

# HL7 CDS Project Updates

## Virtual Medical Record (vMR)

## GELLO Query Language

HL7 San Antonio  
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### **Robert Dunlop, MD**

Director, Clinical Development

InferMed UK

(M) +44-7291-7410

[robert.dunlop@infermed.com](mailto:robert.dunlop@infermed.com)

<http://www.infermed.com>

### **Barbara McKinnon**

McKinnon Associates Inc.

Project Lead: HL7 GELLO &

Virtual Medical Record (vMR) Projects

(O) 610-644-5245

(M) 484-883-6927

[bmm15@comcast.net](mailto:bmm15@comcast.net)

# Discussion Topics

## ⇒ Levels of Clinical Decision Support

## ⇒ Virtual Medical Record (vMR)

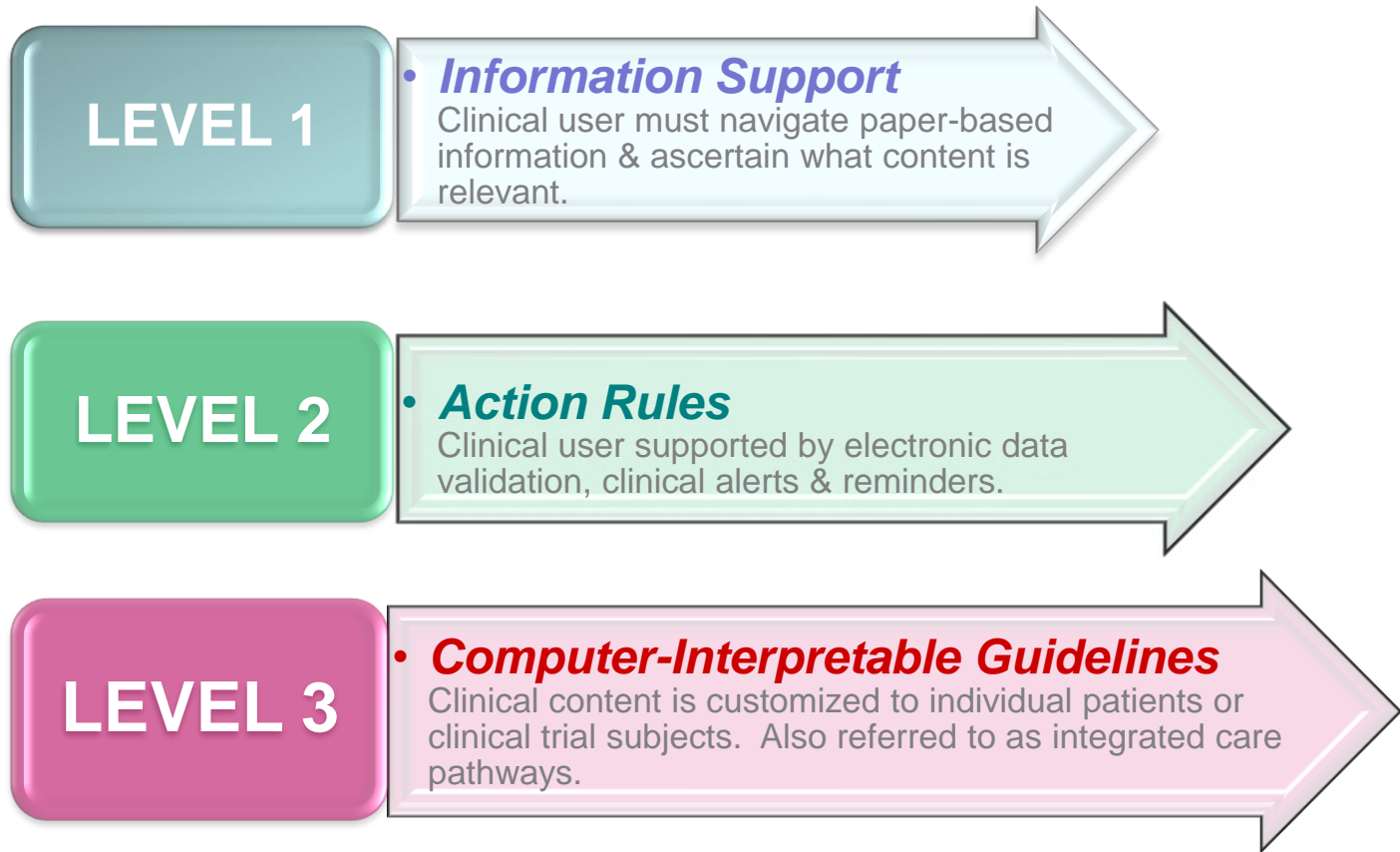
- Goals, Value, Scope
- Team, BUC's, Outreach
- Deliverables & Timeline
- Preliminary Data Elements, Issues

## ⇒ GELLO Query Language

- GELLO, Goals, Value
- Team
- Deliverables & Timeline
- Issues

# 3 Levels of Clinical Decision Support Being Implemented Globally

Computer-Enabled



Concept Developed By UK-NHS Central Design Authority

# Virtual Medical Record (vMR) *for* Clinical Decision Support (CDS)

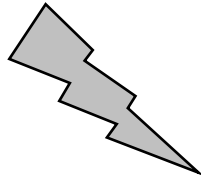
# vMR Project Goals

Create an HL7 vMR data model *recommendation* and *implementation guide*, based on the HL7 v. 3 RIM, which is capable of supporting clinical decision support for “chronic disease management” at the point of care.

~ Utilize existing HL7 data models as the basis for developing the vMR recommendation.

# vMR at the PoC

Patient Accesses  
PHR via Internet



Physician Office / Medical Facility



Electronic

Health

Record

(EHR)



Data  
Queries

i.e. GELLO



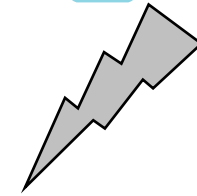
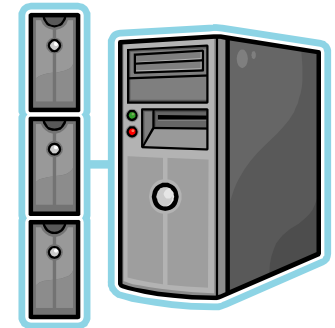
Virtual

Medical

Record

(vMR)

CDS Web Service



# vMR Value

- ⇒ Eliminates the need for EHR vendors to maintain proprietary CDS structures and messages by providing a consistent set of standardized data inputs and outputs.
- ⇒ Advances the use of computer-enabled CDS Levels 2 & 3 by reducing costs and response turn around time.
- ⇒ Allows the physician to activate CDS via their EHR or the EHR to activate CDS triggers to alert the physician.
- ⇒ Packages CDS assessments, decisions, goals, alerts & reminders for delivery to designated resources.

# vMR Project Scope

The Virtual Medical Record (vMR) data model recommendation will define clinical information *inputs* and *outputs* to/from clinical decision support services and address issues related to the effective use of a vMR, i.e. use of vMR with HL7 v.2.

The vMR will be capable of exchanging data with local clinical information systems at the point of care through a software middleware layer that translates the data into a standardized vMR format.

# vMR Team & Storyboards

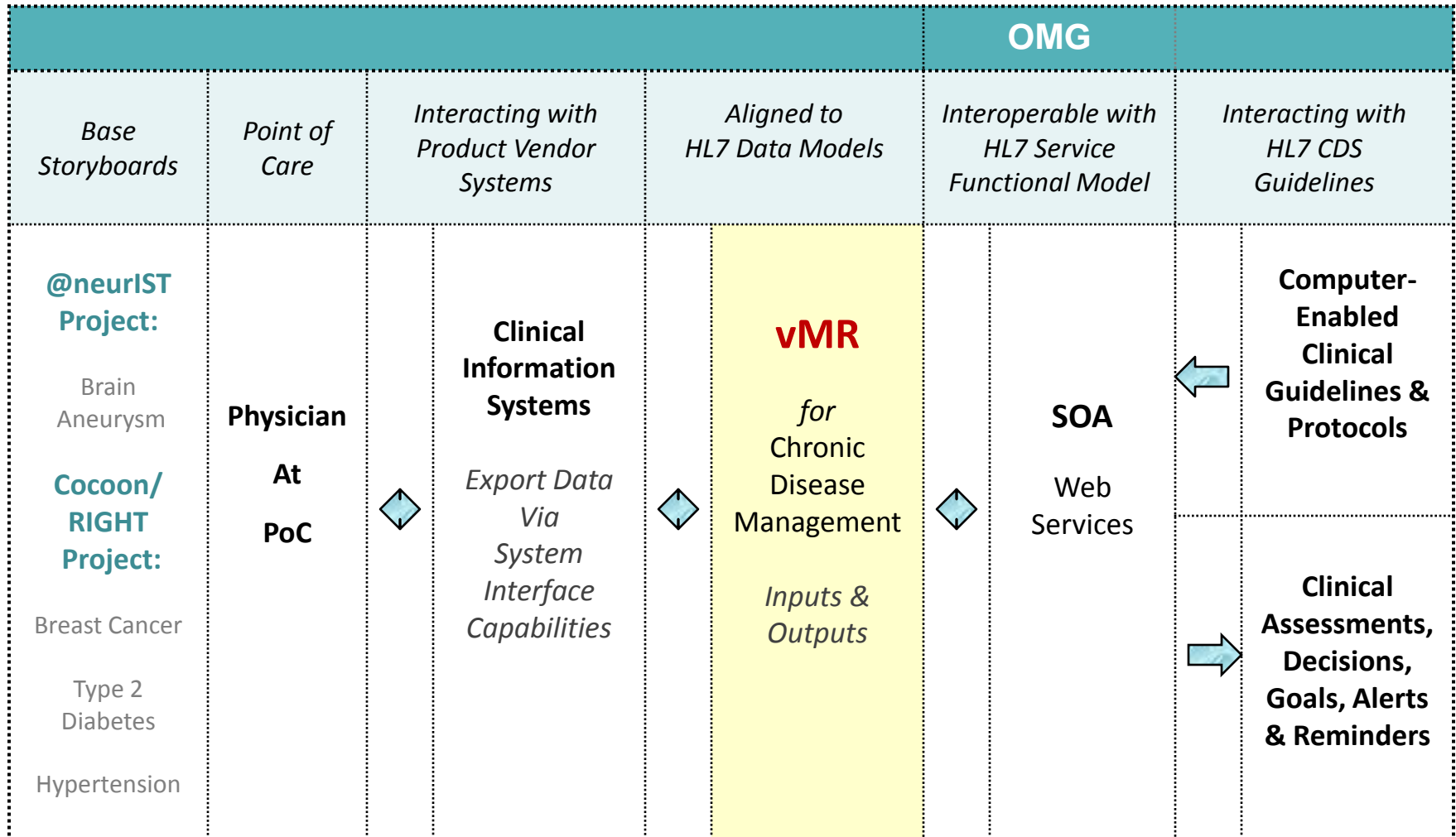
## ⇒ Project Team

- Robert Dunlop, Tech Lead
- Barbara McKinnon, Project Lead
- Matt Sailors, CDS Co-Chair
- Joyce Niland, City of Hope CR
- Mollie Ullman, Partners Genomics
- James Liu, Siemens
- Clayton Curtis, VA
- Thom Kuhn, US HITSP
- Ken Kawamoto, Duke Informatics
- Ann Wrightson, CSW Group, UK

⇒ Initial 4 storyboards will be contributed from the European Union @neurlST and Cocoon/RIGHT projects. (1) Breast Cancer (2) Type 2 Diabetes (3) Hypertension, and (4) Asymptomatic Brain Aneurysm

⇒ These storyboards will be posted on the HL7 DDS listserv for review and comment prior to specification modeling.

# vMR Alignment Diagram



# vMR Outreach

Internal HL7	External Healthcare
<ul style="list-style-type: none"> <li>Clinical Decision Support</li> </ul>	<ul style="list-style-type: none"> <li>HHS - AHRQ</li> </ul>
<ul style="list-style-type: none"> <li>Clinical Genomics</li> </ul>	<ul style="list-style-type: none"> <li>HHS – Personalized HC Initiative</li> </ul>
<ul style="list-style-type: none"> <li>EHR</li> </ul>	<ul style="list-style-type: none"> <li>NIH – National Cancer Institute</li> </ul>
<ul style="list-style-type: none"> <li>Orders &amp; Observations</li> </ul>	<ul style="list-style-type: none"> <li>NIH – National Library of Medicine</li> </ul>
<ul style="list-style-type: none"> <li>Patient Care</li> </ul>	<ul style="list-style-type: none"> <li>NIH – Mental Health</li> </ul>
<ul style="list-style-type: none"> <li>RCRIM</li> </ul>	<ul style="list-style-type: none"> <li>DoD – Tricare Pharmacy</li> </ul>
<ul style="list-style-type: none"> <li>Technical Steering Committee</li> </ul>	<ul style="list-style-type: none"> <li>Mass General – Avon Breast Clinic</li> </ul>
<ul style="list-style-type: none"> <li>Architectural Review Board</li> </ul>	<ul style="list-style-type: none"> <li>Harvard/Partners Genomics</li> </ul>
<ul style="list-style-type: none"> <li>HL7 CEO &amp; Board Members</li> </ul>	<ul style="list-style-type: none"> <li>Kaiser – IT Data Research</li> </ul>
	<ul style="list-style-type: none"> <li>Scripps &amp; U of P Health Systems</li> </ul>

# Project Deliverables & Timeline

Deliverables	Completed	Timeline
HL7 Project Scope Paper.	✓	3Q07-4Q07
HL7 PMO; TC; ARB Approval.	✓	
Bi-Monthly Work Group Teleconferences.	✓	
Draft vMR Storyboards.	✓	
Internal HL7 Outreach.	✓	
External Healthcare Outreach.	✓	
Finalize Storyboards, Activity Diagrams, Specification Models:  (1) Breast Cancer (2) Type 2 Diabetes (3) Hypertension (4) Brain Aneurysm	<i>In Progress</i>	1Q08

# Project Deliverables & Timeline

Deliverables	Timeline
Gap Analyses – vMR Use Cases analysis to (a) HL7 Class & Data Models and (b) CEN vMR Model.	2Q08
Recommendations to other HL7 TC's & SIG's for revisions to existing HL7 data models and identification of new elements required for computer-enabled clinical decision support.	3Q08-4Q08
Issue CDS recommendation on an HL7 vMR (v.3) meta-model for clinical decision support representation and information exchange.	1Q09
Test recommendation within @neurIST and Cocoon / RIGHT Projects. <i>Both projects requiring the vMR to be comprehensive enough to support computer-enabled clinical decision support</i>	2Q09
Issue CDS vMR implementation guide post testing.	By 4Q09

# vMR Preliminary Data Elements

*Identified To Date*

## Summary of Multiple CDS Step Inputs & Outputs

<i>CDS Step Data Inputs</i>	<i>CDS Step Data Outputs</i>
Patient Identifier	Patient Identifier (for audit purposes)
Patient - Gender	Male; Female
Patient - Date of Birth	Calculated Age
Patient - Race	Asian, Caucasian; etc.
Patient - Ethnic Origins	Groups Impacted by Identified Disease - Ashkenazi Jewish – unknown; true; false
Patient – Symptoms	Unknown; true; false
Patient – Diagnoses	Unknown; true; false
Patient – Laboratory Tests	Lab Test Results – unknown; true; false
Patient - Radiology Tests	Radiology Test Results - unknown; true; false
Patient – Surgeries	Surgeries – unknown; true; false
Family History - Specified Diseases; Relationship Id; Relationship Type; Diagnosis; Age at Diagnosis; Age at Death.	Relatives Identified with Disease Diagnoses - unknown; true; false; Relative 1 – Maternal Aunt – Age at Dx=39; Age at Death = 42.

~ Data Elements Not Yet Aligned to HL7 RIM & Data Models

# vMR Preliminary Data Elements

*Identified To Date*

## Summary of Multiple CDS Step Inputs & Outputs

<i>CDS Step Data Inputs</i>	<i>CDS Step Data Outputs</i>
Genetic Profile : Request for Genetic Testing	Test Id; Test Name; Variant/SourceCode
Genetic Profile: Result of Genetic Testing	Test Id: <a href="#">LOINC 21636-6</a> Test Name: <a href="#">BRCA1 Gene Mutation Anal Bid/T</a> Variant/Source Code: <a href="#">Germline</a> GeneticLocus.Name: <a href="#">BRCA1</a> ; GeneticLocus.ID: <a href="#">BRCA1</a> Gene.Region: <a href="#">Exon</a> ; Gene.Region_Sequence: <a href="#">2</a> Sequence.Variation: <a href="#">c.187delAG</a> Interpretation Code: <a href="#">Pathogenic</a> Zygoty: <a href="#">Heterozygous</a>
Request for CDS Assessment	CDS Risk Calculation
Confirmation of Recommendation Completion	CDS Determination(s): <a href="#">Genetic Predisposition to High Breast Cancer Risk = High</a>
	CDS Recommendation(s): <a href="#">Regular Mammography</a> ; <a href="#">Ovarian Screening</a> ; <a href="#">Specialist Consultation</a>
	CDS Argumentation Pros & Cons
	State File of Executable Guideline - Audit trail of inputs & outputs.

# vMR Issues

- ⇒ How to represent CDS Service determination “*pros*” and “*cons*”; both encoded and narrative text.
- ⇒ In the event you have an audit file, how do you represent it in the HL7 RIM?
- ⇒ What are the technical implications of sending an entire CDS audit file vs. sending a point-in-time synopsis of an assessment?
- ⇒ Re-interpretation of patient genetic profile as data elements are updated in EHR, *including how re-interpretation will be initiated: auto-generated via EHR or CDS Service, or person-initiated via EHR; and how patient consent will be obtained.*

# vMR Issues - Continued

⇒ Knowledge databases of:

(a) DNA variations (or variant combinations)

(b) Coded clinical significance: Unknown Significance to Pathogenic or Benign. The system receiving notification of the change might then propagate this information, flagging records for re-evaluation.

# GELLO Query Language

*Guideline Expression Language*  
**for Clinical Decision Support (CDS)**

# HL7 GELLO

**GELLO** is an HL7 standard guideline expression language developed to create re-usable sets of queries to retrieve patient data from healthcare applications.

- ⇒ The language is based on OCL, the object constraint language, but aligned to the HL7 Reference Information Model (RIM), or master data model, to work with encoded clinical data.
- ⇒ GELLO passed in 2005 as both an HL7 and ANSI standard.

# GELLO Project Goals

To re-evaluate the 1<sup>st</sup> release of the HL7 GELLO BNF, approved in 2005, in order to resolve inconsistencies and ambiguities identified when developing authoring and compiler tools.

To issue a revised GELLO BNF as a DSTU for pilot testing prior to submitting the updated syntax for a 2<sup>nd</sup> normative ballot.

# GELLO Value

- ⇒ Provides a single standard for representing clinical queries that can then be translated into other languages such as JAVA or SQL.
- ⇒ Query language aligned to HL7 v.3 RIM.
- ⇒ Provides standardized expression language for CDS, including time-based comparisons and other functions.

# GELLO Project Team

- Robert Dunlop, Project Tech Lead
- Barbara McKinnon, Project Mgmt. Lead
- Matt Sailors, CDS Co-Chair
- Craig Lucas, InferMed UK
- Scott Bolte, GE Healthcare
- Andrew McIntrye, Medical Objects AU
- Peter Tattam, Medical Objects AU
- Jared Davison, Medical Objects AU
- Clayton Curtis, VA

# Project Deliverables & Timeline

Deliverables	<i>In Progress</i>	Timeline
Bi-Monthly Work Group Teleconferences to Research & Discuss: (a) Issues Encountered in Using GELLO. (b) Potential Solutions to Issues. (c) HL7's TC Position on Issues. (d) Maintaining alignment between GELLO and its parent language OCL.	✓	3Q07-1Q08
Draft HL7 Project Scope Paper.	✓	
Draft Functional Requirements.	✓	
Draft Use Cases.	✓	

# Project Deliverables & Timeline

Deliverables	Timeline
Submit HL7 Project Scope Paper to HL7 PMO, Technical Steering Committee, and ARB.	2Q08
File for next DSTU ballot cycle. Prepare supporting documentation.	By 3Q08
Test GELLO within at least two “real life” healthcare applications.	Post DSTU

# GELLO Issues

## ⇒ Syntax Library Operations:

- Can “operations” be specified within HL7?
- If yes, what methodology should be followed?
  - ~ Retain “operations” in Syntax/BNF?
  - ~ Store “operations” in separate reference library?

## ⇒ Pre & Post Conditions:

- 1<sup>st</sup> GELLO ballot specification states GELLO is meant to query data and return a set of values.
- *Issues:*
  - ~ Should GELLO be able to execute actions such as “Post an Alert”?
  - ~ Should GELLO query & retrieve values that will be passed to another application or engine to issue an “Alert”?

# GELLO Execution Options:

HL7 v.3 RIM

Data Types  
Vocabulary

• Basis for:

HL7 RMIM

HL7 Message

Hb = 9

GELLO Query

Is Hb < 10?



GELLO Outputs

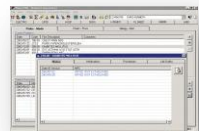
Option 1

- Send this alert to EHR:  
"CDS Alert:  
Hb < 10"

Option 2

- "Hb < 10" =  
True

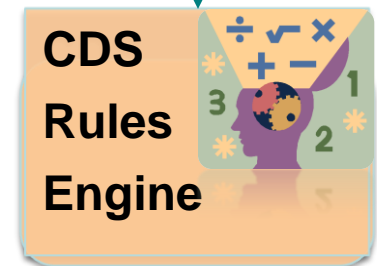
PoC



EHR



Patient  
Data



"CDS Alert:  
Hb < 10"

# GELLO Issues - Continued

- ⇒ **Use of Class Models Outside of HL7 v.3 RIM.**
- ⇒ **Two group works have been actively evaluating OCL, the language GELLO is based on:**
  - University of Dresden & OMG/OCL work group
  - *Issue:*
    - ~ What degree of alignment needs to be maintained between GELLO and its parent language?