

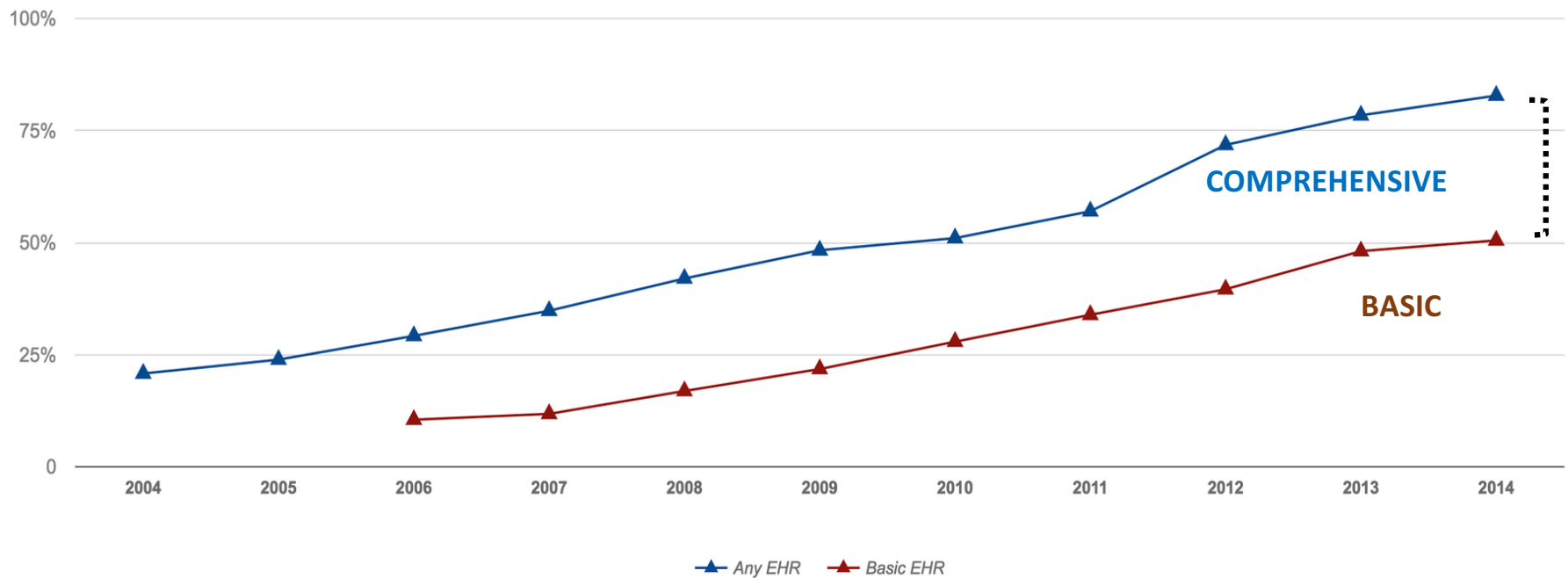
# CDSKB.ORG: A Resource for Genomic Medicine Implementation

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# Adoption of EHRs 2004- 2014



Percentage of Office-based Physicians with Electronic Health Record System  
2004 - 2014

Source: Office of National Coordinator Health IT

Table 2: Electronic Functions Required for Hospital Adoption of Basic or Comprehensive EHR Systems

EHR Functions Required	Basic EHR without Clinician Notes	Basic EHR with Clinician Notes	Comprehensive EHR
<b>Electronic Clinical Information</b>			
Patient demographics	★	★	★
Physician notes		★	★
Nursing assessments		★	★
Problem lists	★	★	★
Medication lists	★	★	★
Discharge summaries	★	★	★
Advance directives			★
<b>Computerized Provider Order Entry</b>			
Lab reports			★
Radiology tests			
Medications	★		
Consultation requests			
Nursing orders			
<b>Results Management</b>			
View lab reports	★		
View radiology reports	★		
View radiology images			
View diagnostic test results	★		
View diagnostic test images			
View consultant report			
<b>Decision Support</b>			
Clinical guidelines			
Clinical reminders			
Drug allergy results			
Drug-drug interactions			
Drug-lab interactions			
Drug dosing support			

**Decision Support**

- Clinical guidelines
- Clinical reminders
- Drug allergy results
- Drug-drug interactions
- Drug-lab interactions
- Drug dosing support

NOTES: Basic EHR adoption requires each  
Comprehensive EHR adoption requires each

# Maturing Resources

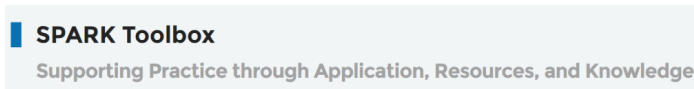
- Identification of Genomic Variation



- Genome-Phenome Associations & Clinical Guidance



- Implementation Resources



# Genomic Data Pipeline

Electronic/Paper Test Order and Sample Acquisition

**Laboratory Testing**

- Specimen Accessioning & Tracking
- Result Quality Review
- Structured Result Reporting

Within Health System or Reference Laboratory

**Genomic Escrow**

- Genetic Results Parsing
- Storage of Genetic Results
- Identification of actionable genomic information

Within Health System, Reference Laboratory, or 3<sup>rd</sup> Party

**Data Interpretation**

- Genotype to Phenotype Translation
- Integration with non-genomic data
- Decision Support Service

**Clinical Care**

- Electronic Health Record
- Personal Health Record
- Prescribing & Other Ordering

Within Health System

# CLIA-compliant Genomic Data Pipeline

Gaps in pipeline

Electronic/Paper Test Order  
and Sample Acquisition

## Laboratory Testing

Specimen Accessioning  
& Tracking

Result Quality Review

Structured Result  
Reporting

Within Health System or  
Reference Laboratory

## Genomic Escrow

Genetic Results Parsing

Storage of Genetic  
Results

Identification of  
actionable genomic  
information

Within Health System, Reference Laboratory, or 3<sup>rd</sup> Party

## Data Interpretation

Genotype to  
Phenotype Translation

Integration with non-  
genomic data

Decision Support  
Service

## Clinical Care

Electronic Health  
Record

Personal Health Record

Prescribing & Other  
Ordering

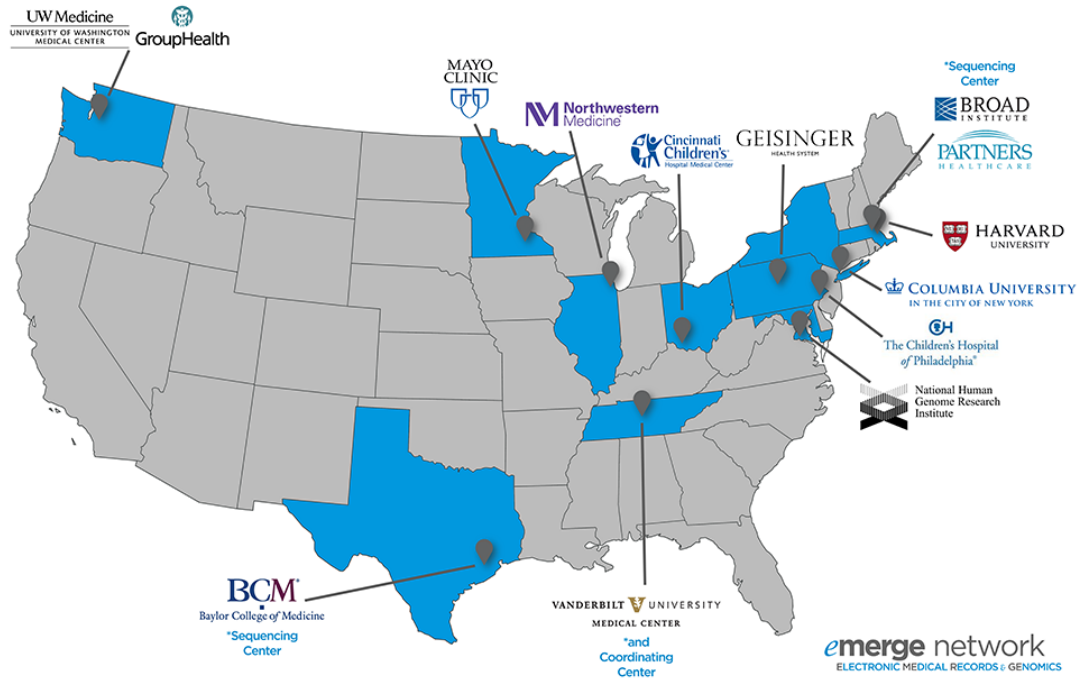
Within Health System

# Genomic Medicine Case Studies

**emerge network**  
ELECTRONIC MEDICAL RECORDS & GENOMICS

**eMERGE PG<sub>x</sub>**

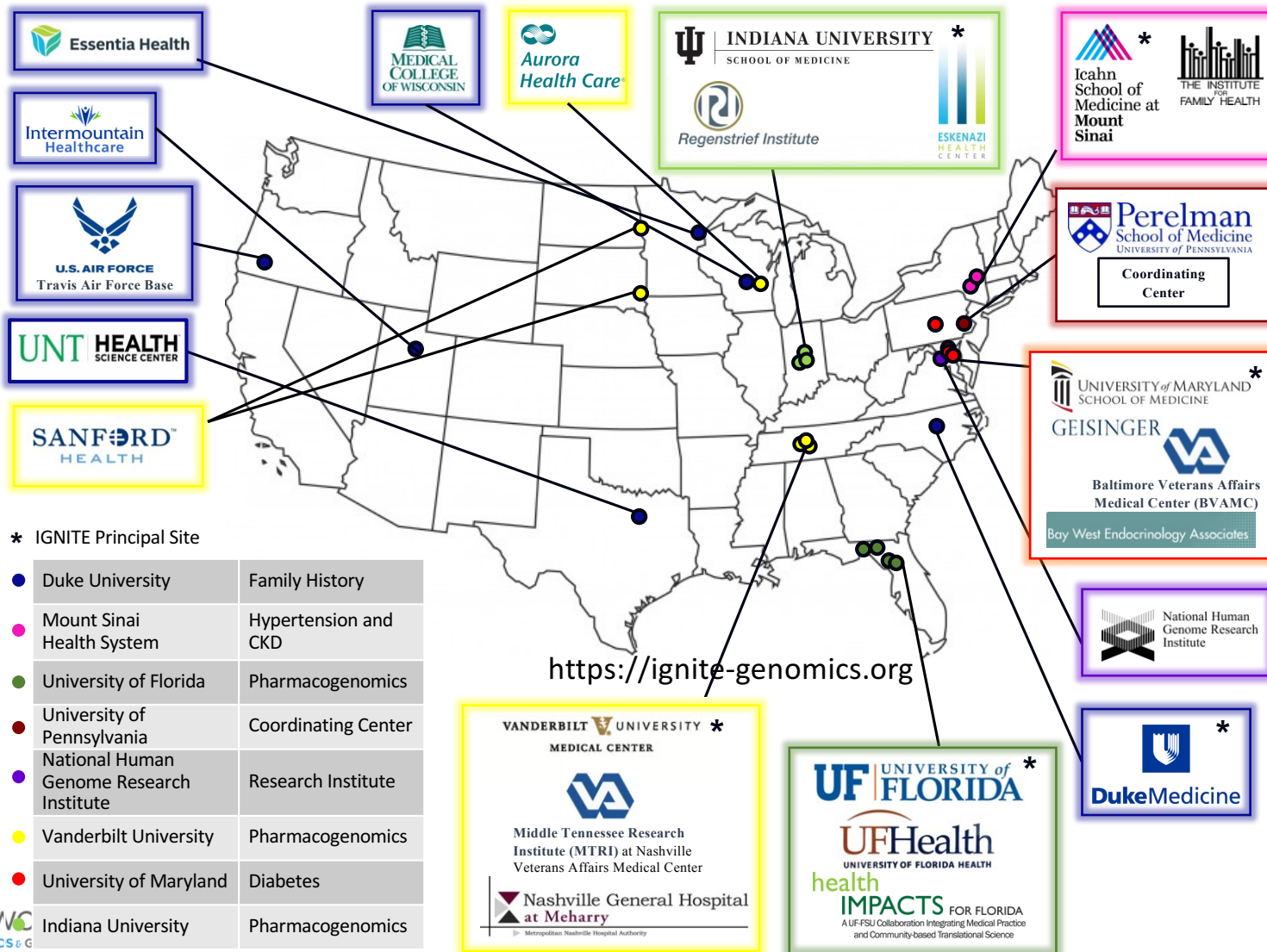
A multi-center pilot of pharmacogenetic sequencing in clinical practice



**emerge network**  
ELECTRONIC MEDICAL RECORDS & GENOMICS

<https://emerge.mc.vanderbilt.edu>

**IGNITE** Implementing GeNomics In practicE



# CDSKB.ORG

The screenshot shows the homepage of CDSKB.ORG. At the top left, the logo reads "CDS\_KB" with "CLINICAL DECISION SUPPORT KNOWLEDGEBASE" underneath. A navigation menu includes "HOME", "CONTRIBUTORS", "LIBRARY", "LEARNING", "COMMUNITY", "CONTACT", and "ABOUT". A dark blue banner features the text "CDS KnowledgeBase is the engine that drives precision medicine." and a graphic of interlocking gears labeled "ehr", "genetics", "CDS", "meds.", and "patient". Below the banner, the "who are we?" section describes CDS as a part of clinical knowledge management. The "CDS KnowledgeBase Partners" section lists "emerge network" (Electronic Medical Records & Genomics) and "IGNITE" (Implementing GeNomics In prActiCE). To the right, "THE COMMUNITY: IDEAS FROM ONE OF MANY" is accompanied by a map of the United States with a network of nodes and connecting lines.

- 59 artifacts from 13 institutions and organizations
- Registered users: 211

## ORGANIZATIONS

### ARTIFACTS

Children's Hospital of Philadelphia

Displaying and Integrating Genetic Information Through the EHR (DIGITize)

Geisinger Health System

Group Health Cooperative

Icahn School of Medicine at Mount Sinai

Marshfield Clinic Research Foundation

Mayo Clinic

Northwestern University

**St. Jude Children's Research Hospital**

University of Maryland School of Medicine

Vanderbilt University (partnering with Meharry Medical College)

## ORGANIZATION DETAILS



St. Jude Children's Research Hospital provides comprehensive inpatient and outpatient care for children with catastrophic diseases, focusing on childhood cancer, infectious diseases, and sickle cell disease. St. Jude has a long history of research and discovery in pharmacogenetics and genomics. Our translational research experience combined with clinical and laboratory expertise in therapeutic drug monitoring have formed the foundation of our efforts to implement pharmacogenetics as standard of care for our patients. Most St. Jude patients are eligible to enroll in an ongoing clinical trial called PG4KDS, a research protocol designed to implement preemptive pharmacogenetic test results into routine clinical care ([www.stjude.org/pg4kds](http://www.stjude.org/pg4kds)). St. Jude has a fully functional and integrated electronic health record (EHR) system from Cerner Corporation.

LOGIN TO CDS\_KB

eCDS\_KB  
CLINICAL DECISION SUPPORT KNOWLEDGEBASE

HOME

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LIBRARY

LEARNING

COMMUNITY

CONTACT

ABOUT

Want to add to this library? [Click here.](#)

SEARCH BY CONTRIBUTOR:

Icahn School of Medicine at

FILTER RESULTS BY REQUIRED  
ELEMENTS:

- CDS Architecture diagrams
- Usage scenarios
- CDS Presentation
- Workflow
- Mapping and translation tables
- Algorithms and pseudocode
- Patient materials
- Uncategorized

CLOPIDOGREL

Icahn School of Medicine at Mount Sinai ^

WORKFLOW DIAGRAM AND TEXT DISPLAY

WORKFLOW : MOUNT SINAI WORKFLOW DIAGRAM AND DISPLAY TEXT --  
CLOPIDOGREL, CYP2C19.PDF

DOWNLOAD:

[pdf version](#)

STEVE ELLIS | AVAILABLE FROM: [HTTPS://CDSKB.ORG/ARTIFACT/?ID=30](https://cdskb.org/artifact/?ID=30)

CDS ARCHITECTURE

Icahn School of Medicine at Mount Sinai ^

ARCHITECTURE FOR GENOMIC-INFORMED CLINICAL DECISION SUPPORT.

CDS ARCHITECTURE DIAGRAMS : MOUNT SINAI CDS ARCHITECTURE.PDF

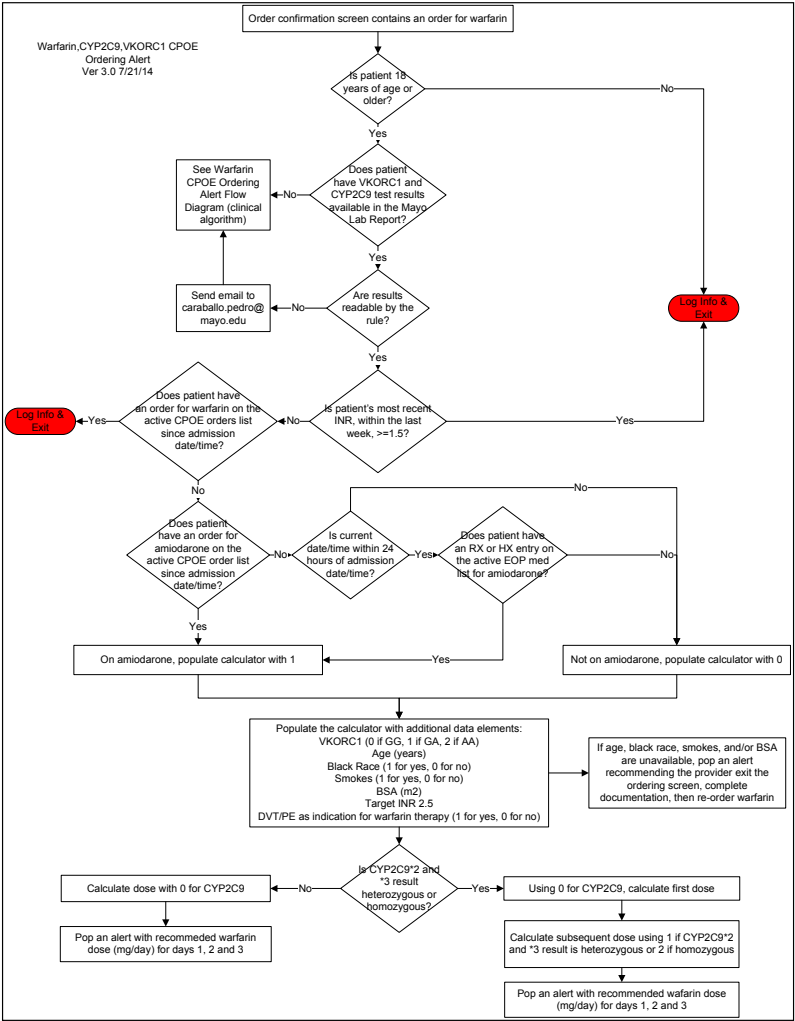
DOWNLOAD:

[pdf version](#)

NO CONTACTS | AVAILABLE FROM: [HTTPS://CDSKB.ORG/ARTIFACT/?ID=39](https://cdskb.org/artifact/?ID=39)

Warfarin – CPOE Screen Rule

Pseudocode  
Warfarin dosing algorithm  
Mayo Clinic



# CYP2C19 / Clopidogrel Alert

## Vanderbilt University Medical Center

### Drug-Genome Advisor

**Intermediate Metabolizer - clopidogrel (Plavix) - Rare Risk Allele**  
**Substitution recommended due to increased cardiovascular risks**

#### If not otherwise contraindicated:

- Prescribe prasugrel (Effient) 10 mg daily

#### Prasugrel should not be given to patients:

- history of stroke or transient ischemic attack
- $\geq 75$  years of age [Current patient age: 51]
- with body weight  $< 60$  kg [Current patient weight: 59.0 kg as of 10/12/2012]

- Prescribe ticagrelor (Brilinta) 90 mg twice daily

#### Ticagrelor should not be given to patients:

- history of severe hepatic impairment
- intracranial bleed

- Continue with clopidogrel (Plavix) prescription

#### Primary override reason:

- Contraindicated for prasugrel or ticagrelor
- Potential side effects
- Provider/Patient opts for clopidogrel
- Cost

[Evidence Link](#)

## Screenshot from Vendor System – CYP2C19 / Clopidogrel Alert Northwestern University

**Genetic test results indicate patient may be a poor metabolizer of clopidogrel Consider alternative- medication may be ineffective if prescribed**

Acknowledge reason:

- Click here to add "Resistance to clopidogrel" to Prob List
- Click here to view Medications
- Click here to change therapy or order a consultation
- Clopidogrel Genetic Results Fact Sheet

Accept & Stay    Accept    Cancel

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# APOL1 Alert for Risk of Renal Failure

## Mount Sinai

Genomic Medicine -- GUARDD Study

### POSITIVE RESULT:

This patient has ***INCREASED RISK*** for END STAGE KIDNEY FAILURE, according to APOL1 genetic testing (result: APOL1 G2/G2)

Evidence suggests that good blood pressure control and renal function testing may forestall kidney failure.

Recent blood pressure readings for this patient were:

2014-09-28	2014-09-28	2014-09-18
<b>138/100</b>	<b>120/80</b>	<b>120/80</b>

[Click here for provider information.](#)

[Click here for patient materials.](#)

*Note: These results will be filed under Labs / Genetics.*

# Metadata

- Name / title
- Description
- Artifact type†
- Authoring institution†
- Network/consortium†
- Contact(s)
- Acknowledgements
- Created
- Last updated
- Tags‡

† - selected from a pre-defined list of values

‡ - UMLS CUI(s)

# Learning Archive: Monthly Webinars

Date	Topic	Presenter(S)	Attendance
10.01.2015	Toward effective knowledge delivery: a proposed framework	Casey Lynnette Overby	18
11.05.2015	SMART on FHIR Genomics	Gil Alterovitz	48
12.03.2015	Genomics and Electronic Health Record	Brad Strock/ Scott Moss (Epic)	38
01.06.2015	DIGITiZE AC	Sandy Aronson (Harvard)	31
02.04.2016	Moffitt Cancer Center	Gillian Bell (Mission Health)	37
03.03.2016	Clinical Decision Support for Precision Oncology	Mia Levy (Vanderbilt)	42
04.21.2016	PGRN PGx guidelines repository	Bob Freimuth (Mayo)	15
05.05.2016	Innovation Around EHR	Ricky Bloomfield (Duke)	19
06.02.2016	The HSPC Open Services Platform	Scott Narus (University of Utah)	13
07.07.2017	Laboratory and precision medicine	John David Larkin Nolen (Cerner)	22
08.04.2016	Deciphering the Genome: Community Driven Efforts	Heidi L. Rehm (Partners)	28
09.01.2016	OpenInfoButton and EMR integration with EPIC and Cerner	Guilherme Del Fiol (University of Utah)	n/a

[henry.ong@vanderbilt.edu](mailto:henry.ong@vanderbilt.edu)

# CDS-KB Goals

- Coverage: Collect examples of every implemented PM CDS and EHR representations of genetic variant
- Building Community: Become part of the network implementation resources and attracting engaged group of implementers and clinical informaticists
  - Anticipating adding CPIC related content
- Promoting Genomic Medicine standards