



AGENCY FOR HEALTHCARE RESEARCH AND QUALITY



# April 2020 CDS Connect Work Group Call



# CDS Connect

# Agenda

Schedule	Topic
• 3:00 – 3:02	• Roll Call, Michelle Lenox (MITRE)
• 3:02 – 3:05	• Review of the Agenda, Maria Michaels (CDC)
• 3:05 – 3:40	• A FHIR-Based CDS Sandbox, Andrey Soares, Ph.D.
• 3:40 – 3:50	• What's New with CDS Connect This Month (MITRE)
• 3:50 – 4:00	<ul style="list-style-type: none"><li>• Open Discussion and Close Out, Maria Michaels (CDC)</li><li>• Open discussion and announcements</li><li>• Concluding comments, review next steps and adjourn</li></ul>

# Objectives

- Discuss a FHIR-based CDS sandbox, Andrey Soares, Ph.D.
- Share lessons learned for use of the CDS Connect
- Share new features and resources available for CDS Connect
- Discuss topics of interest to members relating to opportunities for CDS Connect

# A FHIR-BASED CDS SANDBOX

**Andrey Soares, Ph.D.**

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Data Science to Patient Value (D2V)

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# CDS Sandbox



CDS  
DEVELOPMENT



INDUSTRY  
STANDARDS



INTEROPERABILITY  
WITH FHIR



OPEN SOURCE  
TOOLS



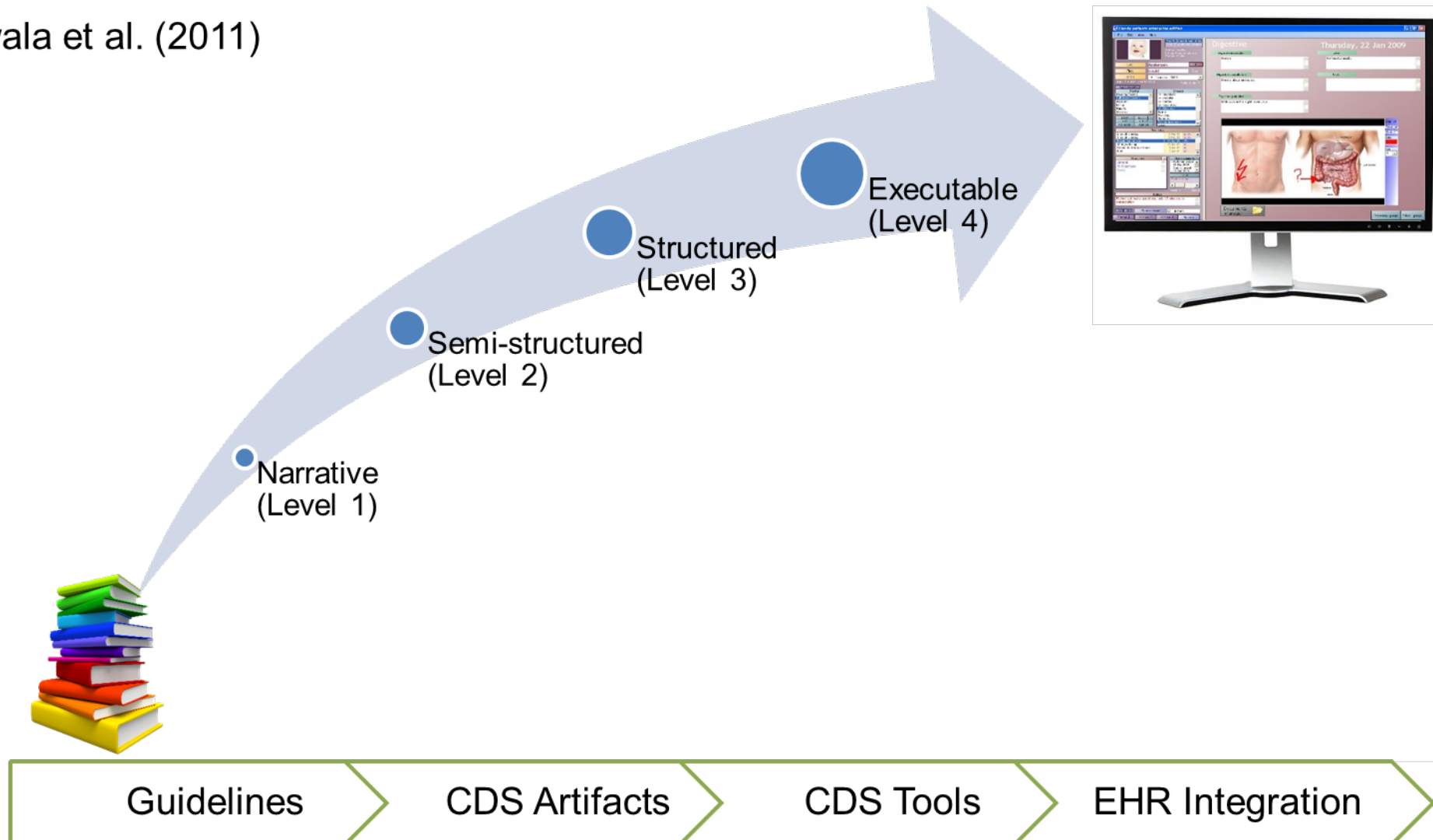
INTEGRATION WITH  
EHR



EHR AGNOSTIC

# Knowledge translation in CDS

Boxwala et al. (2011)



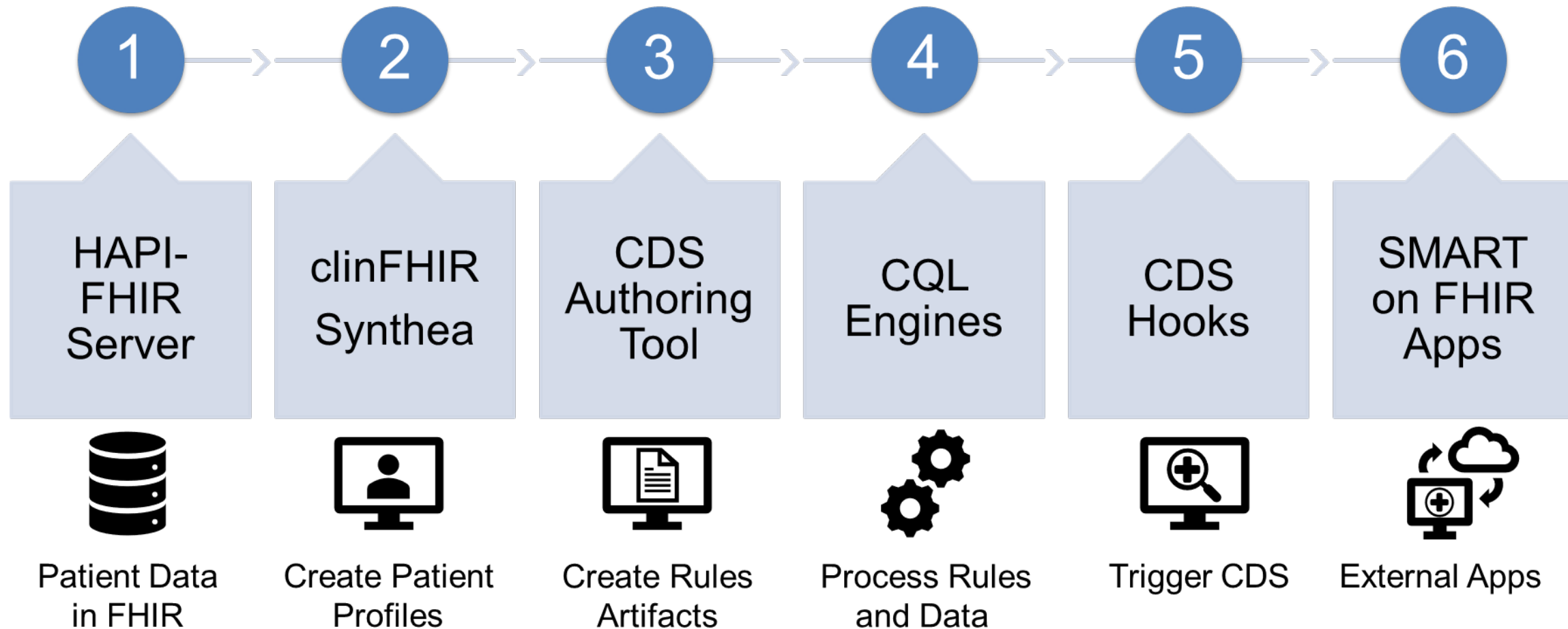
# Technologies and Tools



clinFHIR



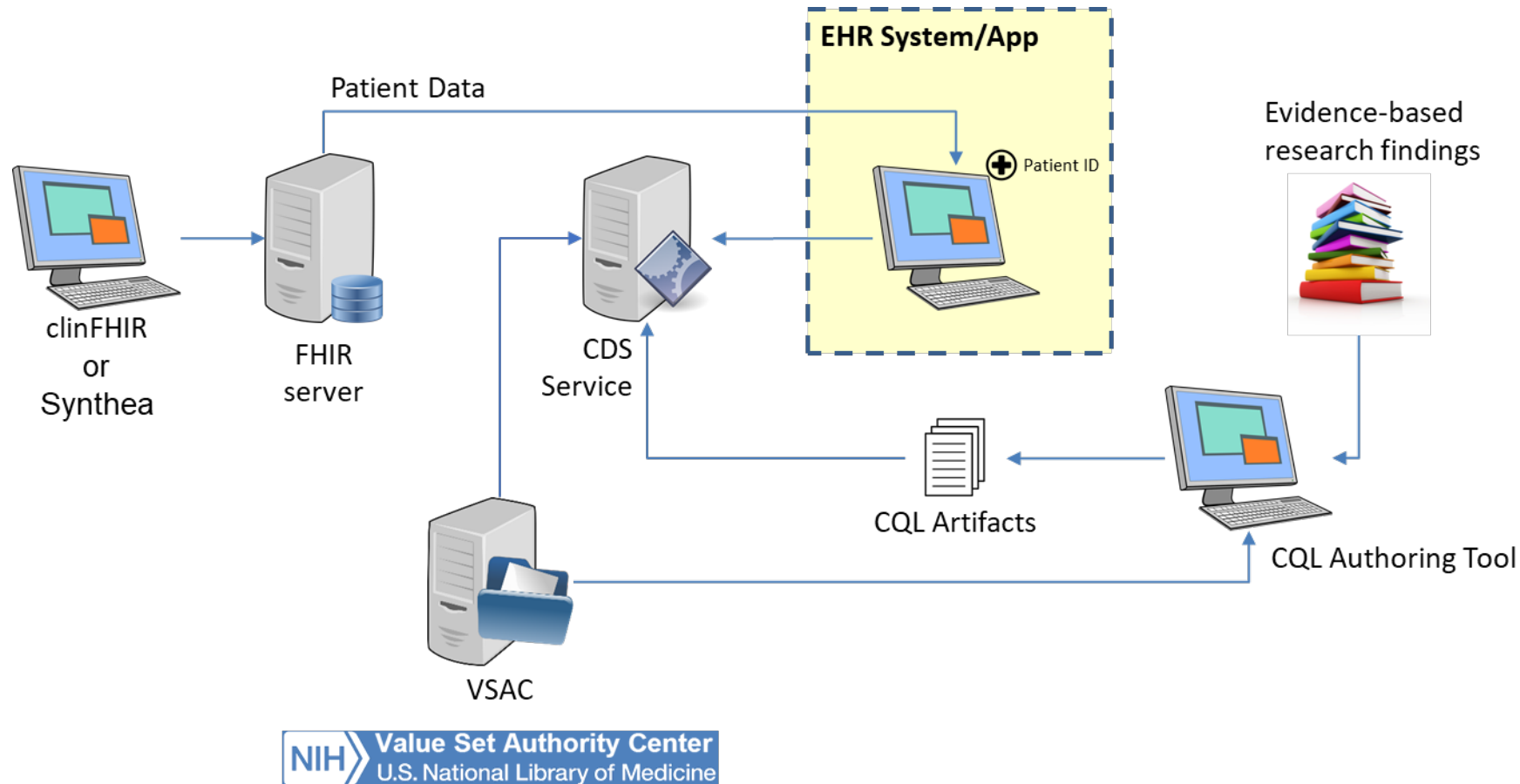
# Open-Source CDS Sandbox





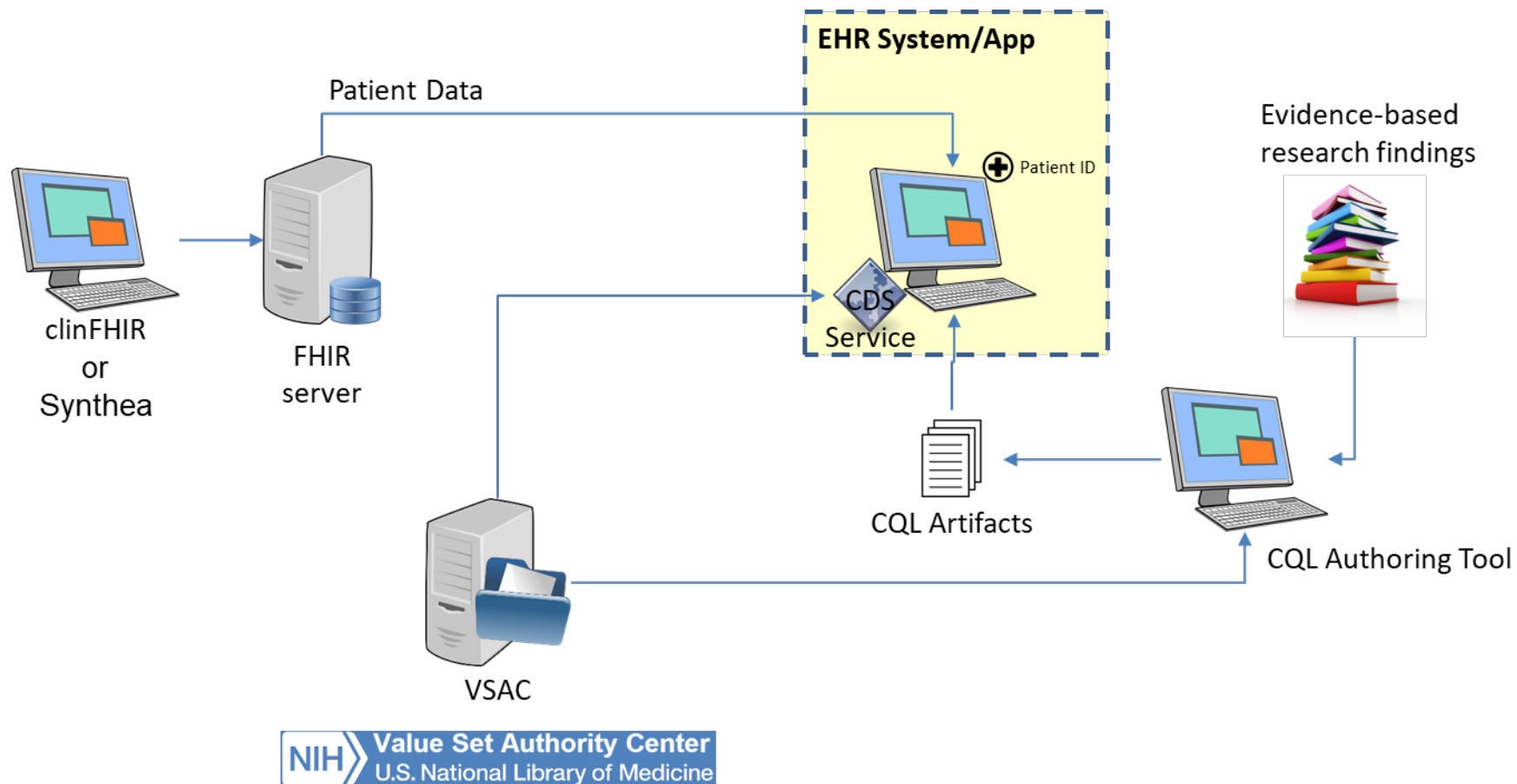
# CQL Engine: Form 1

## 1) AHRQ-CDS-Connect-CQL-SERVICES



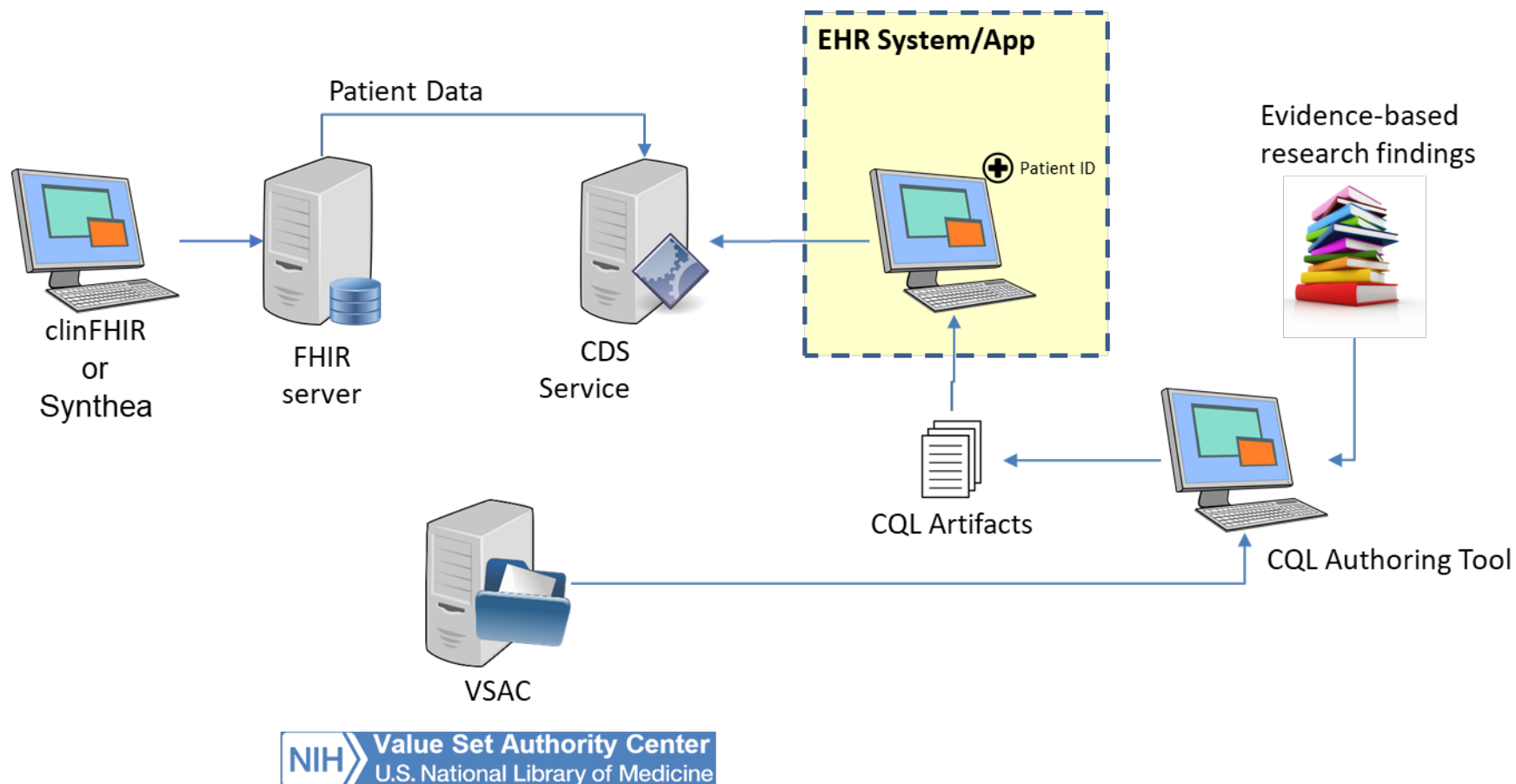
# CQL Engine: Form 2

## 2) cql-execution



# CQL Engine: Form 3

## 3) cql\_execution\_service



# Summary

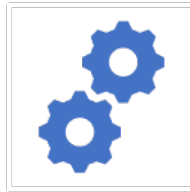
Characteristics	AHRQ-CQL-Services	cql-execution	cql_execution_service
<b>FHIR Data Model</b>	DSTU2, STU3 and R4	DSTU2, STU3 and R4	DSTU2, STU3 and R4
<b>API Endpoint</b>	Yes	No	Yes
<b>Patient Data</b>	Sent to the engine via API	Sent to the engine via script	Retrieved from FHIR server by the engine
<b>Use of CQL Artifacts</b>	Pre-Loaded to the engine	Sent to the engine via script	Sent to the engine via API
<b>Convert CQL to ELM</b>	Convert CQL to JSON	Convert CQL to COFFEE or JSON	The engine handles the conversion
<b>Import Libraries</b>	Yes	Yes	Yes
<b>Latest Commit (as of 04/08/2020)</b>	November 22, 2019	March 20, 2020	April 02, 2020

# Presentation/Demos at the University



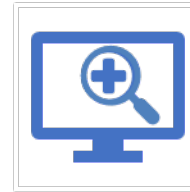
## CQL Authoring

Mammography Screening



## CQL Engine

Statin Therapy



## CDS Hooks

Statin Therapy



## SMART on FHIR

Pain Management  
ASCVD Risk Calculator

# CDS Authoring tool in a graduate course



- **Course Instructor:** Mustafa Ozkaynak, PhD
- **Degree:** MS in Nursing – Health Care Informatics
- **Course:** Decision Support Systems and Data Management
- **Module:** #3 Decision Support Tools
- **Assignment:** Decision Tool Description or Development
  - ▶ Students have two options: (1) Describe a CDS in their clinical settings  
(2) Use CDS Authoring Tool

# Building CDS

## Diabetes

If the patient meets any one or more of these clinical definitions:

### Definition 1:

- ▶ Has any lab result (LOINC: 4548-4, 17856-6, 4549-2) GHBA1C greater than or equal to 7

-or-

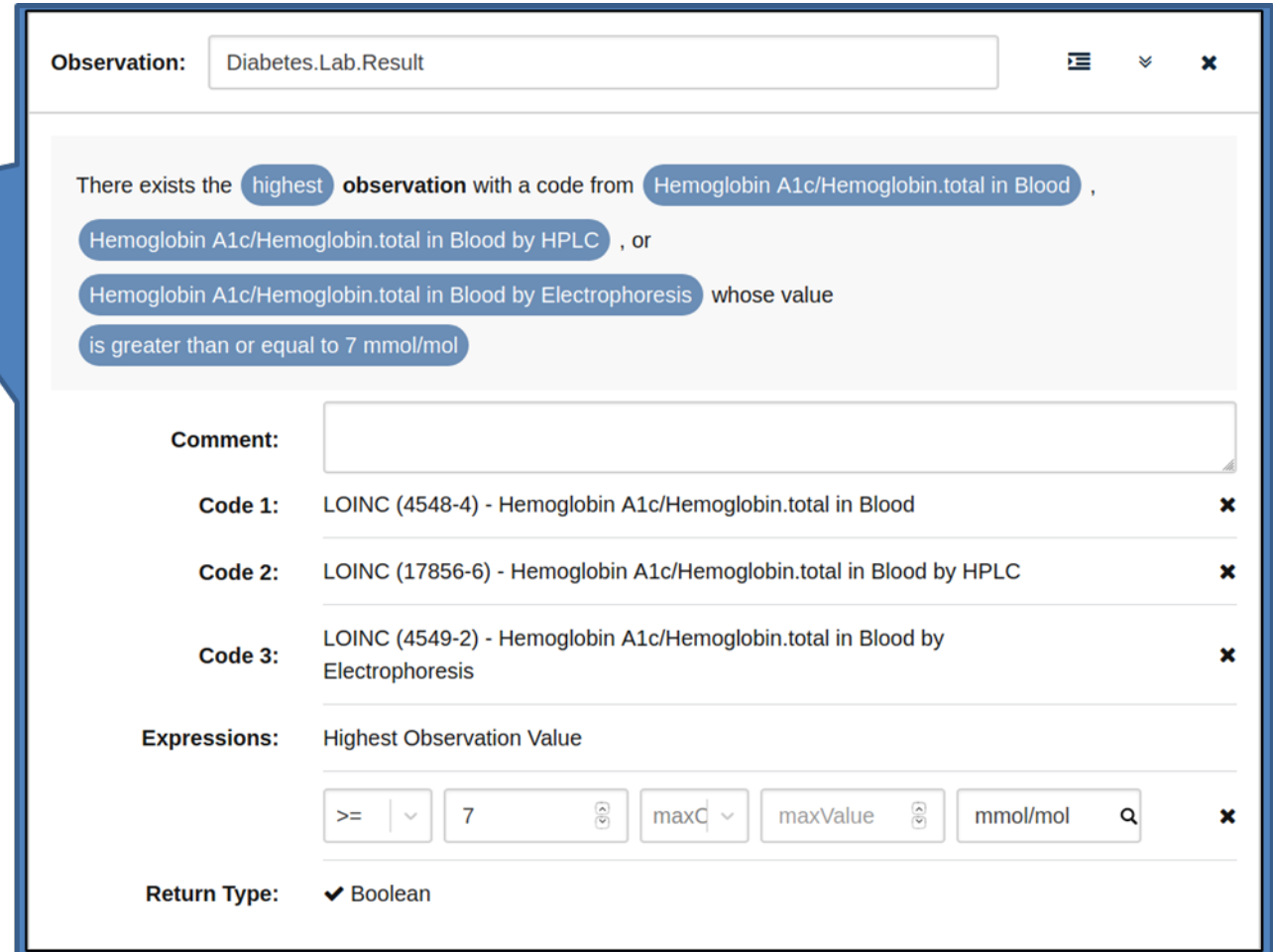
### Definition 2:

- ▶ Has 2 or more billing codes matching 250, 250.0, 250.00, 250.01, 250.02, 250.03, 250.1, 250.10, 250.11, 250.12, 250.13, 250.2, 250.20, 250.21, 250.22, 250.23, 250.3, 250.30, 250.31, 250.32, 250.33, 250.4, 250.40, 250.41, 250.42, 250.43, 250.5, 250.50, 250.51, 250.52, 250.53, 250.6, 250.60, 250.61, 250.62, 250.63, 250.7, 250.70, 250.71, 250.72, 250.73, 250.8, 250.80, 250.81, 250.82, 250.83, 250.9, 250.90, 250.91, 250.92, 250.93. (Diabetes) in his or her problem list.

-or-

### Definition 3:

- ▶ At least one medication in:
  - ETC classes:
    - 5886 (Injectable Antidiabetic Agents)
    - 154 (Oral Antidiabetic Agents)



The screenshot shows a CDS rule editor for the observation 'Diabetes.Lab.Result'. The rule logic is displayed in a text area, showing a logical OR of three conditions: the highest observation with a code from 'Hemoglobin A1c/Hemoglobin.total in Blood', 'Hemoglobin A1c/Hemoglobin.total in Blood by HPLC', or 'Hemoglobin A1c/Hemoglobin.total in Blood by Electrophoresis' whose value is greater than or equal to 7 mmol/mol. Below the logic, there are fields for 'Comment', 'Code 1', 'Code 2', and 'Code 3', each with a corresponding LOINC code and a delete icon. The 'Expressions' field shows 'Highest Observation Value' with a dropdown menu set to 'maxC' and a value of 7. The 'Return Type' is set to 'Boolean'.

Observation: Diabetes.Lab.Result

There exists the highest observation with a code from Hemoglobin A1c/Hemoglobin.total in Blood , Hemoglobin A1c/Hemoglobin.total in Blood by HPLC , or Hemoglobin A1c/Hemoglobin.total in Blood by Electrophoresis whose value is greater than or equal to 7 mmol/mol

Comment:

Code 1: LOINC (4548-4) - Hemoglobin A1c/Hemoglobin.total in Blood

Code 2: LOINC (17856-6) - Hemoglobin A1c/Hemoglobin.total in Blood by HPLC

Code 3: LOINC (4549-2) - Hemoglobin A1c/Hemoglobin.total in Blood by Electrophoresis

Expressions: Highest Observation Value

>= 7 maxC maxValue mmol/mol

Return Type: Boolean

# Future Plans

- Develop a hands-on workshop to disseminate these technologies
  - ▶ AMIA CDS Working Group submitted a workshop to AMIA 2020 Symposium
- Build CDS to demonstrate the sandbox tools
  - ▶ Currently building an app
- Support research and innovations
  - ▶ R&D environment





# **DISCUSSION:**

## **A FHIR-BASED CDS SANDBOX**

# WHAT'S NEW WITH CDS CONNECT

David Winters and Chris Moesel, MITRE

# Updates and New Features



- Authoring Tool
  - ▶ Updated User Guide documentation
  - ▶ Added support for FHIR R4
  - ▶ CPG-on-FHIR alignments in CQL-to-ELM Translator
- Prototype Tools
  - ▶ [CQL Services](#)
    - Version 1.5: Added support for FHIR STU3 and FHIR R4
  - ▶ [Pain Management Summary App](#)
    - Versions 0.3.2: Update table of local codes in documentation
- Repository
  - ▶ Updated and expanded use of "Join Work Group" button
  - ▶ Additional general text updates on various pages (e.g., Work Group, etc.)
- Artifacts
  - ▶ [Factors to Consider in Managing Chronic Pain: A Pain Management Summary](#)
    - DSTU2 update and R4 representation
  - ▶ AHRQ stewarded L3 artifacts receive updated test patient packages

Link to CDS Connect: <https://cds.ahrq.gov/cdsconnect>

# **ANNOUNCEMENTS, OPEN DISCUSSION AND CLOSE-OUT**

Maria Michaels

Office of Public Health Scientific Services  
Centers for Disease Control and Prevention

# Announcement



d i s t a n c e d .

- Host: Sunil Rajaraman
  - ▶ <https://www.distancedpod.com>