EMR Integration and Genomic Medicine Implementation – Big Data, Clinical Disseminations, Clinical Validities & Utilities

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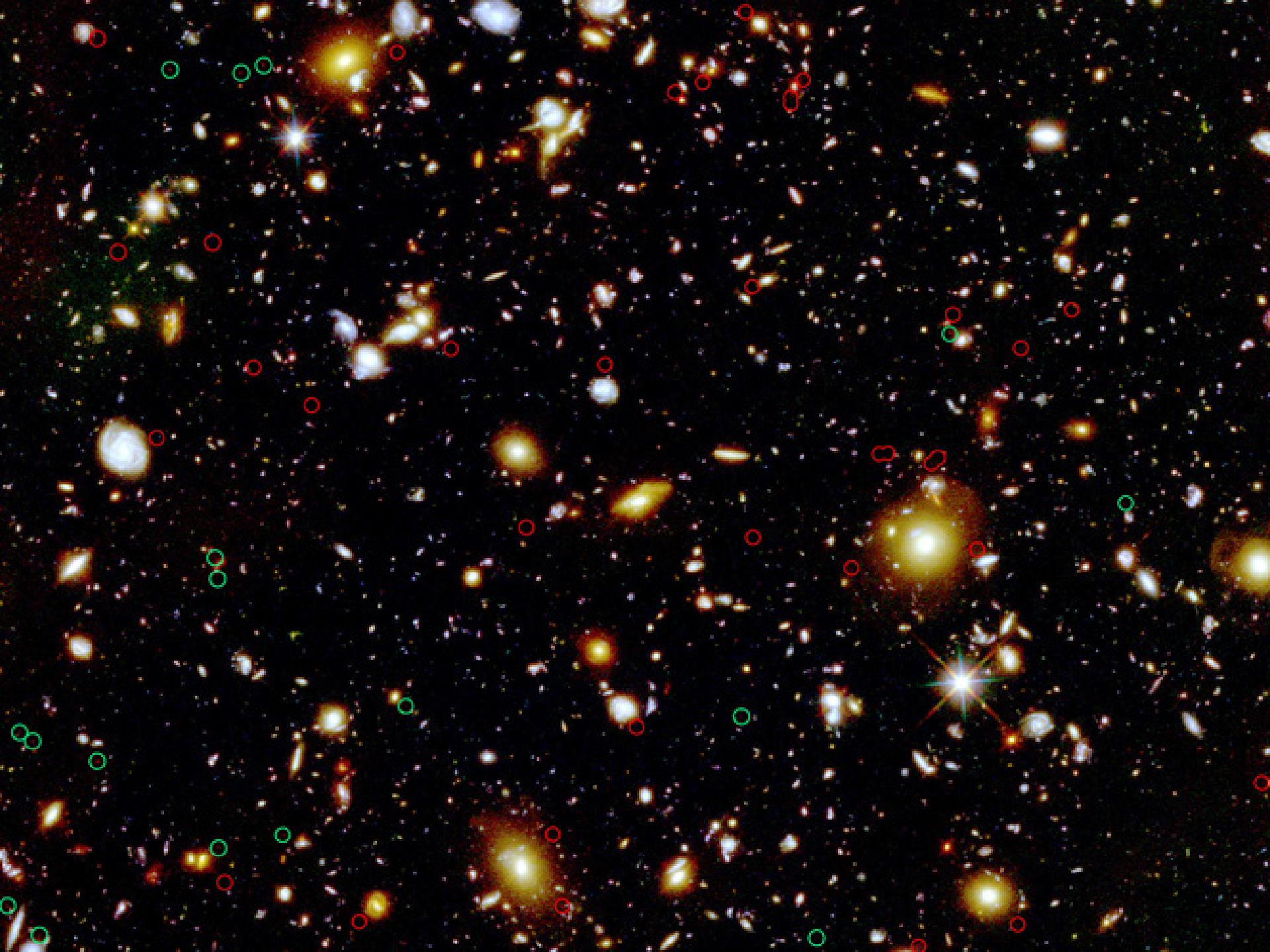


EMR Integration

- Integration involves primarily PGx representation and clinical decision support

PGx

Site	Drug
Mount Sinai, Northwestern, Vanderbilt	*CYP2C19* - clopidogrel; *CYP2C9 / VKORC1* - warfarin; *SLCO1B1* - Simvastatin
Mayo Clinic	*CYP2C19* - clopidogrel; *CYP2C9 / VKORC1* - warfarin; *SLCO1B1* - Simvastatin; *CYP2D6* - Codeine, Tramadol, Tamoxifen
Marshfield/Essentia	*CYP2C19* - clopidogrel; *CYP2C9, VKORC1*, and *CYP4F2* - warfarin; *SLCO1B1* - Simvastatin
Group Health	HLA B* 1502 - Carbamazepine
Geisinger	*CYP2C19* - clopidogrel; *CYP2C9 / VKORC1* - warfarin; *SLCO1B1* - Simvastatin; *IL28B* - Interferon response
Cincinnati Children's	*CYP2D6* - Codeine
Boston Children's	*CYP2C9/VKORC1* - Warfarin
CHOP	*CYP2D6* - Codeine. *SLC02B1* - montelukast; *ABCB1 / CYP2C19* - ranitidine + omeprazole; *CYP2D6 / ABCB1 / OPRM1 / COMT / UGT2B7* - Morphine

Non-PGx

Site	Drug
Northwestern	HFE, Evaluate the use and impact of physician support documents and best practice alerts in the EHR for genomic results
Mayo Clinic	HFE, RCT of communicating genomic risk of a heart attack
Marshfield/Essentia	HFE, Complement Factor H and Macular Degeneration
Vanderbilt	HFE, Reduction of Adverse Drug Events
Group Health	HFE, nonpharmacogenomic results from the PGRN-Seq testing platform (e.g. *RYR1, RYR2, SCN5A,* etc.)
Mount Sinai	HFE, *APOL1* and risk of CKD in AA patients with diabetes and hypertension
Geisinger	HFE, Risk algorithm Abdominal Aortic Aneurysm, Whole Genome Sequencing

eMERGE Infobutton Project

Objective 1: To develop a new information resource based on eMERGE II & PGx scenarios

Objective 2: To implement infobuttons within EHRs at eMERGE sites

Objective 1: To develop a new information resource based on eMERGE II & PGx scenarios

- Collect scenarios from involved sites – *completed*
- Design eMERGE template – *completed*
- Content developers fill out eMERGE template – *in progress*
- Engage target end users (physicians and patients) – *in progress*
- Evaluate resource (survey target end users) – *in preparation*

Objective 2: Implement infobuttons within EHRs at eMERGE sites

- Fill out site survey – *completed*
- Engage institutional stakeholders – *on going*
- Collaborate with University of Utah on OpenInfobutton system and responder – *in progress*
- Migrate content from Objective 1 to content management system – *in preparation*
- Configure EHRs for infobuttons – *in preparation*
- Training & support for installation – *in preparation*
- Configure information resources (including eMERGE resource) – *in preparation*
- Evaluate usage over time – *in preparation*

Challenges

- Implementation of research informatics project into clinical EHR system is really hard
- 1 successful implementation = 1 successful implementation
- Tension and frustration given more rapid pace of eMERGE discovery activities
- eMERGE network outcomes are all process based (some individual site are looking at clinical outcomes)

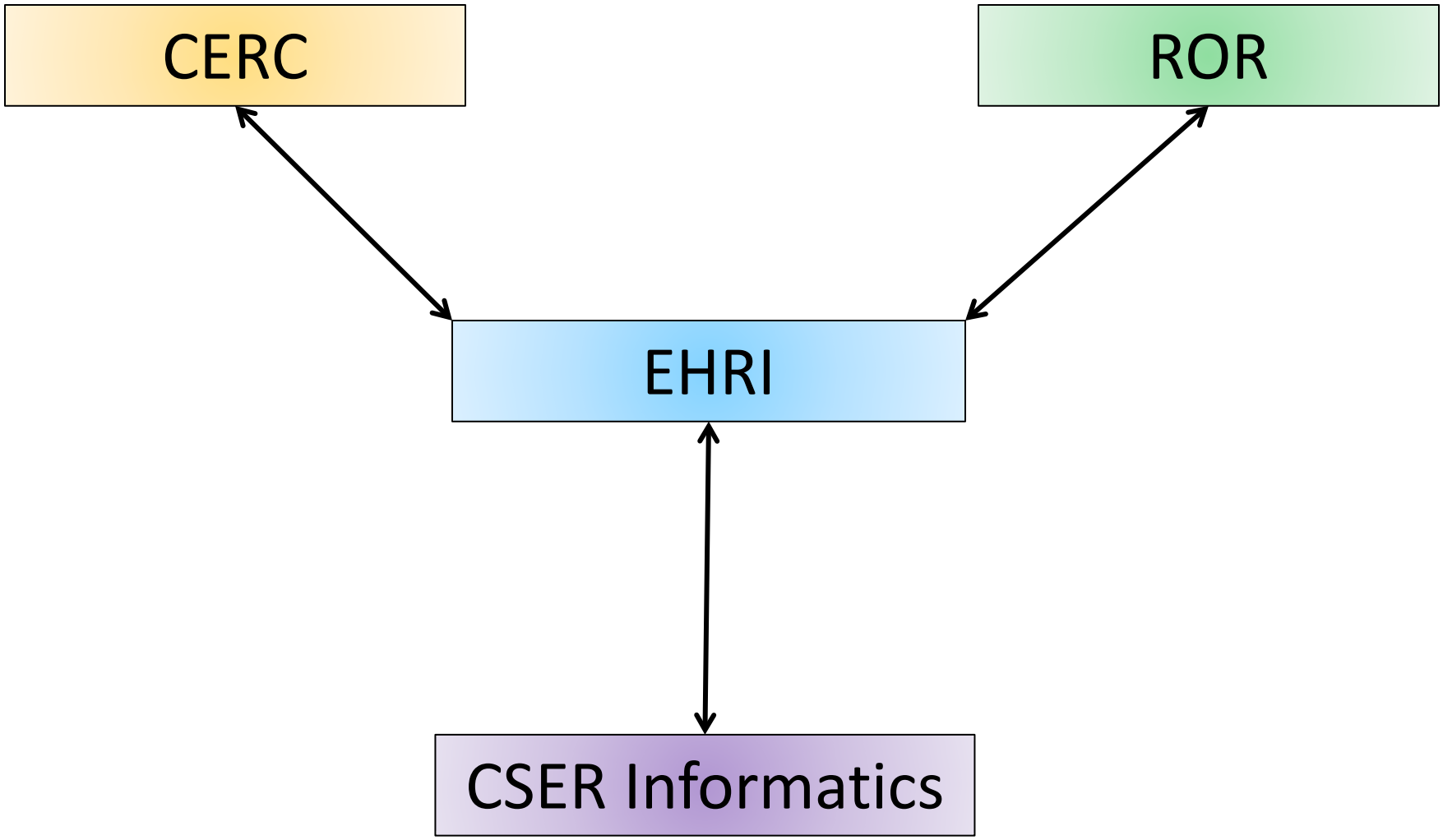
Challenges

Clayton aphorism

- Each system is built 3 times
  1. To see if it can be built
  2. To determine how it should be built
  3. To actually build it

eMERGE status (Starren)

- eMERGE Phase 2 EHRI relates to Clayton 1st stage with some hope of learning enough to proceed with Clayton 2nd stage


CERC
ROR
EHRI
CSER Informatics

Future direction and opportunities

- Research agenda around actionable clinical decision support (CDS)
  - Optimum way to centralize and distribute standardized evidence-based CDS
  - Determination of accuracy of CDS across genomic medicine use cases
  - Study the impact of CDS on relevant clinical outcomes for selected genomic medicine use cases

Future direction and opportunities

- Study the ability to extract real-time patient level data from transactional EHRs to fire CDS for selected genomic medicine use cases
- Study how EHRs, Personal Health Records (PHRs) and Patient Portals can be used to enhance education of patients and providers
  - Measure comparative effectiveness of different approaches