A Clinical Decision Support Consortium Demonstration:

From Rule Authoring, to Knowledge Repository and Portal, to Two Different EMRs: Partners Healthcare and the Regenstrief Institute

November 15, 2010
AMIA 2010 Annual Symposium

Agenda

- Welcome and Introductions
- CDS Consortium Goal and Approach
- Demonstration
  1. Rule Authoring
  2. Knowledge Representation
  3. Sharing via Knowledge Repository
  4. Actionable CDS via Web Services
  5. Expression of CDS
  6. Measuring CDS and Providing Feedback
- Discussion/Q&A

AHRQ's Goals for Advancing Clinical Decision Support

- To facilitate the development, adoption, implementation and evaluation of best practices using CDS.
- To further enhance the nation's efforts to make evidence-based clinical knowledge more readily available to health care providers.

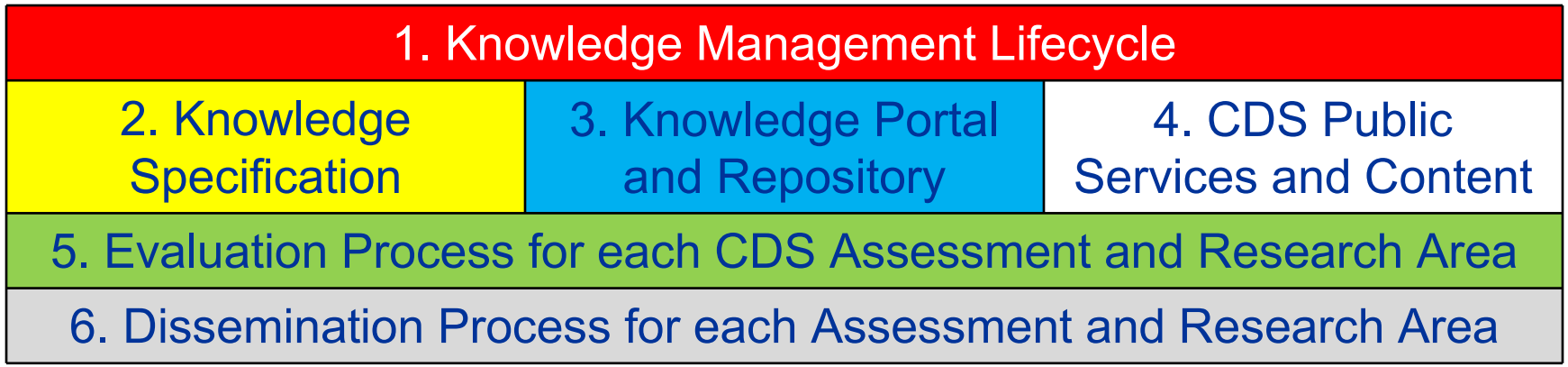
Blackford Middleton, MD, MPH, MSc

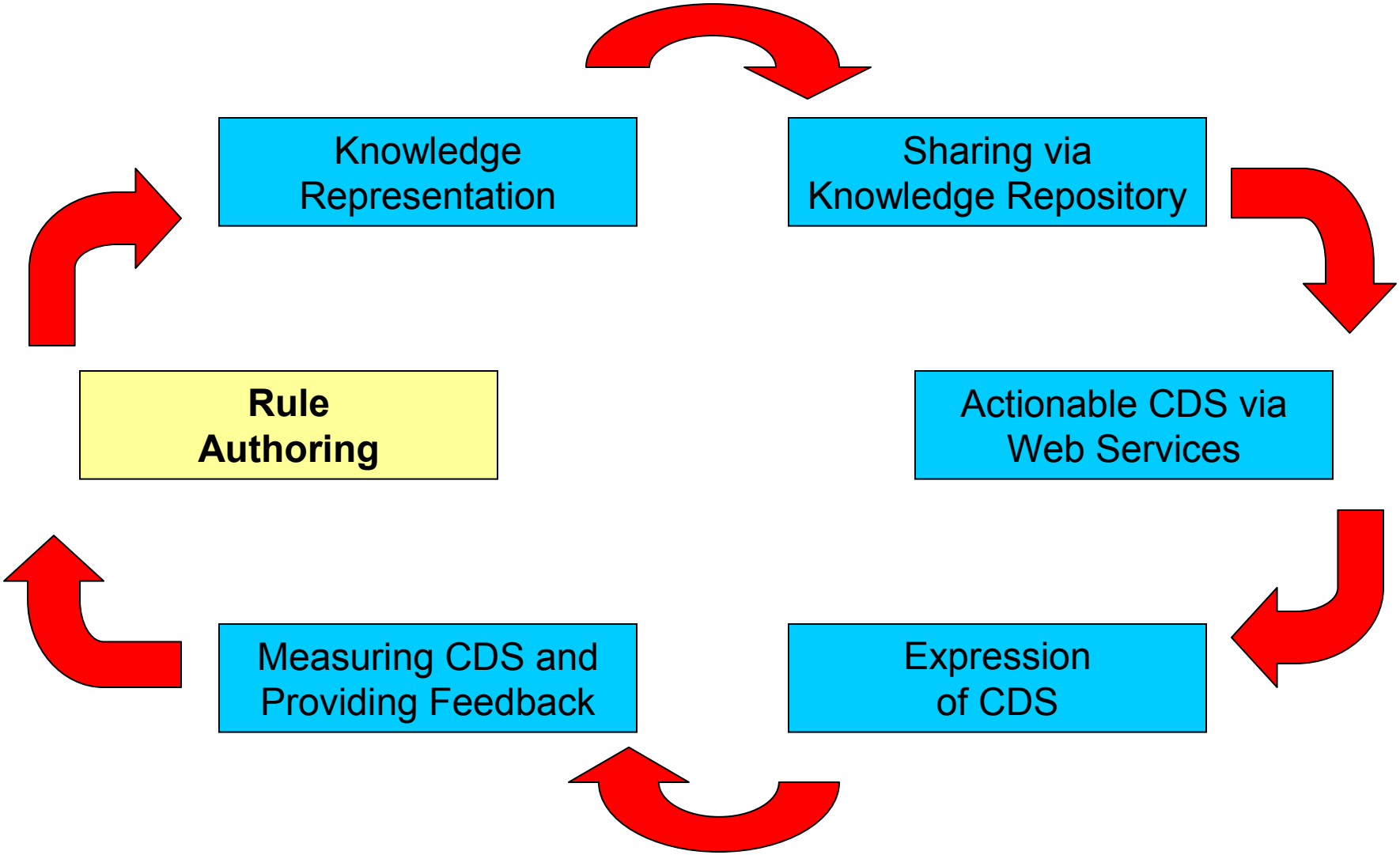
CDS Consortium Goal

To **assess, define, demonstrate,** and **evaluate** best practices for knowledge management and clinical decision support in healthcare information technology at scale – across multiple ambulatory care settings and EHR technology platforms.

CDSC Six Research Objectives

- Knowledge Management Lifecycle
- Knowledge Specification
- Knowledge Portal and Repository
- CDS Knowledge Content and Public Web Services
- Evaluation
- Dissemination




Knowledge Representation
Sharing via Knowledge Repository
Actionable CDS via Web Services
Expression of CDS
Measuring CDS and Providing Feedback
Rule Authoring

Transforming Rules from Narrative

- Narrative form of guideline to control A1c for Type 2 diabetes

Action	Frequency
A1c	Every 6 months if controlled (A1c <7%) and therapy/clinical circumstances remain unchanged Every 3-6 months if uncontrolled (A1c ≥7%) and/or evaluating change in treatment

Saverio Maviglia, MD, MSc

```
- <ApplicableScenario>
  - <LogicalConditionSingle>
      <title>OverdueHgbA1c</title>
      <description>No glycosylated hemoglobin A1c result within last 6 months</description>
      <expression>HgbA1cResults6months->isEmpty()</expression>
    - <dataMapping>
        <title>HgbA1c results in last 6 months</title>
        <description>The set of all glycosylated hemoglobin A1c results within the last 6 months</description>
      - <Data>
        - <LaboratoryResult>
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        </Data>
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          patient.laboratoryResult->select(resultType.codeSystem = "2.16.840.1.113883.6.1" and
          (resultType.code= "17856-6" or resultType.code="4548-4" or resultType.code="4549-2") and
          resultStatus.codeSystem = "2.16.840.1.113883.5.14" and resultStatus.code = "completed" and
          resultDateTime.high.occurredWithin(6, month))</expression>
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      </dataMapping>
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  </ApplicableScenario>
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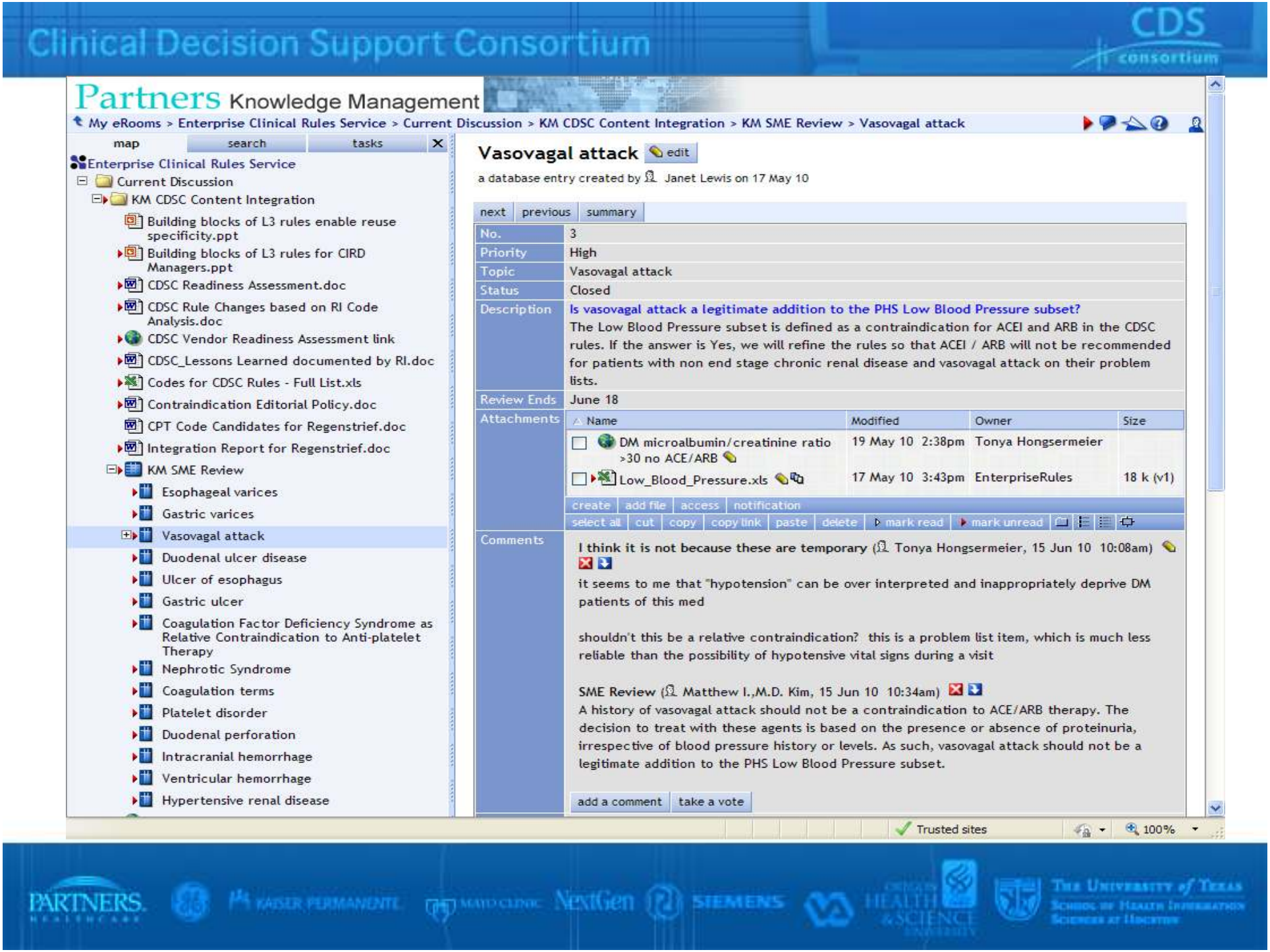
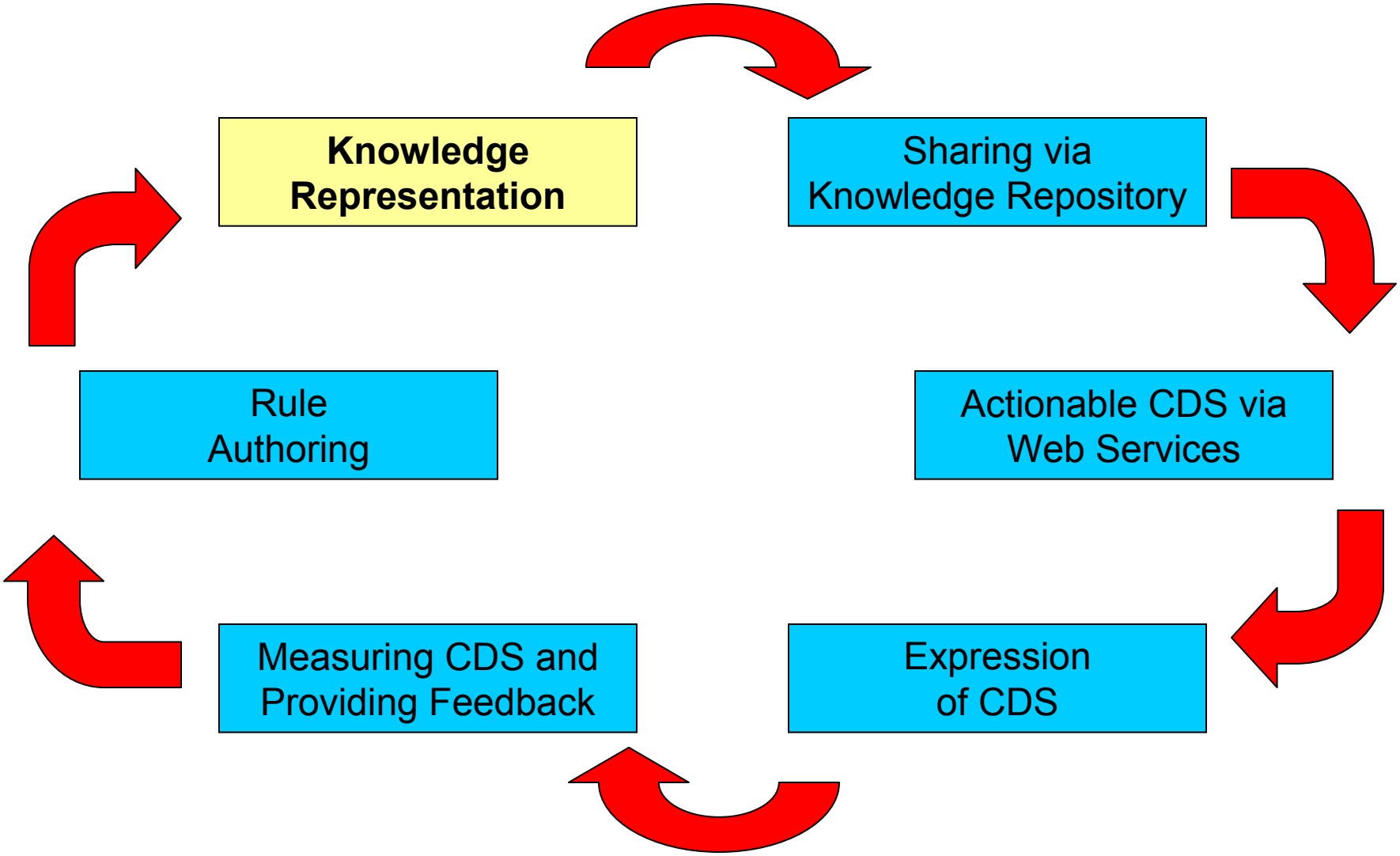

Clinical Decision Support Consortium
CDS consortium
Partners Knowledge Management
My eRooms > Enterprise Clinical Rules Service > Current Discussion > KM CDSC Content Integration > KM SME Review > Vasovagal attack
map
search
tasks
Enterprise Clinical Rules Service
Current Discussion
KM CDSC Content Integration
Building blocks of L3 rules enable reuse specificity.ppt
Building blocks of L3 rules for CIRD Managers.ppt
CDSC Readiness Assessment.doc
CDSC Rule Changes based on RI Code Analysis.doc
CDSC Vendor Readiness Assessment link
CDSC_Lessons Learned documented by RI.doc
Codes for CDSC Rules - Full List.xls
Contraindication Editorial Policy.doc
CPT Code Candidates for Regenstrief.doc
Integration Report for Regenstrief.doc
KM SME Review
Esophageal varices
Gastric varices
Vasovagal attack
Duodenal ulcer disease
Ulcer of esophagus
Gastric ulcer
Coagulation Factor Deficiency Syndrome as Relative Contraindication to Anti-platelet Therapy
Nephrotic Syndrome
Coagulation terms
Platelet disorder
Duodenal perforation
Intracranial hemorrhage
Ventricular hemorrhage
Hypertensive renal disease
Vasovagal attack
edit
a database entry created by Janet Lewis on 17 May 10
next
previous
summary
No. 3
Priority High
Topic Vasovagal attack
Status Closed
Description Is vasovagal attack a legitimate addition to the PHS Low Blood Pressure subset?
The Low Blood Pressure subset is defined as a contraindication for ACEI and ARB in the CDSC rules. If the answer is Yes, we will refine the rules so that ACEI / ARB will not be recommended for patients with non end stage chronic renal disease and vasovagal attack on their problem lists.
Review Ends June 18
Attachments
Name
Modified
Owner
Size
DM microalbumin/creatinine ratio >30 no ACE/ARB
19 May 10 2:38pm
Tonya Hongsermeier
Low_Blood_Pressure.xls
17 May 10 3:43pm
EnterpriseRules
18 k (v1)
create
add file
access
notification
select all
cut
copy
copy link
paste
delete
mark read
mark unread
Comments
I think it is not because these are temporary (Tonya Hongsermeier, 15 Jun 10 10:08am)
it seems to me that "hypotension" can be over interpreted and inappropriately deprive DM patients of this med
shouldn't this be a relative contraindication? this is a problem list item, which is much less reliable than the possibility of hypotensive vital signs during a visit
SME Review (Matthew I.,M.D. Kim, 15 Jun 10 10:34am)
A history of vasovagal attack should not be a contraindication to ACE/ARB therapy. The decision to treat with these agents is based on the presence or absence of proteinuria, irrespective of blood pressure history or levels. As such, vasovagal attack should not be a legitimate addition to the PHS Low Blood Pressure subset.
add a comment
take a vote
Trusted sites
100%
PARTNERS HEALTHCARE
KAISER PERMANENTE
MAYO CLINIC
NextGen
SIEMENS
OREGON HEALTH & SCIENCE UNIVERSITY
The University of Texas School of Health Information Sciences at Houston


Knowledge Representation
Sharing via Knowledge Repository
Actionable CDS via Web Services
Expression of CDS
Measuring CDS and Providing Feedback
Rule Authoring

Multilayered Framework

Unstructured Recommendation layer

Semi-Structured Recommendation layer

Structured Recommendation layer

Implementation layer

Knowledge is structured for use within a specific type of CDS tool at a particular clinical site

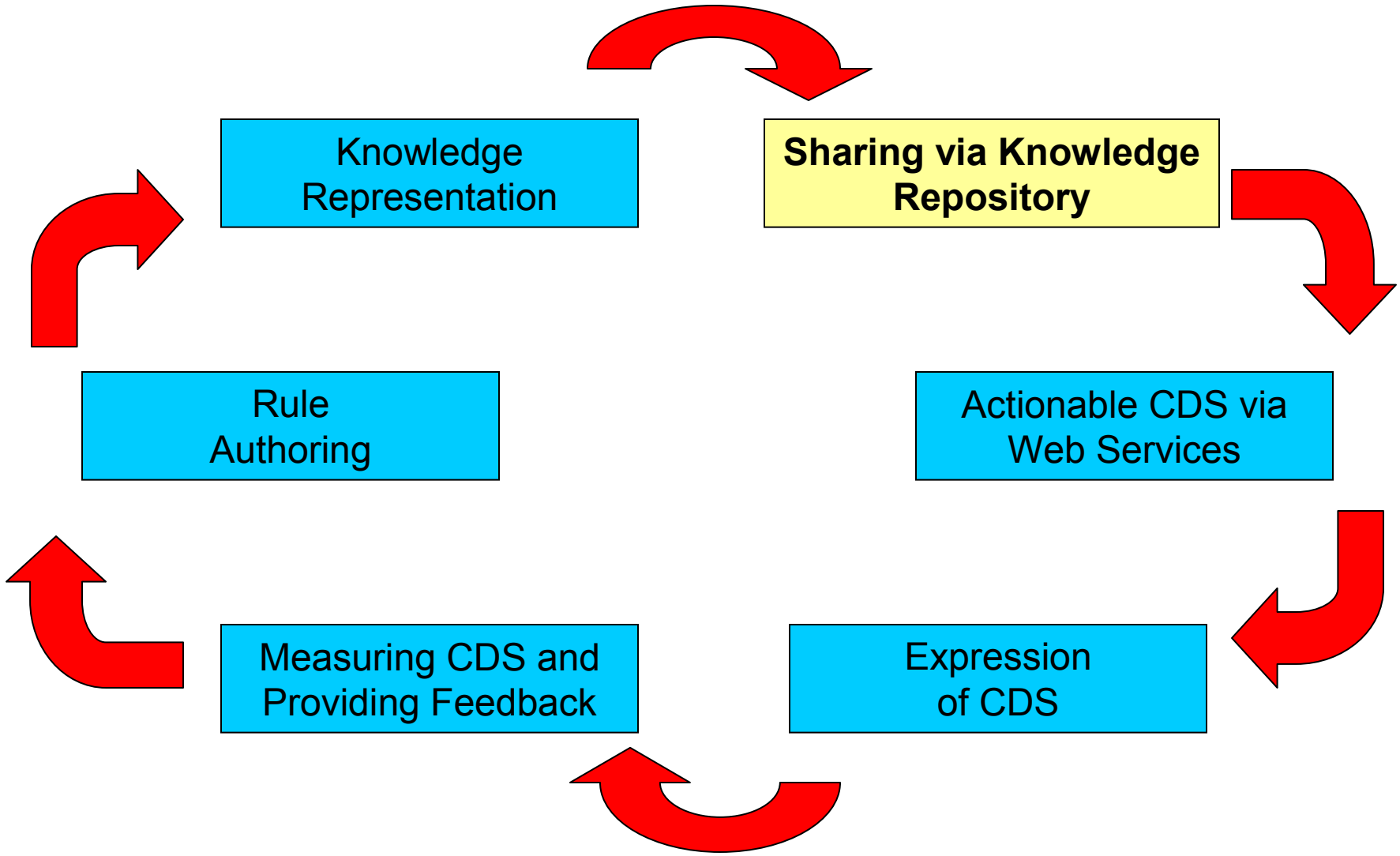
Knowledge encoded in a format that can be rapidly integrated into a CDS tool on a specific HIT platform

E.g., rule could be encoded in Arden Syntax

A recommendation could have several different artifacts created in this layer, one for each of the different HIT platforms

PhD

Live Demonstration of Authoring Tool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Rule Authoring

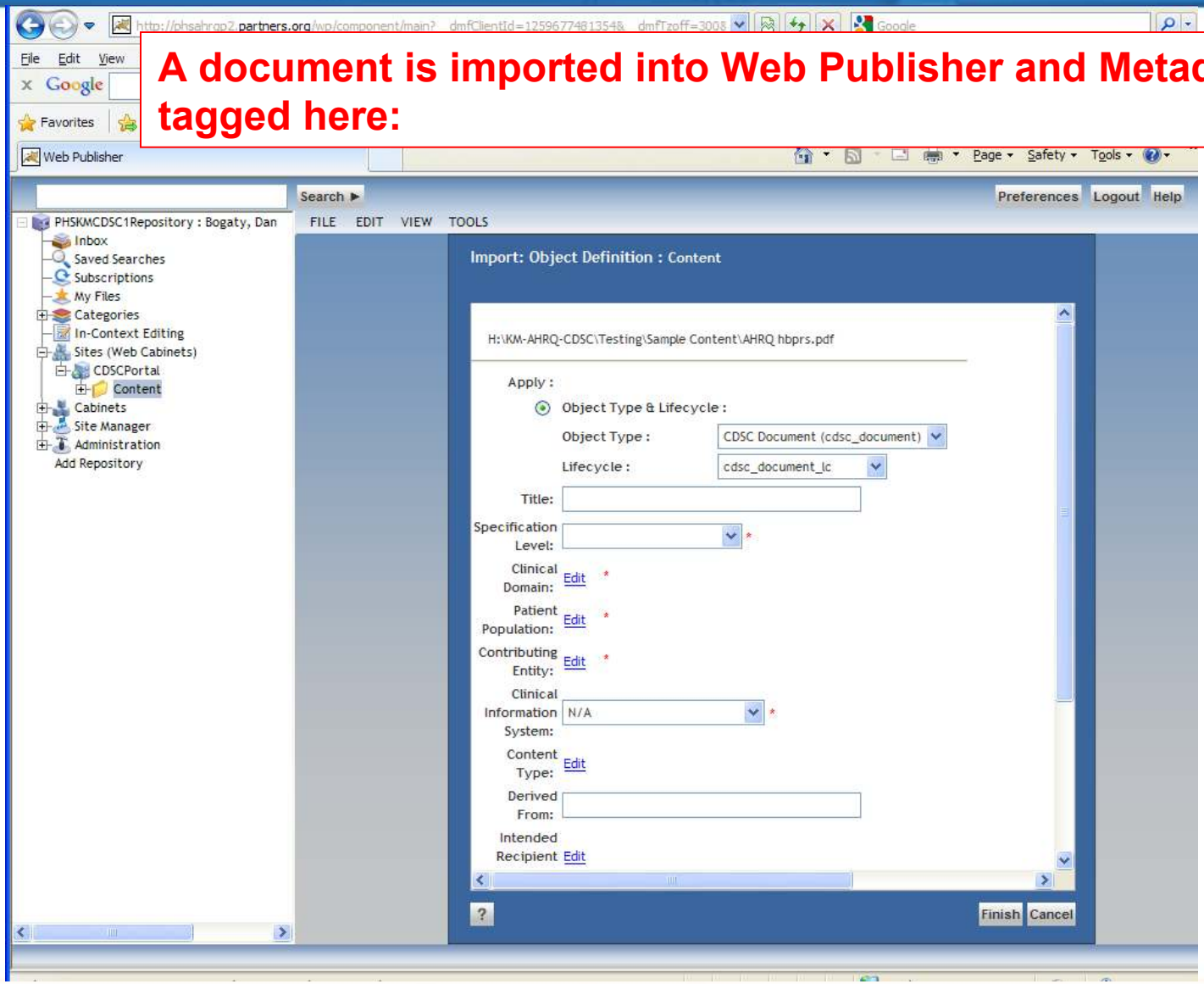
CDSC KM Portal Overview

- The CDSC KM Portal is a combination of 3 components:
  - Virtual collaboration space (EMC-Documentum eRoom)
  - Content Management and Publishing Services (EMC-Documentum CMS and Web Publisher)
  - Clinical Decision Support Library - a document repository for sharing Clinical Decision Support content

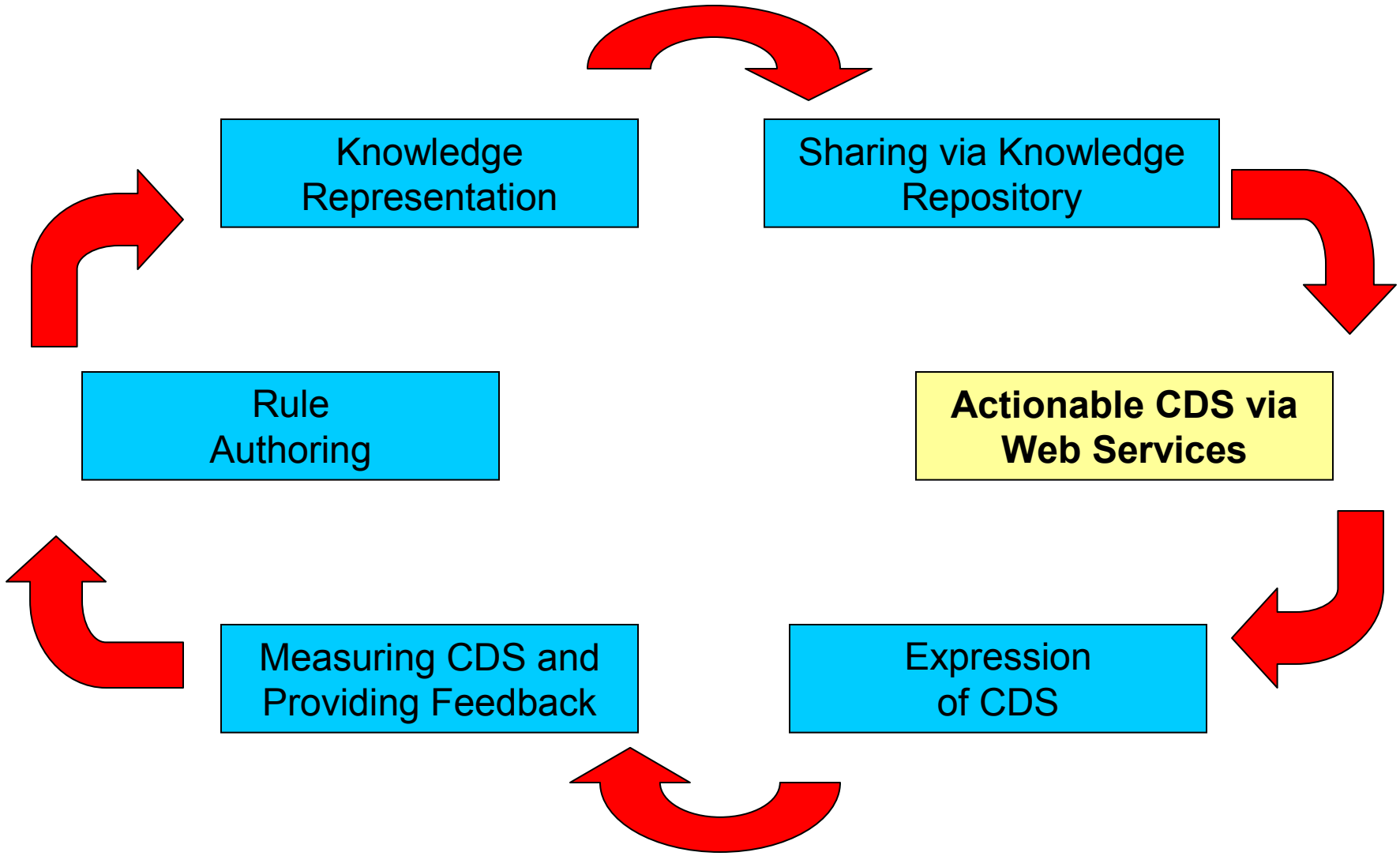
- Types of Documents searchable by robust metadata:
  - Level 1 - Unstructured (human readable guideline)
  - Level 2 - Semi-structured (XML)
  - Level 3 - Structured (XML) includes relevant encoding information
  - Level 4 - Implementation specific content
    - Executable: content executed by or imported into a system
    - Exportable: content exported from a system
    - Description: content describes an implementation
    - Illustration: content illustrates an implementation

Tonya Hongsermeier, MD, MBA

A document is imported into Web Publisher and Metadata is tagged here:



Live Demonstration of KM Portal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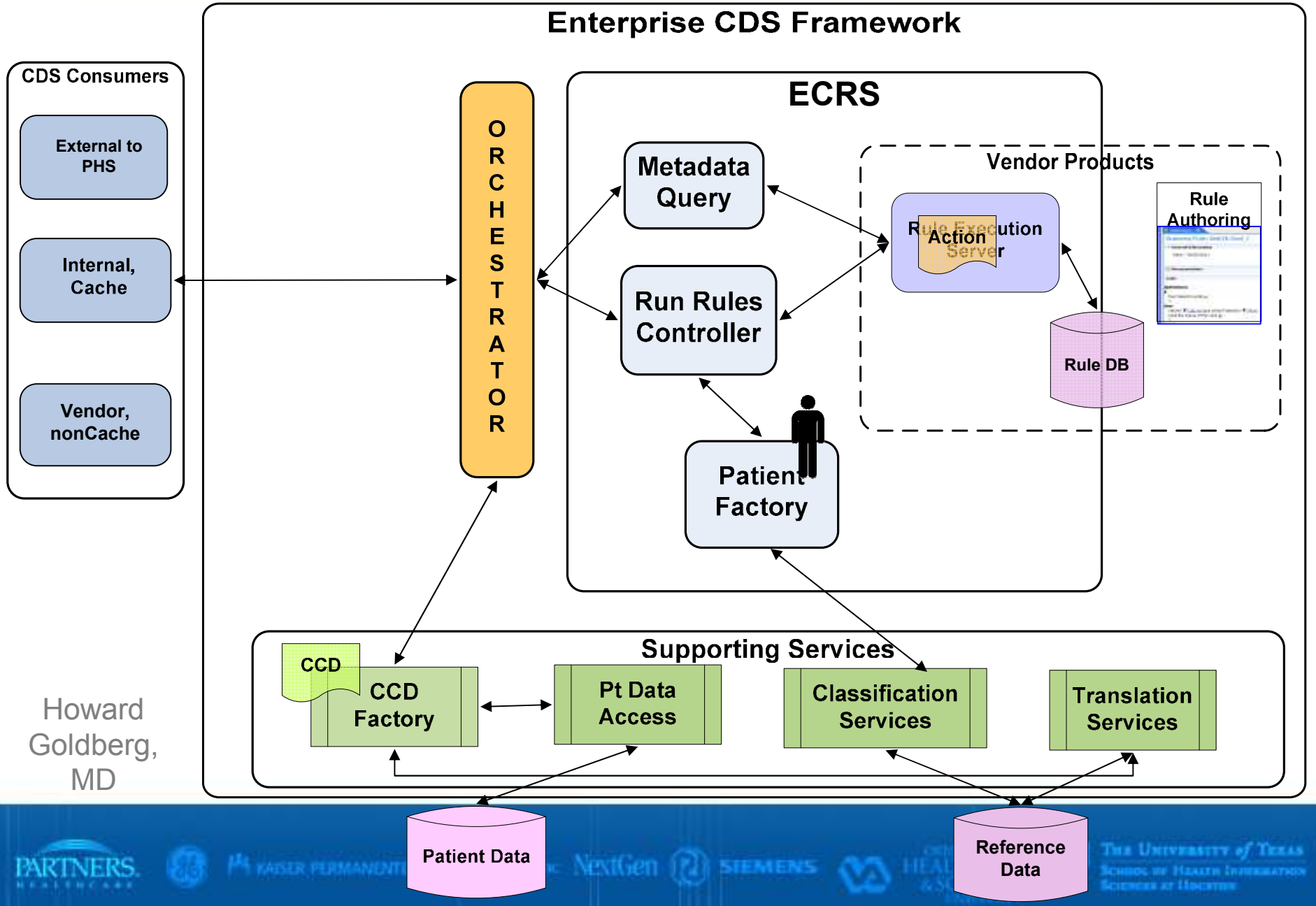


Howard Goldberg, MD

CDSC Services Checklist

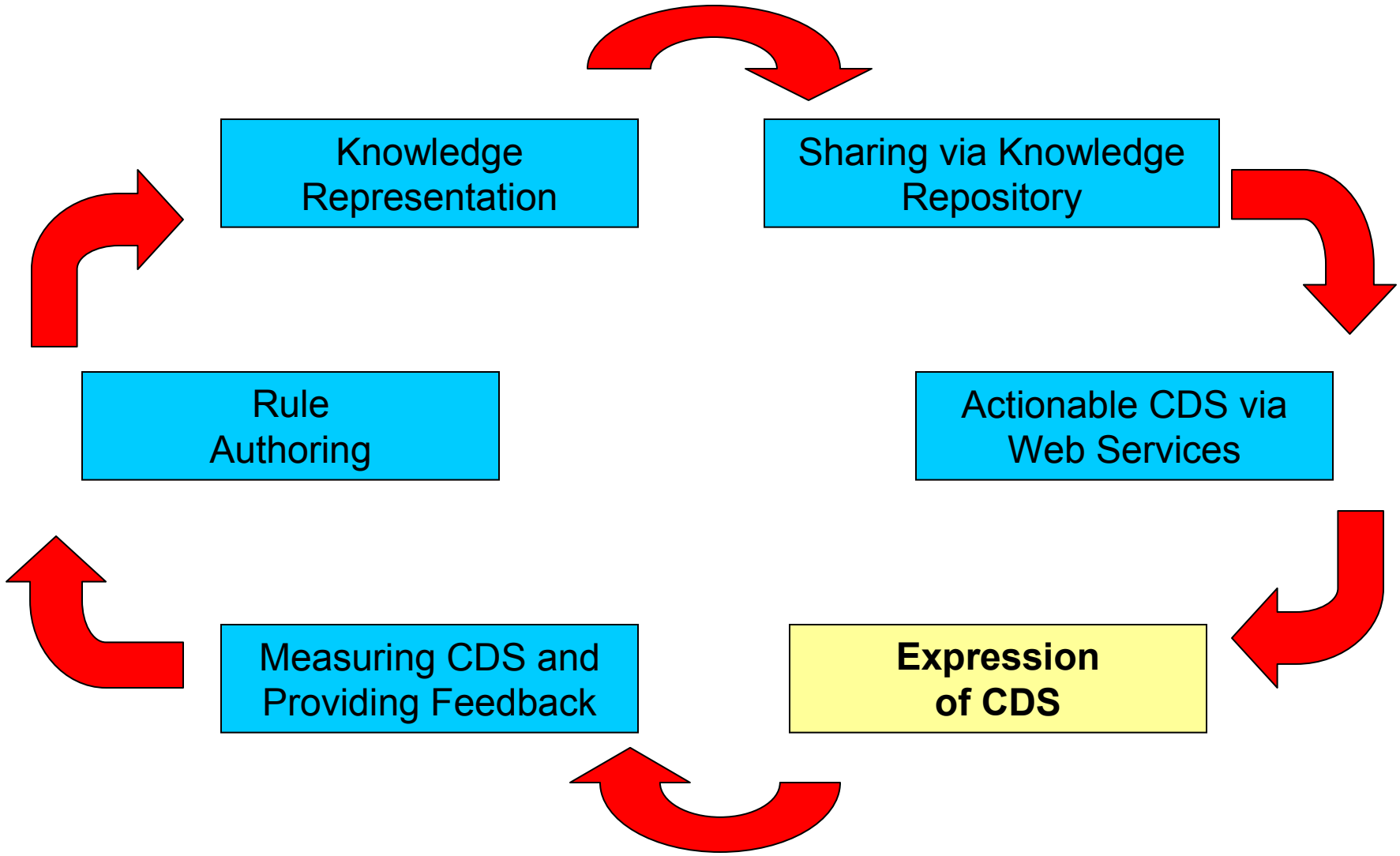
- Capable to generate C32-compliant CCD
- Validate data definition alignment
- Complete data-sharing and services agreement
- Integrate web service at desired insertion points
- End-to-end testing
- Begin production use

CDSC Action Request Model

- Purpose
  - Allows guideline creators to specify discrete parameters of the action
  - Enables client application to transform the structured action into an order
- Requirements
  - Allow related action requests to be grouped
  - Indicate how action requests might be selected by end users
  - Allow specifying a broad class of an action rather than a specific implementable action
  - Allow flexible specification of attributes, i.e., ranges of values, null or empty values
  - Allow an action request to modify or cancel an existing action.

CDSC Recommendation Object

- Recommendation contains
  - Metadata
  - Action
- Action contains
  - 1:n Request Lists
- Request List contains
  - 1:n Requests of any type
  - 0:n Request Lists
  - Display operator (and/or)
- Request contains
  - Structured data specific to the request type
  - Display message
  - Text alternative, for use instead of structured data
- Request Types
  - Encounter
  - Substance Administration
  - Message
  - Clinical State
  - Observation
  - Knowledge Asset
  - Procedure
  - Supply
  - Event
- Data Structures are
  - Consistent with Patient Information Model
  - Conformant to HL7, HITSP terminology standards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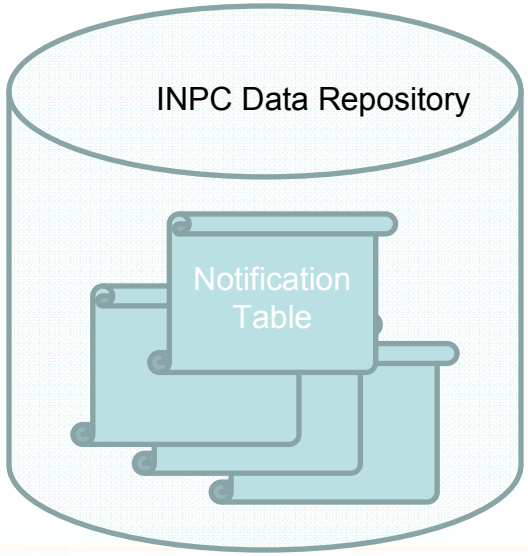
Live Demonstration of Partners Longitudinal Medical Record (**LMR**)

Adam Wright, PhD



Linas Simonaitis, MD

Clinic Registration

CCD Generator

Partners HealthCare

Internet

ADT Message

CCD

CCD

reminders

Regenstrief Project Control

INPC Data Repository

Notification Table

reminders

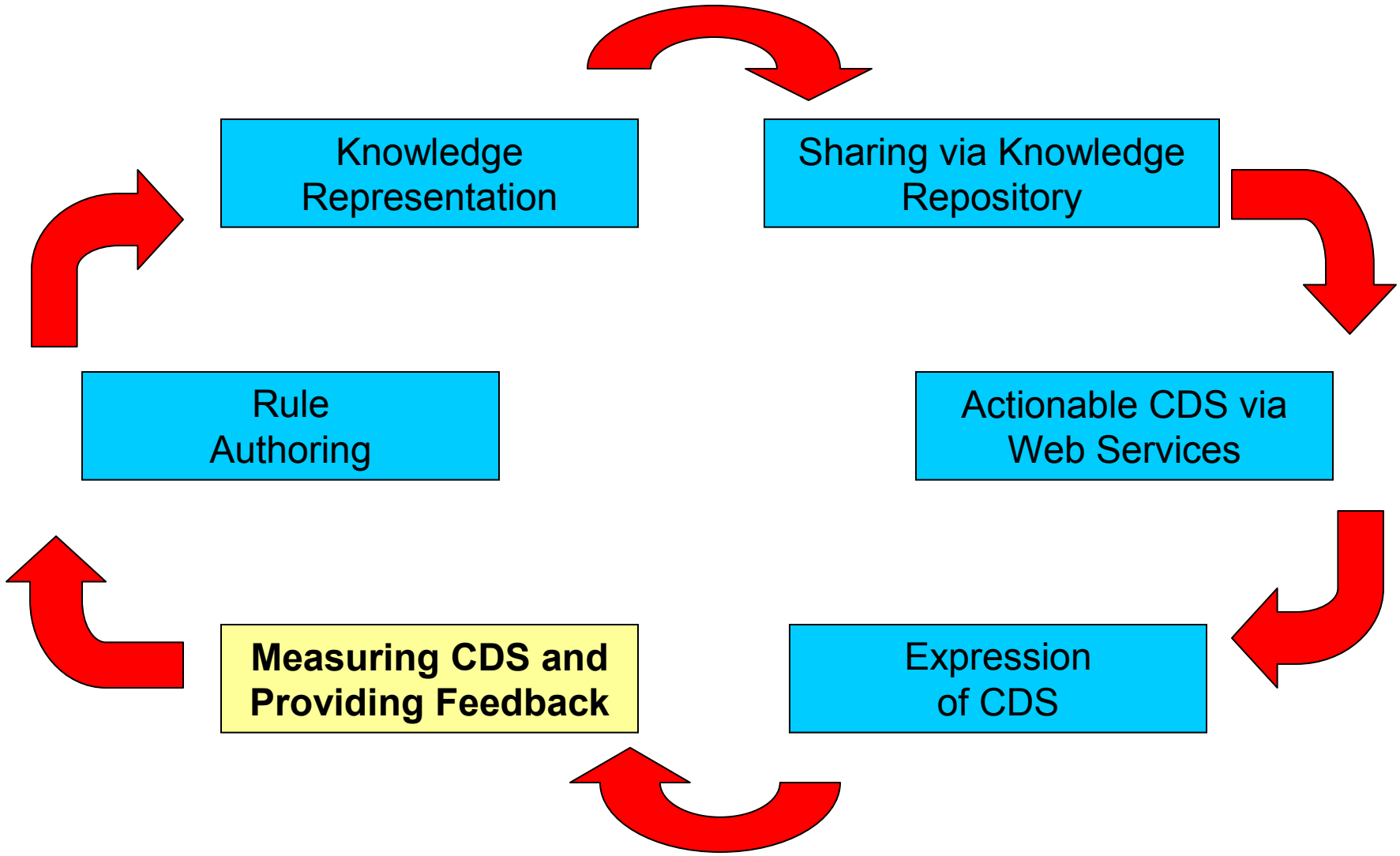
User Login

CareWeb

reminders

Linas Simonaitis, MD

Live Demonstration of Regenstrief Medical Record System (**RMRS**)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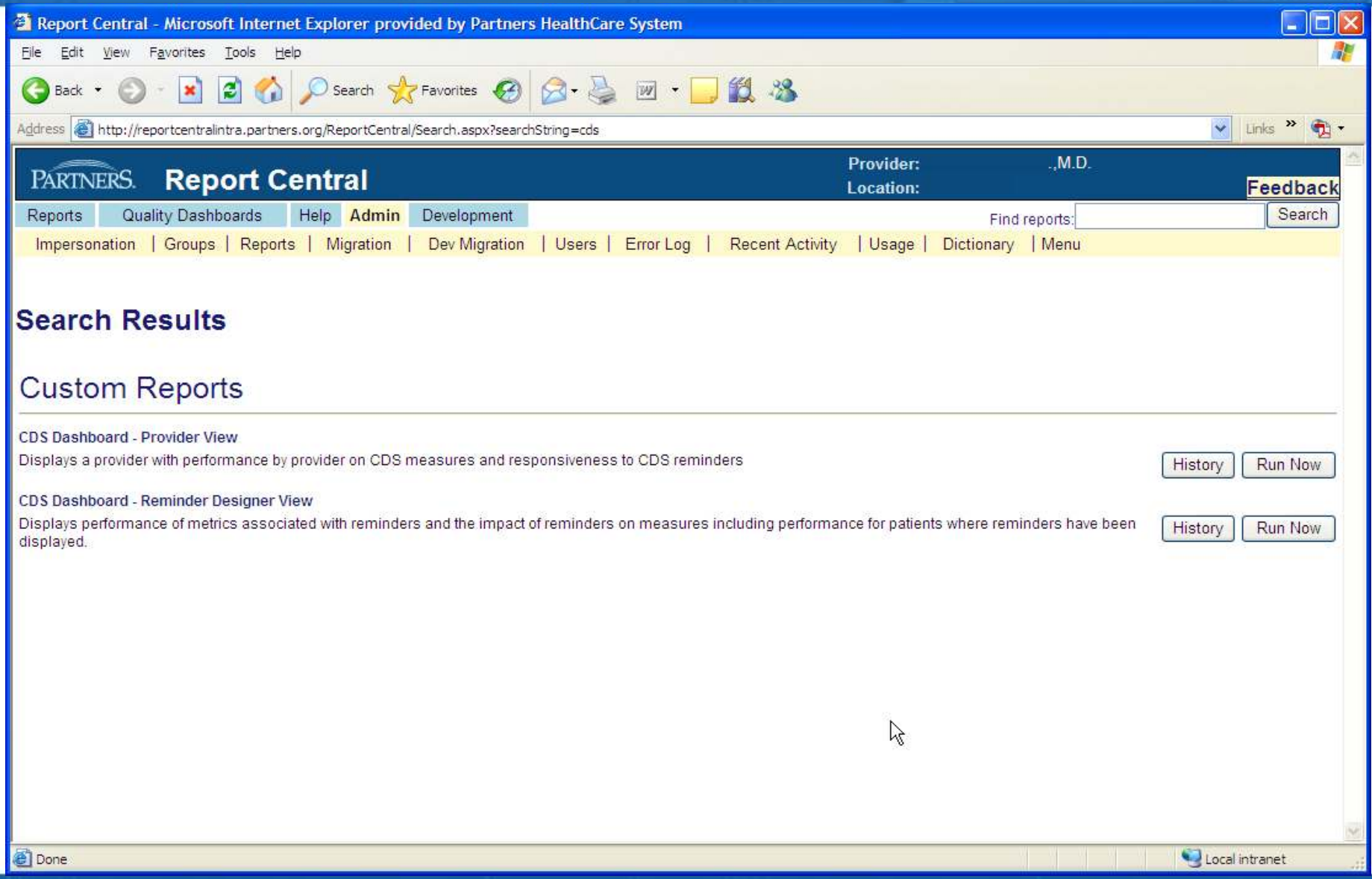
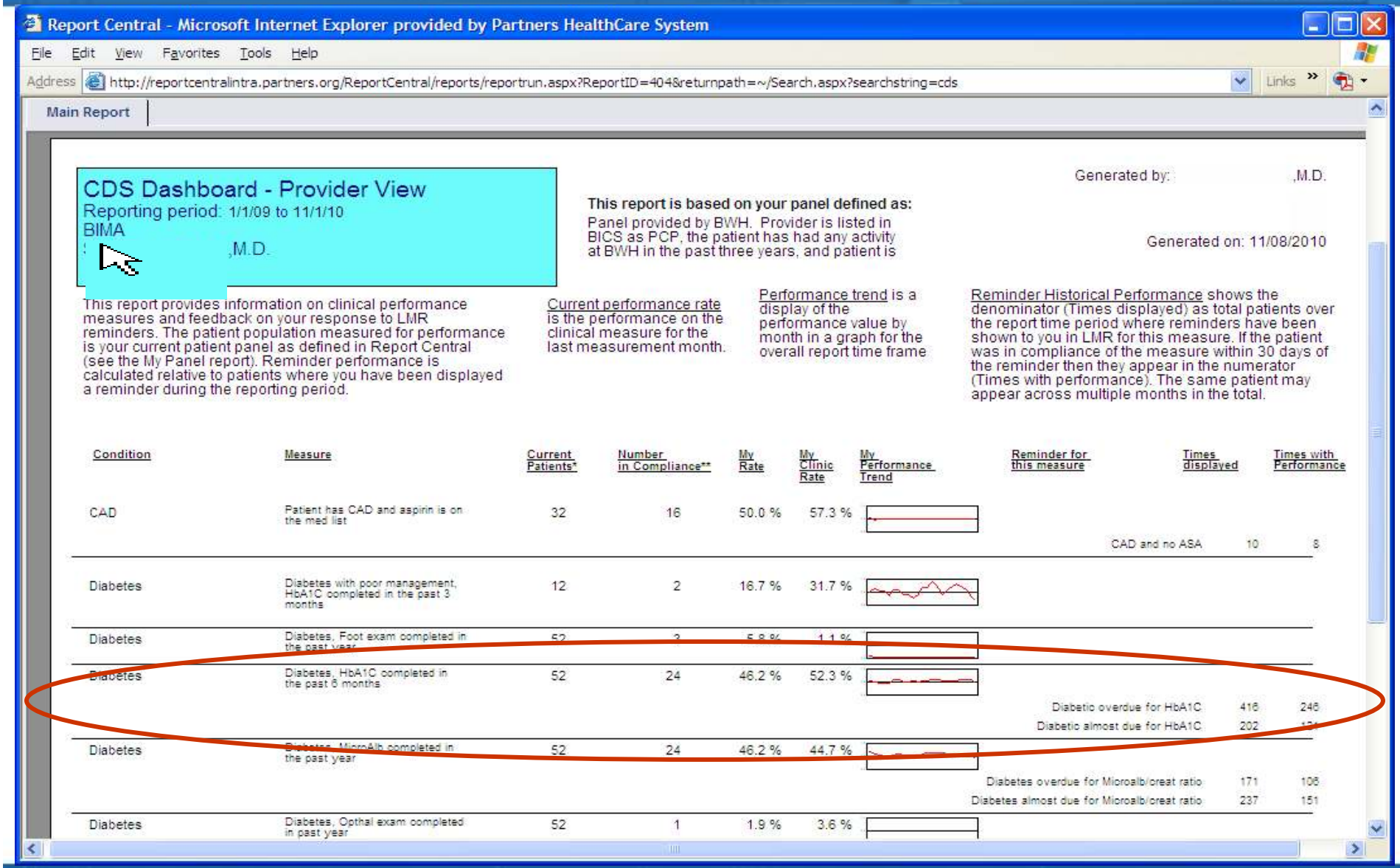
Provider View – "How am I doing?"

- Clinician's performance (clinical) for his/her patients
- Contribution of CDS to clinical performance


Report Central - Microsoft Internet Explorer provided by Partners HealthCare System
File Edit View Favorites Tools Help
Back Search Favorites
Address http://reportcentralintra.partners.org/ReportCentral/Search.aspx?searchString=cds
Links
PARTNERS. Report Central
Provider: .,M.D.
Location:
Feedback
Reports Quality Dashboards Help Admin Development
Find reports: Search
Impersonation | Groups | Reports | Migration | Dev Migration | Users | Error Log | Recent Activity | Usage | Dictionary | Menu
Search Results
Custom Reports
CDS Dashboard - Provider View
Displays a provider with performance by provider on CDS measures and responsiveness to CDS reminders
History Run Now
CDS Dashboard - Reminder Designer View
Displays performance of metrics associated with reminders and the impact of reminders on measures including performance for patients where reminders have been displayed.
History Run Now
Done
Local intranet



Report Central - Microsoft Internet Explorer provided by Partners HealthCare System

File Edit View Favorites Tools Help

Address http://reportcentralintra.partners.org/ReportCentral/reports/reportrun.aspx?ReportID=404&returnpath=~/Search.aspx?searchstring=cds

Links

Main Report

CDS Dashboard - Provider View

Reporting period: 1/1/09 to 11/1/10

BIMA

,M.D.

Generated by: ,M.D.

Generated on: 11/08/2010

This report is based on your panel defined as:

Panel provided by BWH. Provider is listed in BICS as PCP, the patient has had any activity at BWH in the past three years, and patient is

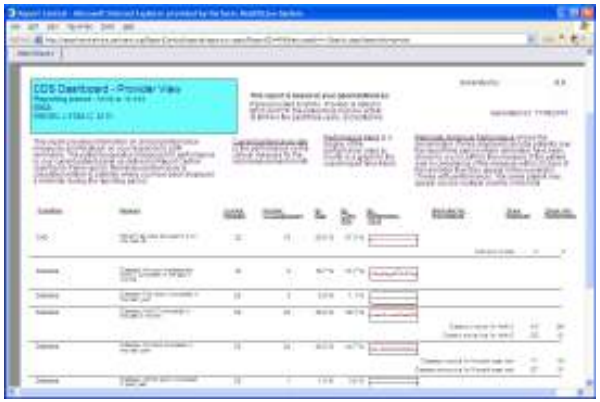
This report provides information on clinical performance measures and feedback on your response to LMR reminders. The patient population measured for performance is your current patient panel as defined in Report Central (see the My Panel report). Reminder performance is calculated relative to patients where you have been displayed a reminder during the reporting period.

Current performance rate is the performance on the clinical measure for the last measurement month.

Performance trend is a display of the performance value by month in a graph for the overall report time frame

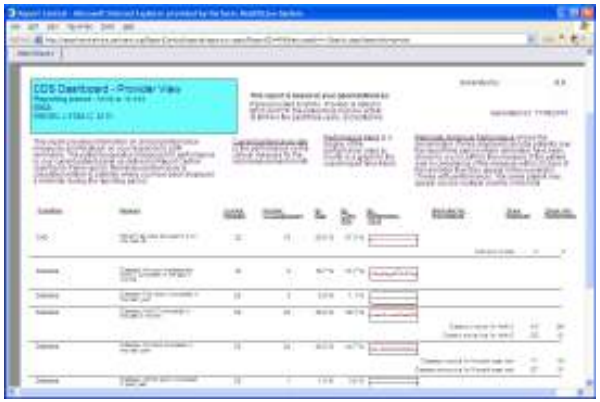
Reminder Historical Performance shows the denominator (Times displayed) as total patients over the report time period where reminders have been shown to you in LMR for this measure. If the patient was in compliance of the measure within 30 days of the reminder then they appear in the numerator (Times with performance). The same patient may appear across multiple months in the total.

Condition	Measure	Current Patients*	Number in Compliance**	My Rate	My Clinic Rate	My Performance Trend	Reminder for this measure	Times displayed	Times with Performance
CAD	Patient has CAD and aspirin is on the med list	32	16	50.0 %	57.3 %				
							CAD and no ASA	10	8
Diabetes	Diabetes with poor management, HbA1C completed in the past 3 months	12	2	16.7 %	31.7 %				
Diabetes	Diabetes, Foot exam completed in the past year	52	3	5.8 %	1.1 %				
Diabetes	Diabetes, HbA1C completed in the past 6 months	52	24	46.2 %	52.3 %				
							Diabetic overdue for HbA1C	416	246
							Diabetic almost due for HbA1C	202	121
Diabetes	Diabetes, MicroAlb completed in the past year	52	24	46.2 %	44.7 %				
							Diabetes overdue for Microalb/creat ratio	171	106
							Diabetes almost due for Microalb/creat ratio	237	151
Diabetes	Diabetes, Opthal exam completed in past year	52	1	1.9 %	3.6 %				



Provider View: Clinical Performance

Measure	Current Patients	Number in Compliance	My Rate	My Clinic Rate	My Performance Trend
Diabetes, HbA1c completed in the past 6 months	52	24	46.2%	52.3%	



Provider View: Contribution of CDS

Reminders for this Measure	Times Displayed	Times with Performance
Diabetic overdue for HbA1c	416	246
Diabetic almost due for HbA1c	202	121

CDS Designer View – "How well are the reminders working?"

- Displayed (Counts)
- Acknowledged (%)
- Performed (%)
- *Number Needed to Remind (NNTR)*

Designer's View

Report: CDS Dashboard - Reminder Designer View
Report Run For: EINBINDER,JONATHAN SETH,M.D.,M.B.A.

Multiple time period view

Condition: Diabetes
ReminderID: 178-Diabetic overdue for HbA1C
Measure: Diabetes, HbA1C completed in the past 6 months

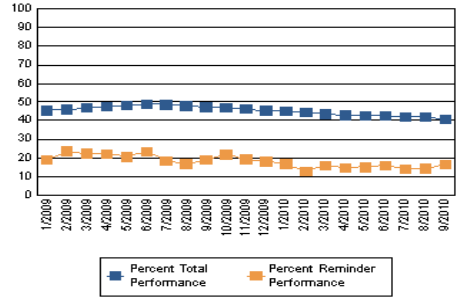
Reminder: Patient with DM overdue for HbA1C (rec: q 6 months)

Data: All users of LMR. From 1-09 thru 9-10.

Total Count Displays (across providers): 713,720
#Patient (months) with reminders displayed: 183,889
#Patient (months) w/ reminder and perf: 33,167
#Patient (months) w/ reminder and no perf: 150,722
#Reminders acknowledged: 2,105
#Reminders acknowledged and perf: 1,220
#Reminders acknowledged and no perf: 885

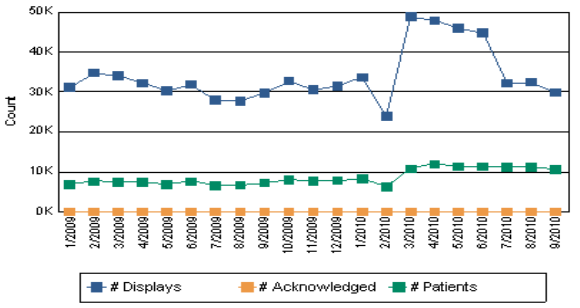
NNTR (Total): 21.52
NNTR (1X per month): 5.54

NNTR is number needed to remind. The denominator is the count where performance followed a reminder within 30 days of the end of the reporting period. The numerator is the cumulative count of all reminders per patient in each month(Total) or only counts a patient with a reminder once per month (1X per month).



Total Performance is the clinical performance for the measure across all LMR patients in the denominator for that period. The patient is counted in the numerator if the patient record shows compliance with the measure's numerator criteria within 30 days of the reporting period.

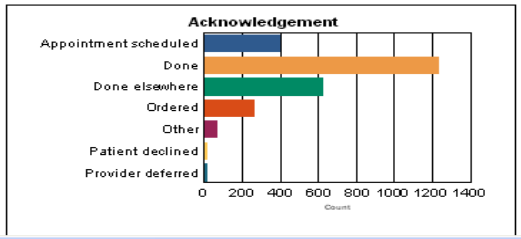
Reminder Performance is the performance for patients where a reminder was displayed to a physician during the reporting period. The denominator is reminders (one per provider / day). If the patient clinical data shows that the criteria for the measure is met within 30 days of the period then the performance is counted in the numerator.



Displays is the count of displays for the reminder during the time period. Note that reminders are counted once per day for each physician such that multiple displays for the same provider on the same day are not counted but multiple providers are counted as separate.

Acknowledged is the count of displayed reminders where there was an acknowledgement through the LMR reminder tool

Patients is the total number of patients that reminders were displayed to. Note: When counting patients across months the concept of a "patient(month)" is needed to cover for duplicate patients that appear in more than one period.



Designer's View

Report: CDS Dashboard - Reminder Designer View
Report Run For: EINBINDER,JONATHAN SETH,M.D.,M.B.A.

Single Month View For Month: 9/2010

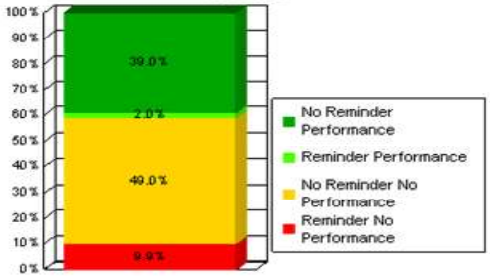
Condition: Diabetes
Measure: Diabetes, HbA1C completed in the past 6 months

Reminder: Patient with DM overdue for HbA1C (rec: q 6 months)

Date Range: 9/2010

Reminder Performance By Category

For 9/2010



Total Acknowledged	151
NNTR - 1 X per month	5.90
NNTR - Total Reminders	16.44
Patients Where Reminder Displayed	10,722
Total Count Displays	29,880
Pts with Reminders & Perf	1,818
Pts with Reminders & no Perf	8,904
Pts with no reminders and no perf	43,940
Pts with no reminders and perf	34,975
Performing Total	36,793
N	89,637

Reminder Performance

For 9/2010

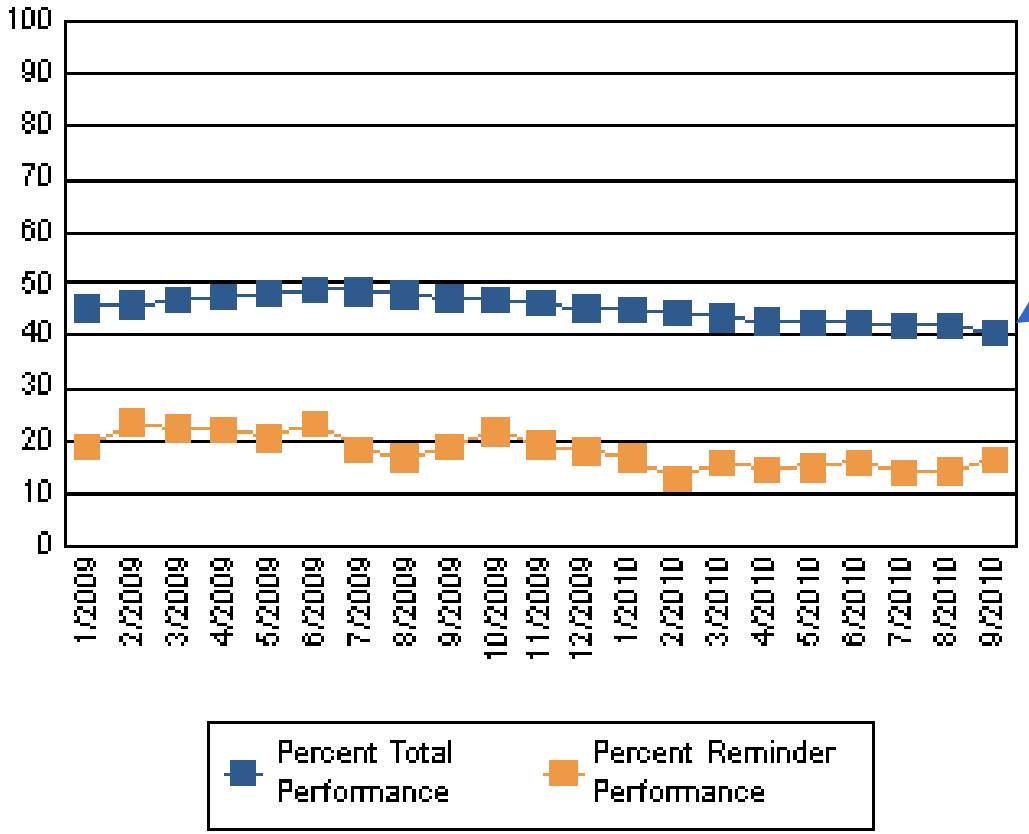
Reminder Acknowledgement

For 9/2010

Acknowledgement Performance

For 9/2010

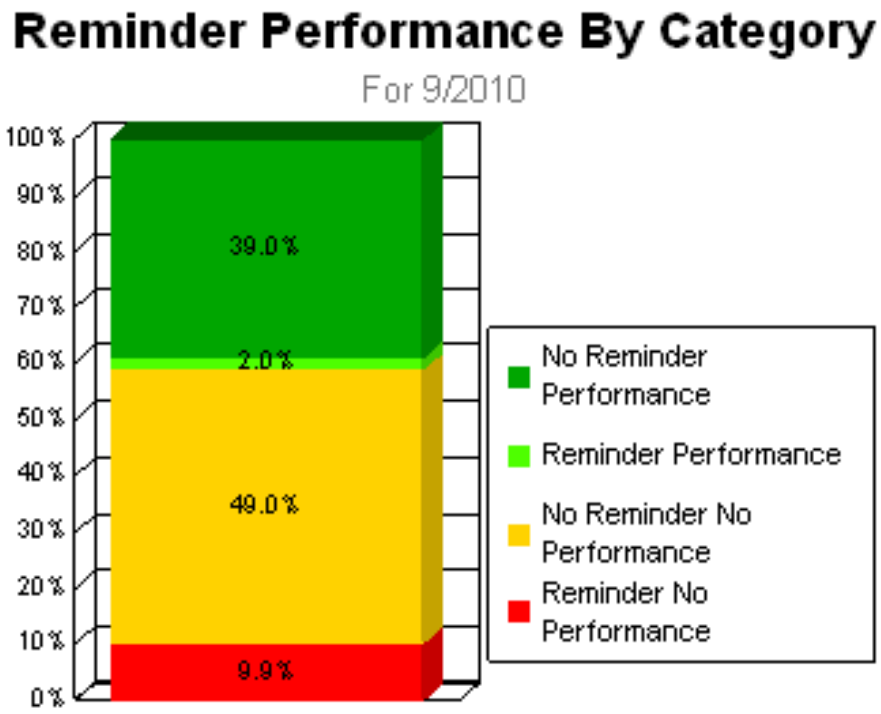
Designer's View



%patients with diabetes who have had an HbA1c result in the past 6 months

%reminders with "performance" within 30 days

Designer's View



Total patients	89,637
Performing total	36,793
Patients where reminders displayed	10,722
Total count of displays	29,880
NNTR	**5.9**

Thank you!

Q&A

The CDSC is made possible by its 50+ members.

Discover more at:
http://www.partners.org/cird/cdsc/

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