HEALTH
UNIVERSITY OF UTAH

DEPARTMENT OF
BIOMEDICAL INFORMATICS

State of the Department

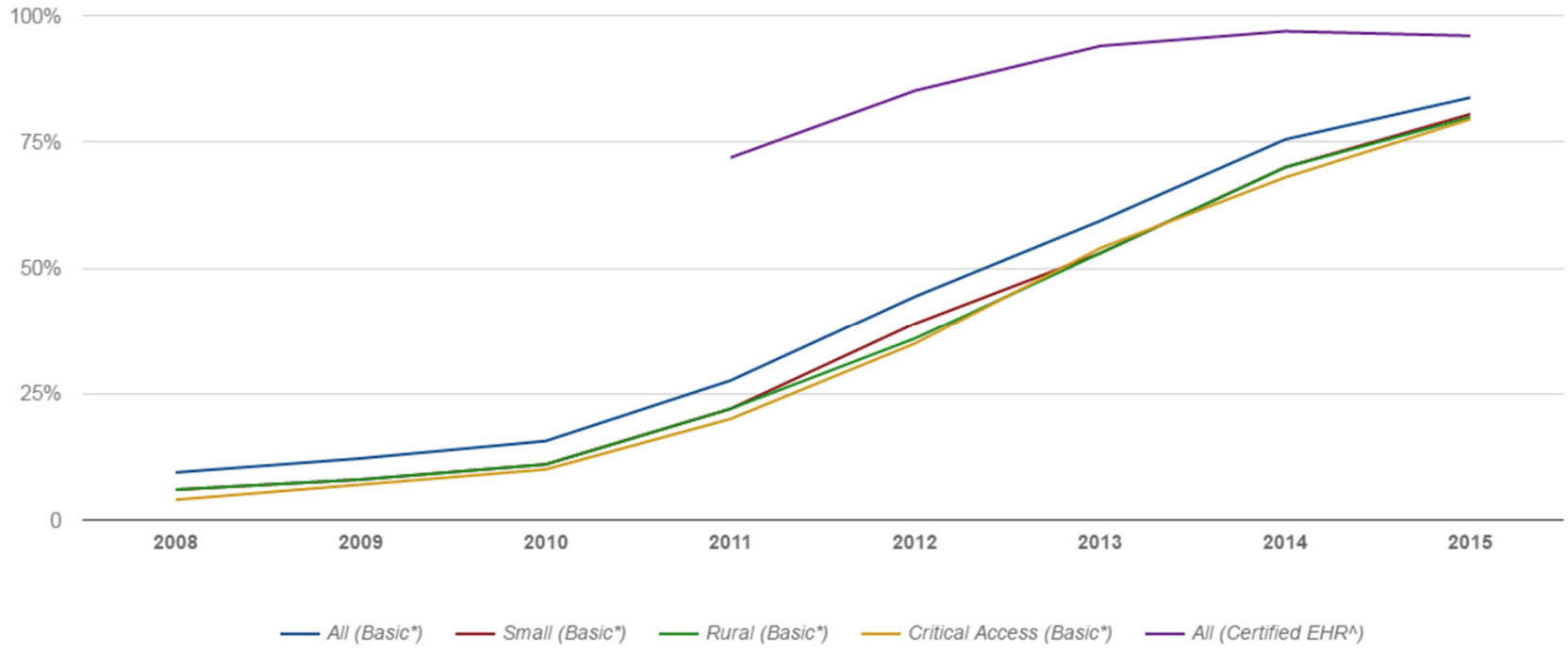
Laurie Becklund

As I Lay Here Dying

"We are each, in effect, one-person clinical trials. Yet the knowledge generated from those trials will die with us because there is no comprehensive database of metastatic breast cancer patients, their characteristics and what treatments did and didn't help them."

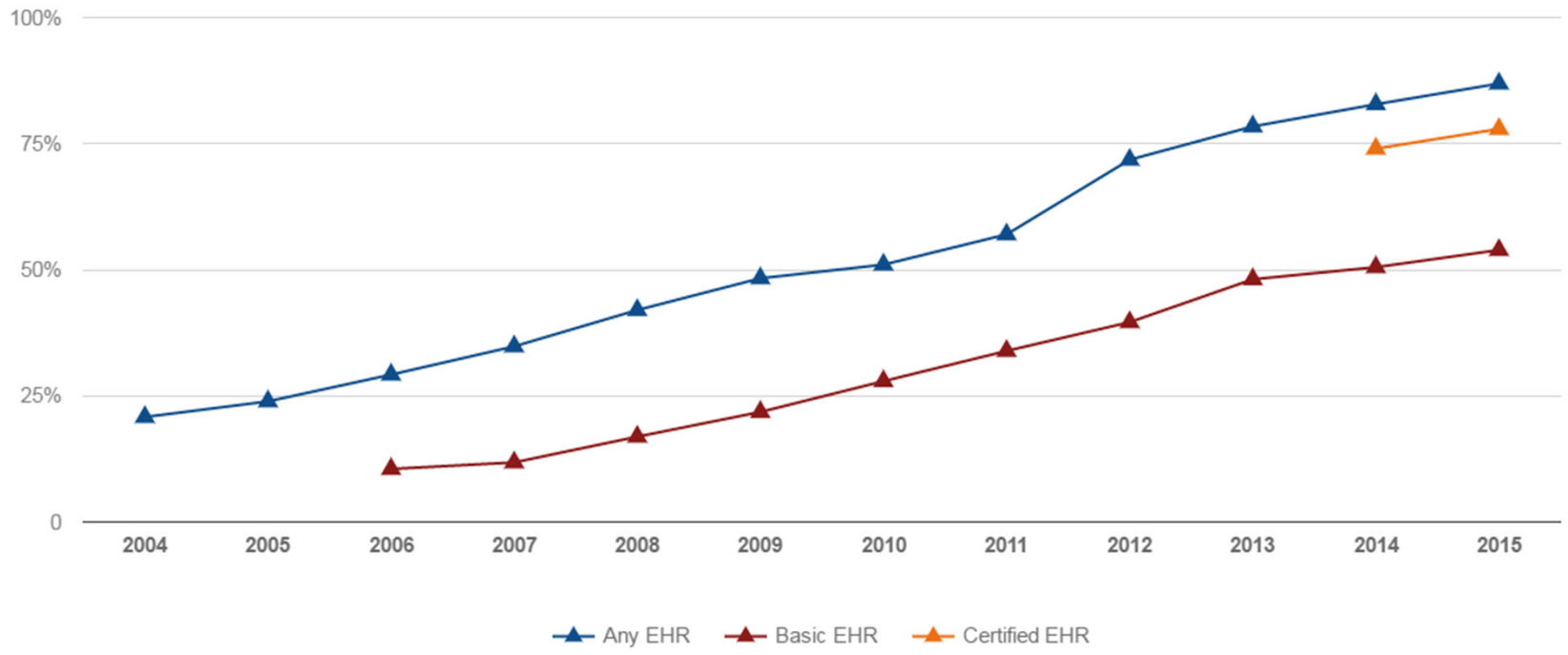
http://www.latimes.com/opinion/op-ed/la-oe-becklund-breast-cancer-komen-20150222-story.html

Adoption of EHRs – Acute Care Hospitals



https://dashboard.healthit.gov/quickstats/quickstats.php

Adoption of EHRs – Physician Offices



https://dashboard.healthit.gov/quickstats/quickstats.php

The NEW ENGLAND JOURNAL of MEDICINE

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PERSPECTIVE

Predicting the Future — Big Data, Machine Learning, and Clinical Medicine

Ziad Obermeyer, M.D., and Ezekiel J. Emanuel, M.D., Ph.D.

N Engl J Med 2016; 375:1216-1219 | September 29, 2016 | DOI: 10.1056/NEJMp1606181

Share:

The algorithms of machine learning, which can sift through vast numbers of variables looking for combinations that reliably predict outcomes, will improve prognosis, displace much of the work of radiologists and anatomical pathologists, and improve diagnostic accuracy.

Healthcare IT News GLOBAL EDITION

Google AI now can predict cardiovascular problems from retinal scans

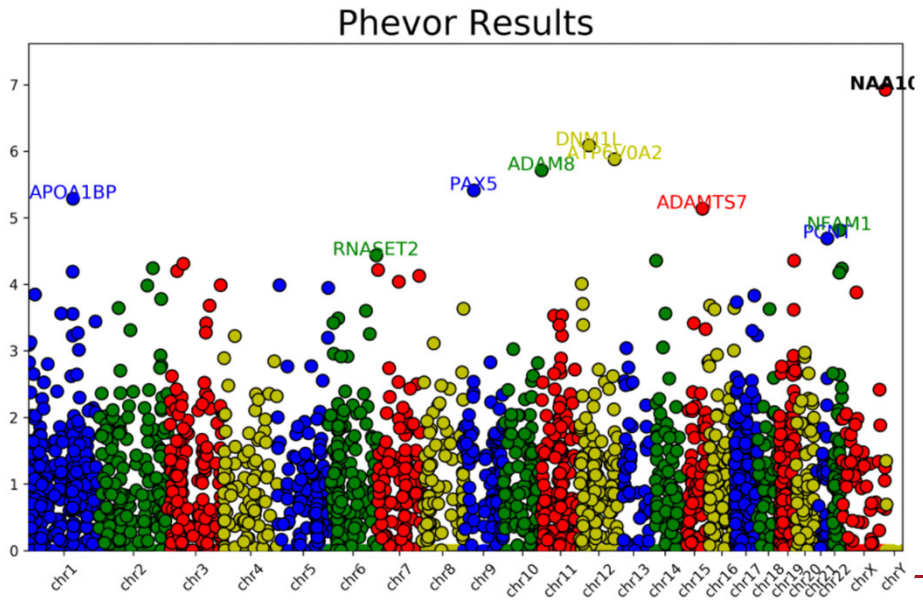
By Bill Siwicki | February 19, 2018 | 12:18 PM

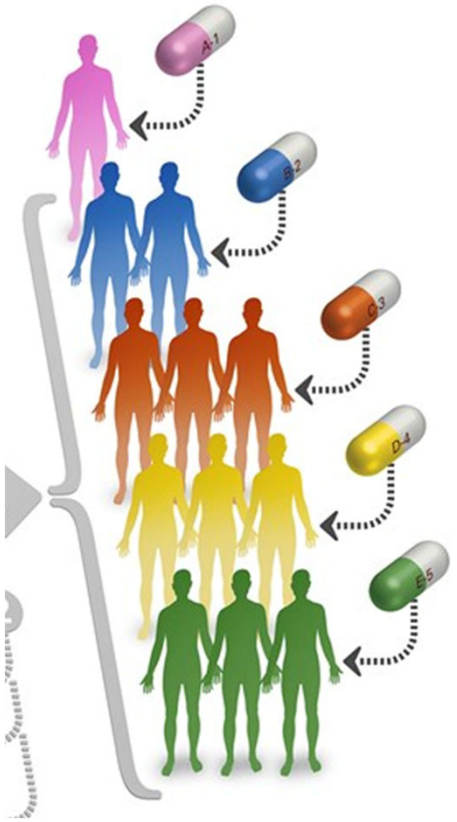
mHealth for Children: 4 Concepts That Could Change the World

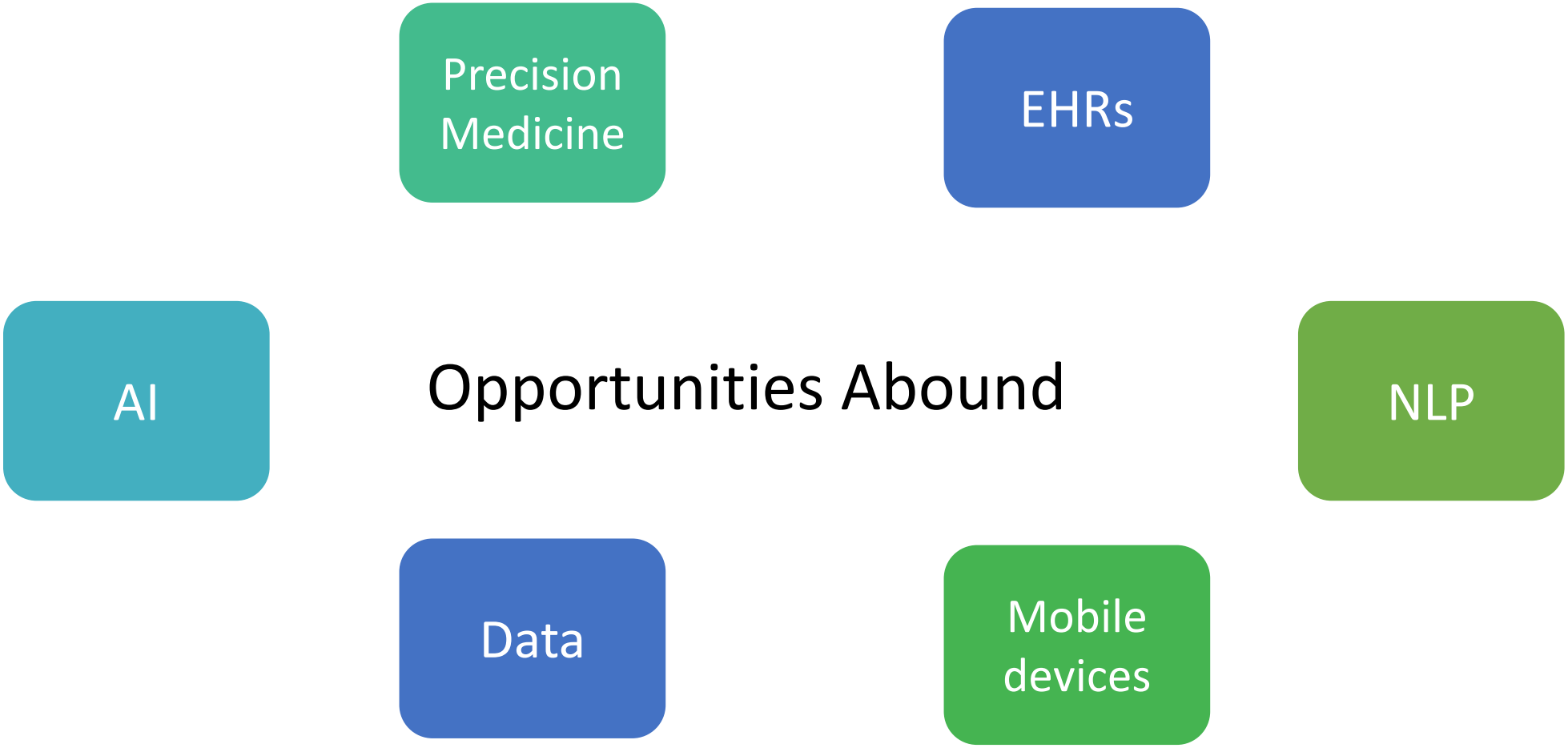
Smart thermometers, pacifiers, earbuds and necklaces have the potential to save millions of children's lives each year, and are gaining notice from USAID and UNICEF.

Precision medicine

- Classify patients into sub populations
- Focus intervention on those who will benefit/respond



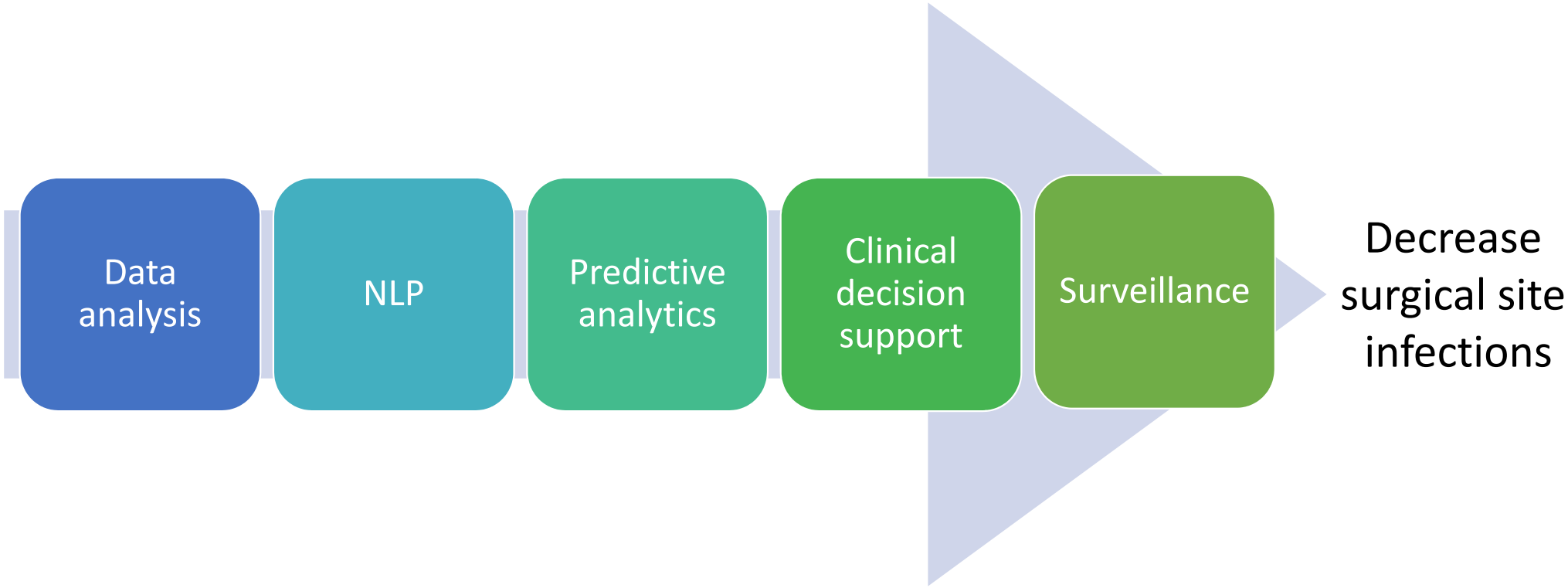



Precision Medicine
EHRs
AI
Opportunities Abound
NLP
Data
Mobile devices

Meet Brian Bucher

Pediatric Surgery

Informatics-enabled Journey



Research Operations

Data analysis

NLP

Predictive analytics

Clinical decision support

Surveillance

Decrease surgical site infections

AMIA Annual Symposium Proceedings Archive

AMIA Annu Symp Proc. 2017; 2017: 515–524.
Published online 2018 Apr 16.
PMCID: PMC5977582
PMID: 29854116

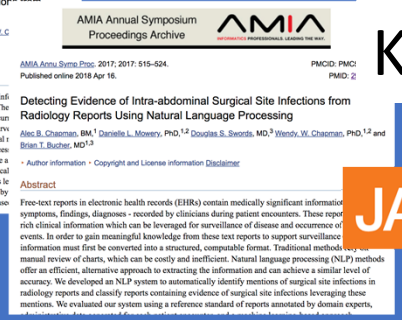
Detecting Evidence of Intra-abdominal Surgical Site Infection… from Radiology Reports Using Natural Language Processing

Alec B. Chapman, BM,[1] Danielle L. Mowery, PhD,[1,2] Douglas S. Swords, MD,[3] Wendy. W. C
Brian T. Bucher, MD[1,3]

Author information • Copyright and License information Disclaimer

Abstract

Free-text reports in electronic health records (EHRs) contain medically significant infor
symptoms, findings, diagnoses - recorded by clinicians during patient encounters. The
rich clinical information which can be leveraged for surveillance of disease and occurr
events. In order to gain meaningful knowledge from these text reports to support surv
information must first be converted into a structured, computable format. Traditional
manual review of charts, which can be costly and inefficient. Natural language proces
offer an efficient, alternative approach to extracting the information and can achieve a
accuracy. We developed an NLP system to automatically identify mentions of surgical
radiology reports and classify reports containing evidence of surgical site infections le
mentions. We evaluated our system using a reference standard of reports annotated by
administrative data generated for each patient encounter, and a machine learning-base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Abstract

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radiology reports and classify reports containing evidence of surgical site infections leveraging these
mentions. We evaluated our system using a reference standard of reports annotated by domain experts,

AHRQ

K grant

JAMA Surgery

Data Science Scholars

Lori Gawron
OB/GYN

Brian Bucher
Pediatric Surgery

Jamie Rhoads
Dermatology

Rashmee Shah
Cardiology

Jia-wen Guo
Nursing

Youjeong Kang
Nursing

Brent Kious
Psychiatry

Marcus Pezzolesi
Nephrology

Sheetal Hardikar
PHS

Andrew Gawron
Gastroenterology

BioNLP

Gastroenterology

AMIA
INFORMATICS PROFESSIONALS. LEADING THE WAY.

IEEE ICHI 2018

JAMA Network Open

JAMA Surgery

7
Grants Submitted

5
Grants Secured

VA Health Services Research & Development Service
HSR&D

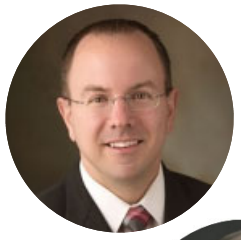
QUERI
Quality Enhancement Research Initiative

National Institute of Nursing Research

AHRQ

National Heart Lung and Blood Institute

NIMH
National Institute of Mental Health



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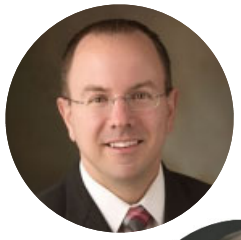

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UTAH DEPARTMENT OF HEALTH

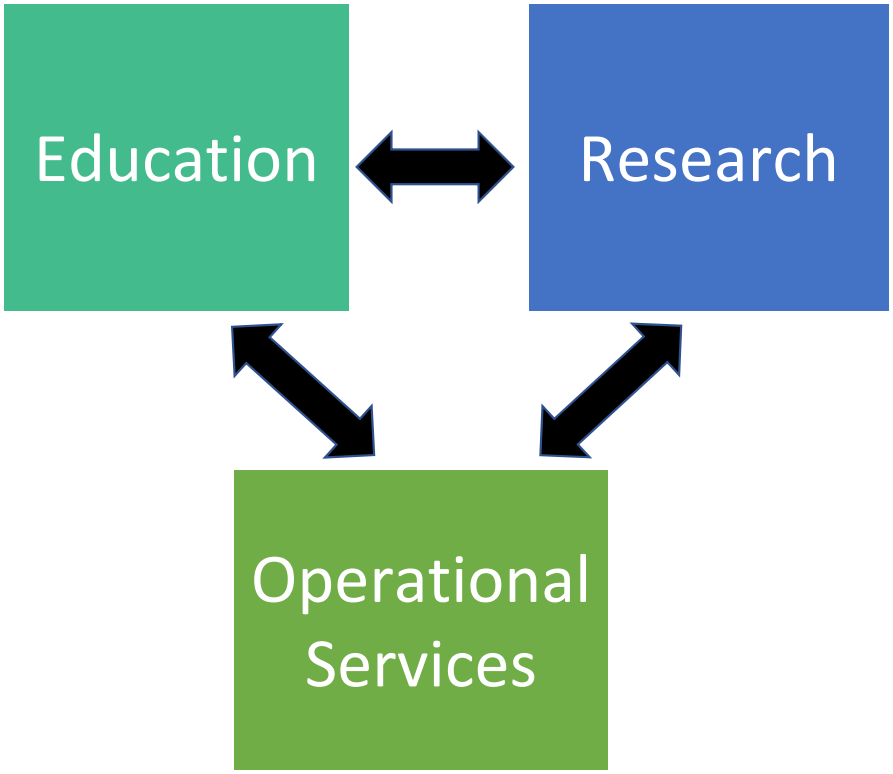
VA

Health Catalyst
ignite outcomes improvement

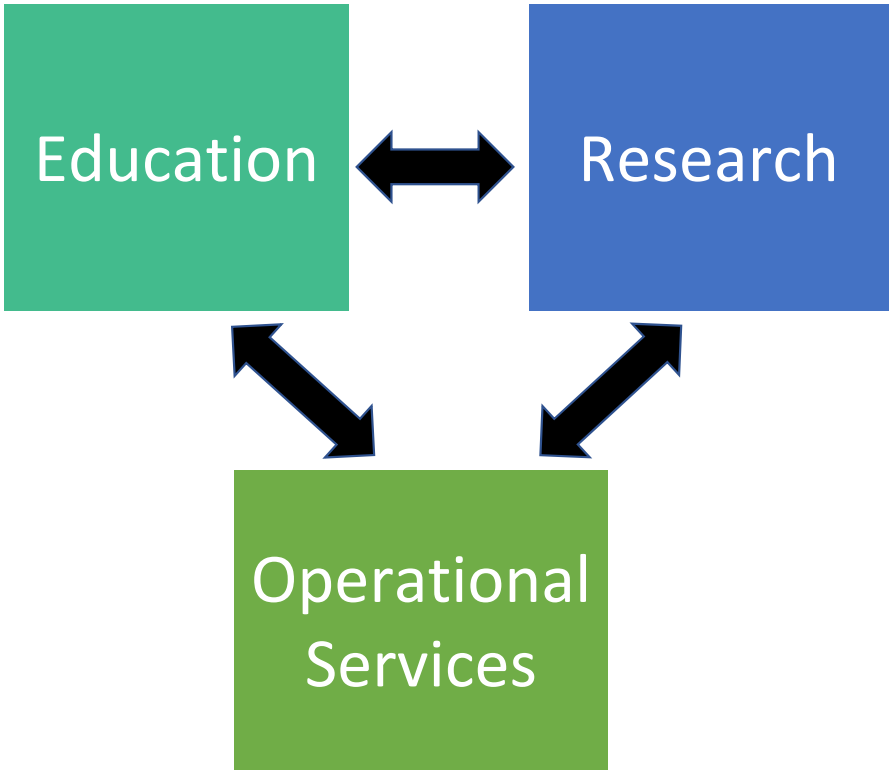
HEALTH FIDELITY

THE UNIVERSITY OF UTAH

Improving patient care requires



Improving patient care requires



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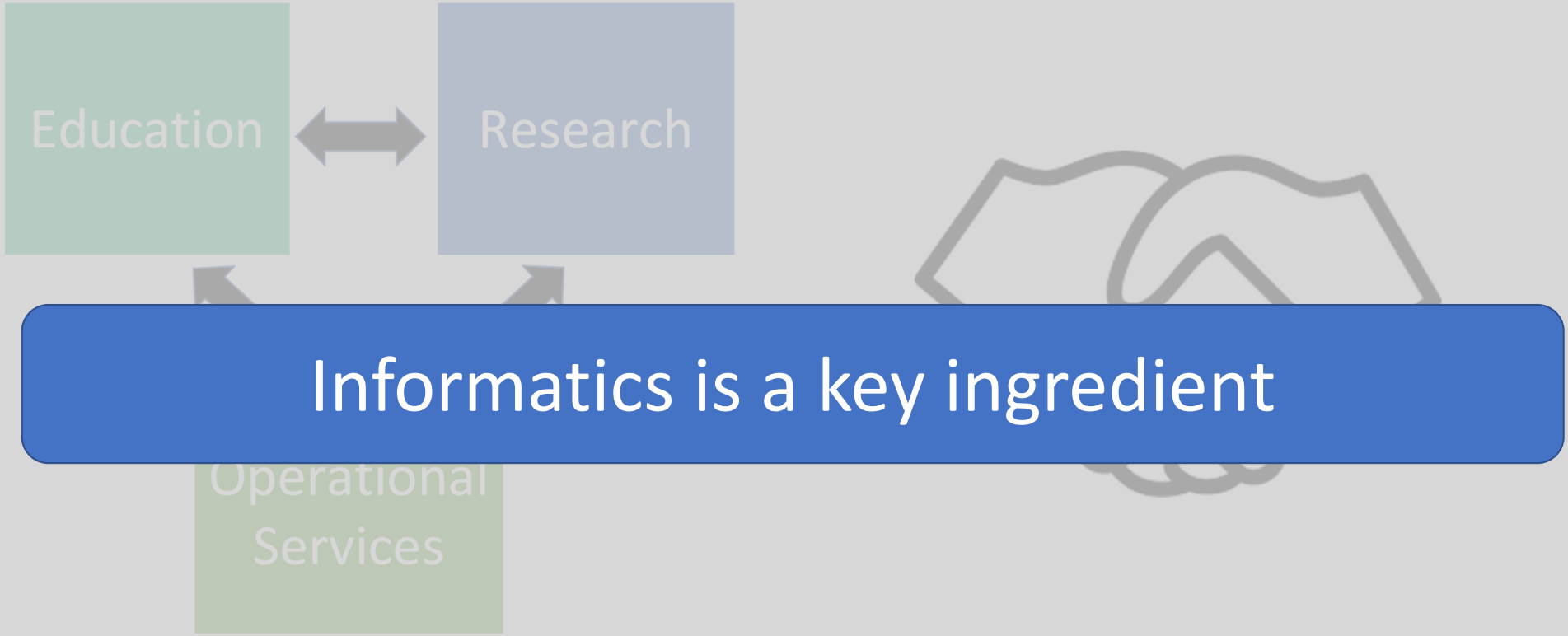
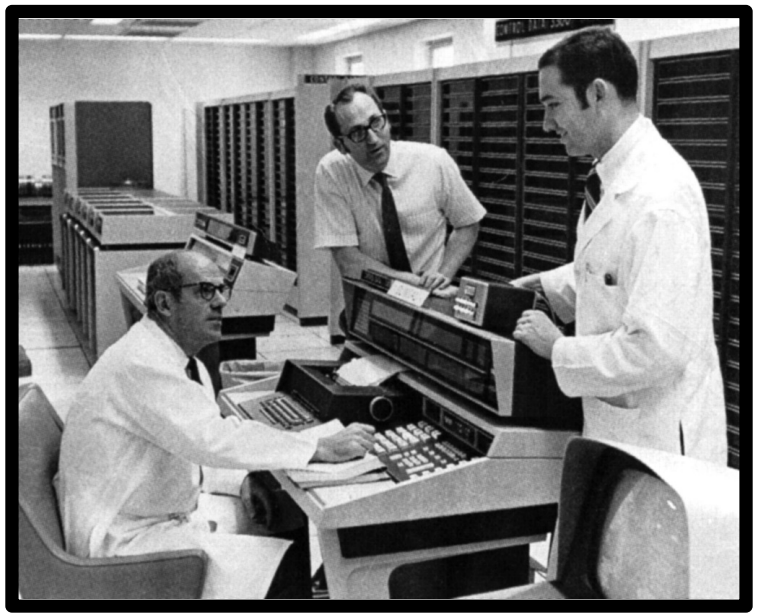


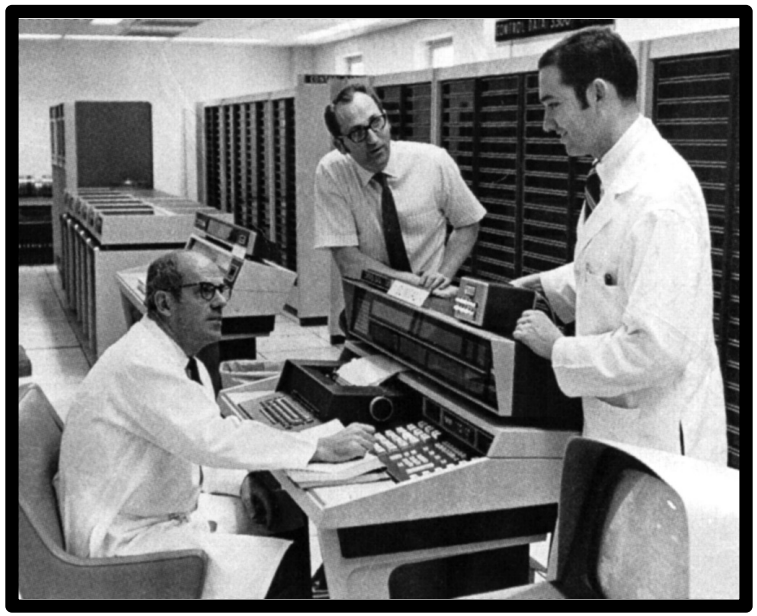
Informatics is a key ingredient

Research Operations
Education



Est. 1964

Research Operations
Education

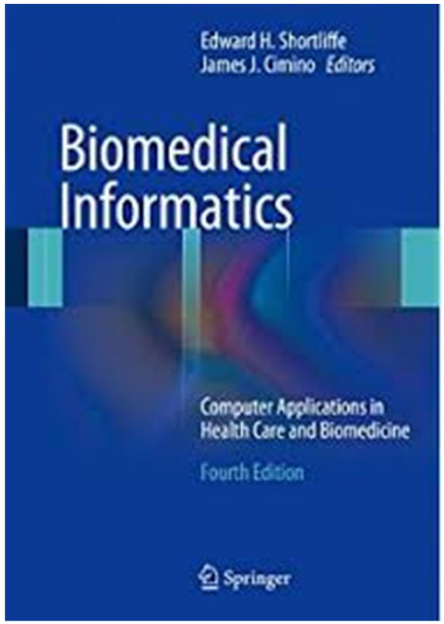


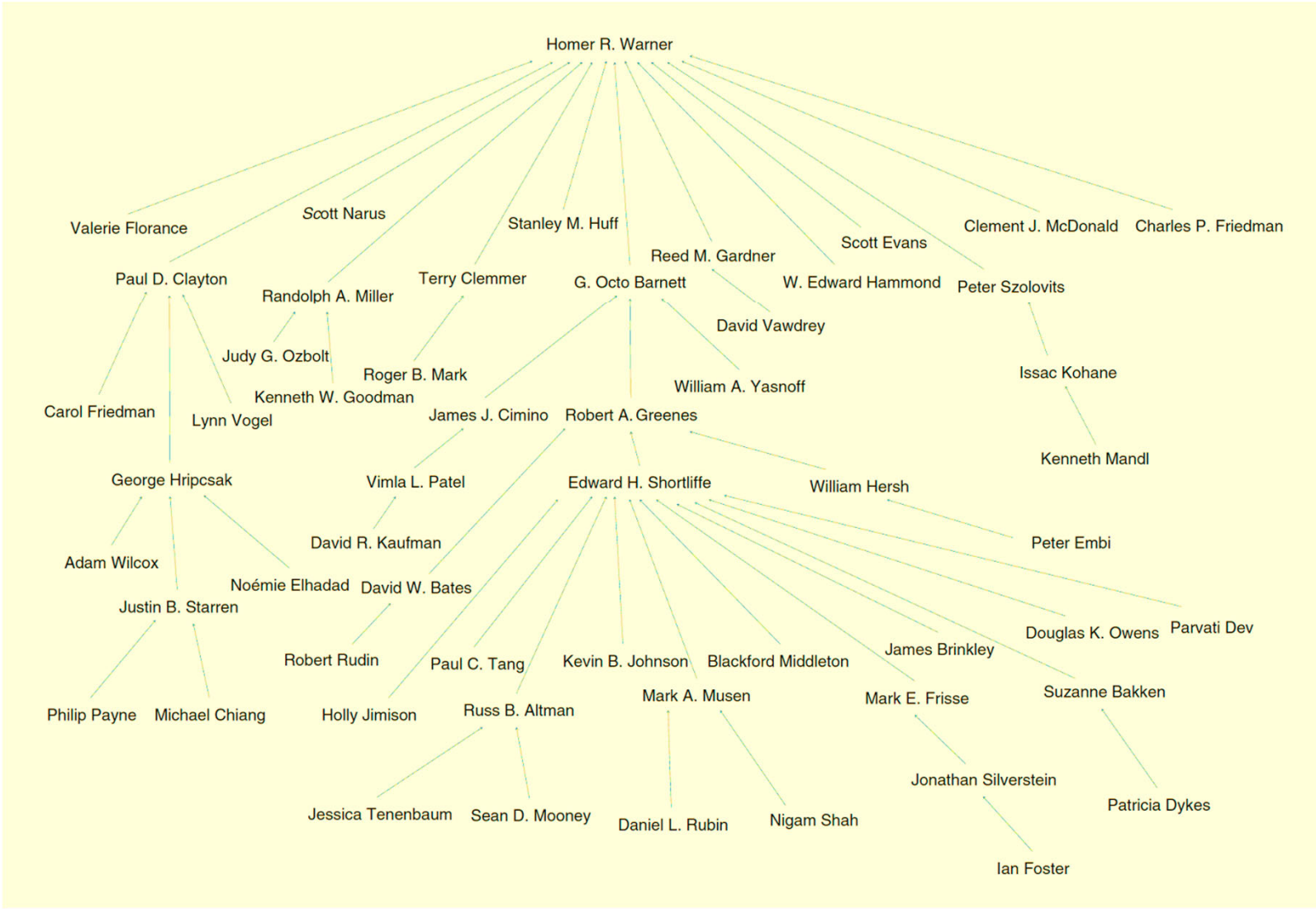
Est. 1964

Partnerships

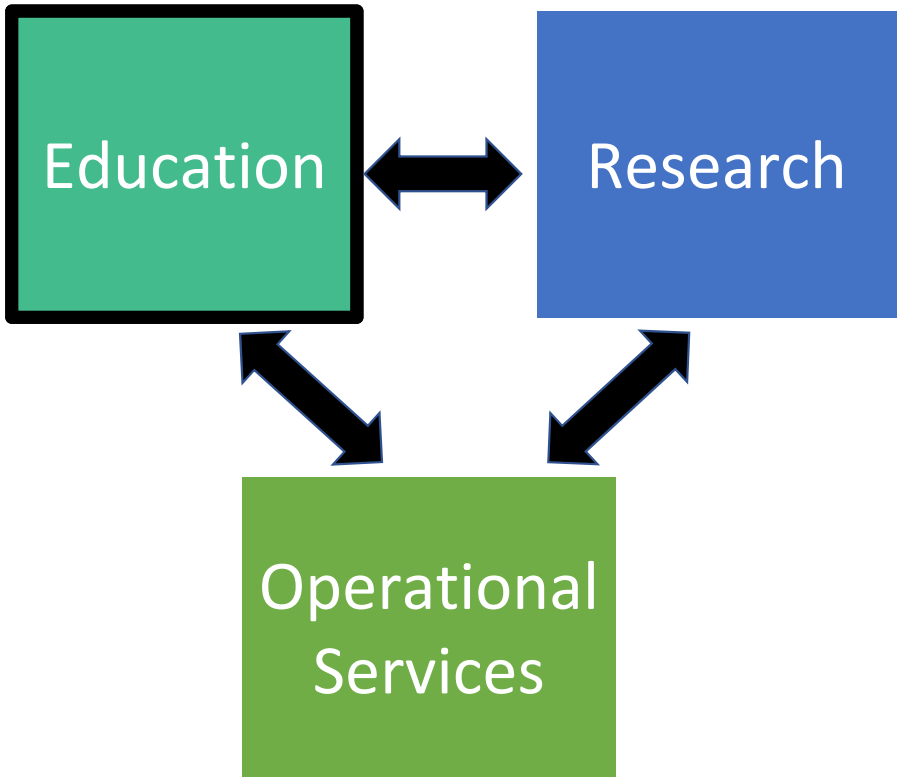
You know, I went to Salt Lake to learn from Homer Warner in 1968.

Kaz Kulikowski


Edward H. Shortliffe
James J. Cimino Editors
Biomedical Informatics
Computer Applications in Health Care and Biomedicine
Fourth Edition
Springer


Homer R. Warner
Valerie Florance
Scott Narus
Stanley M. Huff
Reed M. Gardner
Scott Evans
Clement J. McDonald
Charles P. Friedman
Paul D. Clayton
Randolph A. Miller
Terry Clemmer
G. Octo Barnett
W. Edward Hammond
Peter Szolovits
David Vawdrey
Judy G. Ozbolt
Roger B. Mark
William A. Yasnoff
Issac Kohane
Carol Friedman
Kenneth W. Goodman
Lynn Vogel
James J. Cimino
Robert A. Greenes
Kenneth Mandl
George Hripcsak
Vimla L. Patel
Edward H. Shortliffe
William Hersh
David R. Kaufman
Peter Embi
Adam Wilcox
Noémie Elhadad
David W. Bates
Justin B. Starren
Douglas K. Owens
Parvati Dev
James Brinkley
Robert Rudin
Paul C. Tang
Kevin B. Johnson
Blackford Middleton
Suzanne Bakken
Mark A. Musen
Mark E. Frisse
Philip Payne
Michael Chiang
Holly Jimison
Russ B. Altman
Jonathan Silverstein
Patricia Dykes
Jessica Tenenbaum
Sean D. Mooney
Daniel L. Rubin
Nigam Shah
Ian Foster

Synergy Across Missions



The state of education

Reach

Relevance

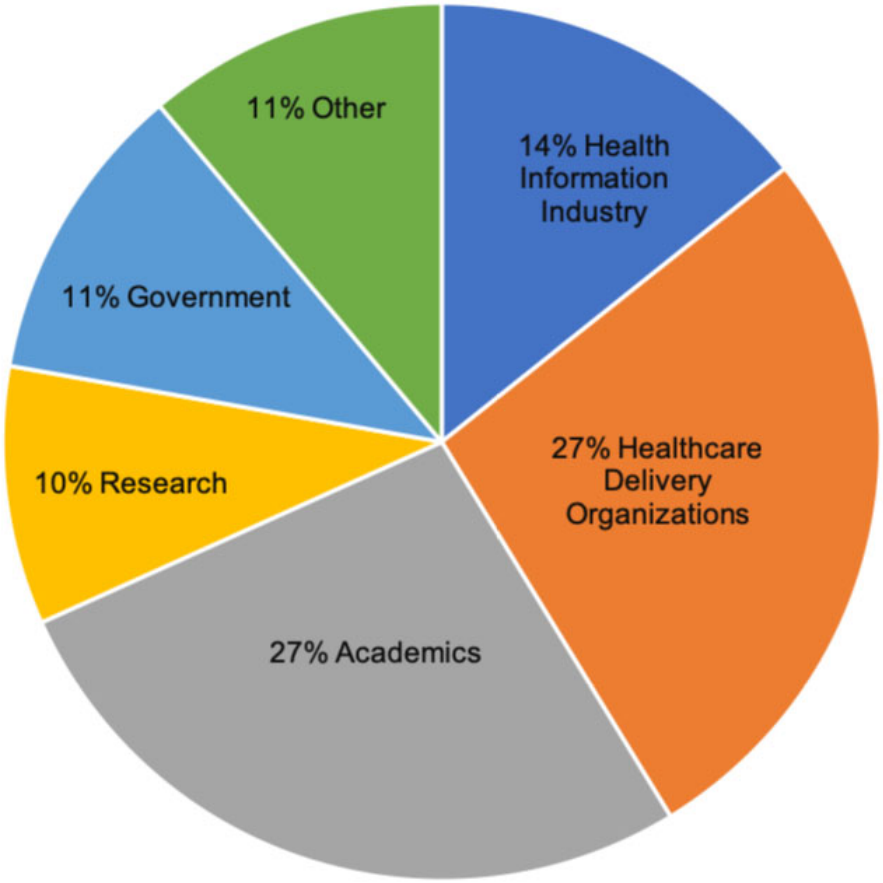
Karen Eilbeck, MSc, PhD
Vice-Chair, Education

Charlene R. Weir, PhD, RN
Director of Graduate Studies

431

Alumni

PhD Alumni Careers Past 10 Years



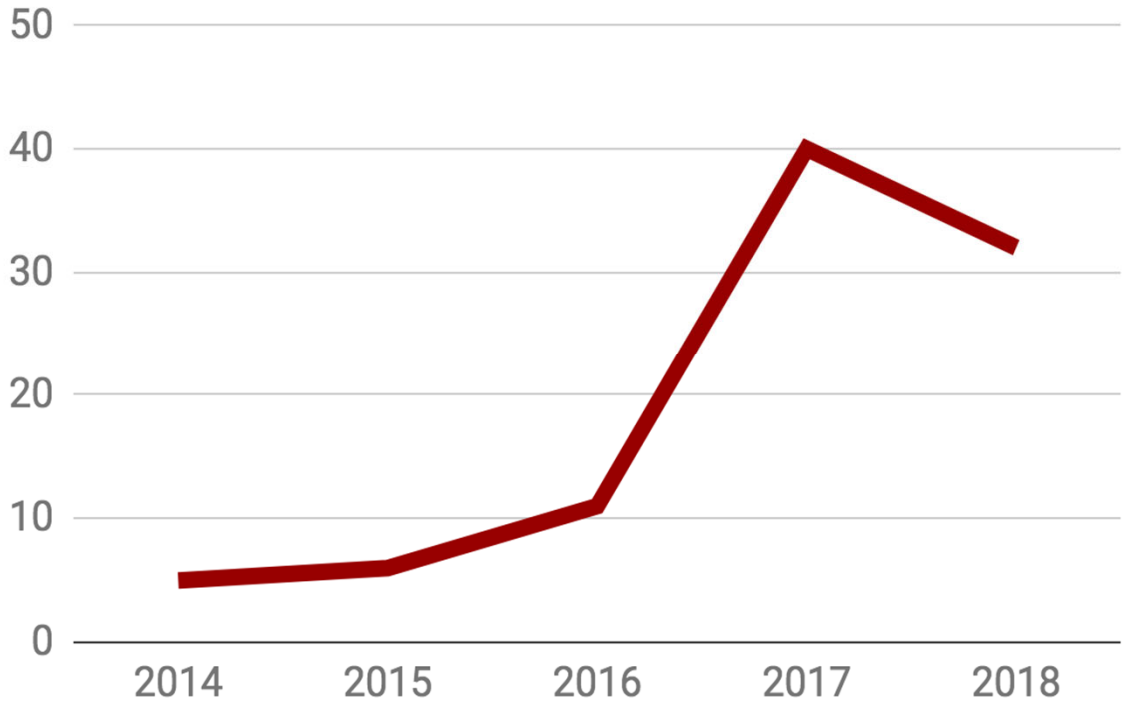
Increase our Reach – MS degree

Utah Campus

Utah-Asia Campus

Online 2019

Utah NTMS Students Matriculated



59 MS

22 PhD

Current Students

Increase our Reach – Across Campus

DeCART Summer School

David Eccles School of Business
THE UNIVERSITY OF UTAH

Physician Assistant Studies

Data Science for Basic Sciences

Increase our Relevance

Application Tracks

Clinical Informatics

Translational Bioinformatics

Population & Public Health Informatics

Bioinformatics

Increase our Relevance

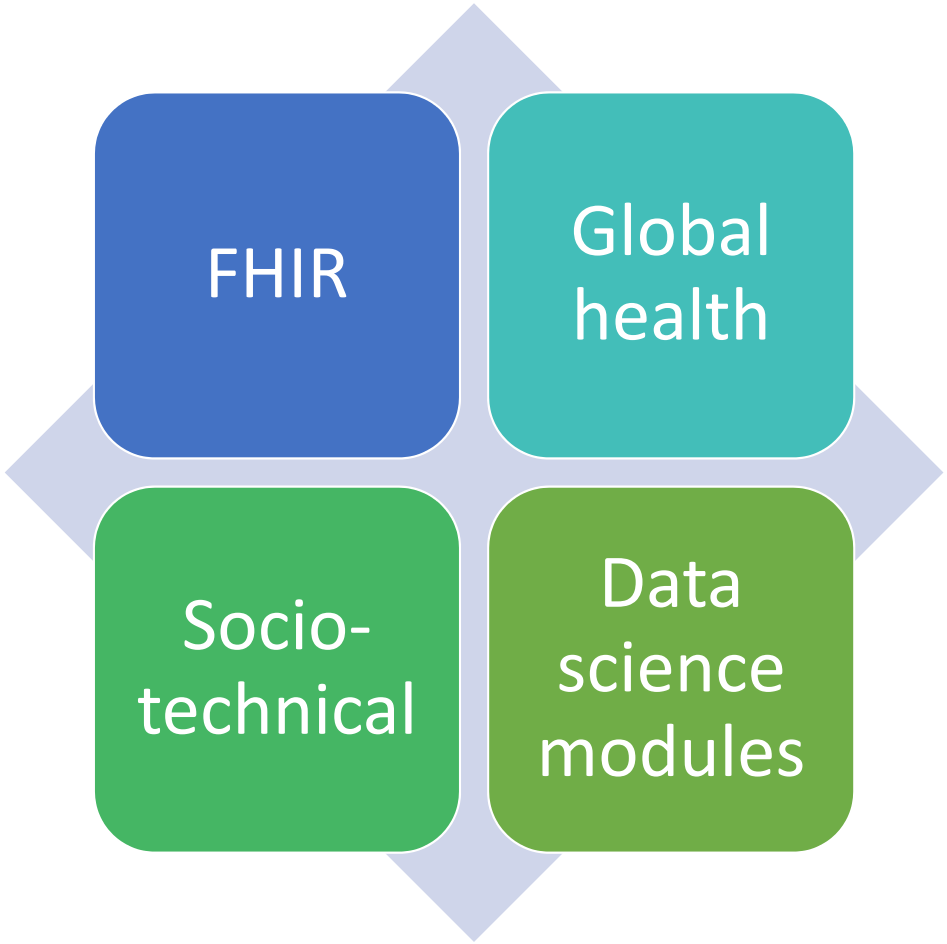
Application Tracks

- Clinical Informatics
- Translational Bioinformatics
- Population & Public Health Informatics
- Bioinformatics

Methods Tracks

- Semantic Interoperability
- Sociotechnical Design & Evaluation
- NLP
- Data Science & Decision Support

Increase our Relevance – Hands-on Practica



PhD Student Highlight

Rosalie Waller

Undergrad degree

BS Biomedical Engineering

PhD Research

Translation of genomics discovery to care

- Genetic epidemiology
- Sociotechnical methods
- Clinical decision support

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PhD Student Highlight

Rosalie Waller

Accomplishments

- NCI F99/K00 Award (6 years)
- John Morgan Award
- Gardner, Fay, and NLM T15 Fellowships
- AMIA poster award, AMIA Student Design Challenge Finalist
- 1 first-author and 3 co-author journal publications
- 2 manuscripts under review, 3 in preparation

NTMS Student Highlight

Yun Ding

Previous Degree

PhD Chemistry

DBMI Pathway

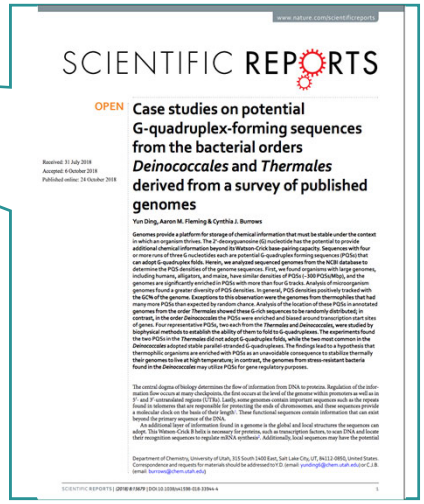
DeCART Summer School → Certificate → NTMS

NTMS Student Highlight

Yun Ding

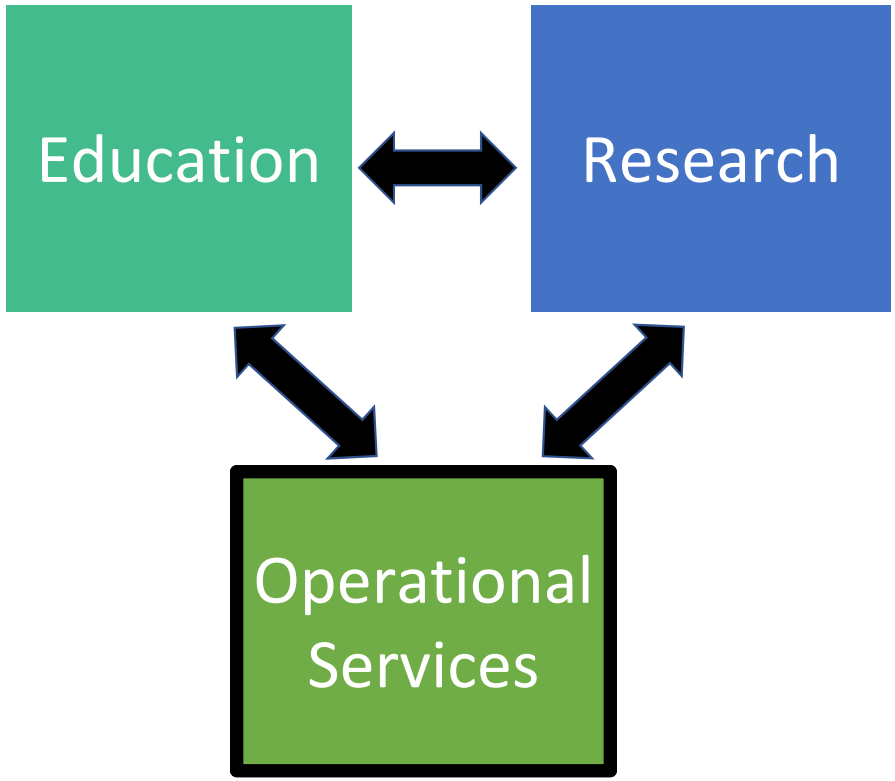
Accomplishments

- Leveraged project-based learning in courses
  - further explore bioinformatics questions



- Bioinformatics Scientist 1

illumina®


Education
Research
Operational Services

The state of operations

ReimagineEHR

Kensaku Kawamoto, MD, PhD, MHS
Vice-Chair, Clinical Operations

Redesigning Care Processes

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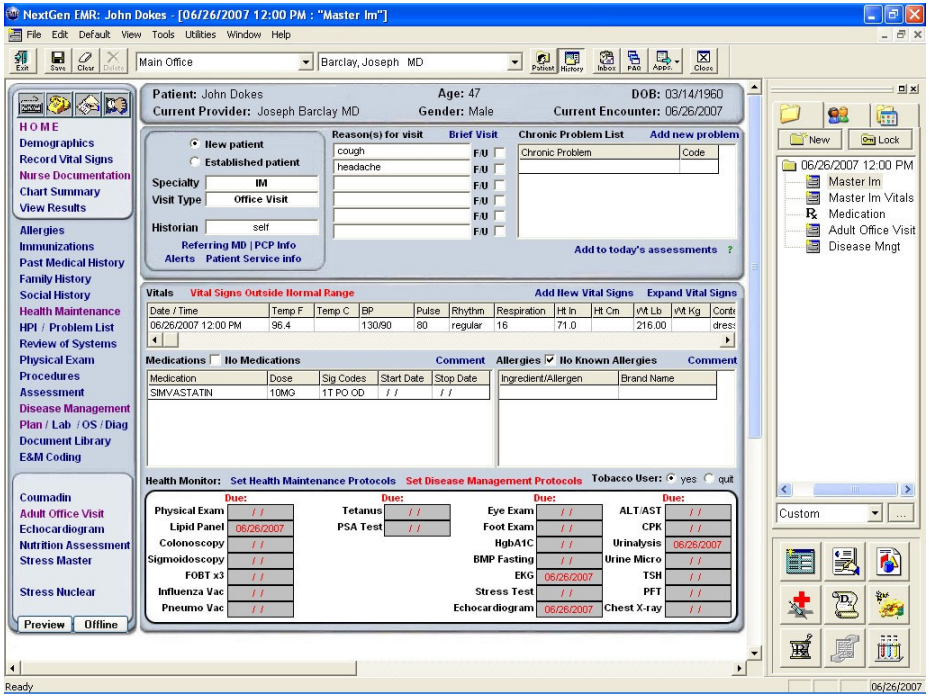
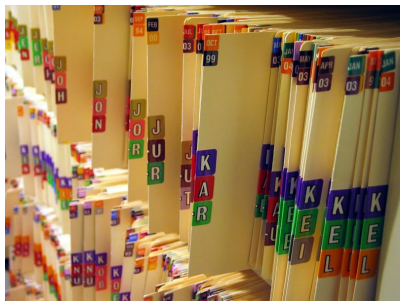
UNIVERSITY OF UTAH

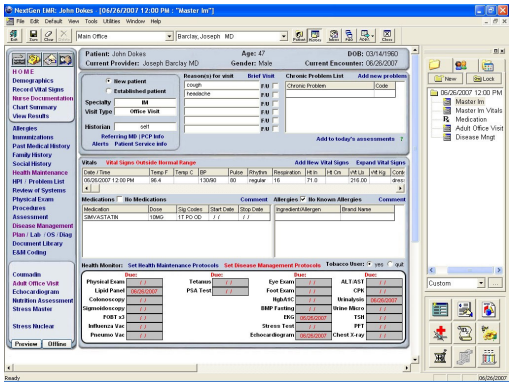
EHR provides

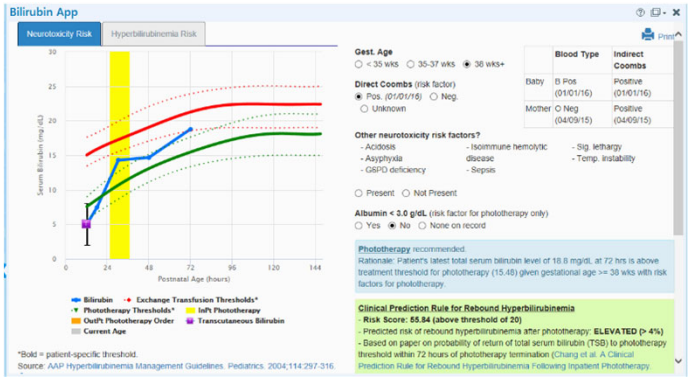
- Opportunity
- Barriers



We want to revolutionize the EHR







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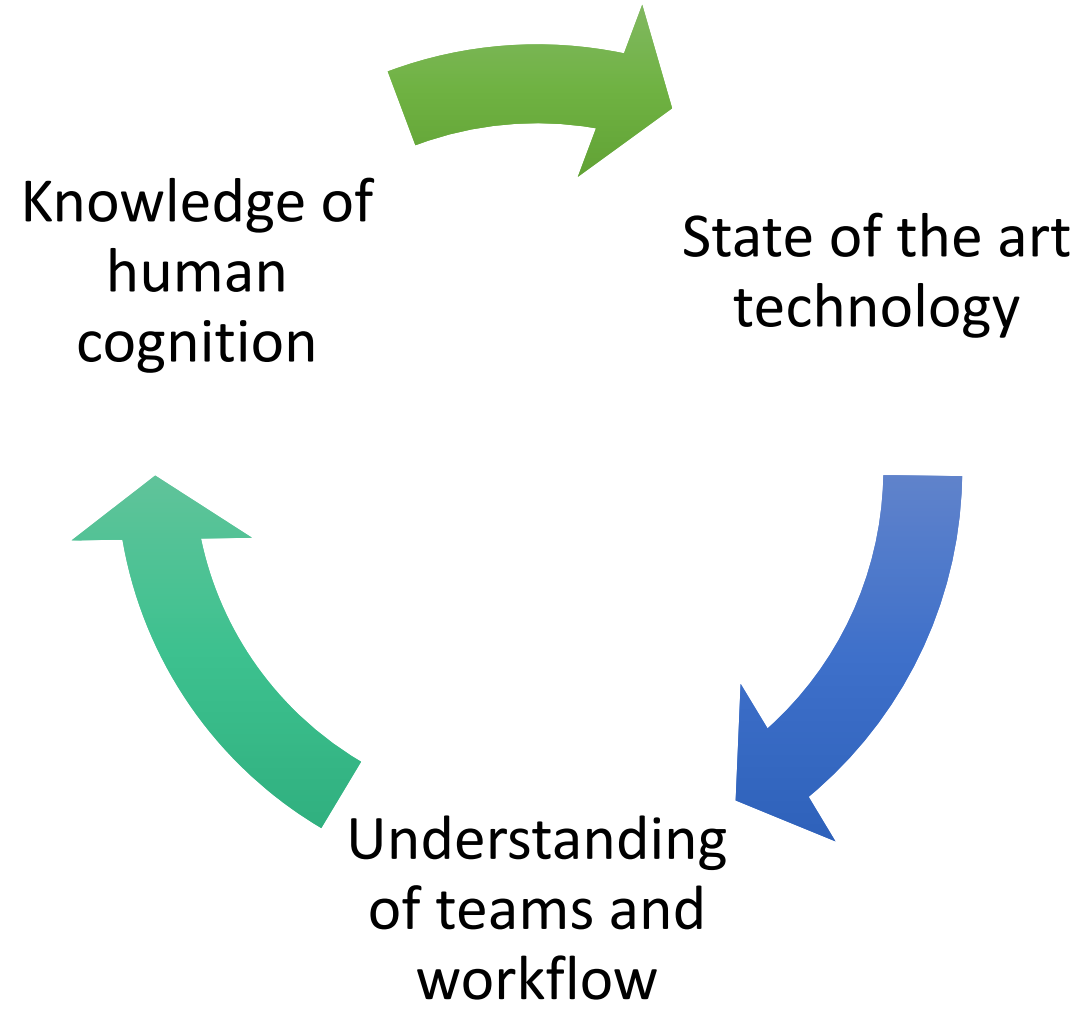
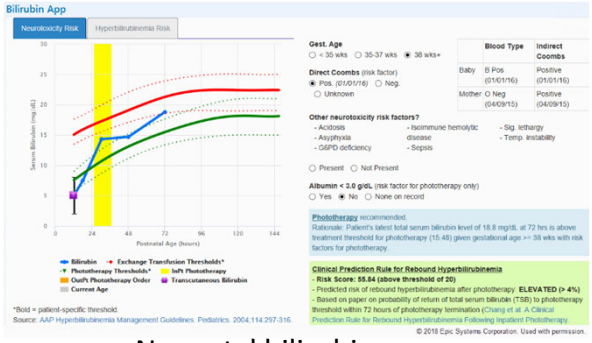
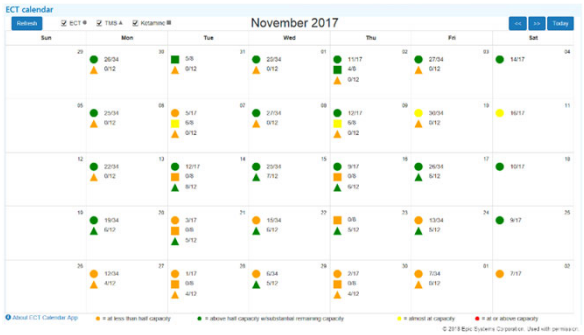

Knowledge of human cognition
State of the art technology
Understanding of teams and workflow

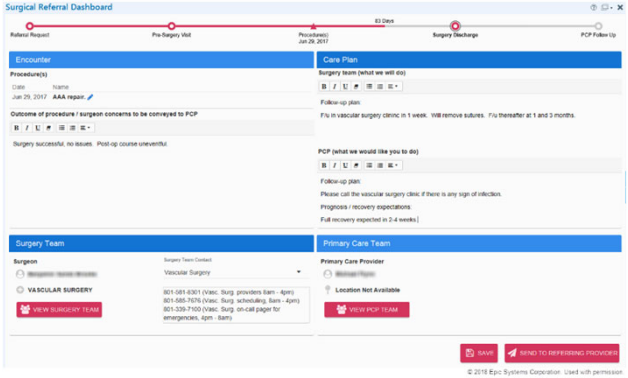
Example Epic-Integrated Applications



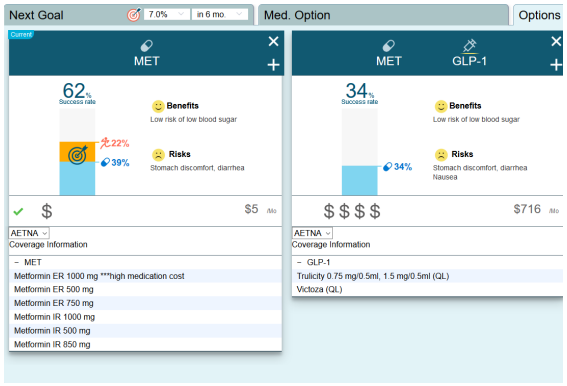
Neonatal bilirubin app



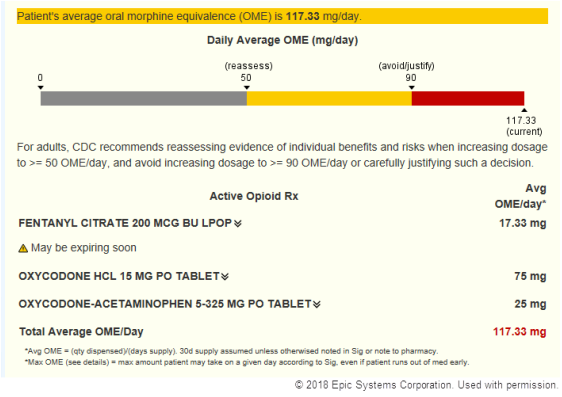
Procedure capacity mgmt.



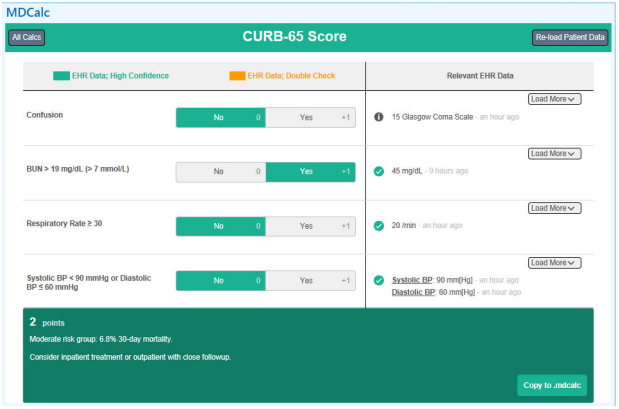
Surgical referral dashboard



Diabetes Rx prediction app



Opioid MME



MDCalc

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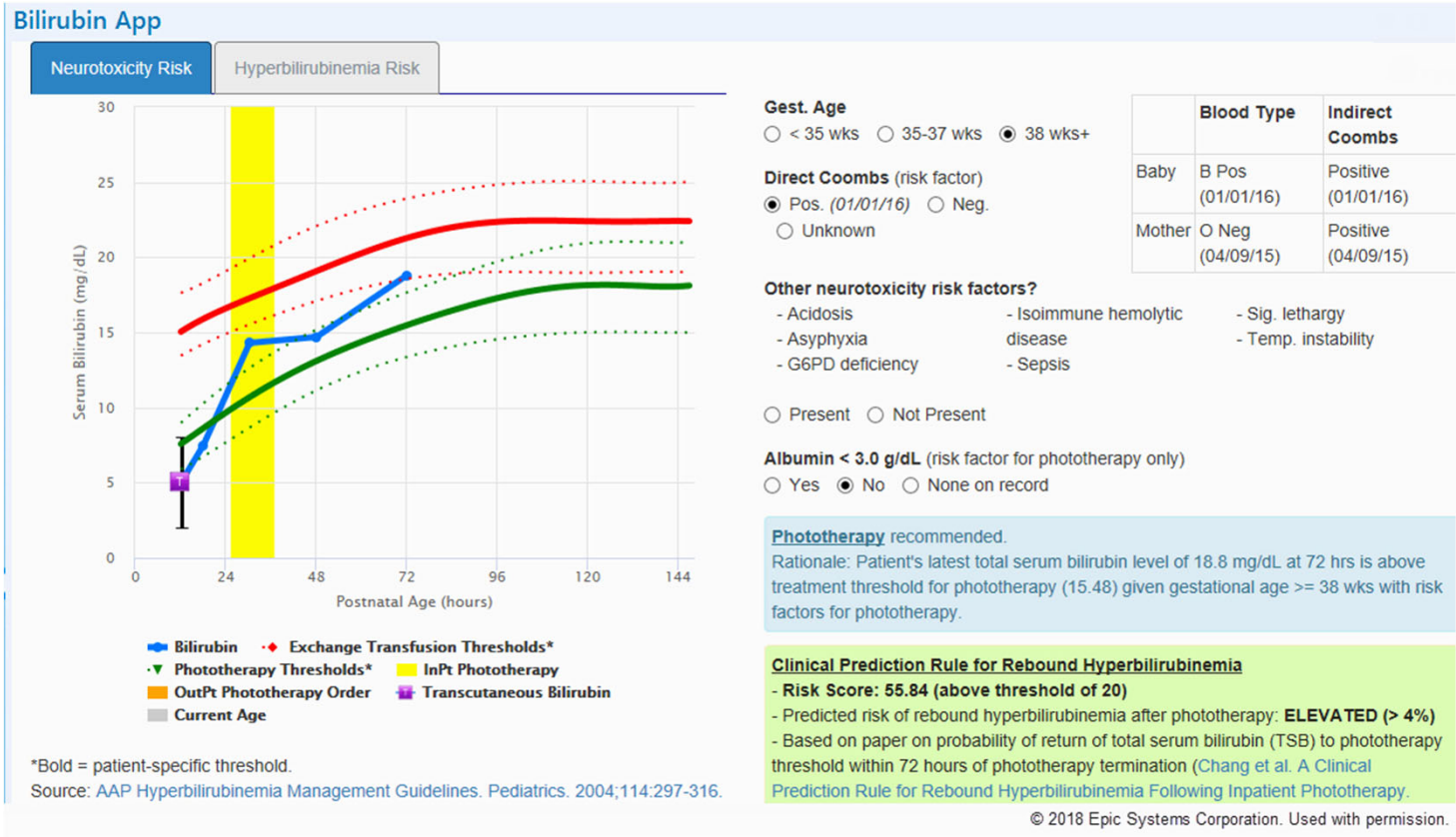
Neonatal Bilirubin Management App



- Recommendations based on AAP guidelines
- Pulls in baby and mother's EHR data
- Estimated to save >300 MD hrs/year
- HHS Provider User Experience App Challenge Awards

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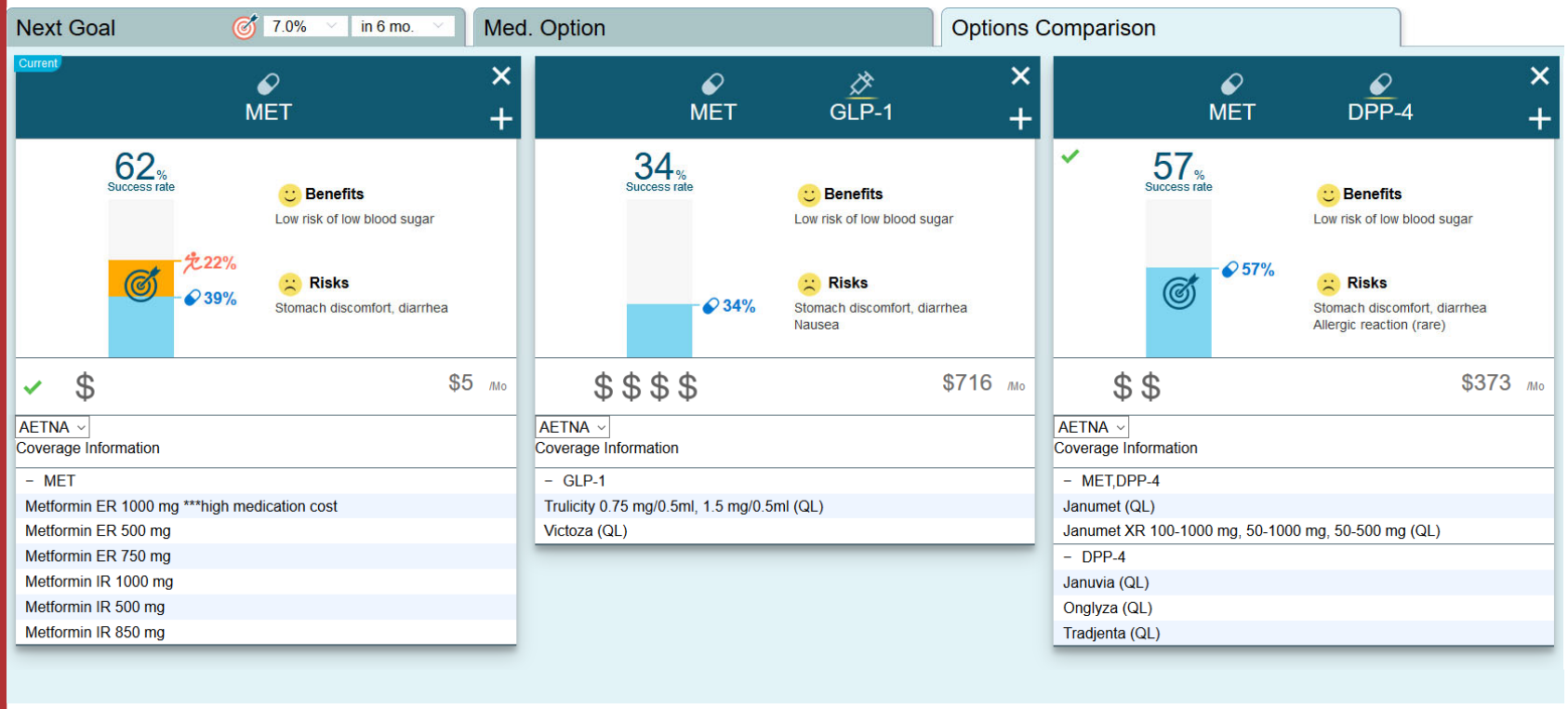
Diabetes Rx Outcomes Prediction App



- Collaboration with Hitachi
- Data-driven Rx guidance (predictive model, AUC 0.87)
- Accounts for insurance for cost info
- In pilot use

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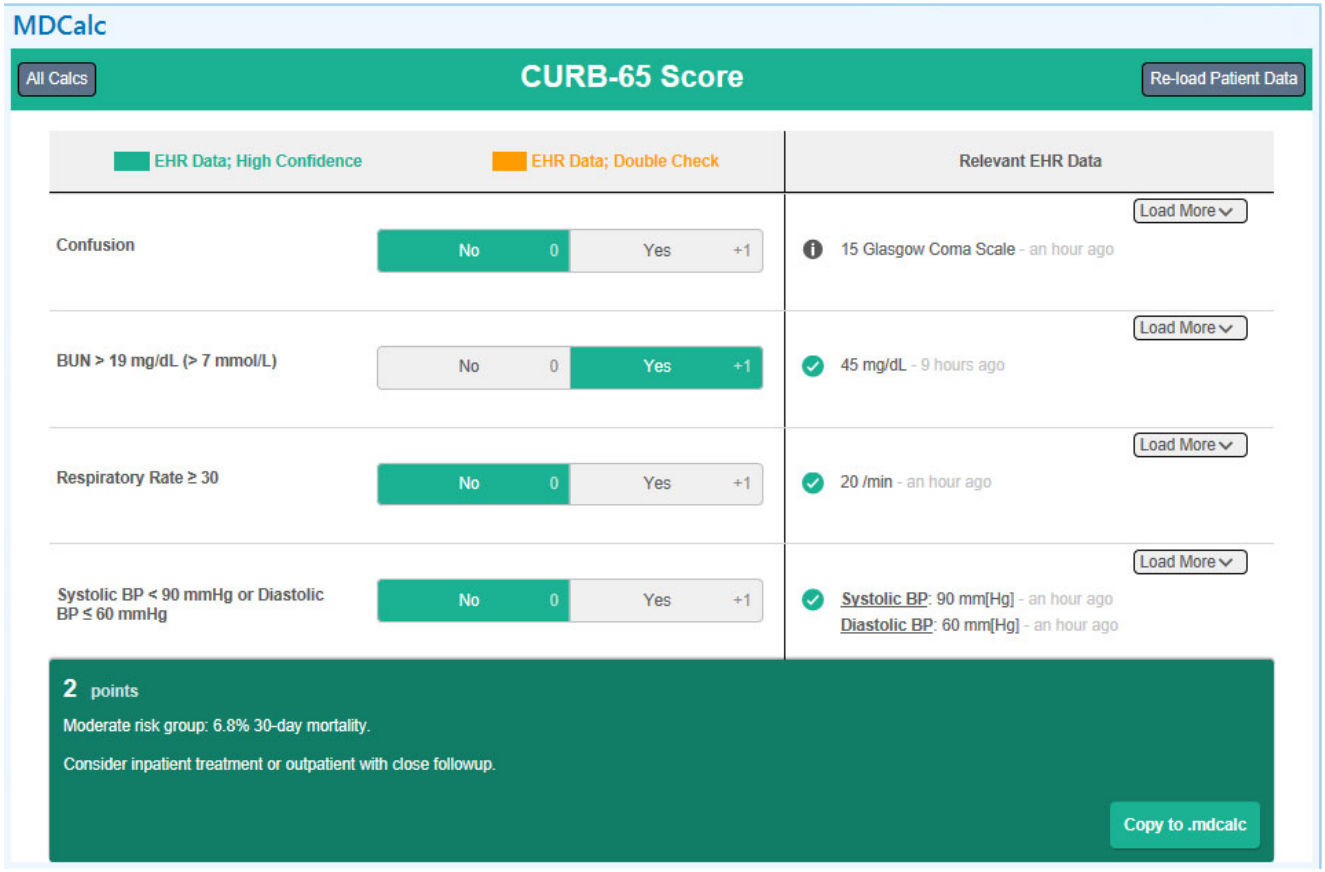
MDCalc Integration



- MDCalc: leading calculation tool
  - > 1 million monthly users from 196 countries
  - 35+ specialties, 200+ conditions
- Top 20 calculators prioritized by UUH in production use
- Auto-population using EHR data
- 1-click integration with dot phrase

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Resourcing Model

Grant funding
> $25 million direct costs

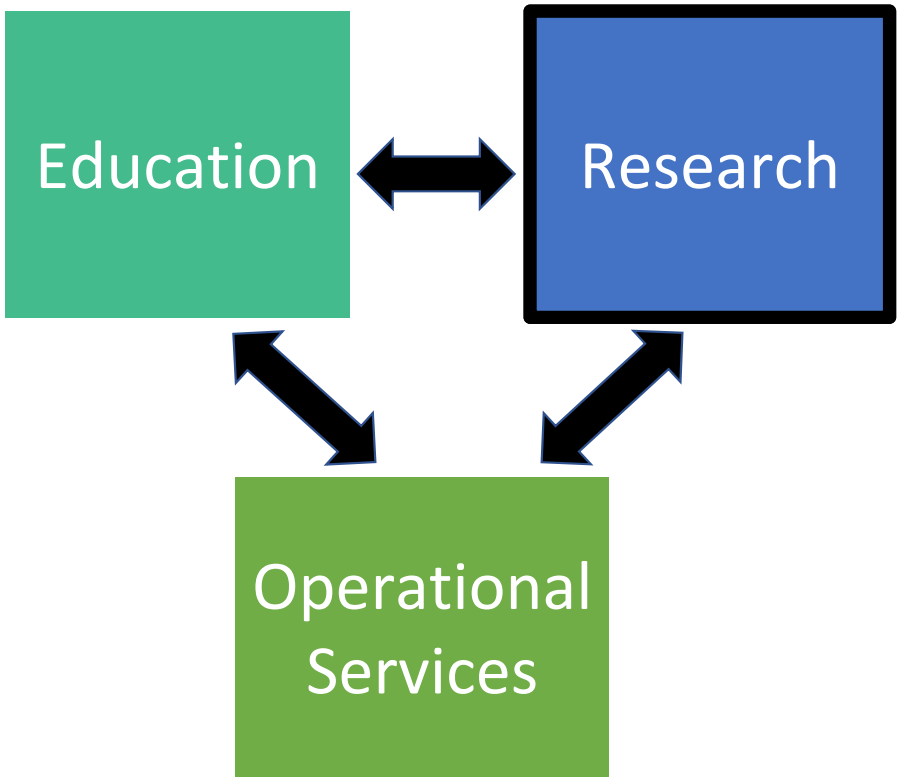
Clinical operations
$900,000 / year

Industry
>$225,000 in sponsored research

Interest and Impact

National leaders

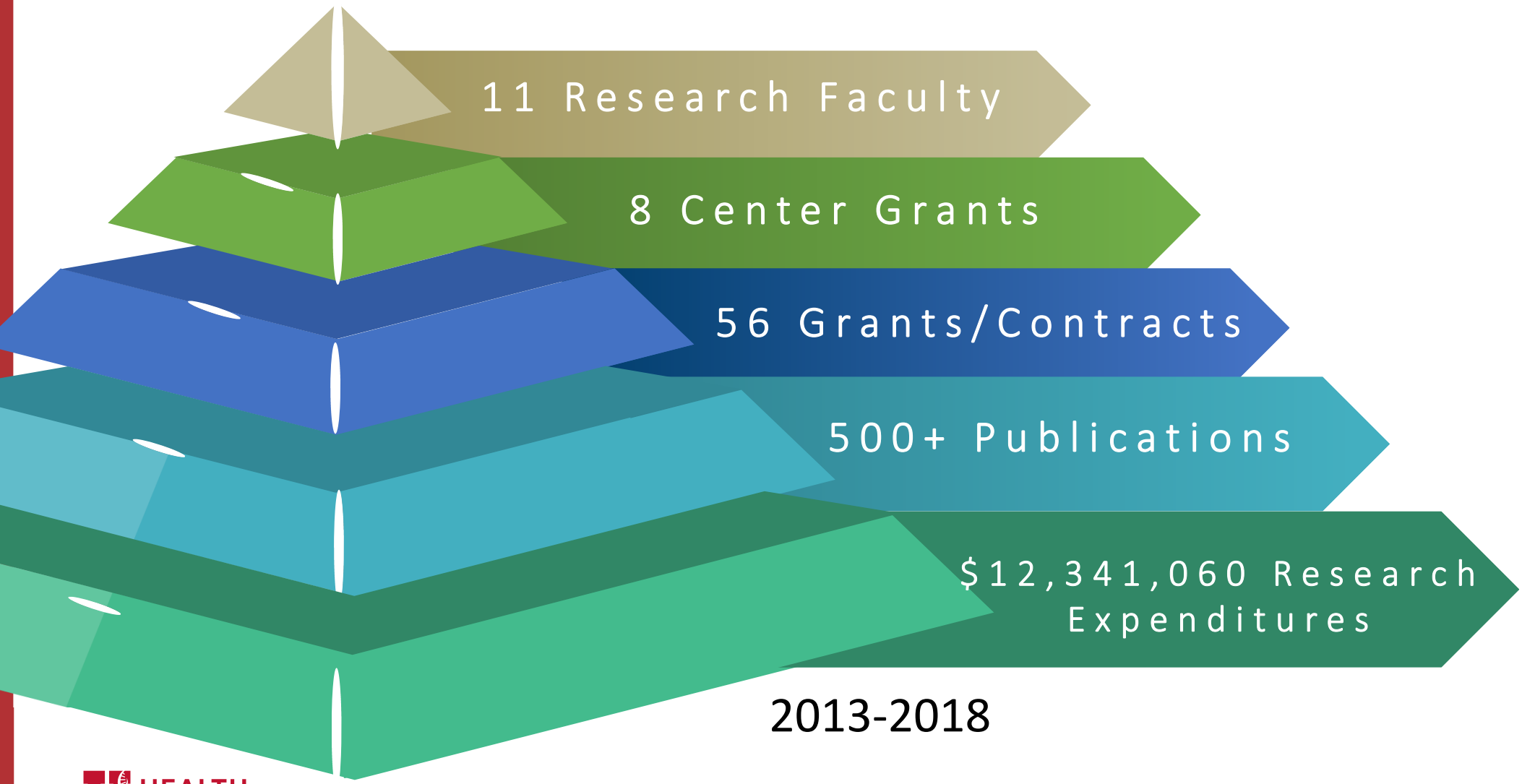
- Significant interest from funding agencies due to potential to scale solutions nationwide
- >$25M grants awarded
- doubling of team with flat operational budget


Education
Research
Operational Services

The state of research

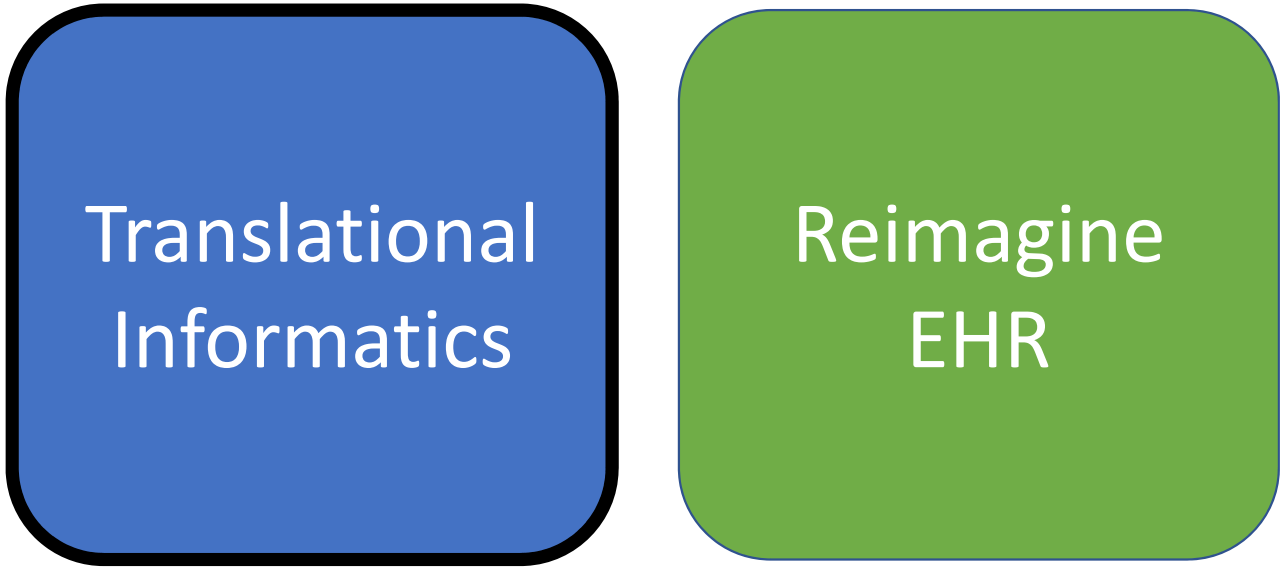
Collaboration
Center grants

Guilherme Del Fiol, MD, PhD
Vice-Chair, Research

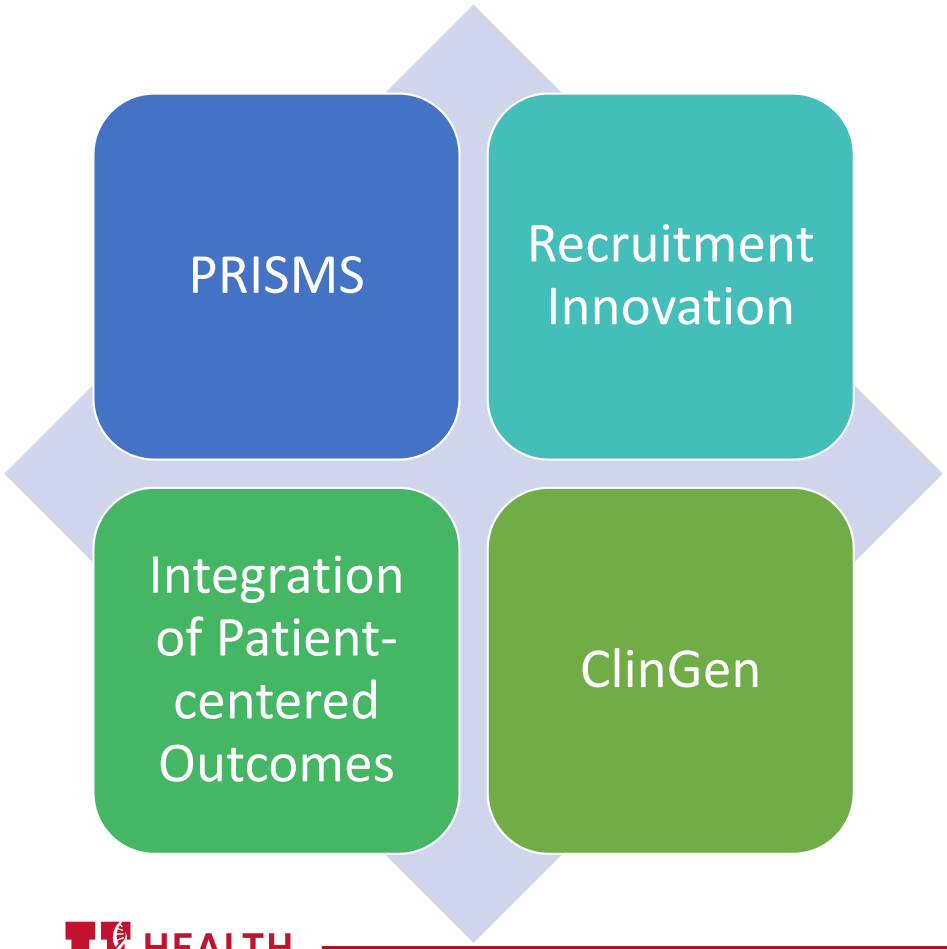

11 Research Faculty
8 Center Grants
56 Grants/Contracts
500+ Publications
$12,341,060 Research Expenditures

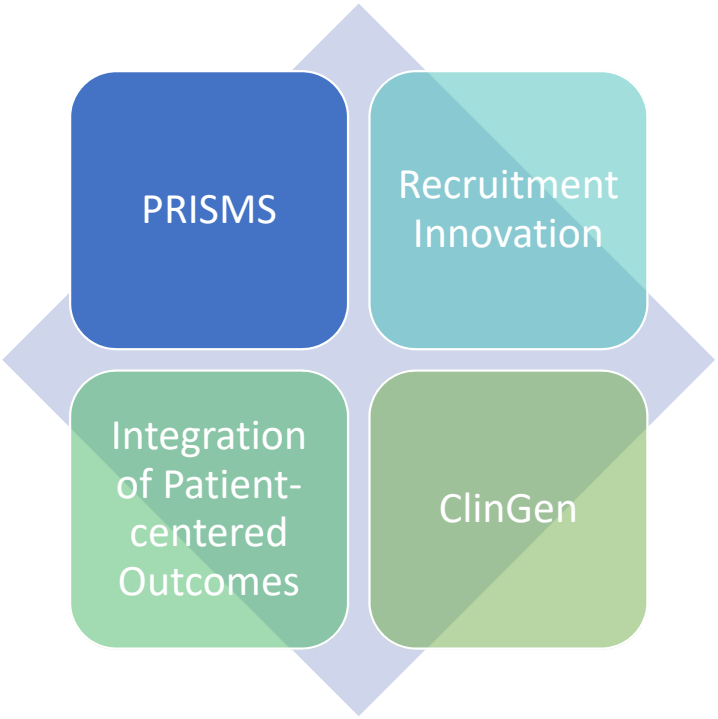
2013-2018

Multi-disciplinary Team Science



Research Highlights – Translational Informatics





Utah PRISMS Informatics Center

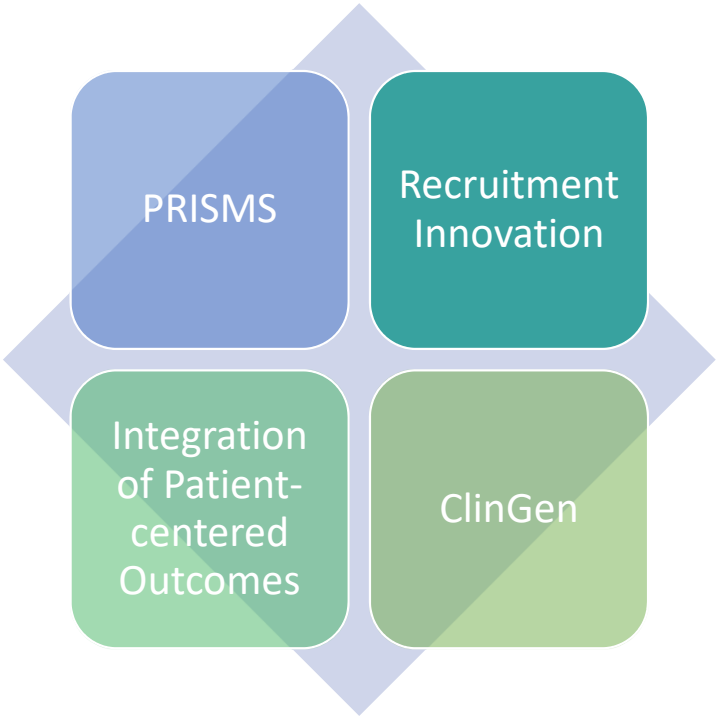
Provide a flexible approach to collecting and managing data from sensors, based on data models for the exposome that can be integrated with clinical data.

Facelli, Sward

DBMI
Nursing
Pediatrics
Pulmonology
Electrical Engeneering
Computer Science
SCI
Atmospheric Sciences

NIBIB

1U54EB021973



Recruitment Innovation Center

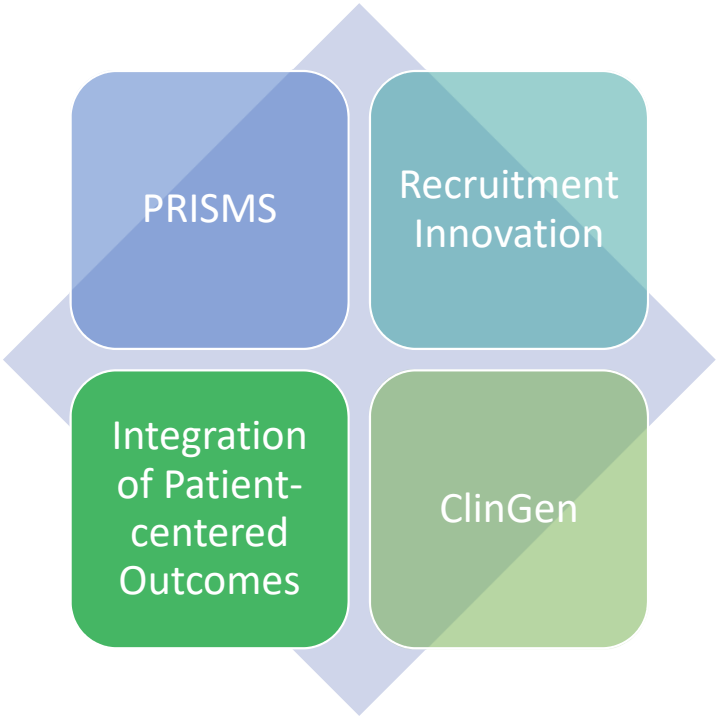
Address challenges in recruitment and retention of participants in clinical trials.

LaSalle
Facelli, Gouripeddi

UL1TR001579

DBMI
Vanderbilt University

NIH National Center for Advancing Translational Sciences



EHR Access to Seamless Integration of PROMIS

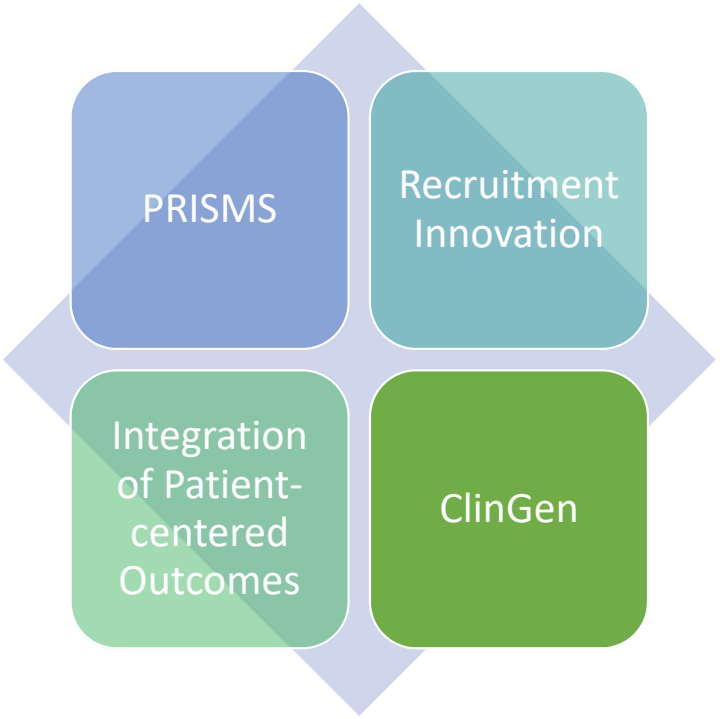
Make it easier for researchers and clinicians to collect patient reported outcomes information and use it to improve clinical care and research.

Facelli, Local PI

ULTR001422

DBMI
Northwestern University

NIH National Center for Advancing Translational Sciences



The Clinical Genome Resource

Provide curated information about all clinically relevant genes and variants

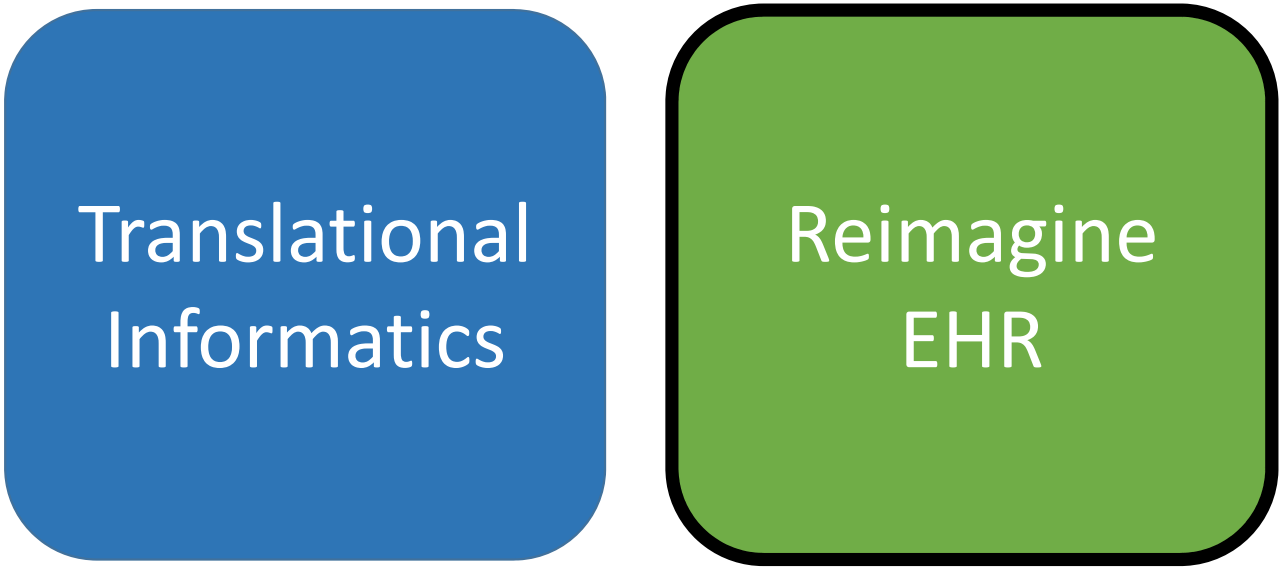
Eilbeck, Del Fiol

U41HG00965

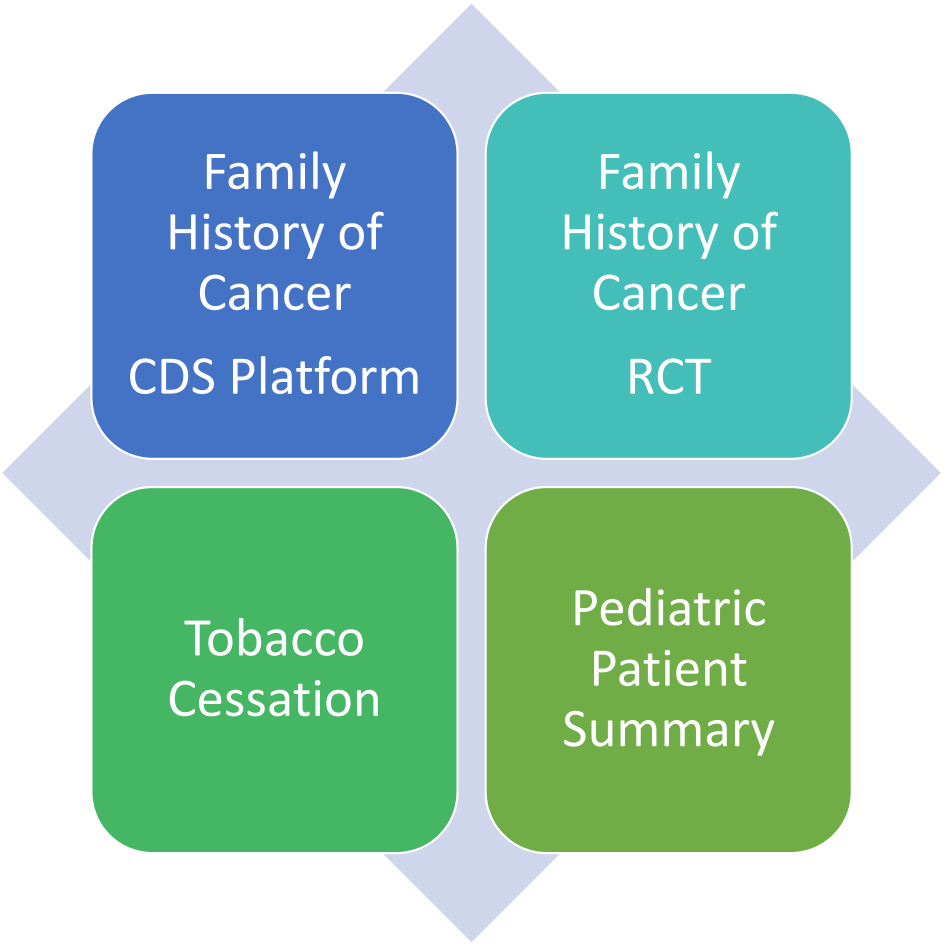
DBMI
UNC
Geisinger

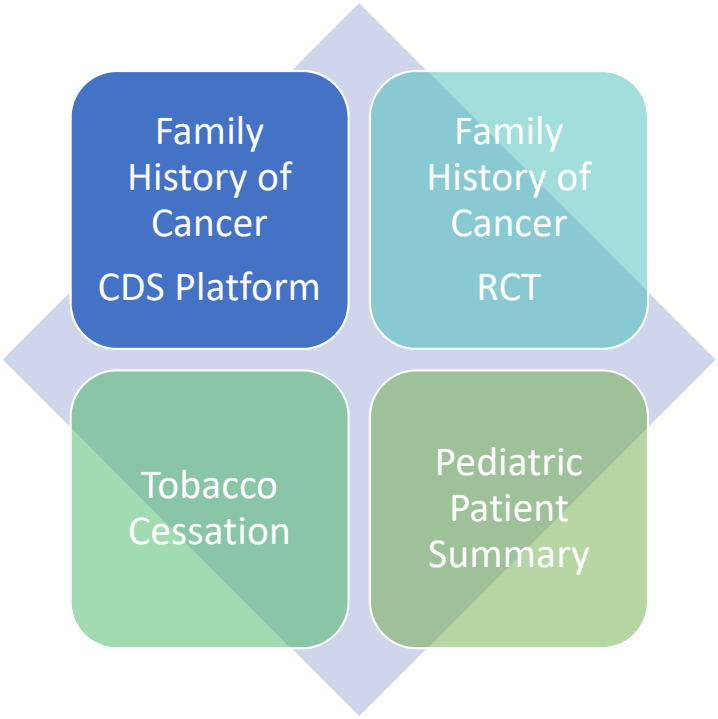
National Human Genome Research Institute

Multi-disciplinary Team Science



Research Highlights – ReimagineEHR





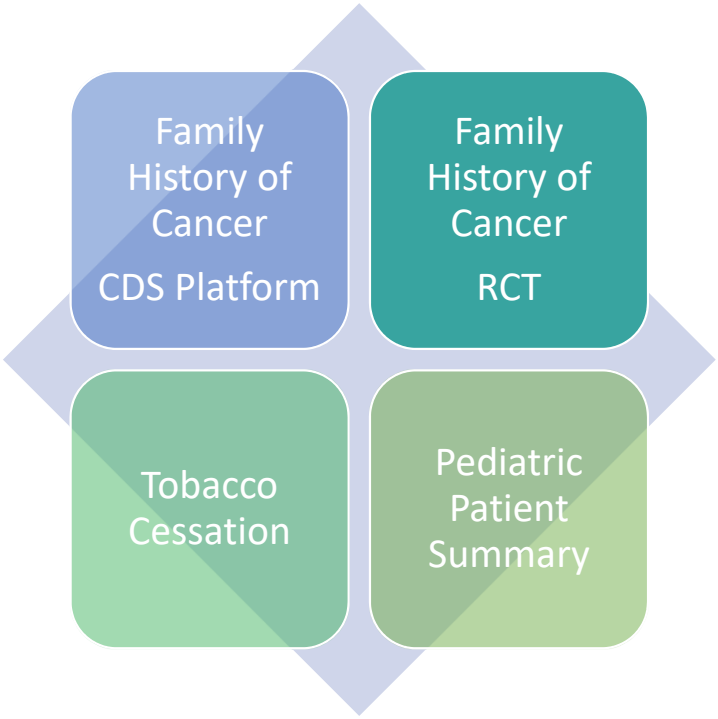
Early Cancer Screening

Population-based clinical decision support to identify patients who meet criteria for early evaluation based on family history.

Del Fiol, Kawamoto, Chapman
Schiffman, Kohlmann, Hess

DBMI
Huntsman Cancer Institute
UHealth Primary Care
Population Health Sciences
UHealth IT Services
Intermountain Healthcare

NATIONAL CANCER INSTITUTE



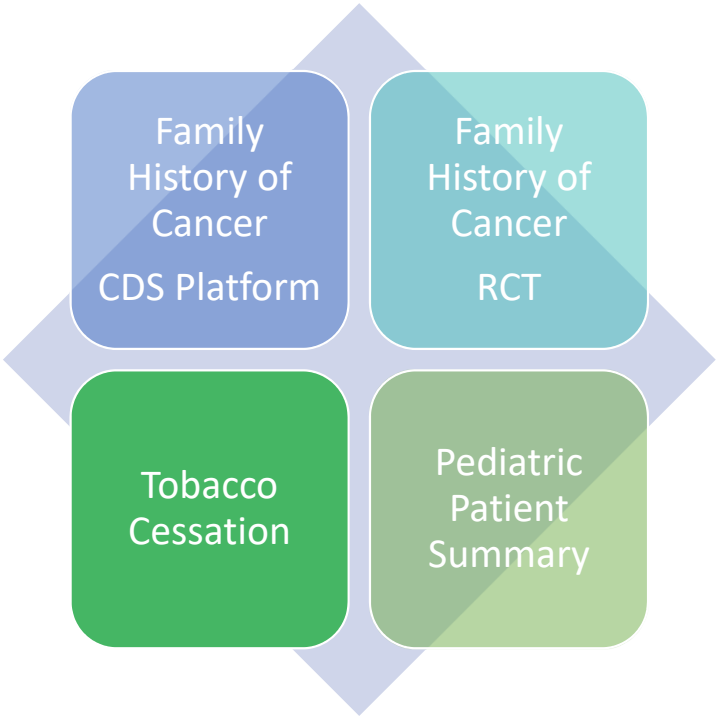
Randomized Controlled Trial

Compare genetic counseling versus self-directed genetic testing for familial cancer risk evaluation.

Kaphingst, Buys
Del Fiol, Kawamoto

Huntsman Cancer Institute
DBMI
UHealth Primary Care
Population Health Sciences
Uhealth IT Services

NATIONAL CANCER INSTITUTE



Smart Trial

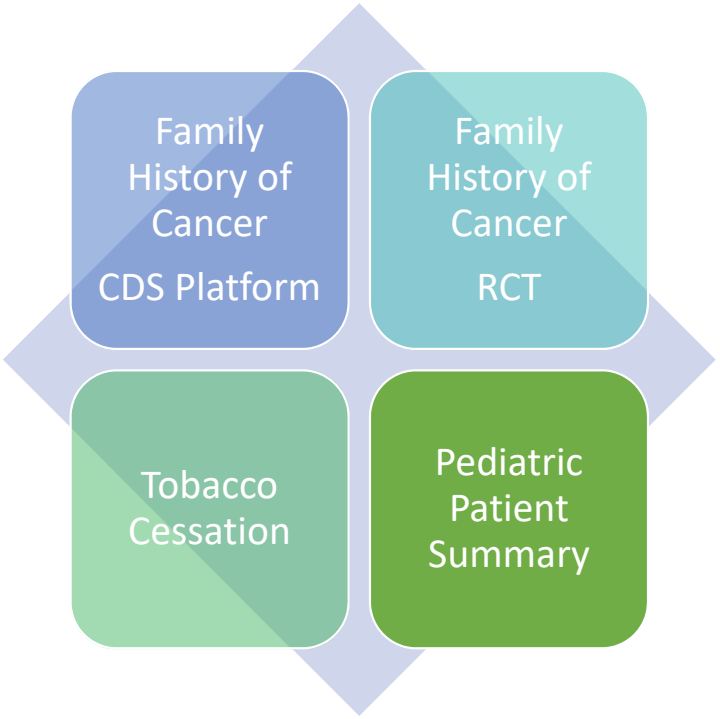
EHR-enabled tobacco cessation intervention in Utah community health centers

Wetter

Del Fiol, Kawamoto

Huntsman Cancer Institute
DBMI
Population Health Sciences
IT Services
Utah Community Health Centers

pcori



Provide automated, cross-institutional EHR summary to help teams care for children with special health care needs.

Del Fiol, Norlin
Thraen

DBMI
Pediatrics
Utah Health Information Exchange
State Medicaid
Intermountain Healthcare

2017-18 Faculty National Awards and Recognition

National Academy of Medicine
Lindberg Innovation Award

U.S. HIT Advisory Committee
HL7 Board

Elected Fellow of ACMI

2018 Homer Warner
Paper Award

2017-18 Student National Awards and Recognition

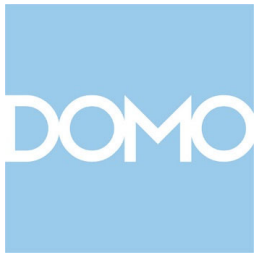
2018 AMIA Student Paper Competition Winner

F99/K00 from the NCI

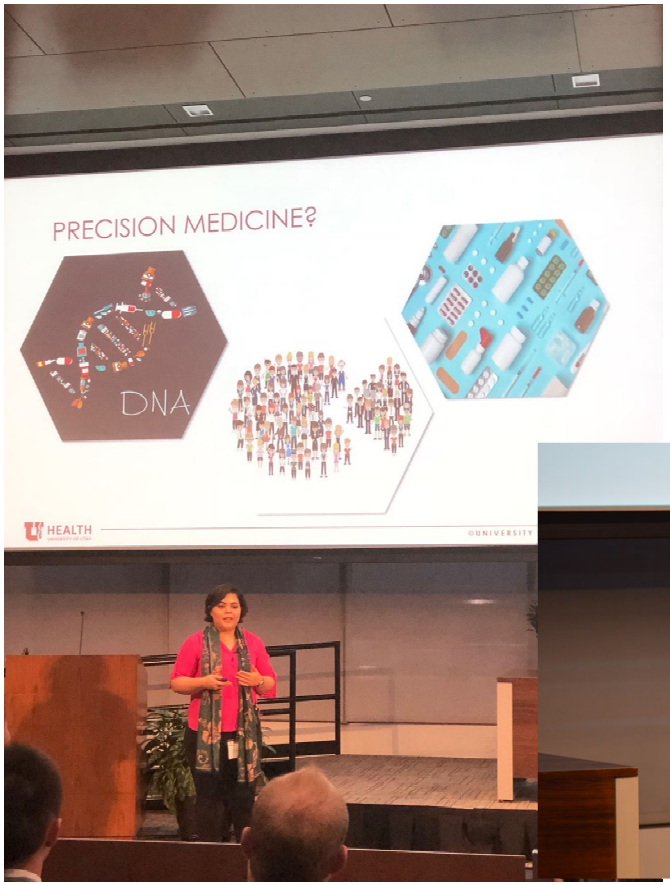
2017 Student Paper Competition Finalists (2nd place - Pallavi)

2018 Student Design Challenge Finalists

The state of industry



IABTalks



Conclusion

It's about the people

Samir E. Abdelrahman, MSc, PhD
Machine Learning

Damian A. Borbolla, MD, MS
Clinical Informatics

Bruce E. Bray, MD
Clinical Informatics

Wendy W. Chapman, PhD
Natural Language Processing

Mike Conway, PhD
Population Informatics

Guilherme Del Fiol, MD PhD
Clinical Informatics

Karen Eilbeck, MSc, PhD
Bioinformatics

R. Scott Evans, MS, PhD, FACMI
Clinical Informatics

Julio C. Facelli, PhD
Translational Informatics

Bryan S. Gibson, DPT, PhD
Consumer Health Informatics

Ramkiran Gouripeddi, MS, MBBS
Translational Informatics

Joseph W. Hales, PhD
Clinical Informatics

Peter J. Haug, MD
Clinical Informatics

Stanley M. Huff, MD
Semantic Modeling

John F. Hurdle, MD, PhD
Natural Language Processing

Kensaku Kawamoto, MD PhD, MHS
Clinical Informatics

Bernard A. LaSalle, BS
Translational Informatics

Younghee Lee, PhD
Bioinformatics

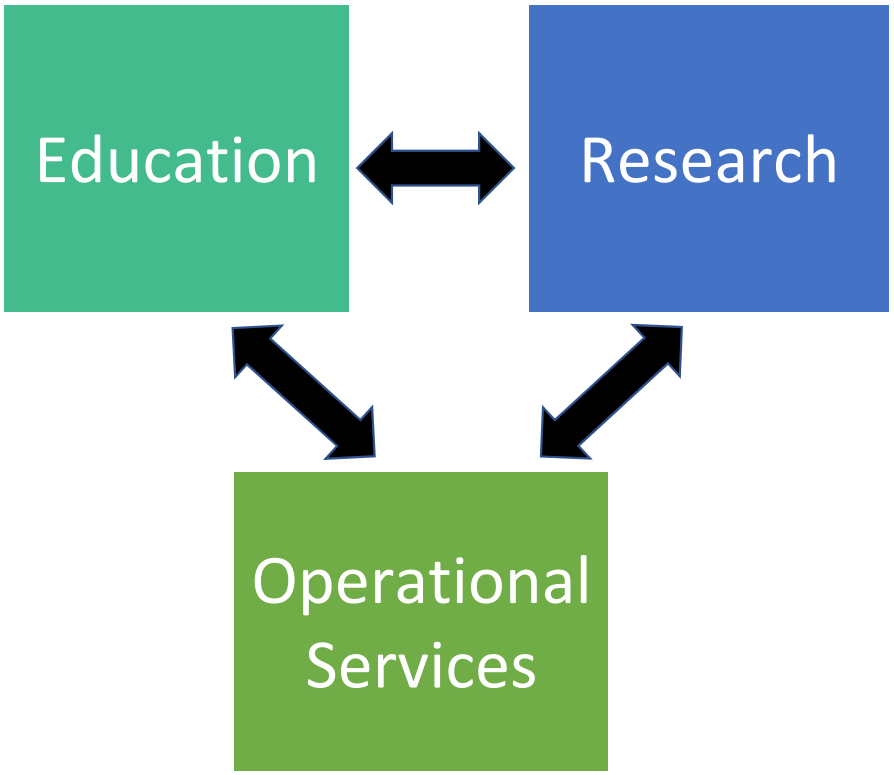
Scott P. Narus, PhD, MS
Clinical Informatics

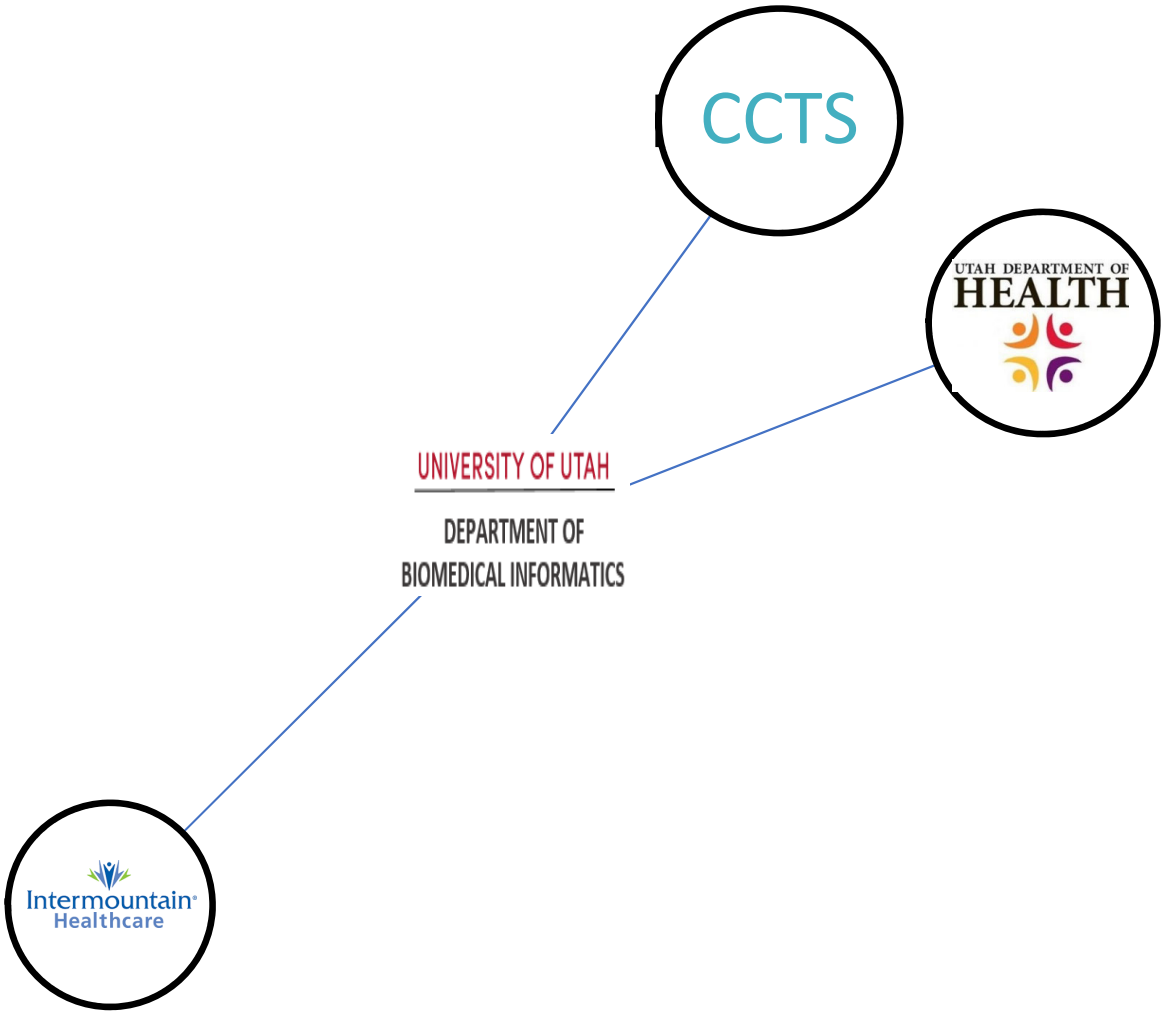
Dennis L. Parker, PhD
Radiology Informatics

Aaron Quinlan, PhD
Bioinformatics

Charlene R. Weir, PhD, RN
Sociotechnical Design & Evaluation

It’s about the partnerships

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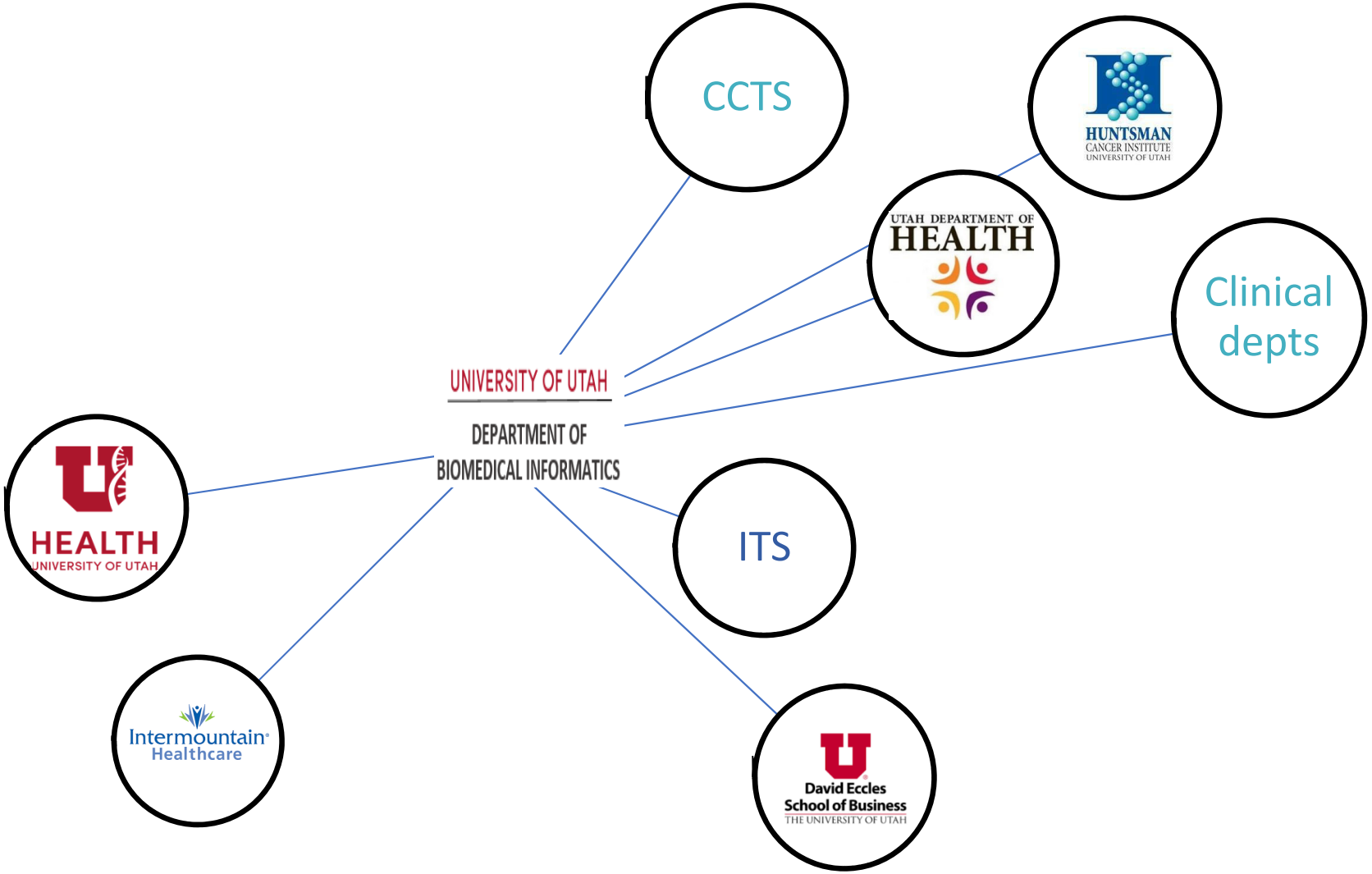
UNIVERSITY OF UTAH
DEPARTMENT OF
BIOMEDICAL INFORMATICS
Intermountain Healthcare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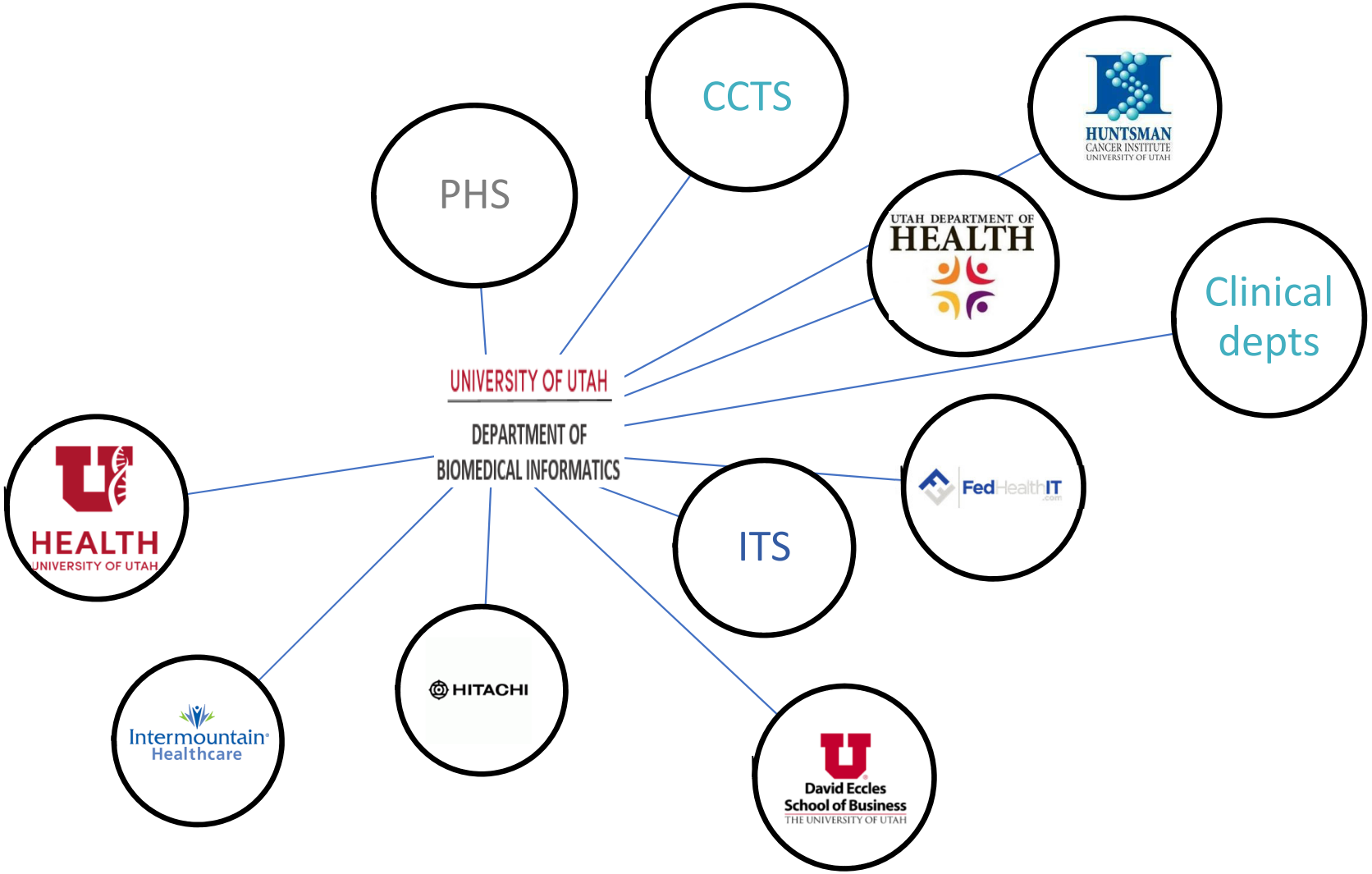
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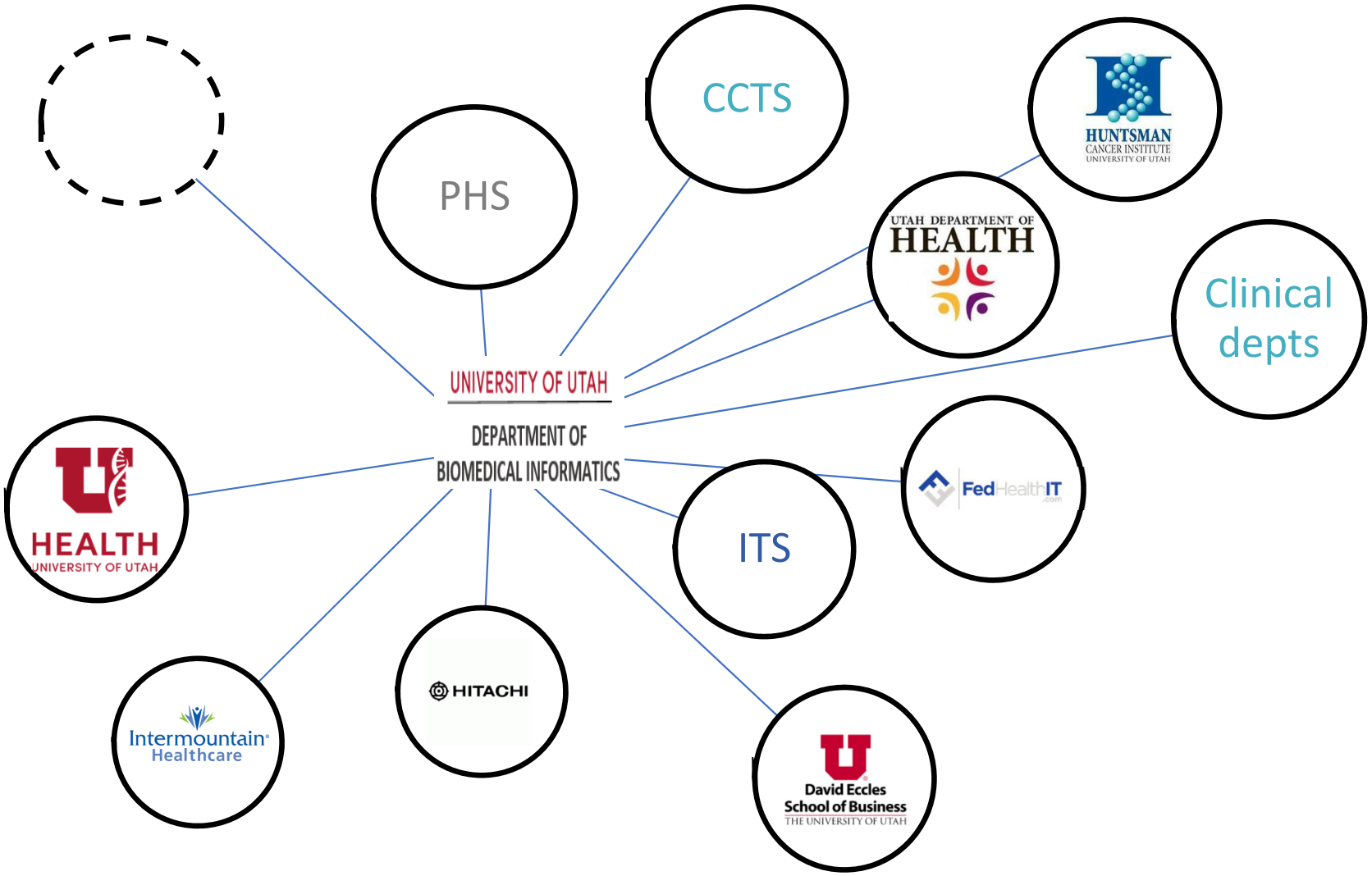
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