

**Meaningful Use Stage 2 Update:  
Deploying SNOMED CT to  
provide  
decision support in the EHR**

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**Implementation Showcase**

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# Disclosure

I receive no financial support from any interests vending electronic health records or vocabulary services



# Agenda

- Meaningful Use Stage 2: Overview
- Terminology specifications required MU
- Deployment of SNOMED CT and LOINC for decision support in Epic
- Issues with use of SNOMED CT and LOINC in decision support



# Meaningful Use Business case for the EHR

## Medicare Eligible Professional Stages Timeline

This is a timeline of participation and payments by stage of meaningful use for Medicare eligible professionals:

Maximum Payment by Start Year	2011	2012	2013	2014	2015	2016
2011	1	1	1	2	2	3
\$43,720	\$18,000	\$12,000	\$7,840 Reduction (\$160)	\$3,920 Reduction (\$80)	\$1,960 Reduction (\$40)	
2012		1	1	2	2	3
\$43,480				\$7,840 Reduction (\$160)	\$3,920 Reduction (\$80)	\$1,960 Reduction (\$40)
2013			1	1	2	2
\$38,220			\$14,700 Reduction (\$80)	\$11,760 Reduction (\$240)	\$7,840 Reduction (\$160)	\$3,920 Reduction (\$80)
2014				1	1	2
\$23,520				\$11,760 Reduction (\$240)	\$7,840 Reduction (\$160)	\$3,920 Reduction (\$80)

University of Nebraska



*Note: Medicare EHR incentive payments made are subject to the mandatory reductions in federal spending known as sequestration. This 2% reduction will be applied to any Medicare EHR incentive payment for a reporting period that ends on or after April 1, 2013. If the final day of the reporting period occurs before April 1, 2013, those incentive payments will not be subject to the reduction.*

Eligible Professional's Guide to Stage 2 of the EHR Incentive Programs 9



# Meaningful Use

Stage 1: 14 core; 5/10 menu

Standards specified:

- Problem list: SNOMED CT or ICD-9-CM
- CPOE decision support: FDB, Medispan
- E-prescribing: NCPDP
- Lab results to PH: LOINC, HL7v2.X
- Summary of care: CCD
- (HIPAA: ICD-9-CM; CPT/HCPCS, CDT)



# Stage 2: 17 core; 3 menu; CQMs

## Stage 2 Eligible Professional (EP) Meaningful Use Core and Menu Measures

### Standards Criteria

#### § 170.207(h) Smoking Status

Smoking status must be coded in one of the following SNOMED CT® codes:

- (1) Current every day smoker. 449868002
- (2) Current some day smoker. 428041000124106
- (3) Former smoker. 8517006
- (4) Light tobacco smoker. 266919005
- (5) Patient status unknown. 77176002
- (6) Unknown if ever smoked. 266927001
- (7) Heavy tobacco smoker. 428071000124103
- (8) Light tobacco smoker. 428061000124105

Eligible Professional

LOINC, SNOMED CT observables

SNOMED CT code set

HL7 Infobutton, ???

- (2) Generate a report that shows changes in the following vital signs: height/length and weight (no age limit); blood pressure (ages 3 and over); cholesterol (ages 18 and over); and body mass index (BMI); and plot and display growth charts for patients (ages 3 and over).
- (3) Record the smoking status for patients 18 years old or older.
- (5) Record smoking status for patients 18 years old or older.
- (6) Use clinical decision support to improve performance on high-priority health conditions.
- (7) Provide patients the ability to view online, download and transmit their health information within four business days of the information being available to the EP.

# Stage 2

CDA CCD R2(document)

HL7 2.5.1  
LOINC

(9)	Generate <u>clinical summaries</u> for patients for each office visit.
(10)	Incorporate <u>chronic health information</u> created or maintained by the Certified EHR Technology through the implementation of appropriate technical capabilities.
(11)	<u>Generate lists of patients</u> by specific conditions to use for quality improvement, reduction of disparities, research, or outreach.
(12)	Use clinically relevant information to identify patients who should receive <u>reminders for preventive/follow-up care</u> and send these patients the reminders, per patient preference.
(13)	Use information from <u>specific</u> and provide the information to the patient.
(14)	When a patient is transferred from another setting of care or provider of care or believes an EP should perform <u>medication reconciliation</u> .
(15)	The EP who transfers their patient to another setting of care or provider of care or refers their patient to another provider of care should provide a <u>summary care record for each transition of care</u> or referral.
(16)	Capability to submit <u>electronic data to immunization registries</u> or immunization information systems except where prohibited, and in accordance with applicable law and practice.
(17)	Use <u>secure electronic messaging</u> to communicate with patients on relevant health information.

HL7 2.5.1  
CVX code set

XDR/XDM CDA CCD R2



# CDA HITSP C32: Continuity of Care Document(CCD)

- Document types and sections: LOINC
- Demographics: LOINC, SNCT Obs, OMB codes
- Payers
- Advance Directives
- Support
- Functional Status
- Problems: SNCT CF, Ev, Sit
- Family History: SNCT CF, Soc
- Social History: LOINC, SNCT Obs
- Allergies: RxNORM, NDF-RT, SNCT Subs, CF, Pharm, Qual
- Medications: RxNORM
- Medical Equipment
- Immunizations: CVX, MVX
- Vital Signs: LOINC, SNCT Obs
- Results: LOINC
- Procedures: HCPCS, SNCT Proc
- Encounters
- Plan of Care





# CCD Body Entries

- “Temperature is 36.9 C”

```
<section>
  <code code="8716-3" codeSystem="2.16.840.1.113883.6.1"
    codeSystemName="LOINC"/>
  <title>Vital Signs</title>
  <text>Temperature is 36.9 C</text>
  <entry>
    <observation classCode="OBS" moodCode="EVN">
      <code code="386725007" codeSystem="2.16.840.1.113883.6.96"
        codeSystemName="SNOMED CT" displayName="Body temperature"/>
      <statusCode code="completed"/>
      <effectiveTime value="200004071430"/>
      <value xsi:type="PQ" value="36.9" unit="Cel"/>
    </observation>
  </entry>
</section>
```



# Stage 2

**SNOMED CT**

## Professional Menu Objectives

- (1) Capability to submit [electronic syndromic surveillance data](#) to public health agencies except where prohibited, and in accordance with applicable law and practice.
- (2) Record [electronic notes](#) in patient records.
- (3) [Imaging results](#) consisting of the image itself and any explanatory information are accessible through CEHRT.
- (4) Record patient [family health history](#) as structured data.
- (5) Capability to [identify and report cancer cases](#) to a public health central cancer registry, except where prohibited, and in accordance with applicable law and practice.
- (6) Capability to [identify and report specific cases](#) to a specialized registry (other than a cancer registry), except where prohibited, and in accordance with applicable law and practice.

**XDR/XDM CCD R2**

**SNOMED CT LOINC**

View or download all of the EP [Stage 2 Core and Menu Objectives](#) for Stage 2.

# MU stage 2 Vocabulary Standards 2014

- SNOMED CT International July 2012 and US extension March 2012
- ICD-\*-CM
- LOINC v2.40 or later
- RxNORM vAugust 2012, FDB
- CVX, MVX code set vJuly 11, 2012
- CPT; HCPCS
- ISO languages and country codes



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# Reference Standards in Epic

- SNOMED CT: HLX master file supports concept identifiers and descriptions -including US extension – along with subtype ('IS-A') relationship; mapping from EDG by third party
- LOINC: LNC master file supports concept identifiers and long name; LRR mapped by site
- RxNORM: mapping to ERX supported by FDB interoperability module includes NDC codes
- ICD-\*-CM: mapping provided by IMO third party
- HCPCS: mapped by Epic
- CVX: master table LIM mapped by site



# Decision Support in Epic

## Epic Grouper technology

- Problem oriented record summaries
- Health maintenance alerts
- Best practice alerts
- Registries and population management tools

## Data Warehousing

- Cogito data warehouse
- GPC: i2b2 research data warehouse



# Groupers

- Reporting and decision support in Epic can employ vocabulary (SNOMED CT subtypes; ICD-9-CM, FDB, HCPCS) to create groupers
- Compiled into code sets to build decision

## Use Case:

Select a heart failure

## Use Case:

Display any procedure the procedure

## Use Case:

Place chart trigger

## Use Case:

Create for you

## Use Case:

Create a Best Practice Alert for patients with any diagnosis of heart failure not on a beta blocker

# Groupers

- SNOMED CT 'IS-A' for:
  - Clinical findings, Events, Situations, Social history – problem list
  - Procedures – surgical history
- ICD-9-CM numerical code range for diagnoses or problem list
- FDB for pharmaceutical or treatment class
- **NO LOINC – Results or Orders**
- **SNOMED CT observables - Physical findings are NOT integrated with Clinical LOINC**





# Creating Groupers: Diabetes

- Choose the parent node in a hierarchy subtree of SNOMED CT

The screenshot displays the SNOMED CT browser interface for the concept 'diabetes mellitus' (Concept Id: 73211009, Description Id: 121589010). The interface is divided into several sections:

- Header:** Shows the Concept Id (73211009) and Description Id (121589010). The concept name is 'diabetes mellitus' (Type: clinical finding).
- Search:** A search bar contains 'diabetes mellit'.
- Hierarchy:** A tree view shows the hierarchy. The 'diabetes mellitus' node is highlighted with a red box. Its parent nodes are 'disorder of endocrine system' and 'disorder of glucose metabolism'. The hierarchy includes various subtypes such as 'Diabetes mellitus due to genetic defect in beta cell function', 'maturity-onset diabetes of the young', 'neonatal diabetes mellitus', 'diabetes mellitus due to genetic defect in insulin action', 'diabetes mellitus during pregnancy, childbirth and the puerperium', 'diabetes mellitus without complication', 'Houssay's syndrome', 'secondary diabetes mellitus', 'Type 1 diabetes mellitus', 'type 2 diabetes mellitus', and 'pregnancy and type 2 diabetes mellitus'.
- Properties:** A panel on the right shows the concept status as 'current'. It lists descriptions in English (en-US): 'diabetes mellitus (disorder)', 'diabetes mellitus', and 'DM - Diabetes mellitus'. It also shows the definition as 'Primitive' and lists relationships: 'is a' (disorder of glucose metabolism, disorder of endocrine system), 'finding site' (structure of endocrine system), and 'Qualifiers' (severity: severities, episodicity: episodicitities, clinical course: courses). Codes are listed as 'Original SNOMED Id: DB-61000' and 'Read Code (Ctv3Id): C10..'. The interface also includes a toolbar with various icons and a search filter set to 'Words - any order'.

# Diabetic Problem View

3/6/2015 visit with James R Campbell, MD for RETURN VISIT-MEDS - 3 months ago

[Orders for Surgery](#)
[Orders for Admission](#)
[Images](#)
[References](#)
[Media Manager](#)
[Preview AVS](#)
[Print AVS](#)
[Benefits Inquiry](#)

- Charting
- Visit Info
- Vital Signs
- Allergies
- Verify Rx Benefits
- Reconcile Dispos...
- Medications
- History
- Problem List**
- Progress Notes
- Goals
- Orders
- BestPractice
- Visit Diagnoses
- Meds & Orders
- SmartSets
- Discharge
- Pt. Instructions
- LOS
- Follow-up
- Chart Check
- Charge Capture
- Quality Measures
- Close Encounter

**Coronary artery disease** 414.00 [Edit Notes](#) [High](#)

[Overview](#)

**COPD (chronic obstructive pulmonary disease)** 496 [Edit Notes](#) [High](#)

[Overview](#)

**Type 2 diabetes mellitus** 250.00 [Edit Notes](#) [High](#)

[Details](#) Noted: 1/3/2007 One Chart | PATIENT:

[Overview](#) Edited: James R Campbell, MD 3/19/2012

[+ Create Current Assessment & Plan Note](#)

[+ Related Goals](#)

Search for new item [+ Add](#)

None for this problem

[+ Relevant Medications and Unsigned Orders \(Past 5 years\)](#)

Search for new order [+ New Order](#)

Name	Dose, Frequency
<b>Medications</b>	
<a href="#">insulin glargine (LANTUS) 100 unit/mL injection</a>	10 Units, Nightly
<a href="#">Pharmacy: LDI PHARMACY [Patient Preferred] 314-652-1121</a>	

[+ Relevant Results](#)

	Most Recent	-2 days	-5 mo
<b>Chemistry Panels</b>			
<b>CHOLESTEROL</b>	159 (-2 days)	159	
<b>LDL CALC</b>	87 (-2 days)	87	
<b>LDL MEASURED</b>	52 (-8 mo)		
<b>TRIGLYCERIDES</b>	199 (-2 days)	199	
<b>Pancreas, Diabetes</b>			
<b>HEMOGLOBIN A1C</b>	6.4 (-2 days)	6.4	6.7
<b>Urine Chemistries-</b>			
<b>RATIO MCGALB/MGCREAT</b>	173.05 (-8 mo)		
<b>UR ALBUMIN MG/DL</b>	28.38 (-8 mo)		

**Medium**

**Reflux esophagitis** 530.11 [Edit Notes](#) [Medium](#)

[Overview](#)

**Hypertension** 401.9 [Edit Notes](#) [Medium](#)

[Overview](#)

# Health Maintenance Alerts

Female, 77 y.o., PCP: Campbe... MRN: 00452663 Allergies Metformin, Diclofenac... Adv Dir?: Patie... Primary Ins.: MEDICARE One Chart | P  
 My Sticky Note: CSN: None Code: Need O... Pref Lang: C

**Health Maintenance** [?] Close X

Postpone Remove Postpone Override Remove Override Edit Modifiers Report Update HM

Due Date	Topic	Date (Reason)			
9/1/2014	INFLUENZA VACCINE	10/14/2013	<a href="#">10/14/2013</a>	10/29/2012	<a href="#">10/29/2012</a>
10/14/2014	URINE ALBUMIN/CREATININE RATIO	<a href="#">10/14/2013</a>	<a href="#">10/29/2012</a>	<a href="#">7/18/2011</a>	<a href="#">12/31/2008</a>
11/20/2014	DIABETES OPHTHALMOLOGY EXAM	11/20/2013			
1/7/2015	HM DIABETES HEMOGLOBIN A1C	<a href="#">7/7/2014</a>	<a href="#">1/9/2014</a>	<a href="#">6/26/2013</a>	<a href="#">5/1/2013</a>

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**Health Maintenance Modifiers**

Diabetes Mellitus

**Health Maintenance Plans**

DIABETES MELLITUS OPHTHAMOLOGY EXAM 12 MONTHLY  
 DIABETES MELLITUS URINE ALBUMIN/CREATININE RATIO  
 HM DIABETES HEMOGLOBIN A1C EVERY 6 MONTHS  
 INFLUENZA VACCINE AGE 6 MO THROUGH GERIATRIC

**Health Maintenance Summary**

INFLUENZA VACCINE	Overdue	9/1/2014
URINE ALBUMIN/CREATININE RATIO	Next Due	10/14/2014
DIABETES OPHTHALMOLOGY EXAM	Next Due	11/20/2014
HM DIABETES HEMOGLOBIN A1C	Next Due	1/7/2015

**Status Legend**

Overdue Due On Due Soon Postponed

**Definitions**

Completed: Done with the required satisfactions  
 Addressed: Overridden with the intention of not completing the topic

**Override Type Abbreviations**

Done Done  
 Declined Declined  
 (N/S) Reason not specified

# SNOMED CT, LOINC and Epic

- Epic has integrated the semantics of the SNOMED “Is\_a” relationship into reporting and decision support technology for the user community
- Epic has expanded support for US extension in compliance with meaningful use
- Model system components include many pre-compiled Grouper records in standard reports and MU monitoring; build of additional SNOMED concept groupers easy to implement



# Decision support use cases NOT supported

- Infectious disease cases by causative organism
- All lab results for a specified procedure regardless of methodology
- All lab results for a specified order panel
- All physical findings which are components of the respiratory exam



# Cogito

### My Panel Metrics

	Q2 '12	Q3 '12	Q4 '12	Q1 '13	QTD
▶ ACE Inhibitor or ARB Therapy for LVSD	94 ✓	93 ✓	91 ✓	89 ✓	86 ◆
▶ Diabetes: Hemoglobin A1c Control	76 ✓	74 ✓	72 ◆	73 ✓	72 ◆
▶ Hypertension: Blood Pressure Control	74 ✓	73 ✓	74 ✓	72 ✓	72 ✓
▶ Cervical Cancer Screening	82 ◆	84 ◆	85 ◆	83 ◆	82 ◆
▶ Colorectal Cancer Screening	64 ✓	66 ✓	66 ✓	68 ✓	64 ✓
▶ Breast Cancer Screening	76 ✓	78 ✓	77 ✓	77 ✓	78 ✓
▶ Childhood Immunization Status	88 ✓	88 ✓	89 ✓	90 ✓	89 ✓

### Meaningful Use Quality Measures

	Q2 '12	Q3 '12	Q4 '12	Q1 '13	QTD
▶ Adult Weight Screening and Follow-Up for Patients 18 to 64 Years of Age	67	66	68	69	68
▶ Adult Weight Screening and Follow-Up for Patients 65 Years of Age and Older	67	72	74	75	75
▶ Hypertension: Blood Pressure Measurement	92	96	94	95	96
▶ Tobacco Cessation Intervention	76	78	79	79	78
▶ Tobacco Use Assessment	89	90	92	91	92

### System Proficiency

	Q2 '12	Q3 '12	Q4 '12	Q1 '13	QTD
▶ Place Orders Quickly Using a Template	59 !	62 ◆	64 ◆	66 ✓	68 ✓
▶ Close Visits the Same Day	98 ✓	95 ✓	96 ✓	97 ✓	99 ✓
▶ Write Your Orders in the Exam Room	92 ✓	89 ✓	86 ✓	88 ✓	86 ✓
▶ Quickly Review Results Messages	89 ◆	87 ◆	87 ◆	85 ◆	80 !
▶ Review Allergies	89 ◆	96 ✓	99 ✓	93 ✓	92 ✓

### HB AR Summary

	Amount	%	Days
In-House (Unbilled)	18,947,344	12%	4.5
Held for Minimum Days	14,574,880	9%	3.5
✓ Candidate for Billing	11,659,904	7%	2.8
◆ Outstanding Claims	73,238,772	45%	17.6
Claims with Open Denials	5,829,952	4%	1.4
Self-pay	20,404,832	13%	4.9
Outsourced - Self Pay	2,532,519	2%	0.6
Outsourced - Insurance	14,756,318	9%	3.5
Undistributed	115,321	0%	0.0
Credit Balance	-364,372	0%	-0.1
<b>Total AR</b>	<b>161,695,470</b>		<b>38.8</b>
<b>Bad Debt</b>	<b>8,744,928</b>		
<b>External Agency AR</b>	<b>14,546</b>		

*AR days calculated using an Average Daily Revenue of 4,169,353*

### Visit Statistics

	Q2 '12	Q3 '12	Q4 '12	Q1 '13	QTD
▶ Visits	1,506	1,498	1,517	1,489	1,104
▶ New Patients	231	227	225	225	168
▶ Average Wait Time Before Rooming	08m	07m	07m	08m	00m
▶ Average Wait Time for Provider	14m	15m	14m	15m	00m
▶ Work RVUs	6,546	6,466	6,288	6,411	4,824
▶ Charges (\$)	113,898	112,509	109,402	111,547	83,929

### Top Providers By Delinquent Deficiencies

Provider	Count	Cnt Age (d)	Total	Tot Age (d)
Labelle, Susan, MD	28	26.1	38	22.1

### Report Listing

# Greater Plains Collaborative: i2b2

i2b2 Query & Analysis Tool

Project: i2b2 Demo

User: James R. Campbell

Navigate Terms

Find Terms

- [-] Clinical Measurements [67,475,602 facts; 518,830 patients]
- [-] DRG [34,356 facts; 23,199 patients]
- [-] Demographics [50,929,758 facts; 1,737,382 patients]
- [-] Diagnoses (ICD9CM) [6,887,084 facts; 498,807 patients]
- [-] Encounters [34,576,070 facts; 954,980 patients]
- [-] Laboratory Measurements [146,001,219 facts; 544,898 patients]
- [-] PCORI [99,487,439 facts; 1,736,608 patients]
- [-] Procedures [5,458,439 facts; 233,641 patients]
- [-] SNOMEDCT
- [-] UNMC One Chart [31,915,785 facts; 415,134 patients]
  - [-] Laboratory tests [31,915,785 facts; 415,134 patients] - 415134
    - [-] Hematology [26,109,507 facts; 390,463 patients] - 390463
      - [-] Complete blood count without differential [26,109,507 facts; 390,463 patients] - 390463
        - [-] Hematocrit [3,606,065 facts; 379,643 patients] - 379643
        - [-] Hemoglobin [3,644,385 facts; 388,871 patients] - 388871
        - [-] MCH
        - [-] MCHC [3,130,745 facts; 369,826 patients] - 369826
        - [-] MCV [3,135,238 facts; 369,904 patients] - 369904
        - [-] Platelet count [3,167,093 facts; 364,792 patients] - 364792
        - [-] RDW [3,135,209 facts; 369,902 patients] - 369902
        - [-] Red blood cell count [3,141,903 facts; 370,004 patients] - 370004
        - [-] White blood cell count [3,148,869 facts; 370,003 patients] - 370003
    - [-] Urinalysis [5,806,278 facts; 229,608 patients] - 229608

Query Tool

Query Name:

Temporal Constraint:

Treat all groups

Group 1			Group 2		
Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude
Treat Independently ▾			Treat Independently ▾		
<b>drop a term on here</b>					

Run Query

Clear

Print Query

0 Groups

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# SNOMED CT and Epic

- Defining relationships and qualifiers need to be deployed in grouper functionality to support full SNOMED CT semantics
- New term submission and extension concept management needs to be negotiated and standardized with Epic research data team
- Procedures under discussion with Epic for fully defining SmartData elements NOT well deployed
- Research data model for Cogito under discussion



# SNOMED CT/LOINC:

## Decision support for Observables

- Integrated and harmonized Observables ontology fully classified needed for Physical findings, Laboratory and Radiology results
- Epic Grouper technology needs to be extended to employ these harmonized semantics
- Informatics community needs to be informed of these developments



Questions?

