and deployment
- Implementation scope
  - ECA rule based on eCQM 164, *Ischemic Vascular Disease (IVD): Use of Aspirin or another Antithrombotic*
  - Documentation template of a suicide risk assessment
  - Suicide risk assessment scoring logic
  - Order sets for management and treatment of suicide risk

Portable CDS Knowledge Artifacts Pilot

ECA Rule: Artifact Specification



Diagrammatic representation of an ECA artifact for eCQM 164,
Ischemic Vascular Disease (IVD): Use of Aspirin or another Antithrombotic

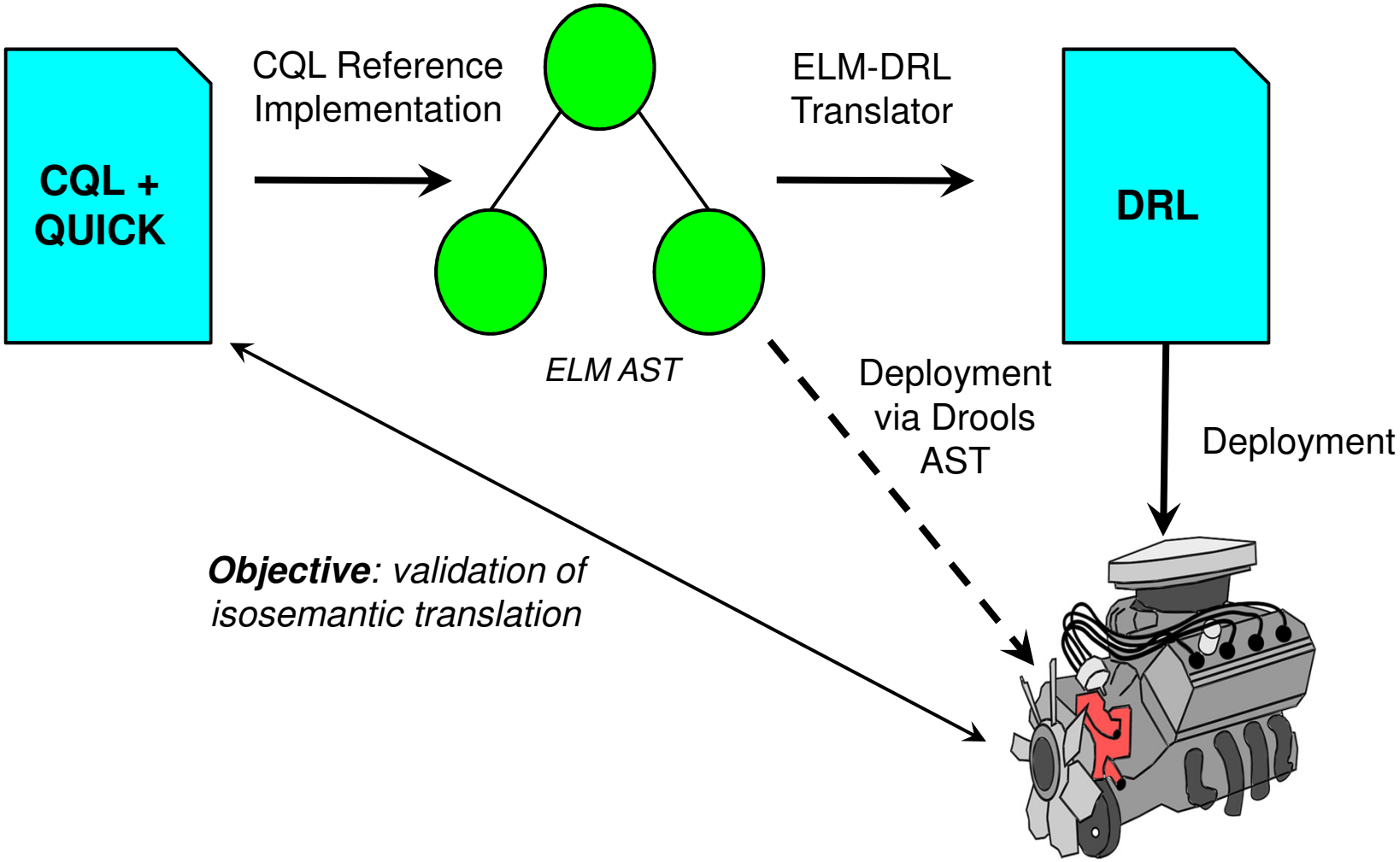
Portable CDS Knowledge Artifacts Pilot

ECA Rule: CQL Artifact Excerpt

```
define LastAMI =
   first( [Condition: "Diagnosis, Active: Acute Myocardial Infarction"] C
      where C.statusElement.valueAsString in {'confirmed', 'working'} and ifnull(C.onsetDateTimeType,
               C.dateAssertedElement) during ACSreviewPeriod
      return tuple { DxText: C.code.textElement.value, DxTime: ifnull(C.onsetDateTimeType,
               C.dateAssertedElement)
      }
      sort by DxTime.value desc
   )

 define HadAMI = exists LastAMI

define LastIHDprocedure =
   first( ( [Procedure: "Procedure, Performed: Percutaneous Coronary Interventions"]
         union
         [Procedure: "Procedure, Performed: Coronary Artery Bypass Graft"] ) P
         where startOf(P."date") during ACSreviewPeriod
         return tuple { PxText: P.type.text,
                  PxTime: startOf(P."date") }
            sort by PxTime.value desc )

define HadIHDprocedure = exists LastIHDprocedure
```

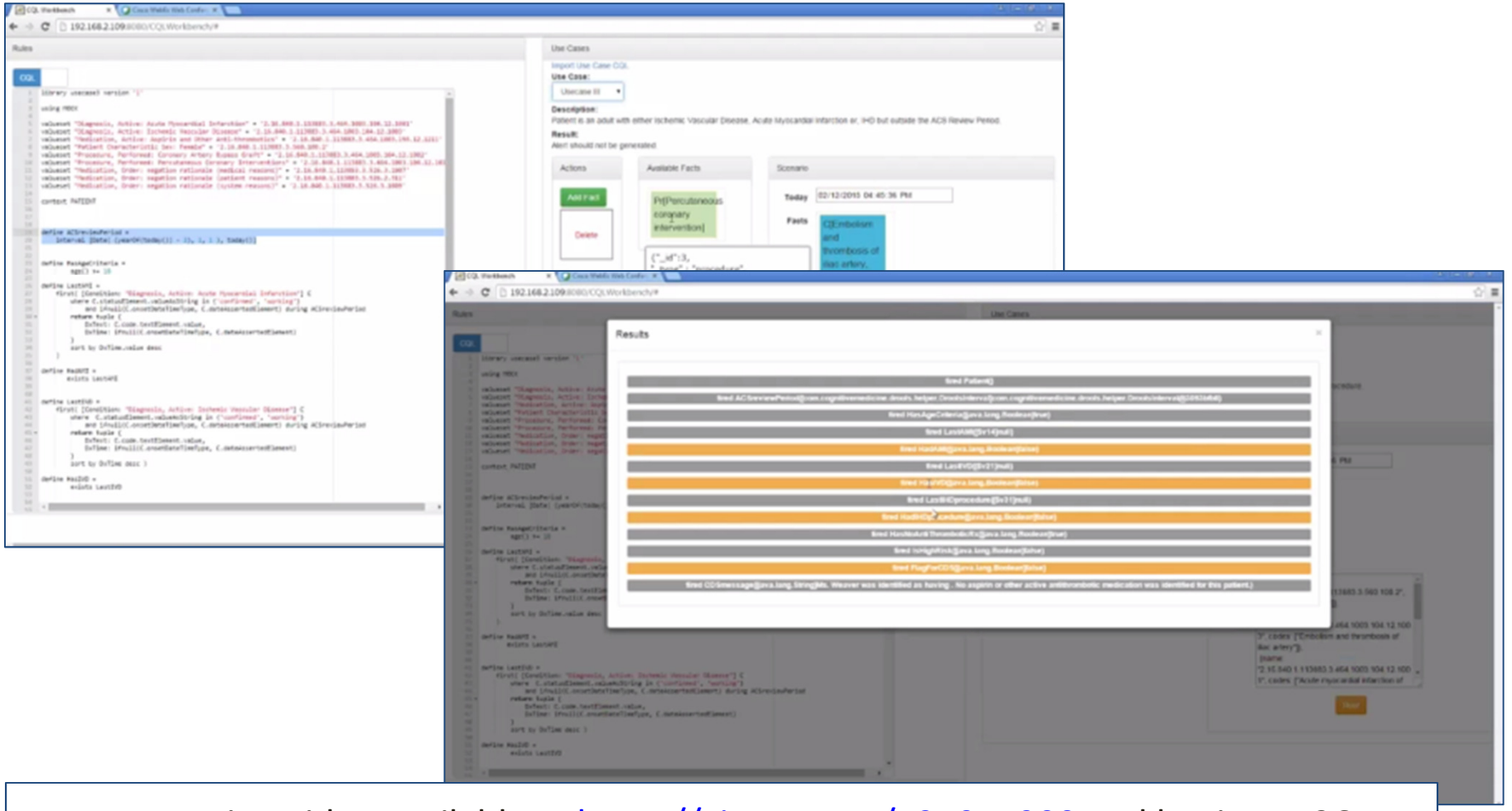
Portable CDS Knowledge Artifacts Pilot

ECA Rule: Translation and Deployment



Portable CDS Knowledge Artifacts Pilot

ECA Rule: Demonstration



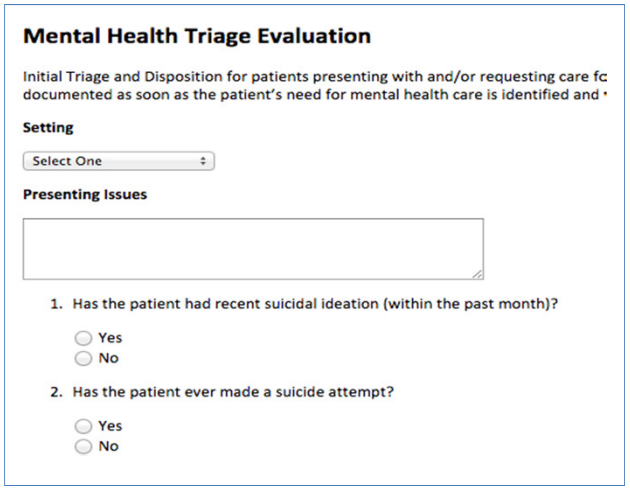
Demonstration video available at https://vimeo.com/121041900 and begins at 36 minutes and 30 seconds

Portable CDS Knowledge Artifacts Pilot

Documentation Template: Scoring and Order Set Identification

Suicide Risk Assessment Documentation Template

Integrate



Dynamic form rendered in browser

Fill and submit

Based on the information provided, the patient's suicide risk assessment score is: ***Low***

ELM scoring logic translated to JSON, executed upon form submission using Javascript

Retrieve order set

Suicide risk assessment score used to retrieve relevant KAS order set

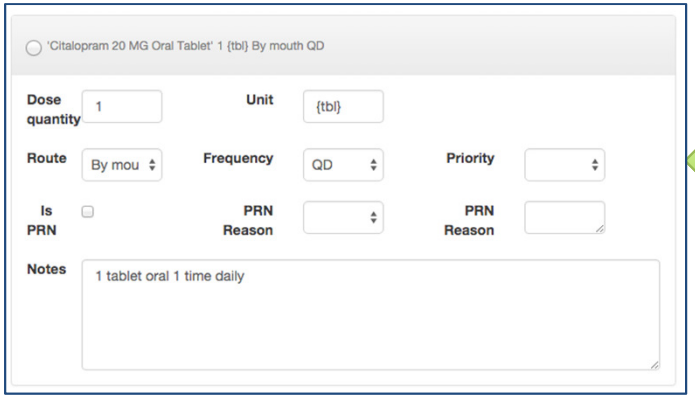
Portable CDS Knowledge Artifacts Pilot

Order Sets: Retrieval, Presentation, and Submission

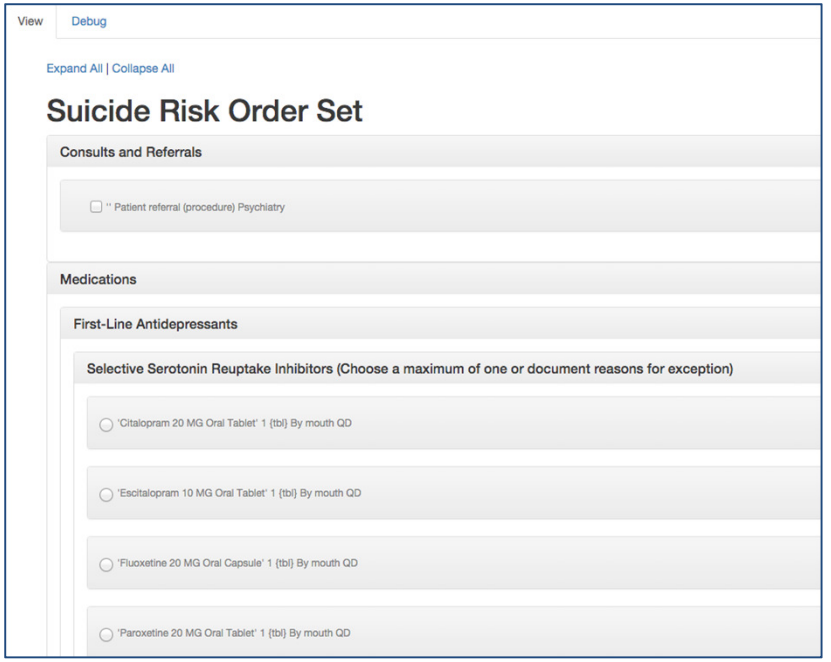
Relevant order set found and listed

Select order set

KAS Low Suicide Risk Order Set



Place order



Order ID	Description	Status
d0aadbef-1544-4ddb-aaca-0d1b63663bcd	Citalopram 20 MG Oral Tablet 1.0 {tbl} By mouth	Signed
12b081d8-b075-48dc-b15e-58574d54d8bf	Bupropion Hydrochloride 75 MG Oral Tablet 1.0 {tbl} By mouth	Signed
75987cfa-10ab-4c39-b955-064ddf266339	duloxetine 30 MG Delayed Release Oral Capsule 1.0 {tbl} By mouth	Signed
b667a9e1-3a61-47e8-bdf3-cf38277ff851	Mirtazapine 15 MG Oral Tablet 1.0 {tbl} By mouth	Signed

Modify, place, and review orders

Dynamically rendered from KAS representation

Key Insights from Pilots

- CQF standards can be leveraged to support clinically meaningful, real-world quality improvement use cases
- Detailed clinical models and associated value sets will need to be defined to ensure interoperability
- Specific vs. general interoperability specifications (e.g., GAO vs. CQIF) have tradeoffs and need to be harmonized
- Ease of implementation and alignment with industry trends (e.g., FHIR) will be critical to adoption
- Coordination and harmonization with other relevant initiatives will also be critical to adoption

Further Information

- Pilot lead contacts
  - cqframework.info
  - kensaku.kawamoto@utah.edu

- Pilot Showcase
  - August 27th, 2015
  - 200+ attendees
  - Materials and Video available at http://wiki.siframework.org/Clinical+Quality+Framework+Past+Meetings

Partnerships with Related Initiatives

- Goals:
  - Broaden the stakeholder community
  - Reduce implementer burden
- ONC Structured Data Capture (SDC) initiative
  - Collaborating to ensure alignment between CQIF documentation templates and SDC Questionnaires
- ONC Data Access Framework (DAF) initiative
  - QICore based on DAF FHIR profiles
  - Exploring options for closer alignment
- Clinical Information Modeling Initiative (CIMI) and Health Services Platform Consortium (HSPC)
  - Exploring whether CIMI/HSPC data models and FHIR profiles can be leveraged to meet CQF data needs

Tom Oniki

HSPC AND CIMI COLLABORATION

The Motivation for HSPC and CIMI

The complexity of modern medicine exceeds the inherent limitations of the unaided human mind.

- David M. Eddy, MD, Ph.D.

Intermountain and other providers can only provide the highest quality, lowest cost health care with the use of advanced clinical decision support systems integrated into frontline clinical workflow

But we can’t keep up!

- We have ~150 decision support rules or modules
- We have picked the low hanging fruit
- There is a need to have 5,000 decision support rules or modules
- There is no path from 150 to get to 5,000 unless we fundamentally change the ecosystem

Strategic Goal

- We need a way to share what we create, benefit from what others create
- This includes:
  - data
  - applications
  - reports
  - alerts
  - protocols
  - decision support modules
- And effective sharing requires “plug-n-play” interoperability

What Is Needed to Create a New Paradigm?

- Standard set of detailed clinical data models coupled with standard coded terminology
- Standard APIs for healthcare related services
- Open sharing of models, coded terms, and APIs
- Sharing of decision logic and applications

Clinical Information Modeling Initiative

http://www.opencimi.org/

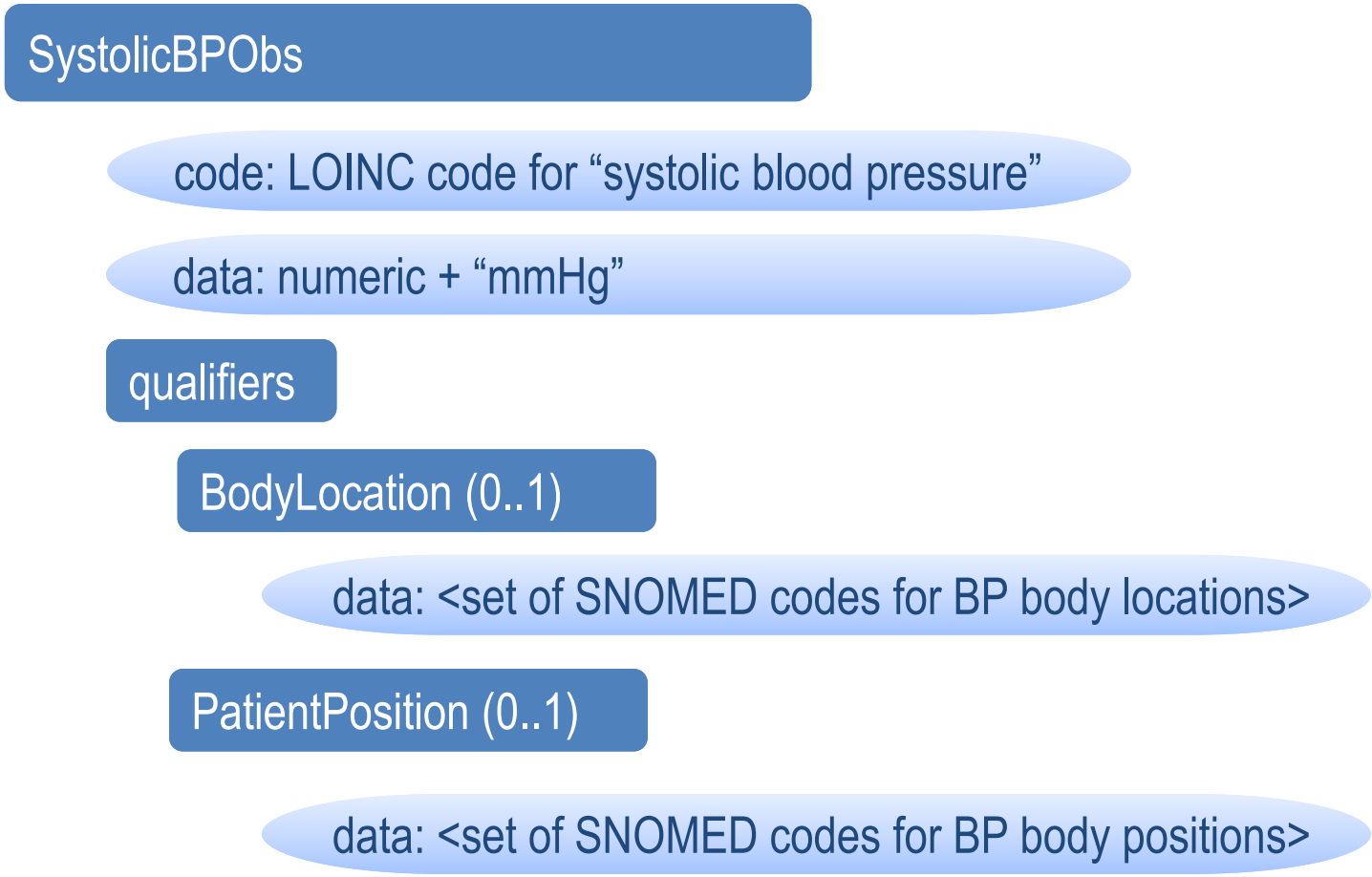
CIMI

- A community of interest that is producing detailed clinical models to enable interoperability of health care information systems
- Became an HL7 working group Oct 2015
  - interim co-chairs: Stan Huff, Intermountain; Virginia Riehl; Linda Bird, IHTSDO; Harold Solbrig, Mayo
- CIMI models are free for use for all purposes

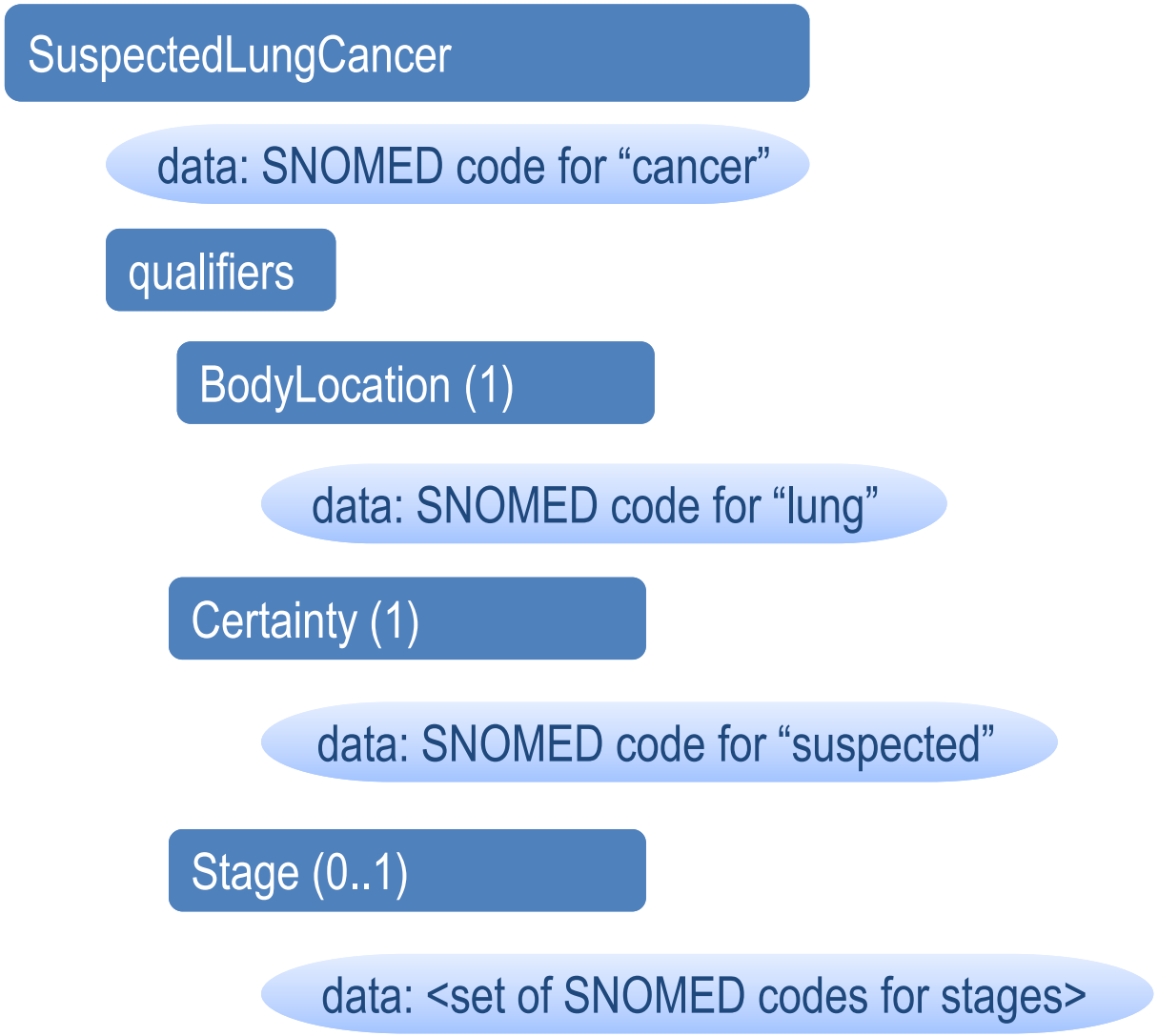
Clinical modeling activities

- Netherlands/ISO Standard
- ISO EN 13606
- UK – NHS and LRA
- Singapore
- Sweden
- Australia
- openEHR Foundation
- Canada
- US Veterans Administration
- US Department of Defense
- Intermountain Healthcare
- Mayo Clinic
- MLHIM
- SemanticHealthNet
- HL7
  - Version 3 RIM, message templates
  - TermInfo
  - CDA plus Templates
  - Detailed Clinical Models
  - greenCDA
- Tolven
- NIH/NCI (Common Data Elements, CaBIG)
- CDISC SHARE
- Korea - CCM
- Brazil
- Others . . .

An Example of a Detailed Clinical Model



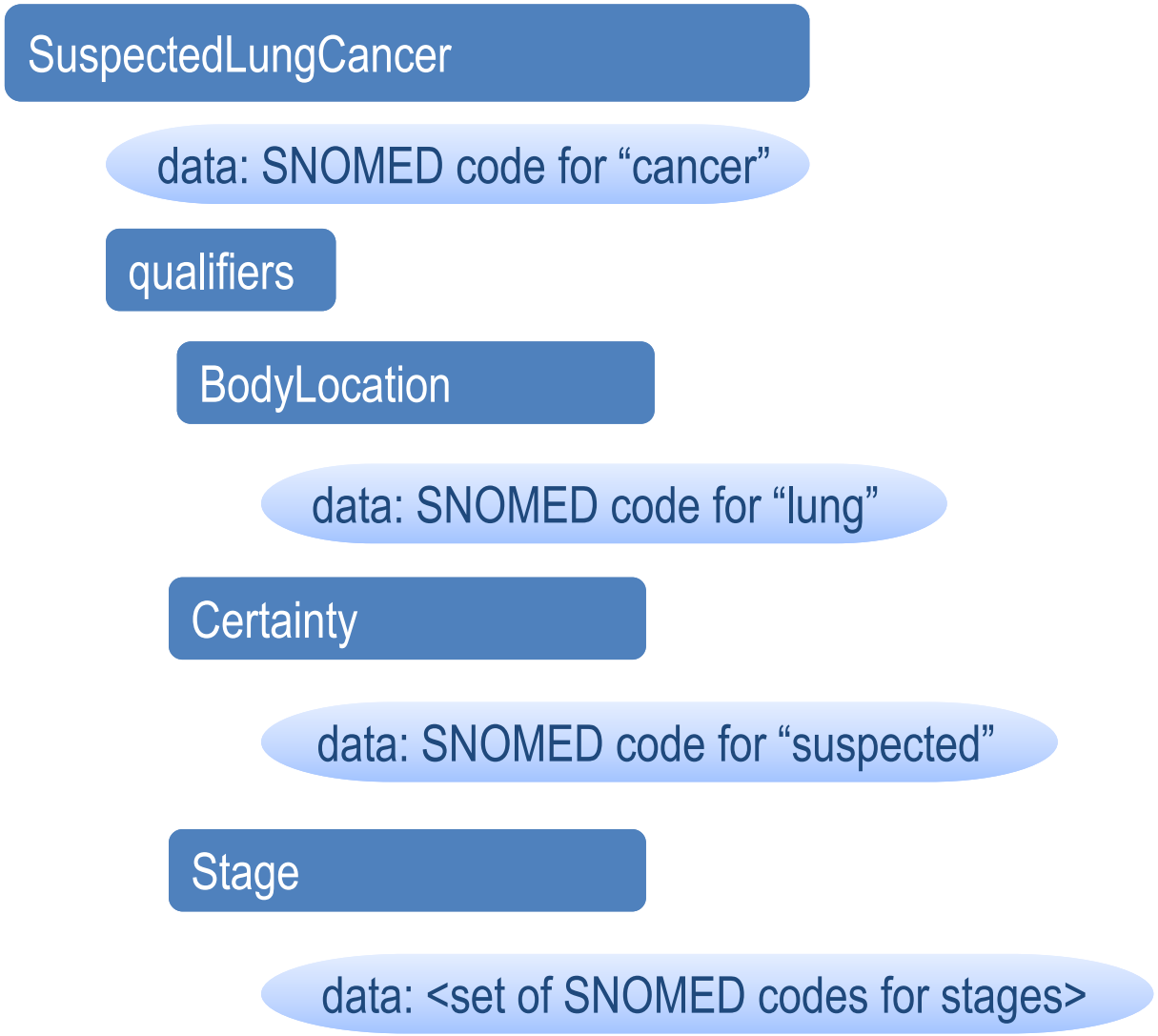
Another Example of a Detailed Clinical Model



What Is Needed to Create a New Paradigm?

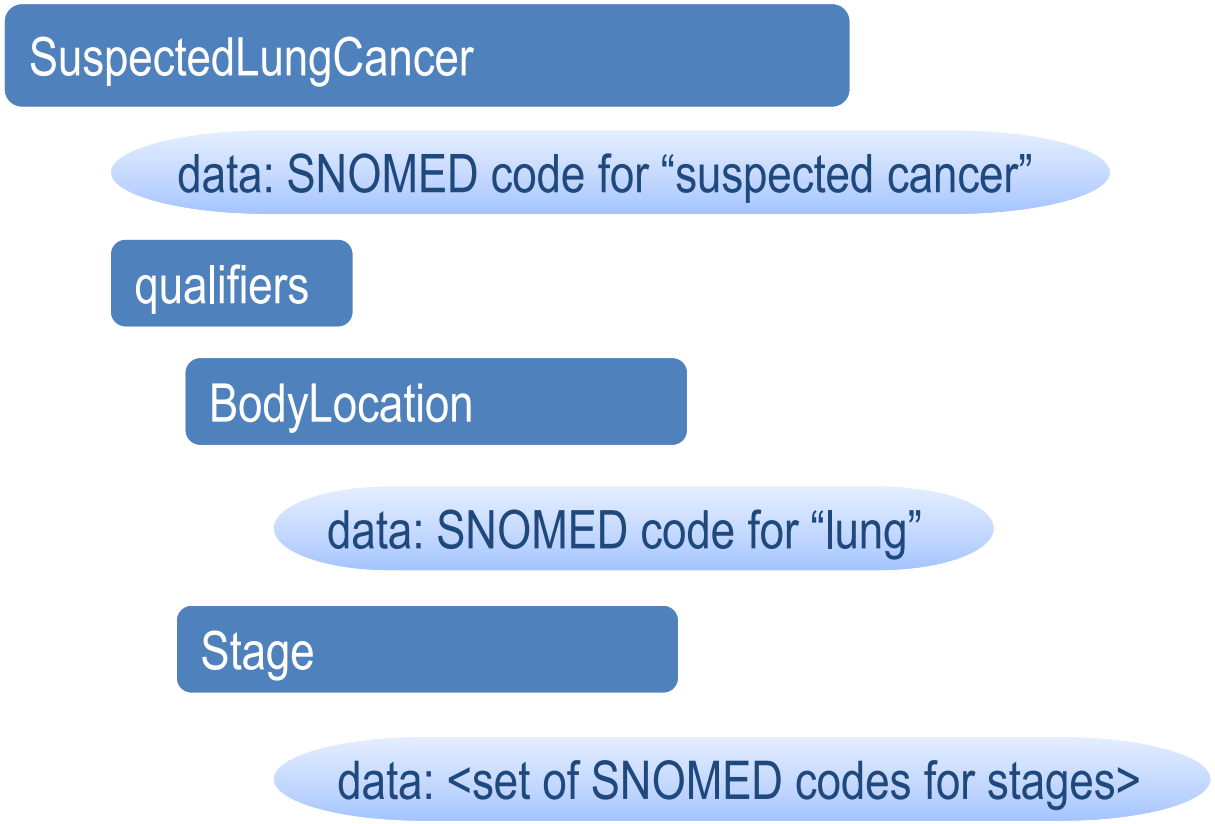
- ***Standard*** set of detailed clinical data models coupled with…
- Standard coded terminology
- Standard APIs for healthcare related services
- Open sharing of models, coded terms, and APIs
- Sharing of decision logic and applications

Another Example of a Detailed Clinical Model

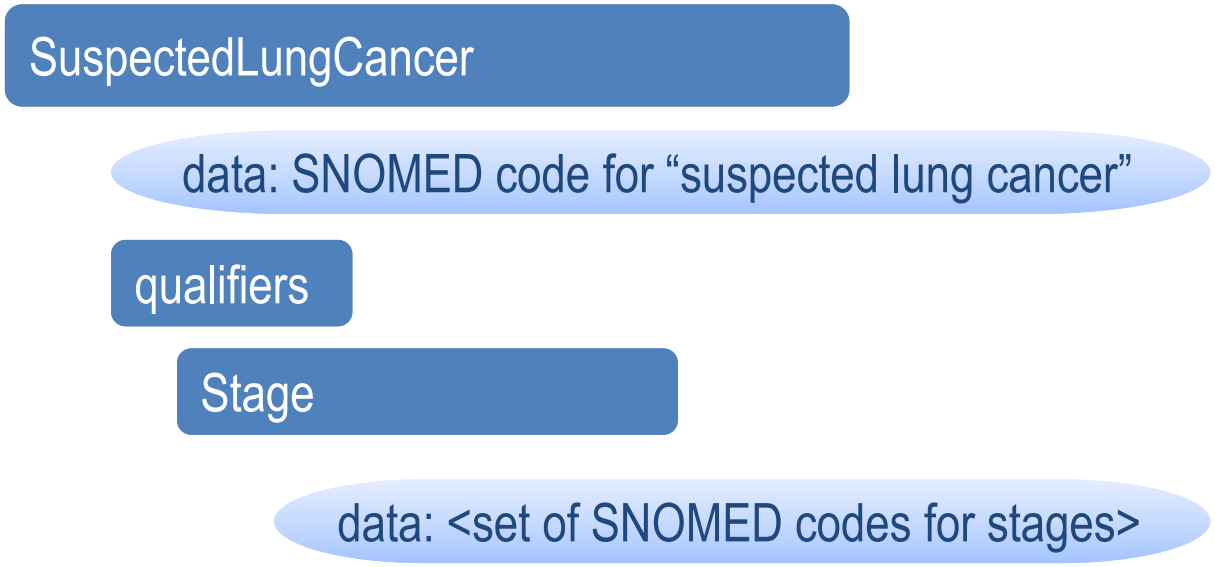


Another Example of a Detailed Clinical Model

Another Example of a Detailed Clinical Model



Another Example of a Detailed Clinical Model



CIMI Repository

Objective: Create a single, shared repository of detailed clinical information models

- using approved formalisms
  - Archetype Definition Language (ADL)
  - Archetype Modeling Language (AML)
- with formal bindings to standard coded terminologies

Progress

- CIMI data types approved
- CIMI Reference Model approved
- A set of reference archetypes approved
- ~2000 CIMI lab models created
  - http://www.clinicalelement.com/cimi-browser/

Primary Near Term Goals

- Build a CIMI authoring tool
- As soon as possible, make more CIMI models available in a web accessible repository
- Get the models used in working systems
- Document our experience
- Improve our processes and models
- Repeat!

HSPC | the healthcare services platform consortium™

THE HEALTHCARE INNOVATION ECOSYSTEM

- Wiki: https://healthservices.atlassian.net/wiki/display/HSPC/Healthcare+Services+Platform+Consortium
- Website: http://hspconsortium.org/#/

HSPC MISSION

Improve health by creating a vibrant, open ecosystem of interoperable applications

HSPC

- Provider-driven organization of healthcare organizations, IT vendors, systems integrators, and venture firms
- Incorporated as 501(c)(3) Aug 2014
  - Chairman of the Board: Stan Huff, MD, Intermountain Healthcare/University of Utah
  - CEO: Oscar Diaz, formerly VP, Harris Systems

HSPC Members To Date

Benefactor

- Intermountain Healthcare
- Louisiana State University
- Dept of Veterans Affairs

Associate

- Motive
- Regenstrief Institute

Individual

- American Medical Association
- Cognizant
- Jon Farmer
- Med Red
- Thomas Lang
- Regional Healthcare Improvement
- Wave Access

Sample of Participants

- HL7 FHIR – Grahame Grieve
- SMART – Josh Mandel
- Cerner – David McCallie, Marc Overhage
- Epic – Janet Campbell
- VA – Jonathan Nebeker, Paul Nichol
- openEHR – Thomas Beale
- Open Health Tools – David Carlson
- Harris – Vishal Agrawal
- Intermountain Healthcare
- Systems Made Simple – Viet Nguyen
- LSU – Frank Opelka, Wayne Wilbright, John Couk
- Center for Medical Interoperability – Todd Cooper
- RelayHealth – Arien Malec
- NLM – Clem McDonald
- Infocare Healthcare – Herb White
- Mayo Clinic – Cris Ross
- Clinical Architecture – Shaun Shakib
- Cognitive Medical Systems – Doug Burke, Claude Nanjo, Emory Fry
- IBM – Jeff Rogers, Dennis Leahy
- ASU – Aziz Boxwalla, Robert Greenes
- Regenstrief Institute – Douglas Martin
- U of Utah – Ken Kawamoto

The **Essential** Functions

- Identify a set of services and their appropriate use cases
- Identify/create content (models/profiles) that reference standard terminology
- Identify protocols for security, authorization, context sharing, transport, etc.
- Publish the standards and development instructions openly, licensed free-for-use
- Provide conformance testing of software
- Engage vendors in supporting the standard services

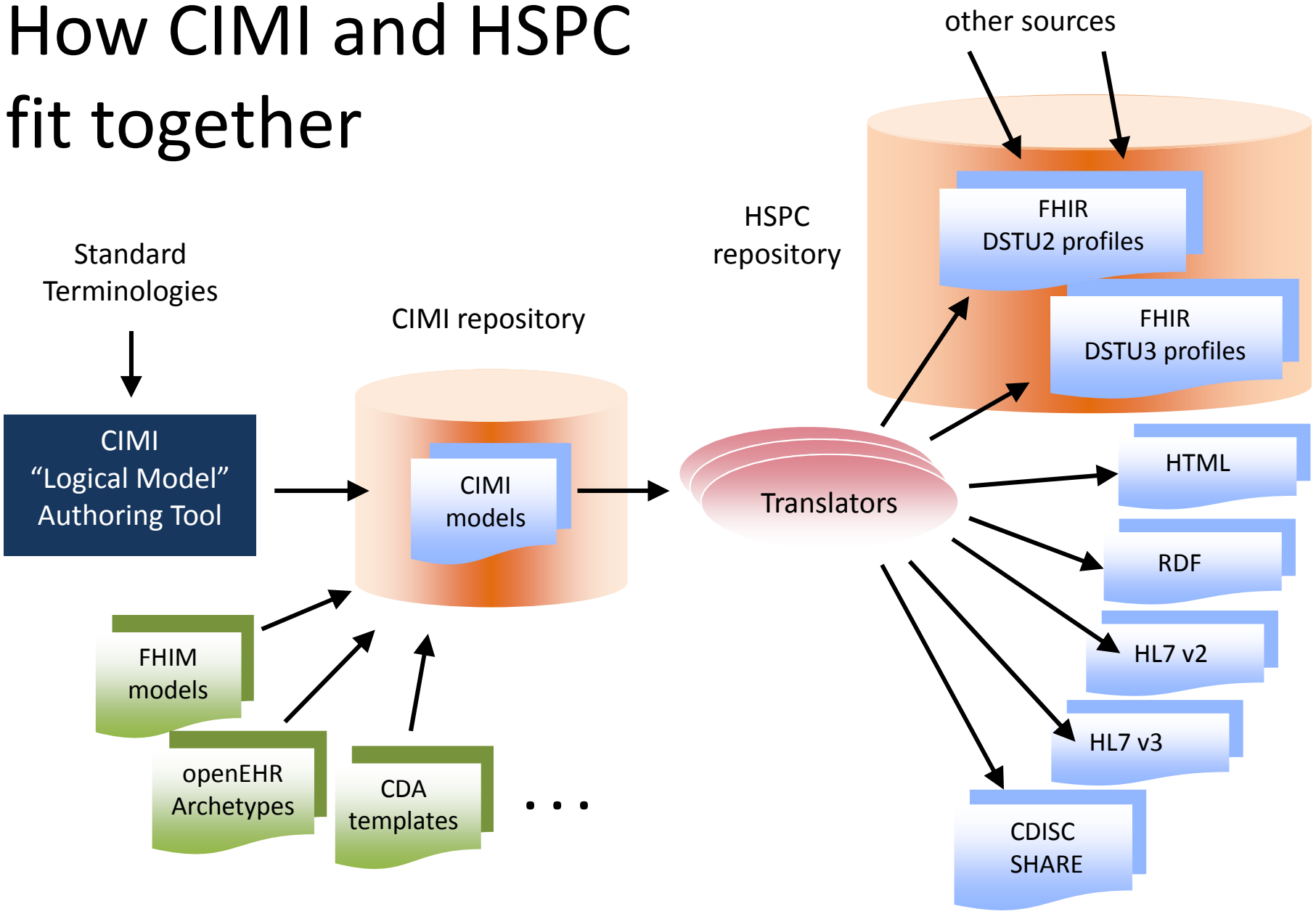
Other Functions of the Consortium

- Enable development “sandboxes”
- Set up a vendor- and provider-neutral “App Store”
- Create a business framework to support collaborative development
- Provide a way for people to invest (venture capital) in HSPC technologies

HSPC Technology Decisions

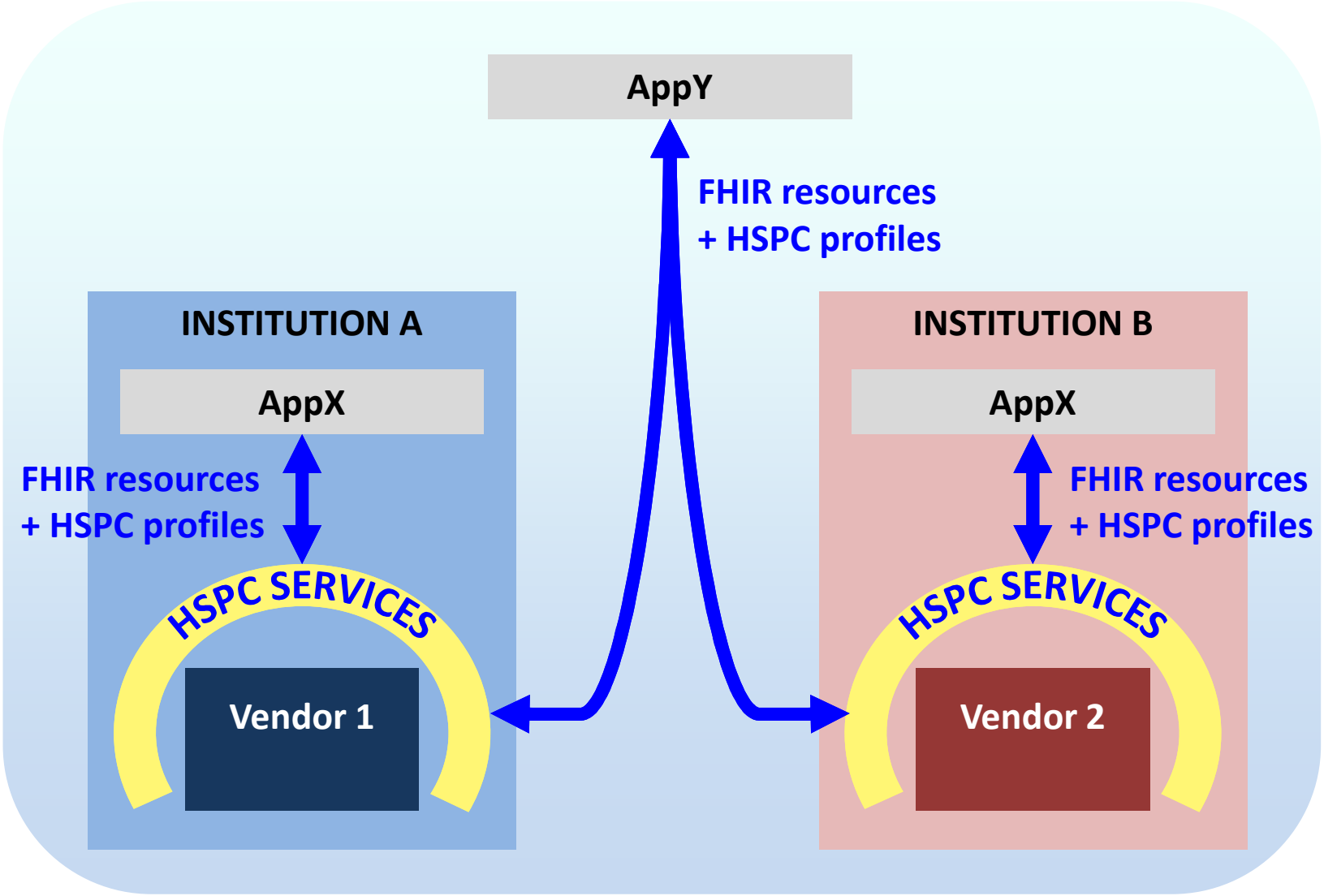
- Services – FHIR
- Logical Data models (basis for FHIR profiles)
  - CIMI models + other existing content
- Terminology
  - LOINC, SNOMED CT, RxNorm, HL7 tables
- EHR Integration – SMART on FHIR

How CIMI and HSPC fit together



CQF Wiki: cqframework.info

The HSPC Mission



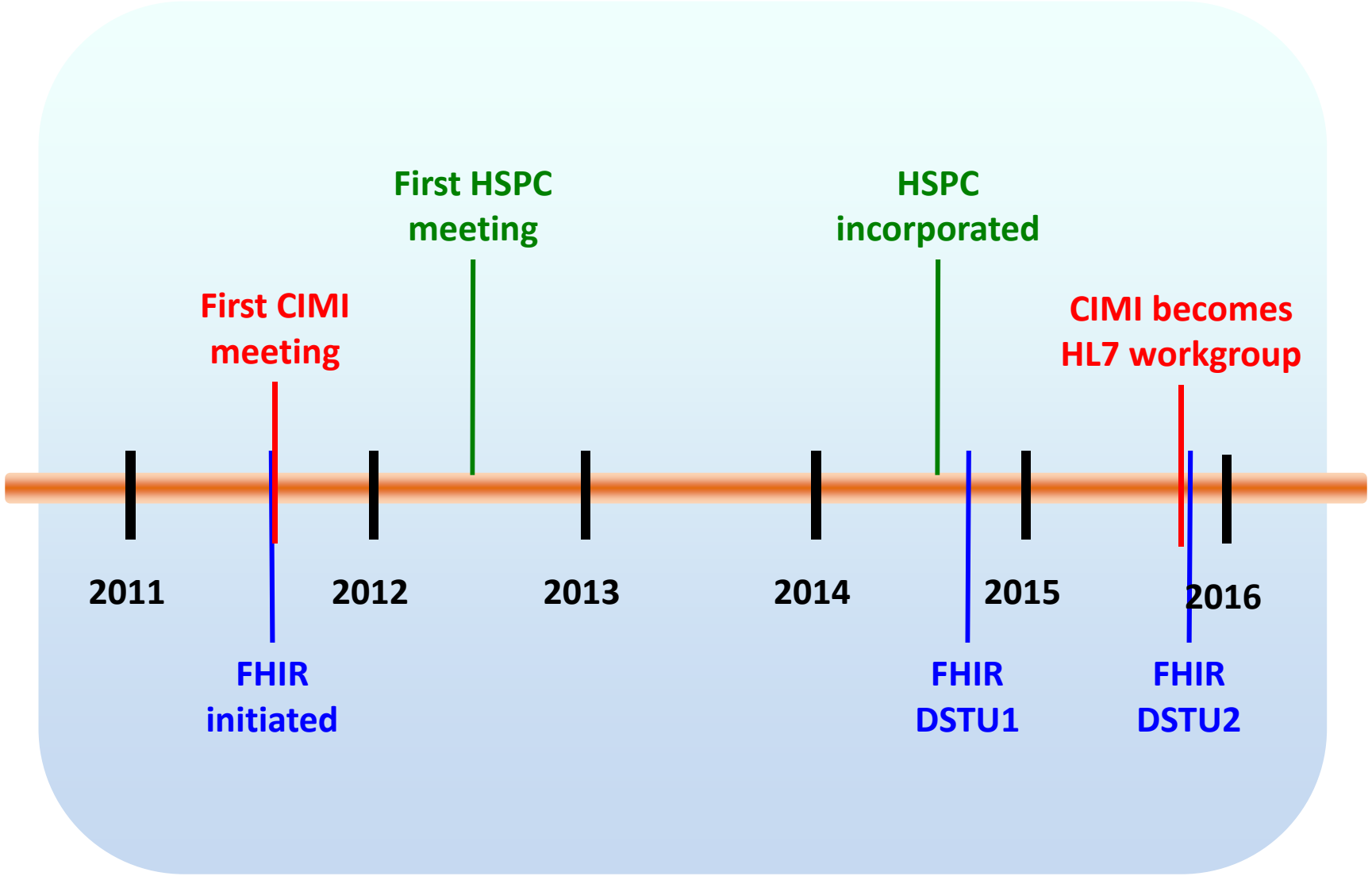
CQF Wiki: cqframework.info

HSPC: More than just Data Virtualization

Specify standards for:

- Implementing a multi-layered services architecture (SOA)
- Supporting common Decision Support models (BPMN2/Drools)
- Supporting common workflow models (BPMN2)
- etc.

The HSPC, CIMI, and FHIR Timeline

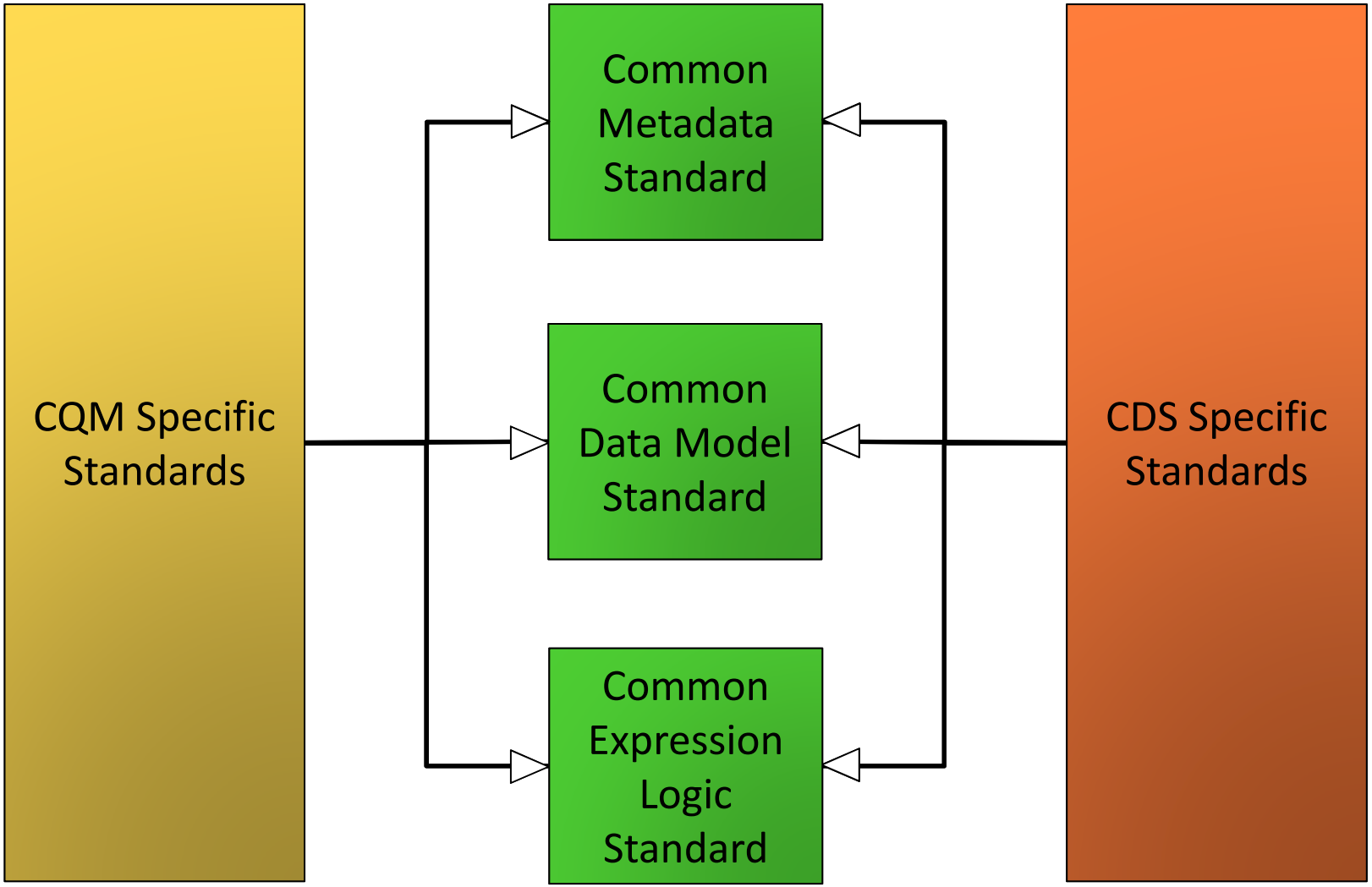


CQF Wiki: cqframework.info

CIMI, HSPC, and CQF

an evolving relationship . . .

CQF Value Statement
(reproduced from wiki.siframework.org)



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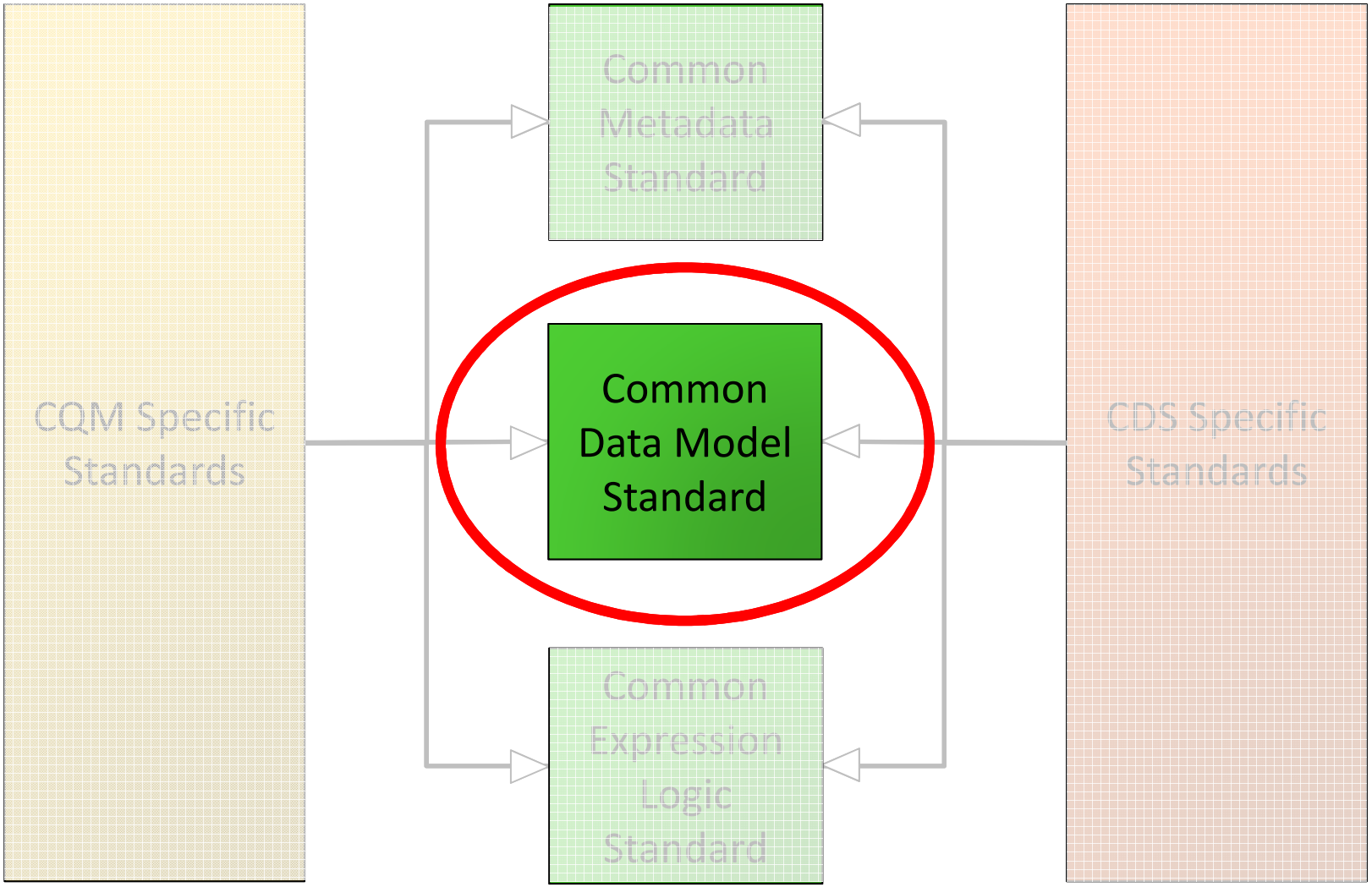
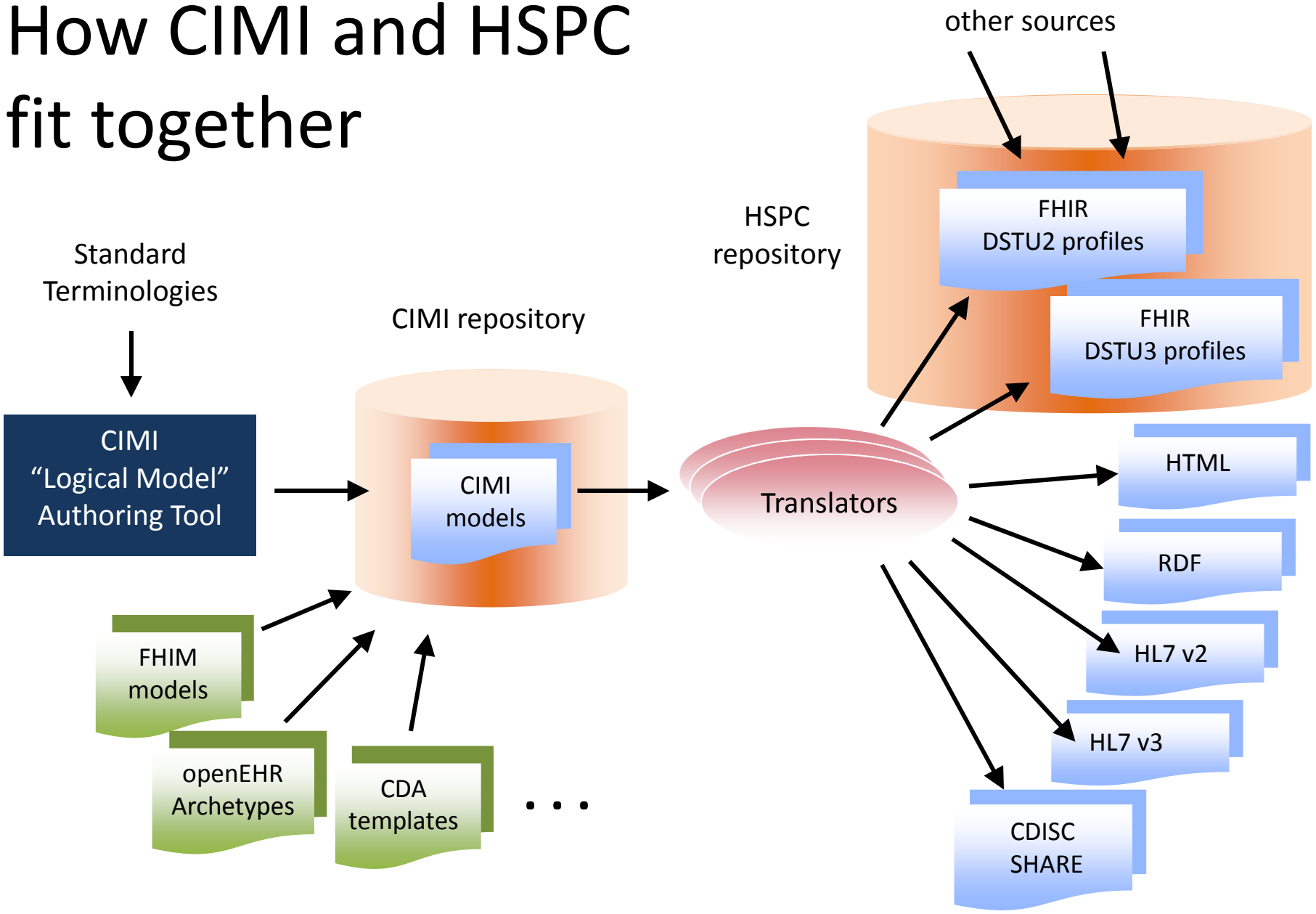


CQF Wiki: cqframework.info

Why it Makes Sense

- Motivation for CIMI/HSPC is decision support and computable data
  - emphasis on coded data
  - tendency toward postcoordination
- CIMI already talking to modeling community
- Synergy -- CQF can leverage CIMI/HSPC experience and content and vice versa

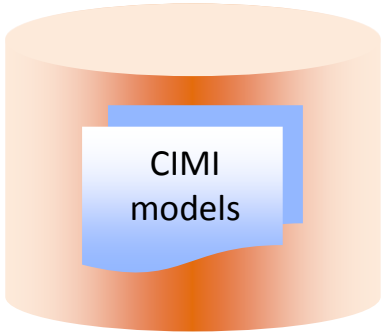
How CIMI and HSPC fit together



CQF Wiki: cqframework.info

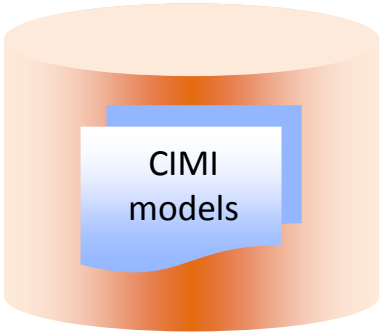
CIMI, HSPC, and CQF

CIMI repository

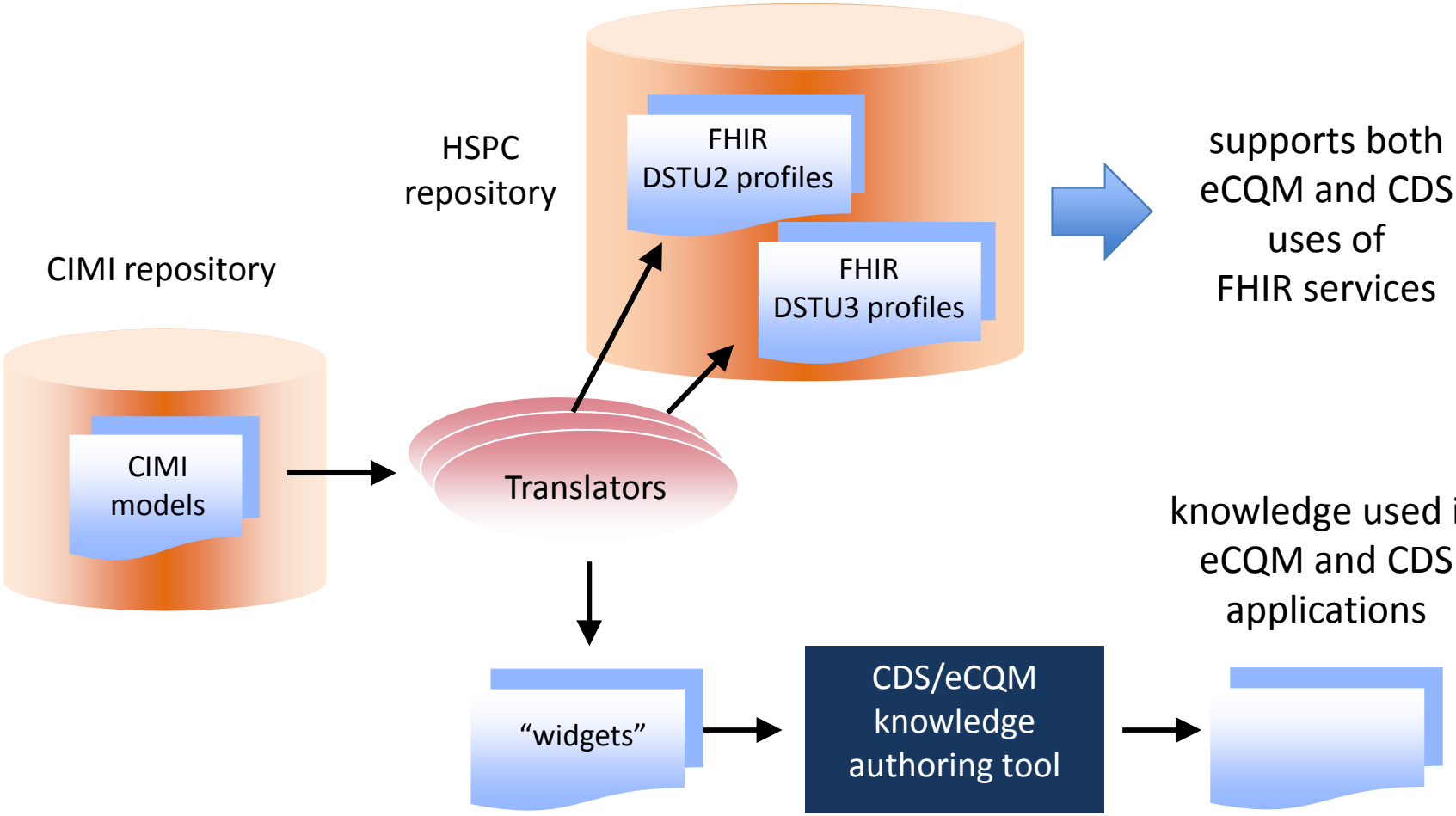


CIMI, HSPC, and CQF

CIMI repository



CIMI, HSPC, and CQF



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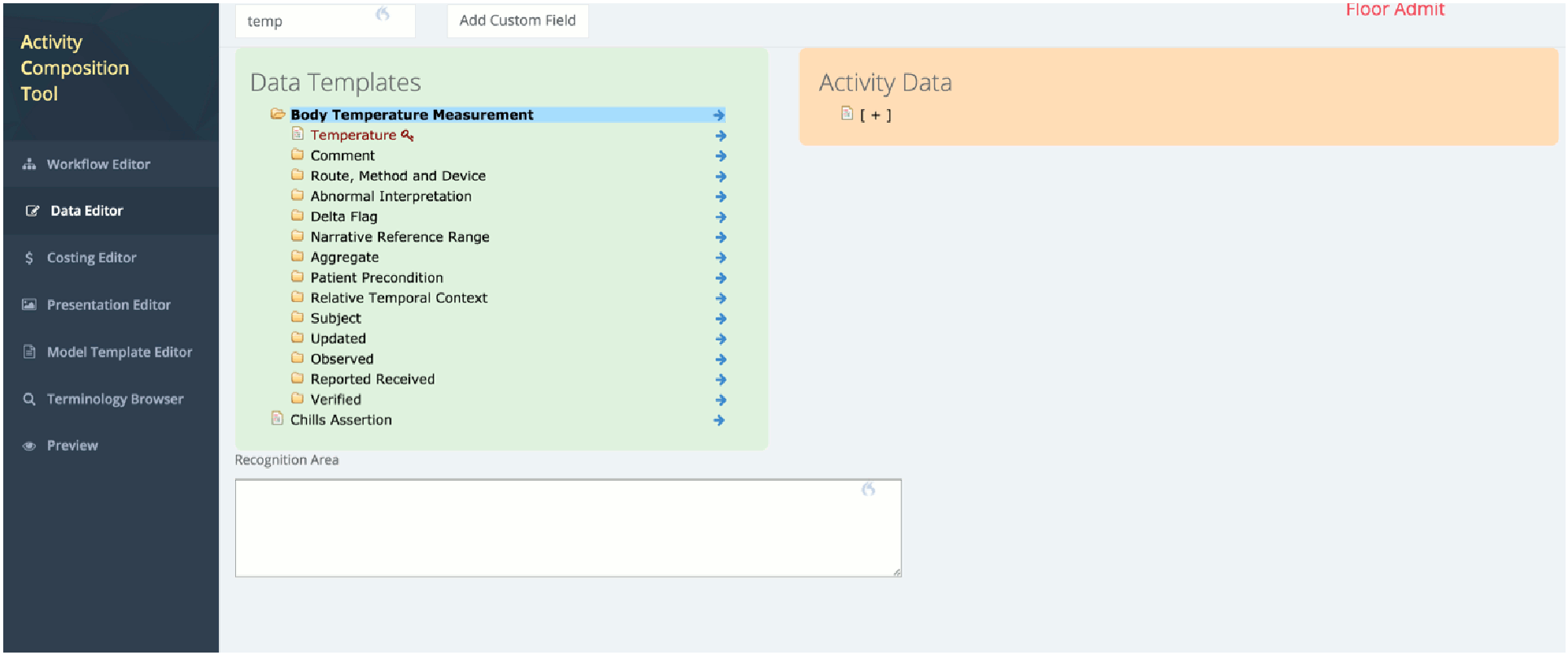
Activity Composition Tool
Workflow Editor
Data Editor
Costing Editor
Presentation Editor
Model Template Editor
Terminology Browser
Preview
temp
Add Custom Field
Floor Admit
Data Templates
Body Temperature Measurement
Temperature
Comment
Route, Method and Device
Abnormal Interpretation
Delta Flag
Narrative Reference Range
Aggregate
Patient Precondition
Relative Temporal Context
Subject
Updated
Observed
Reported Received
Verified
Chills Assertion
Activity Data
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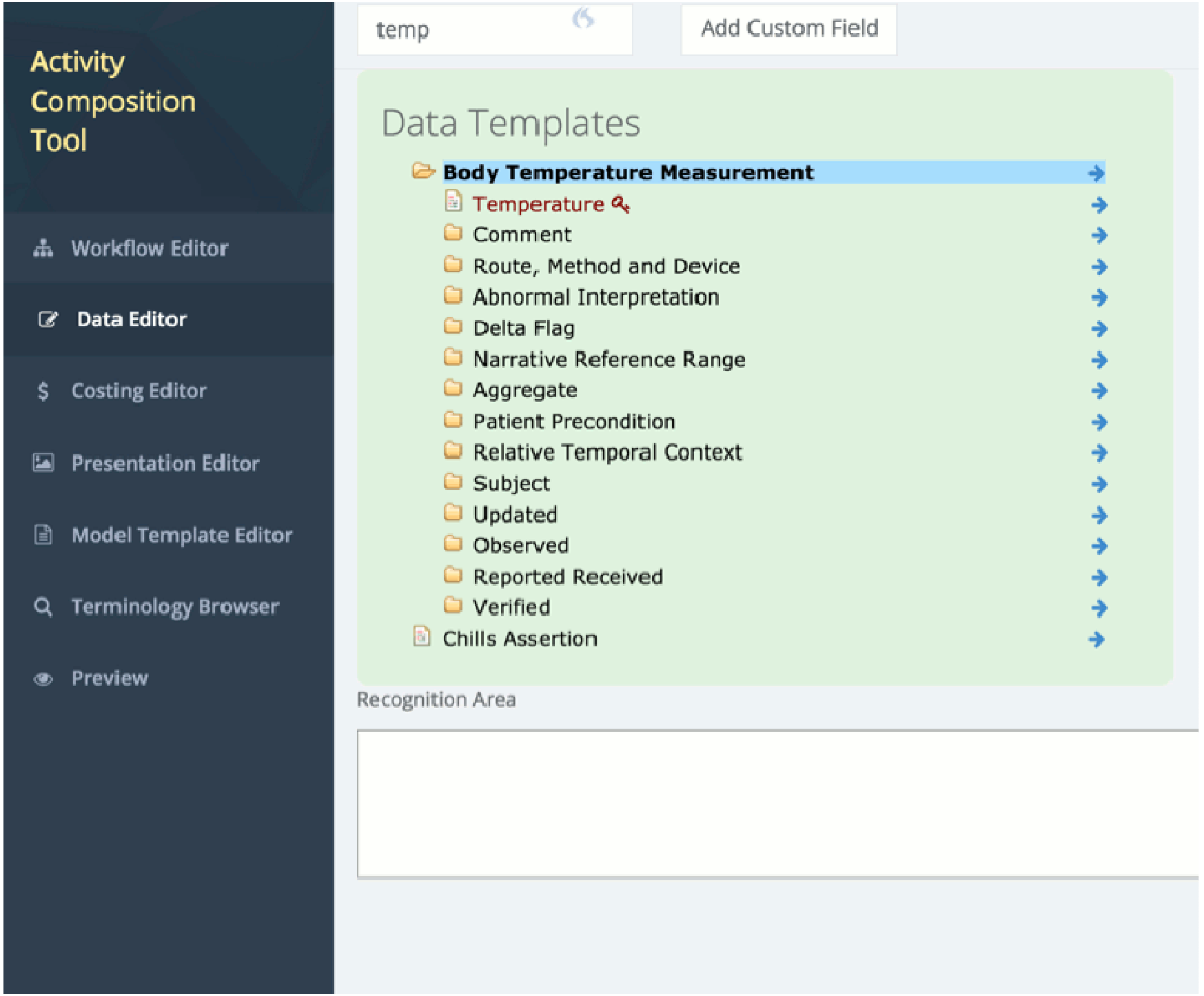
Recognition Area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Temperature
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Verified
Chills Assertion
Recognition Area

Floor Admit

Activity Data

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Floor Admit

Activity Data

Body Temperature Measurement

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Floor Admit

Activity Data

- Body Temperature Measurement +F +P ×
- Heart Rate Measurement +F +P ×
- Blood Pressure Measurement +F +P ×
- Respiratory Rate Measurement +F +P ×
- Pain Assertion +F +P ×
- Height Measurement +F +P ×
- Body Weight Measurement +F +P ×
- Personal Belongings Disposition Evaluation +F +P ×
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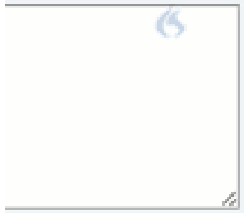

Conclusion

- CIMI/HSPC can serve as the data model standard needed by the CQF effort.
- CIMI models can serve as the logical basis for HSPC FHIR profiles and CDS/eCQM knowledge artifacts adopted by CQF.
- CIMI/HSPC + CQF => synergy

DISCUSSION AND Q&A

Discussion Questions

- What do you think about the proliferation of standards and efforts to coordinate among standards development initiatives? Do you think the alignment efforts described are headed in the right direction?
- What recommendations do you have for standards development and implementation in this area?
- What gaps still exist in the available standards related to CDS and eCQM? How should we address those gaps?
- What clinical domain areas can most benefit from standards-based, interoperable CDS and eCQM (e.g., immunizations, chronic disease management, chemotherapy)?
- How should CDS and eCQM be leveraged in the short-term and long-term to improve clinical quality and health outcomes?

Thank You!

Panelist	Title	Initiative Role
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Tom Oniki, PhD Tom.Oniki@imail.org	Senior Medical Informaticist Intermountain Healthcare	Collaboration Coordinator, HSPC and CIMI

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