Sustaining a Community CDS Resource when External Funding Ends: Perspectives from the OpenCDS Experience

December 6, 2011

From Demonstration to Standard Practice: Developing Sustainable Tools and Processes for CDS
AHRQ CDS Meeting, Rockville, Maryland

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UNIVERSITY OF UTAH HEALTH CARE

Disclosures

- I am or have recently been a consultant to Partners HealthCare and RAND Corporation for the ONC Advancing CDS Task Order, which is related to the AHRQ CDSC effort.
- I was formerly a consultant for Religent, Inc. and formerly a co-owner and consultant for Clinica Software, Inc., which holds IP rights to a CDS technology known as SEBASTIAN.
- I have no financial competing interests related to OpenCDS.

Agenda

- OpenCDS background and journey
- Lessons learned
- Recommendations
- Discussion

OpenCDS: the 10,000-feet View

- Multi-institutional, collaborative effort to develop scalable, open-source CDS tools and resources
- Primary deliverables:
  - For CDS consumers: CDS services with HL7 Decision Support Service (DSS) interface (~CDSC rules service)
  - For CDS developers: fully-featured, open-source knowledge authoring platform
  - For CDS developers with existing knowledge resources: open-source “wrappers” to share capabilities via HL7 DSS interface

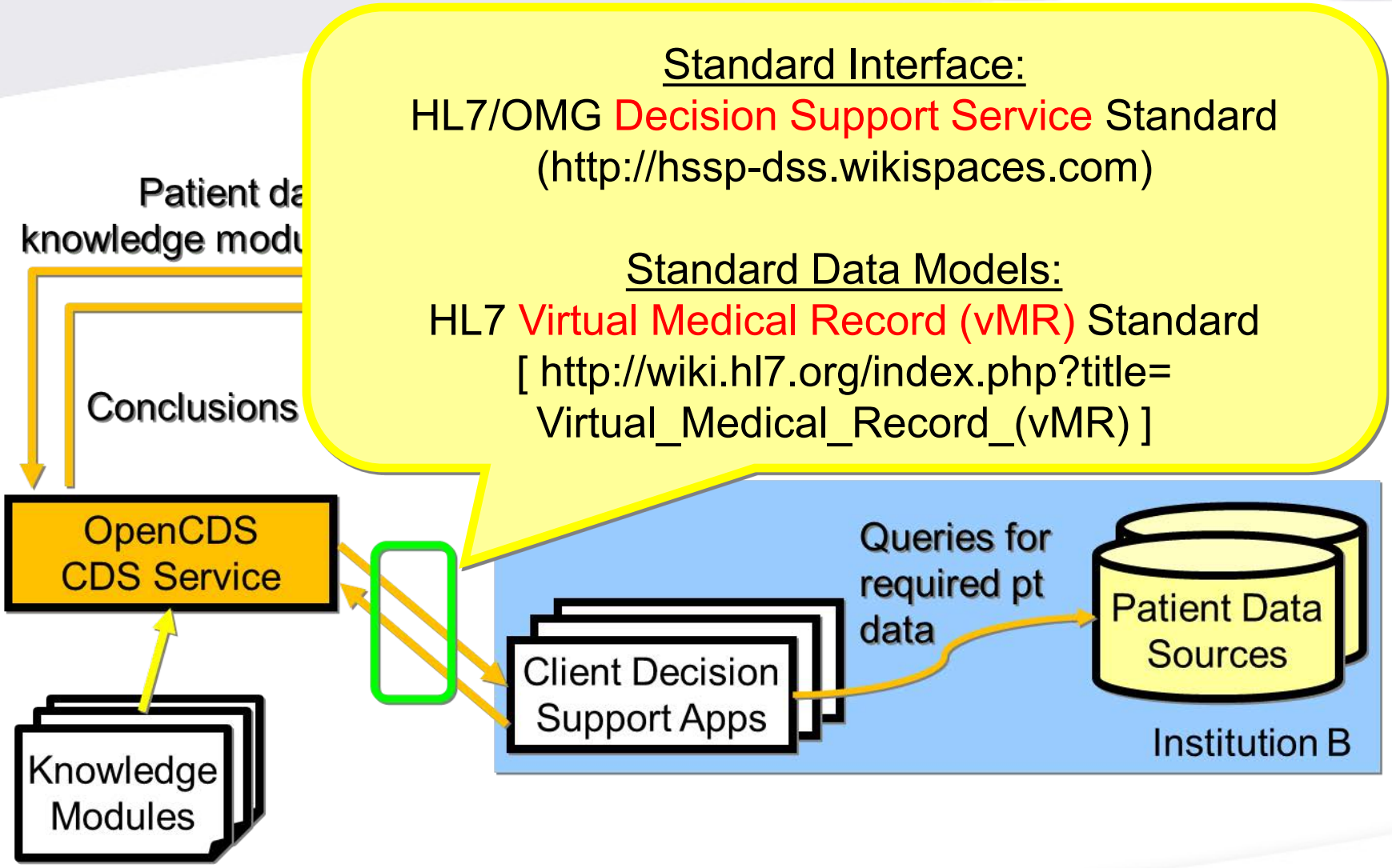
OpenCDS: History

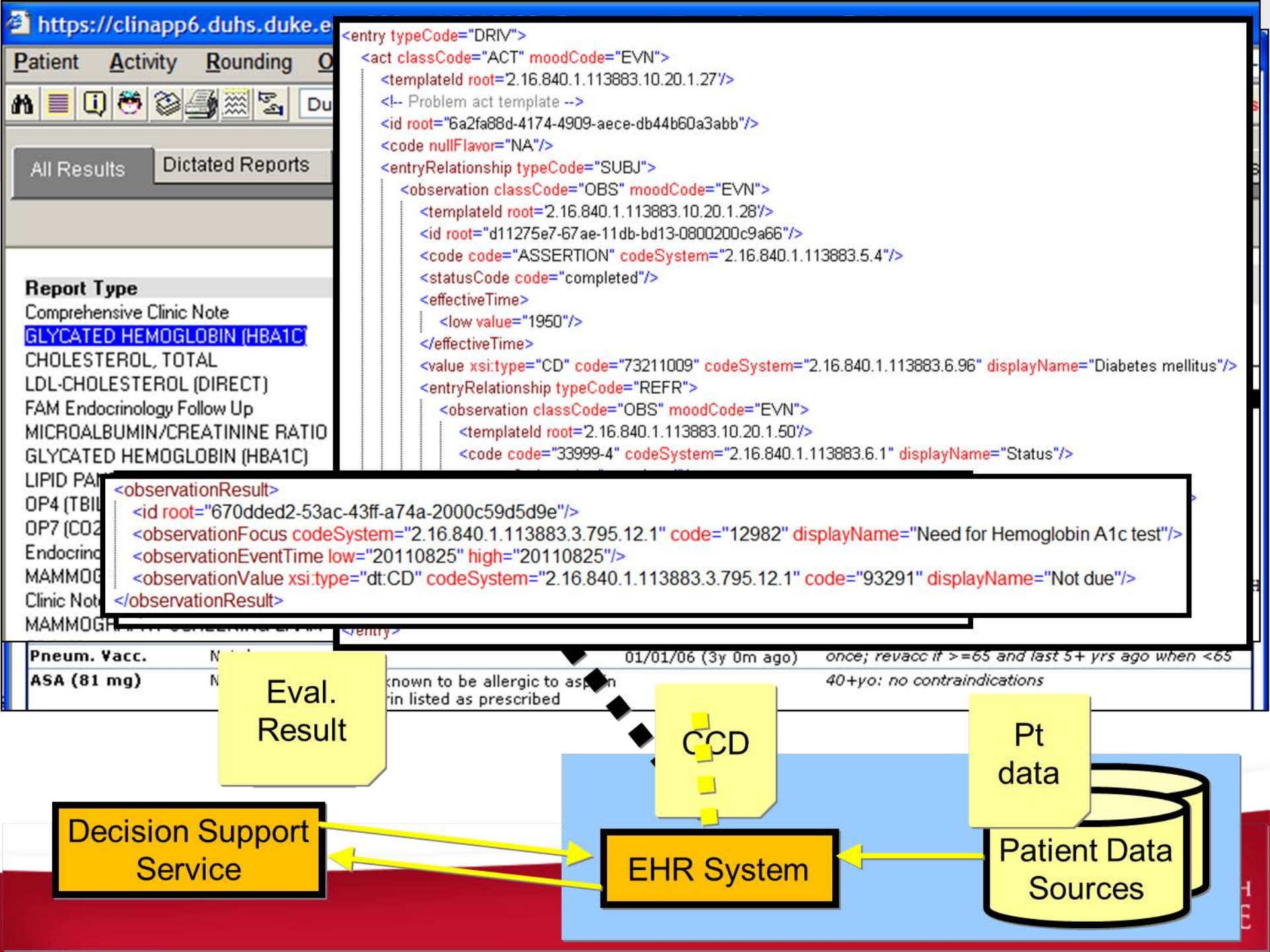
- Early 2000s to 2009: focus on OpenCDS predecessor (SEBASTIAN)
  - Due to commercialization efforts, became difficult to collaborate and scale
- Late 2009: initiation of OpenCDS effort
  - Funding via NHGRI K01 Career Development Award
- Nov 2010: alpha release at AMIA 2010; rapid accrual of collaborators
- Apr 2011: internal funding begins (Univ. of Utah)
- Aug 2011: external funding ends
- Dec 2011: 1.0 release (scheduled)

Collaborators

- University of Utah
- HP Advanced Federal Healthcare Innovation Lab
- HLN Consulting, LLC
- Apelon, Inc.
- Intermountain Healthcare
- New York Citywide Immunization Registry
- Alabama Department of Public Health
- Veterans Health Administration
- Wolters Kluwer Health
- EBSCO
- Univ. of NC at Chapel Hill
- Main Line Health
- Hospital Universitario Virgen del Rocío, Spain
- Keona Health
- Mass. General Hospital
- Stanford University
- MaRS Innovation, Canada
- SmartCare, Africa
- Emetra AS, Norway
- Visumpoint, LLC
- Genesys, LLC
- df8health
- IsoDynamic, Inc.
- Calcudos.com, Inc.
- CogniTech Corporation

OpenCDS – Architectural Overview




https://clinapp6.duhs.duke.e
Patient
Activity
Rounding
All Results
Dictated Reports
Report Type
Comprehensive Clinic Note
GLYCATED HEMOGLOBIN (HBA1C)
CHOLESTEROL, TOTAL
LDL-CHOLESTEROL (DIRECT)
FAM Endocrinology Follow Up
MICROALBUMIN/CREATININE RATIO
GLYCATED HEMOGLOBIN (HBA1C)
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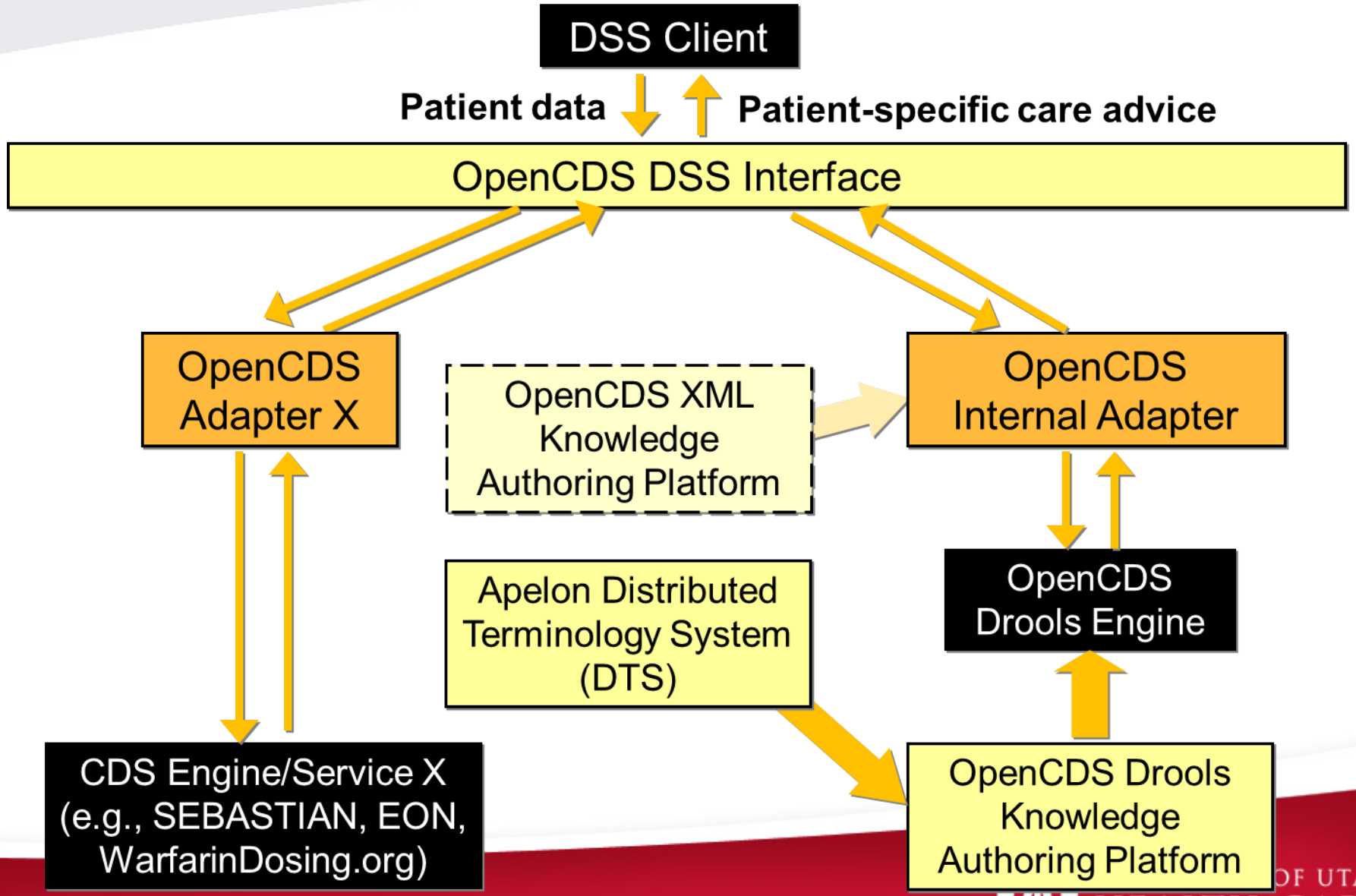
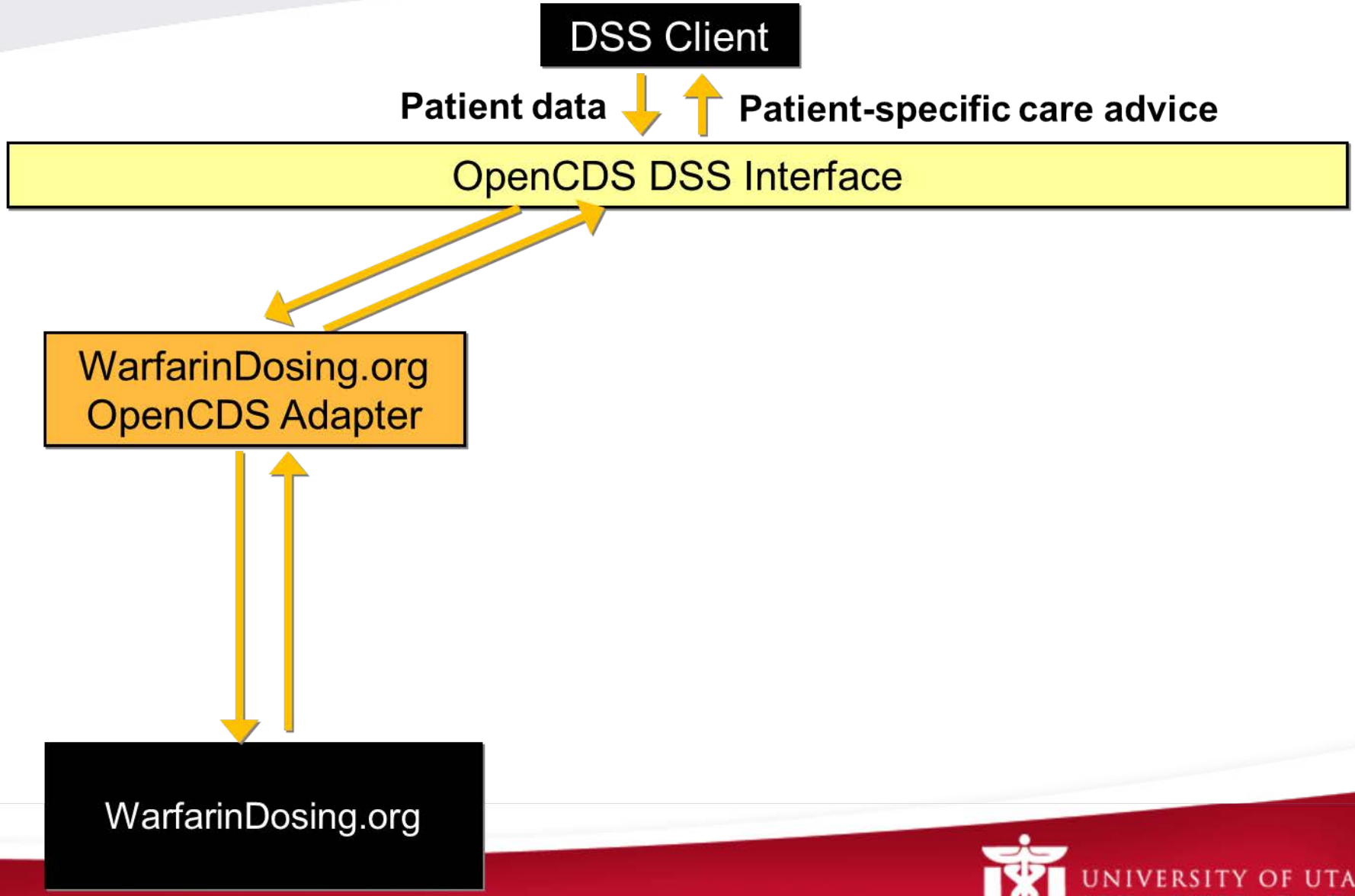
<observationValue xsi:type="dt:CD" codeSystem="2.16.840.1.113883.3.795.12.1" code="93291" displayName="Not due"/>
</observationResult>
Pneum. Vacc.
01/01/06 (3y 0m ago)
once; revacc if >=65 and last 5+ yrs ago when <65
ASA (81 mg)
40+yo: no contraindications
Eval. Result
CCD
Pt data
Decision Support Service
EHR System
Patient Data Sources

Support for Multiple Knowl. Rep. Approaches



WarfarinDosing.org Integration



WARFARINDOSING

www.WarfarinDosing.org

- Warfarin Dosing
- Clinical Trial
- Outcomes
- Hemorrhage Risk
- Patient Education
- Contact Us
- References
- Glossary
- About Us

User:
Patient:
Version 2.34
Build : Oct 30, 2011

Required Patient Information

Age: | **Sex:** -Select- **Ethnicity:** -Select-

Race: -Select-

Weight: lbs **or** kgs

Height: (feet and inches) **or** (cms)

Smokes: -Select- **Liver Disease:** -Select-

Indication: -Select-

Baseline INR: **Target INR:** Randomize & Blind

Amiodarone/Cordarone® Dose: mg/day

Statin/HMG CoA Reductase Inhibitor: -Select-

Any azole (eg. Fluconazole): -Select-

Sulfamethoxazole/Septra/Bactrim/Cotrim/Sulfatrim: -Select-

Genetic Information

VKORC1-1639/3673: Not available/pending

CYP4F2 V433M: Not available/pending

GGCX rs11676382: Not available/pending

CYP2C9*2: Not available/pending

CYP2C9*3: Not available/pending

CYP2C9*5: Not available/pending

CYP2C9*6: Not available/pending

Accept Terms of Use

> ESTIMATE WARFARIN DOSE

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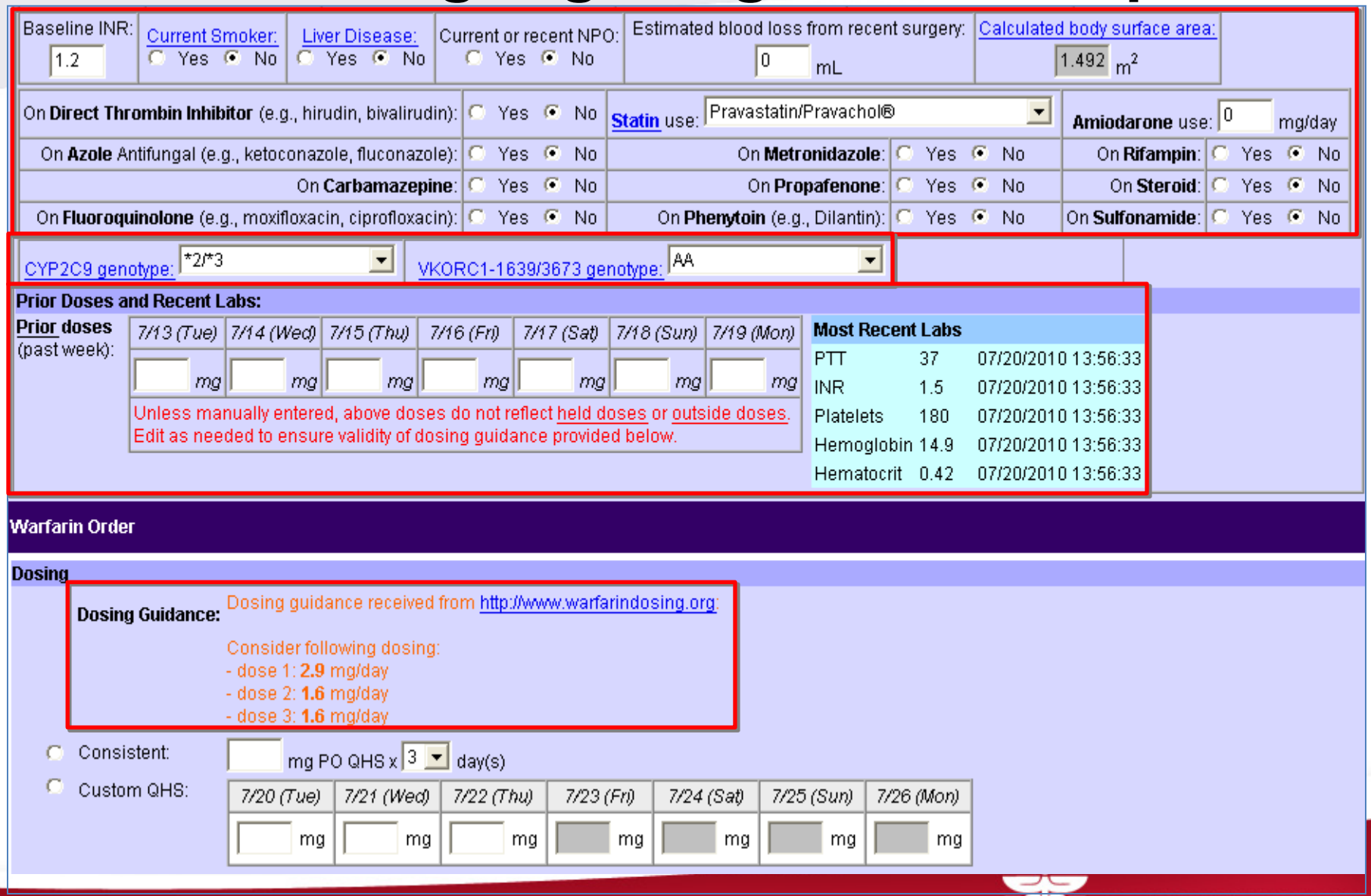
WarfarinDosing.org Integration via OpenCDS



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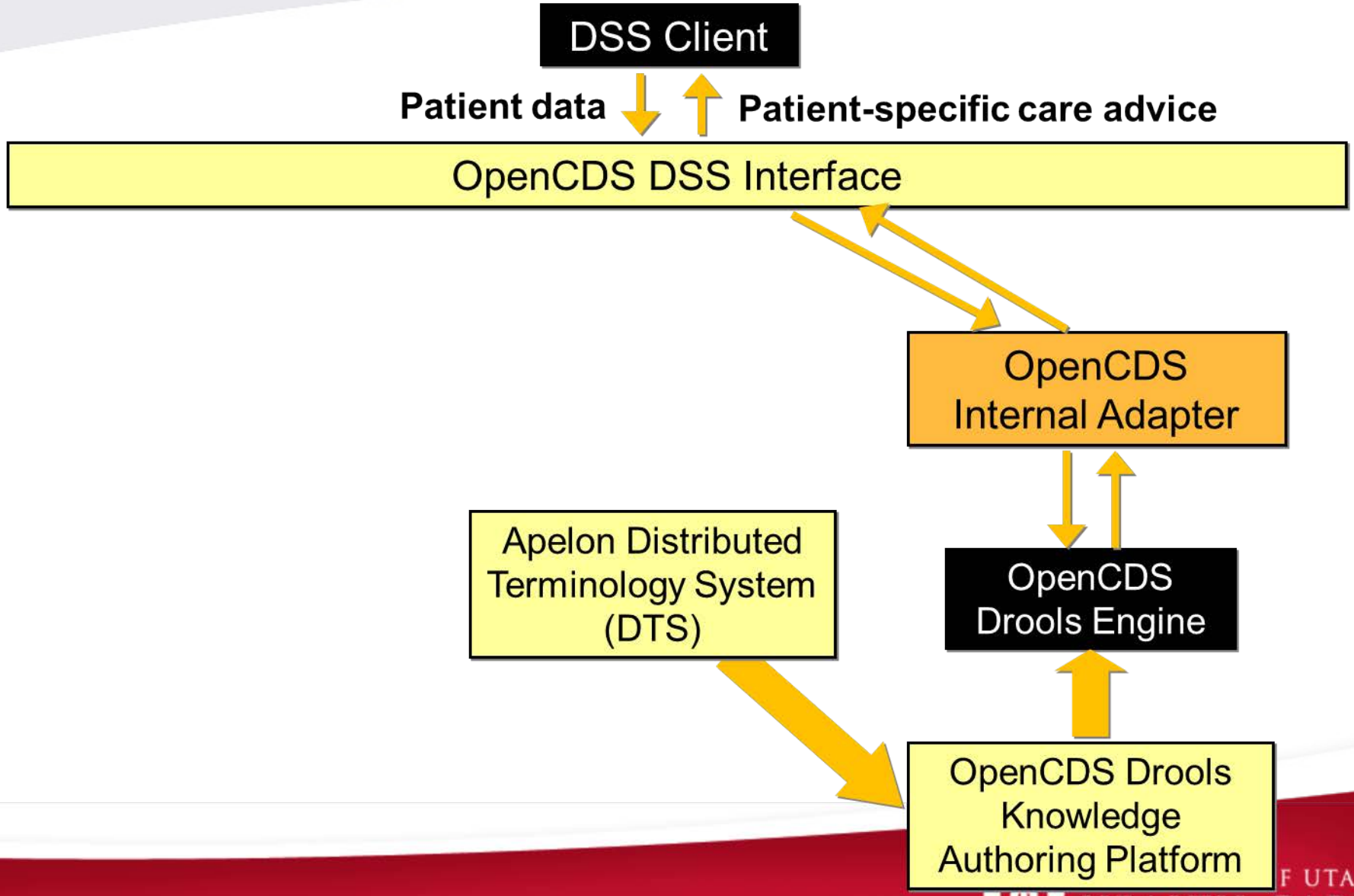
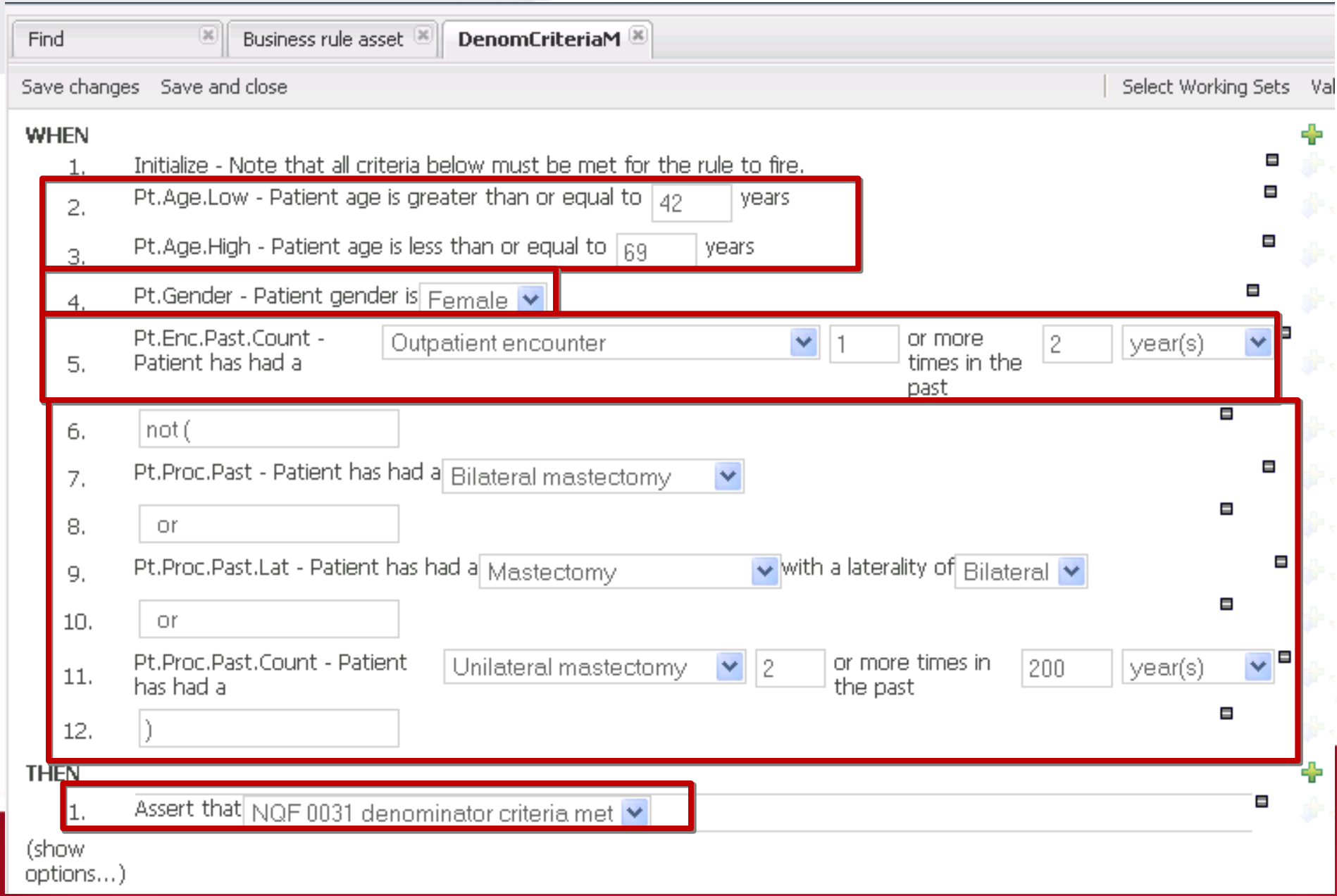
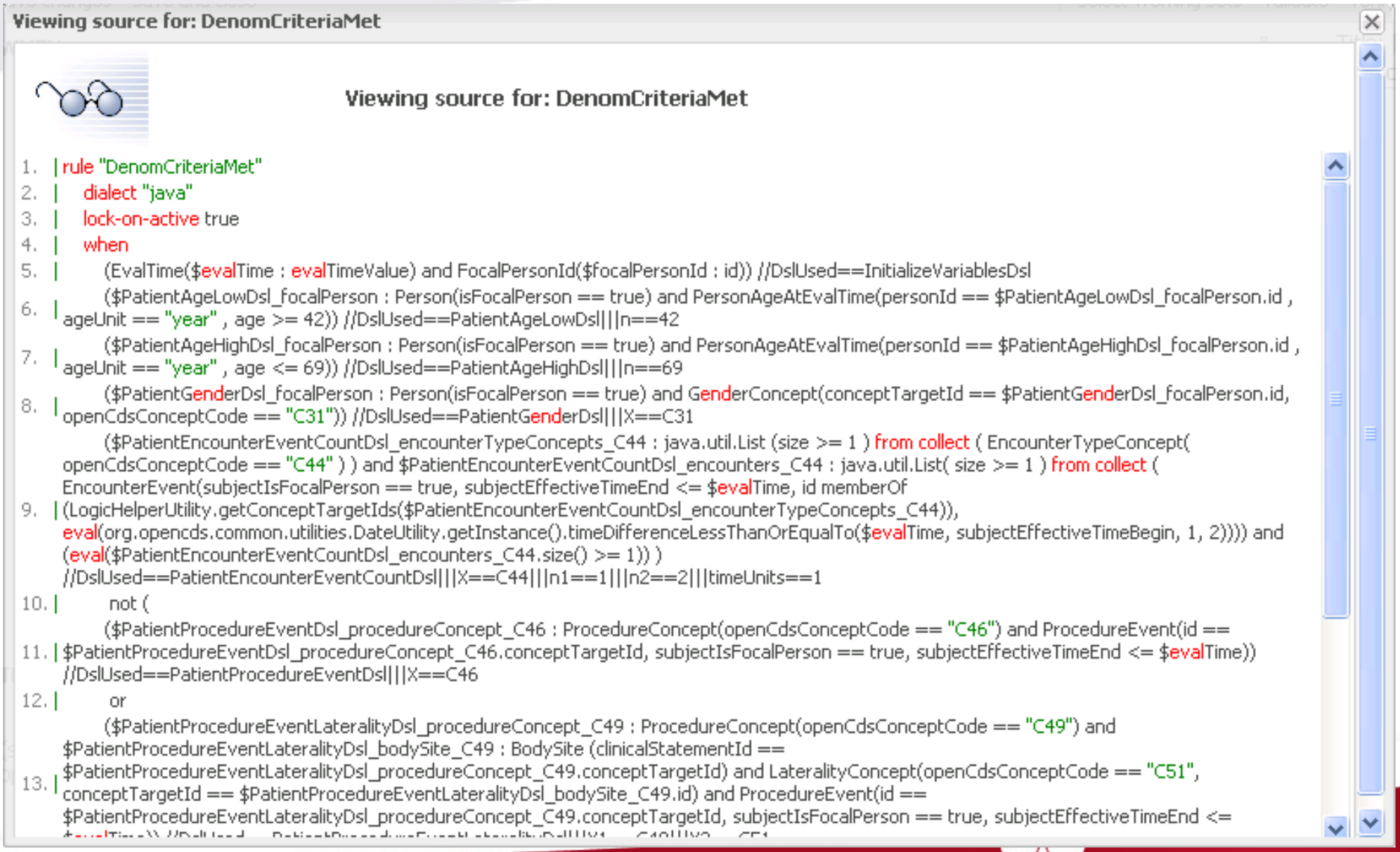
OpenCDS Knowledge Workbench



Web-based Authoring – Decision Rules



OpenCDS Implement. – Underlying Details



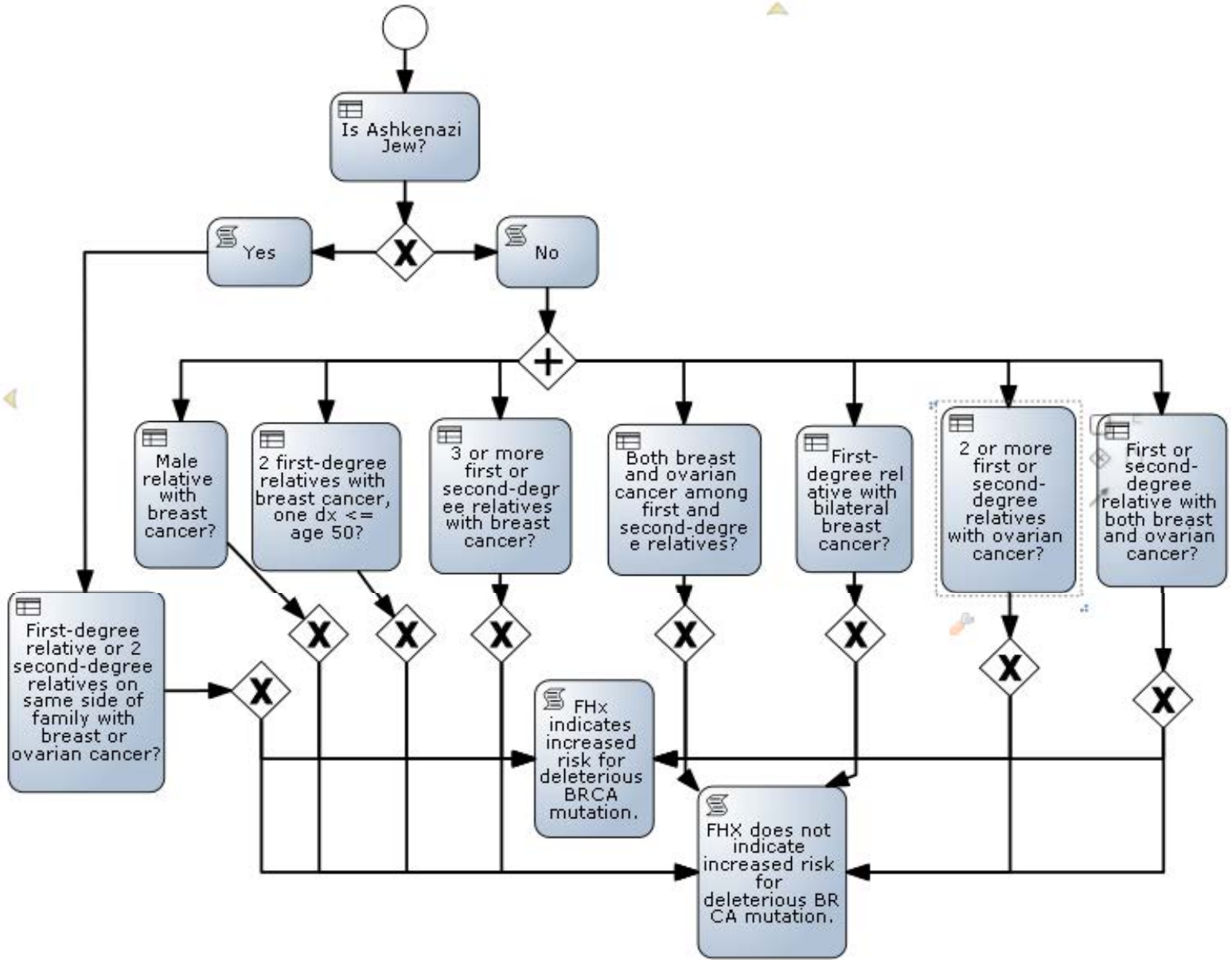

```
1.  rule "DenomCriteriaMet"
2.      dialect "java"
3.      lock-on-active true
4.      when
5.          (EvalTime($evalTime : evalTimeValue) and FocalPersonId($focalPersonId : id)) //DslUsed==InitializeVariablesDsl
6.          ($PatientAgeLowDsl_focalPerson : Person(isFocalPerson == true) and PersonAgeAtEvalTime(personId == $PatientAgeLowDsl_focalPerson.id ,
    ageUnit == "year" , age >= 42)) //DslUsed==PatientAgeLowDsl|||n==42
7.          ($PatientAgeHighDsl_focalPerson : Person(isFocalPerson == true) and PersonAgeAtEvalTime(personId == $PatientAgeHighDsl_focalPerson.id ,
    ageUnit == "year" , age <= 69)) //DslUsed==PatientAgeHighDsl|||n==69
8.          ($PatientGenderDsl_focalPerson : Person(isFocalPerson == true) and GenderConcept(conceptTargetId == $PatientGenderDsl_focalPerson.id,
    openCdsConceptCode == "C31")) //DslUsed==PatientGenderDsl|||X==C31
9.          ($PatientEncounterEventCountDsl_encounterTypeConcepts_C44 : java.util.List (size >= 1 ) from collect ( EncounterTypeConcept(
    openCdsConceptCode == "C44" ) ) and $PatientEncounterEventCountDsl_encounters_C44 : java.util.List( size >= 1 ) from collect (
    EncounterEvent(subjectIsFocalPerson == true, subjectEffectiveTimeEnd <= $evalTime, id memberOf
    (LogicHelperUtility.getConceptTargetIds($PatientEncounterEventCountDsl_encounterTypeConcepts_C44)),
    eval(org.opencds.common.utilities.DateUtility.getInstance().timeDifferenceLessThanOrEqualTo($evalTime, subjectEffectiveTimeBegin, 1, 2)))) and
    (eval($PatientEncounterEventCountDsl_encounters_C44.size() >= 1)) )
    //DslUsed==PatientEncounterEventCountDsl|||X==C44|||n1==1|||n2==2|||timeUnits==1
10.         not (
11.         ($PatientProcedureEventDsl_procedureConcept_C46 : ProcedureConcept(openCdsConceptCode == "C46") and ProcedureEvent(id ==
    $PatientProcedureEventDsl_procedureConcept_C46.conceptTargetId, subjectIsFocalPerson == true, subjectEffectiveTimeEnd <= $evalTime))
    //DslUsed==PatientProcedureEventDsl|||X==C46
12.         or
13.         ($PatientProcedureEventLateralityDsl_procedureConcept_C49 : ProcedureConcept(openCdsConceptCode == "C49") and
    $PatientProcedureEventLateralityDsl_bodySite_C49 : BodySite (clinicalStatementId ==
    $PatientProcedureEventLateralityDsl_procedureConcept_C49.conceptTargetId) and LateralityConcept(openCdsConceptCode == "C51",
    conceptTargetId == $PatientProcedureEventLateralityDsl_bodySite_C49.id) and ProcedureEvent(id ==
    $PatientProcedureEventLateralityDsl_procedureConcept_C49.conceptTargetId, subjectIsFocalPerson == true, subjectEffectiveTimeEnd <=
```

Web-Based Authoring – Decision Table

Decision table

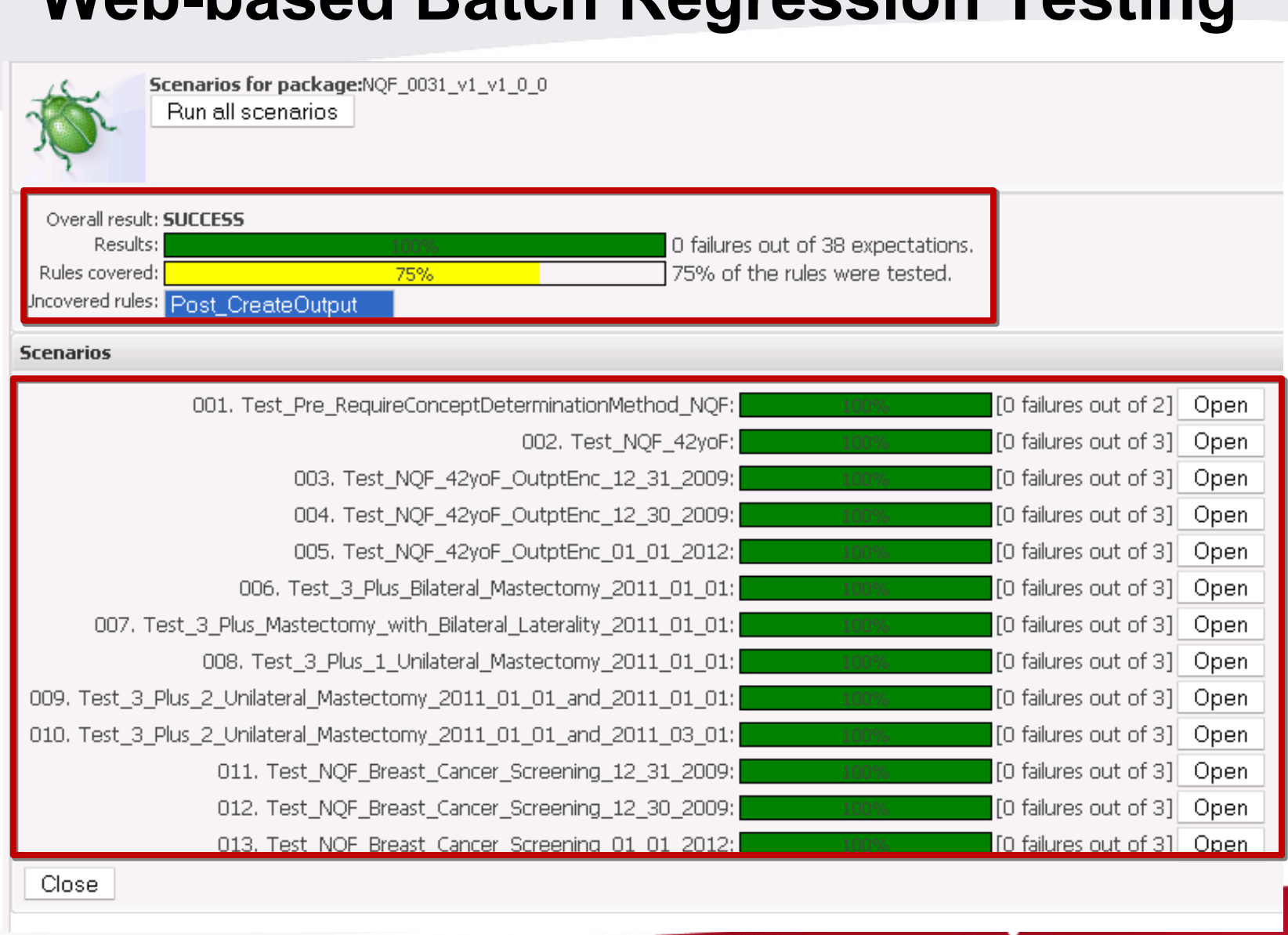
#	Desc	Vaccine	Gender	Dose #	Min Age	Units1	Max Age	Units2	Index Dose #	Min Interval	Units3	Rec Interval	Units4
1		HPV	Female	1	9	Yr	26	Yr					
2				2					1	24	Day	61	Day
3				3					2	80		121	
4									1	164		182	
5			Male	1	11								
6				2					1	24	Day	61	Day
7				3					2	80		121	
8									1	164		182	

Web-Based Authoring – Decision Diagram



Web-based Testing Environment

Web-based Batch Regression Testing



OpenCDS Status

- Alpha release available
- 1.0 preview available to collaborators
- 1.0 release scheduled December 2011
- Multiple ongoing initiatives

Sample Initiatives

- Vaccine forecasting
  - Contributors
    - HLN Consulting, New York Citywide Immunization Registry, Alabama Department of Public Health, University of Utah
  - Developing next-generation immunization CDS knowledge management and delivery platform
- Personalized medicine
  - Contributors
    - Intermountain Healthcare, Washington University, IsoDynamic, University of Utah, potentially others
  - Implementing family history-informed risk assessment algorithms
  - Supporting genetically-guided warfarin dosing via www.WarfarinDosing.org

Sample Initiatives (cont'd)

- Patient-centered medication CDS
  - Contributors
    - HP Advanced Federal Healthcare Innovation Lab, Apelon, University of Utah
  - Developed prototype medication CDS platform for smartphones within a simulated VHA environment
- Enterprise analytics and population health management
  - Contributors
    - University of Utah, others in discussion
  - Part of enterprise Knowledge Management & Mobilization (KMM) initiative

Current Staffing of Core Team

- University of Utah
  - Project director (~0.5 FTE)
  - Senior informaticist (full-time)
  - Senior data warehouse architect (part-time)
  - Multiple graduate students
- HLN Consulting
  - 2 senior software engineers (full-time)
  - Business analyst (part-time)

OpenCDS Funding Sources

- (completed) NHGRI K01 HG004645
- University of Utah Health Care
  - Using OpenCDS to meet institutional business needs
  - Key to sustainability
- University of Utah Dept. of Biomedical Informatics
  - Investing in OpenCDS as platform for future funding
- ONC Beacon Community program
  - Using OpenCDS for public health reporting
- In-kind contributions of various collaborators

Key Lessons Learned

- Local operational support is essential
  - Meeting internal institutional needs must be #1 priority
  - Collaborators may make significant in-kind contributions but are generally reluctant to pay for services
- Grant/contract funding is still very important
  - Significantly strengthens business case for developing a CDS infrastructure that scales beyond local institution
  - Necessary to provide sufficient attention to needs of the community (vs. needs of the local institution)
- An open-source, freely available technology stack significantly facilitates adoption

Key Lessons Learned (cont'd)

- Ask not what the community can do for you; ask what you can do for the community
  - Contributions generally arise because (i) the CDS resource targets an important business need and (ii) the collaborator must enhance the CDS resource to meet its own business need
- Most CDS implementers with established knowledge representation approaches are very reluctant to adopt a new approach
  - Conversely, they are very interested in having their resource made accessible to a wider audience through an open-source, standard service "wrapper"

Key Lessons Learned (cont'd)

- Many organizations are exploring alternate CDS approaches but are reluctant to go "all-in" with any given effort because of multiple competing approaches
  - Collaboration is likely in everybody's interest, especially if external funders can foster such collaboration
- It is incredibly fulfilling to work with like-minded collaborators to establish a community CDS resource

Recommendations

- Ensure local operational support
- Continue to identify and meet community needs
- Move towards low-cost, open-source technology stack
- Support stakeholders who utilize different approaches to knowledge representation
- Coordinate (merge?) efforts with other like-minded initiatives (e.g., OpenCDS)
- Federal agencies: support coordination and further development of community CDS resources

www.opencds.org

OpenCDS

Search this site

Home | Collaborators | Architecture | Key Components | Screenshots | References | Acknowledgments | Alpha Release | Join OpenCDS

Home

What is OpenCDS?

OpenCDS is a **multi-institutional, collaborative effort** to develop **open-source, standards-based clinical decision support (CDS) tools and resources** that can be widely adopted to enable CDS at scale.

Who is Involved?

OpenCDS was founded by Dr. Kensaku Kawamoto, MD, PhD, who is a faculty member at the Duke Center for Health Informatics and a co-chair of the HL7 CDS Work Group. OpenCDS collaborators include the University of Utah, Intermountain Healthcare, the Veterans Health Administration, the University of North Carolina at Chapel Hill, and Apelon, Inc.

Breaking News

OpenCDS Alpha Release Available An alpha release of OpenCDS is now available to collaborators. Please see the Alpha Release tab for more information.
Posted Apr 26, 2011 9:51 AM by Kensaku Kawamoto

EBSCO Joins as OpenCDS Collaborator The OpenCDS team is very excited to announce that EBSCO, one of the leading knowledge content providers in healthcare, has joined OpenCDS as a collaborator. The OpenCDS team will be ...
Posted Apr 26, 2011 9:51 AM by Kensaku Kawamoto

OpenCDS at AMIA 2010 OpenCDS collaborators will be discussing OpenCDS and/or its component technologies at the following sessions of the 2010 American Medical Informatics Association (AMIA) Fall Symposium, which will be held in ...
Posted Apr 26, 2011 9:50 AM by Kensaku Kawamoto

Thank You!

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