

UAB THE UNIVERSITY OF
ALABAMA AT BIRMINGHAM.

SCHOOL OF MEDICINE - DEPT OF BIOMEDICAL INFORMATICS AND DATA SCIENCE (DBIDS)

Department of Biomedical Informatics and Data Science (DBIDS) Symposium

January 29, 2024

This Morning

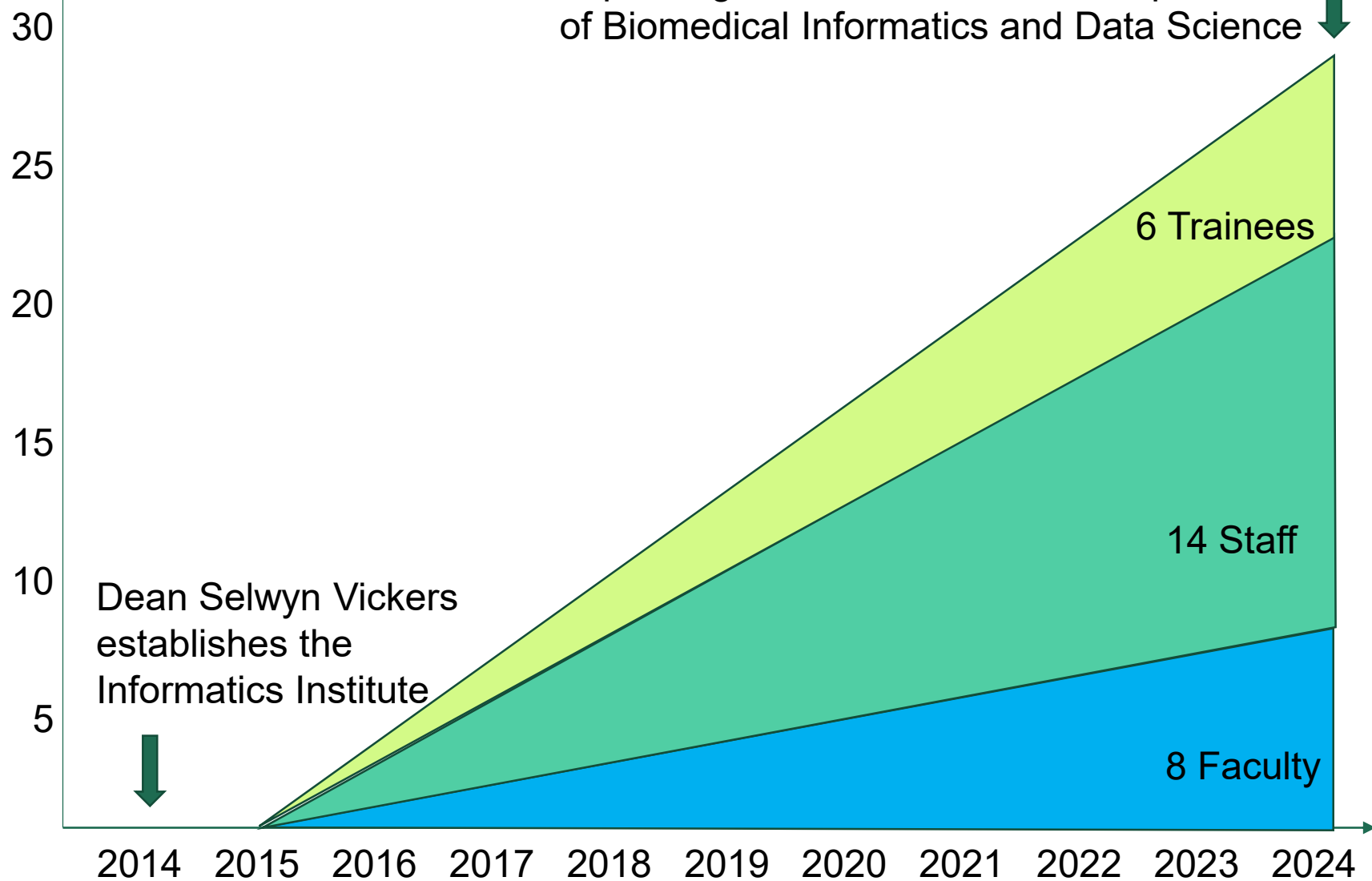
- Introduction to the Department of Biomedical Informatics and Data Science (DBIDS)
 - History
 - Current Activities
 - Vision
- Welcome – Dean Anupam Agarwal
- The Systems Pharmacology Artificial Intelligence Research Center (SPARC) – Jake Chen
- Growing the Next Generation of Biomedical Informatics and Data Science Researchers – Jim Chen

History

Dean Anupam Agarwal establishes the Department of Biomedical Informatics and Data Science



Dean Selwyn Vickers establishes the Informatics Institute



Current Activities

- Research
- Education
- Service

Current Research

- Center for Clinical and Translational Sciences (CCTS)
- Alabama Genome Health Initiative
- All of Us
- Electronic Medical Records and Genomics (eMERGE)
- Individual Research
 - 90 grants
 - 245 papers
 - 120 abstracts

Current Education

- Bioinformatics Bachelor of Science
(College of Arts and Sciences)

Graduates: 8

Current Students, Fall 2023: 55

25 continuing + 30 new

Gender	Percent
Female	54%
Male	46%

Ethnicity	Percent
Asian Pacific Islander	29%
Black, Non-Hispanic	22%
Hispanic	5%
Multi-cultural	3%
Unreported	3%
White, Non-Hispanic	38%

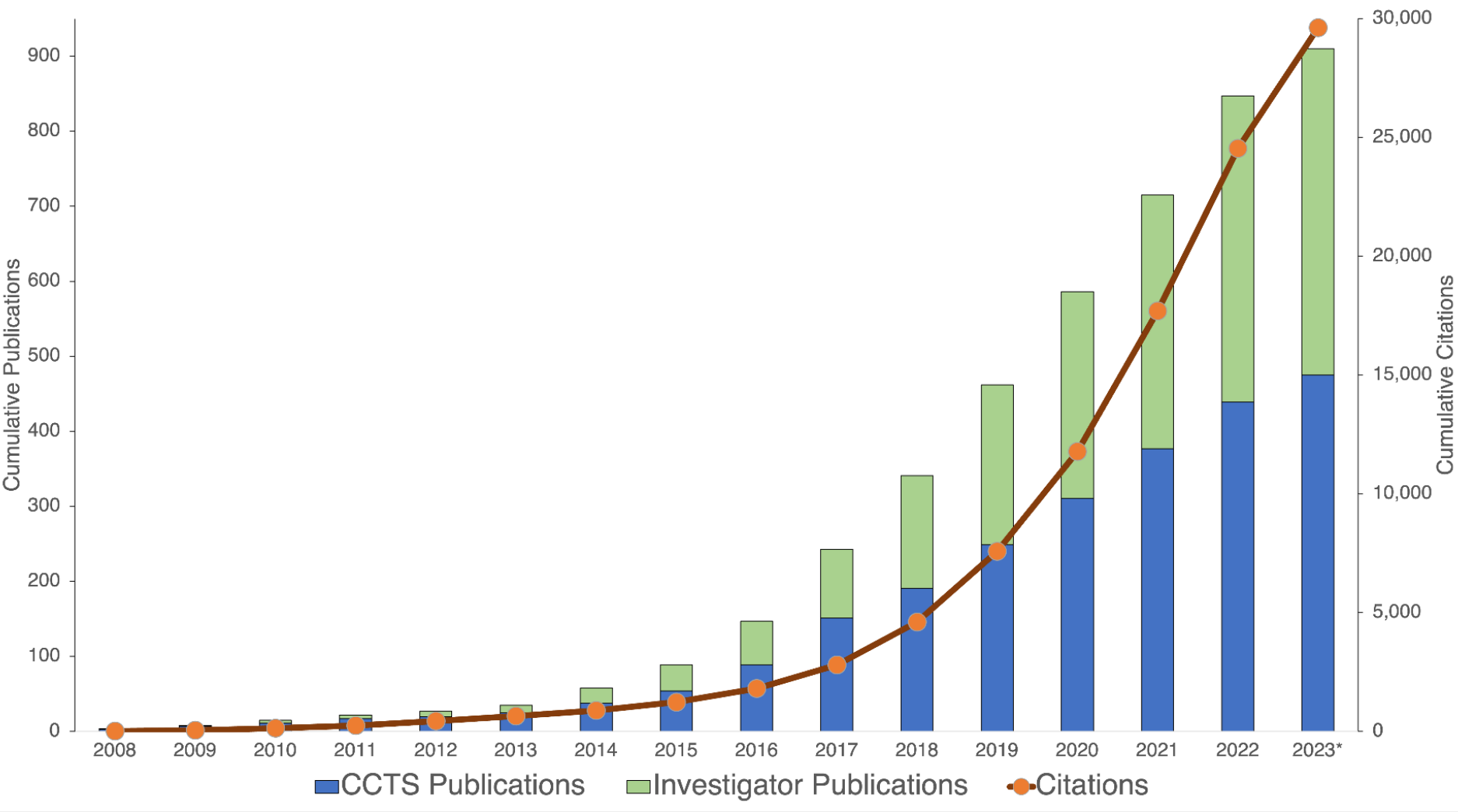
Current Education

- Bioinformatics Bachelor of Science (College of Arts and Sciences)
- Bioinformatics Concentration in Master of Science in Multidisciplinary Biomedical Science (Graduate School)
- Clinical Informatics Masters Track in Health Informatics (School of Health Professions)
- Bioinformatics Track in Genomics, Genetics and Bioinformatics Theme PhD (Graduate Biomedical Science)
- Bioinformatics PhD Track in Biomedical Engineering (School of Engineering)

Current Service

- Bioinformatics analytics

CCTS Informatics Publication Record



Current Service

- Bioinformatics analytics
- i2b2 and the Enterprise Data Warehouse

Enterprise Data Warehouse Volume

Patient Volume - Last Year

Ambulatory Visits	1,807,251
Emergency Visits	112,286
Inpatient Visits	94,402
Observations (Total Facts)	707,550,176
Unique Patients	345,490
Visits/Encounters	2,013,939

Patient Volume - Total (~2010-Present)

Ambulatory Visits	18,192,895
Emergency Visits	1,173,271
Inpatient Visits	1,207,050
Observations (Total Facts)	9,831,509,497
Unique Concepts Documented	1,500,249
Unique Patients	1,365,649
Visits/Encounters	20,573,216

i2b2

UAB i2b2 Query/Analysis Tool

Project: UAB LDS (Early Feb 2016) **Fresh Data Load starting end of May 2016** User: MATTHEW WYATT Find Patients | Analysis Tools | Help | Logout

Navigate Terms **Find**

Search by Names Search by Codes

Containing **Find** Medications (Multum Ontology)

- proton pump inhibitors
 - dexlansoprazole - 3386
 - esomeprazole - 94153
 - lansoprazole - 7399
 - omeprazole - 65050
 - omeprazole-sodium bicarbonate - 1035
 - pantoprazole - 69107
 - rabeprazole - 1380

Query Tool

Query Name: Gastro--proton @10:10:46

Temporal Constraint:

Group 1			Group 2			Group 3								
Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude						
Treat Independently			Treat Independently			Treat Independently								
Gastro-esophageal reflux disease (ICD10:K21) - 37077			proton pump inhibitors - 181615											
one or more of these			AND			one or more of these			AND			drop a term on here		

Run Query **Clear** **Print Query** 2 Groups

Show Query Status **Graph Results**

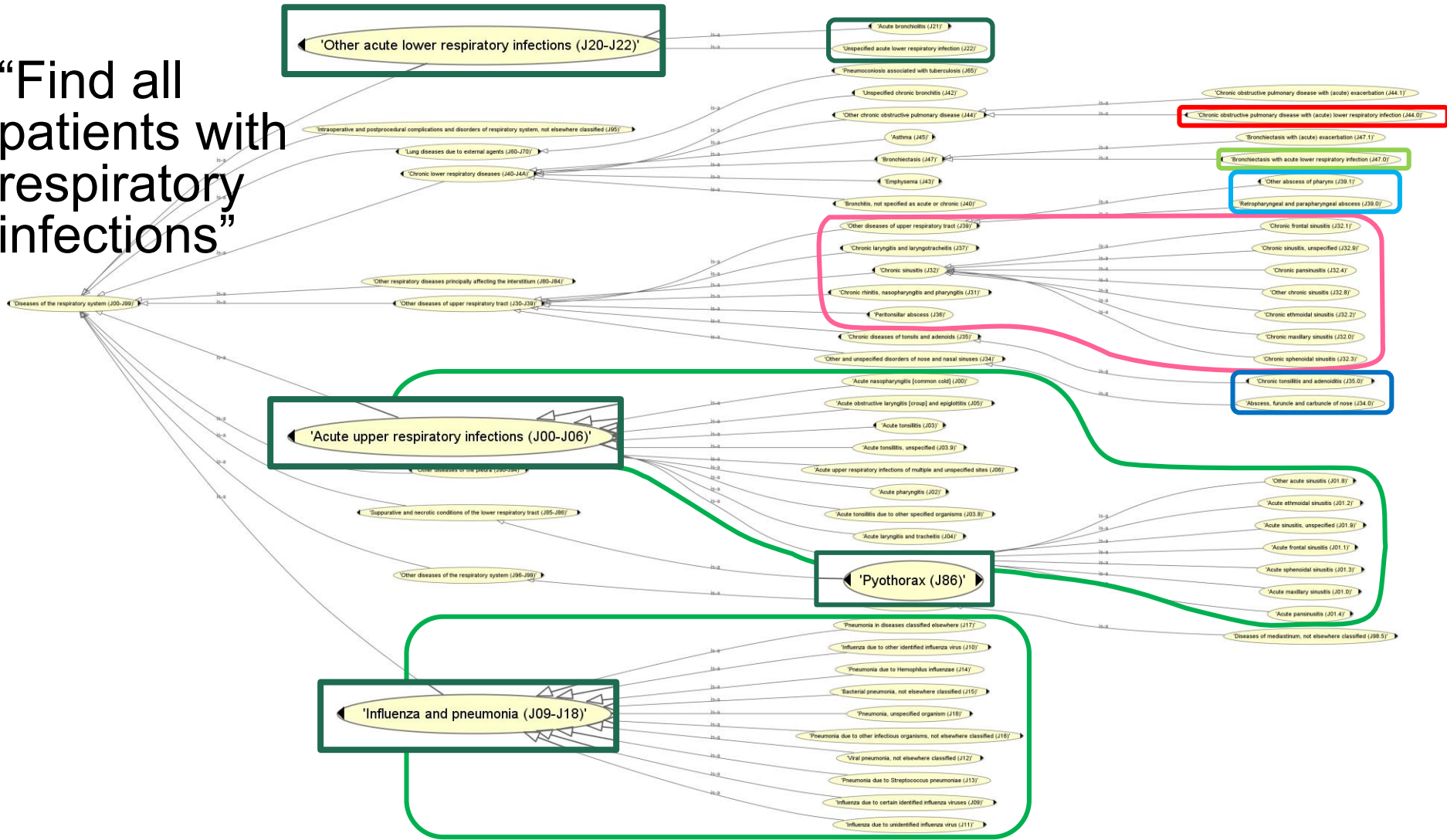
Number of patients

30170

For Query "Gastro--proton @10:10:46"

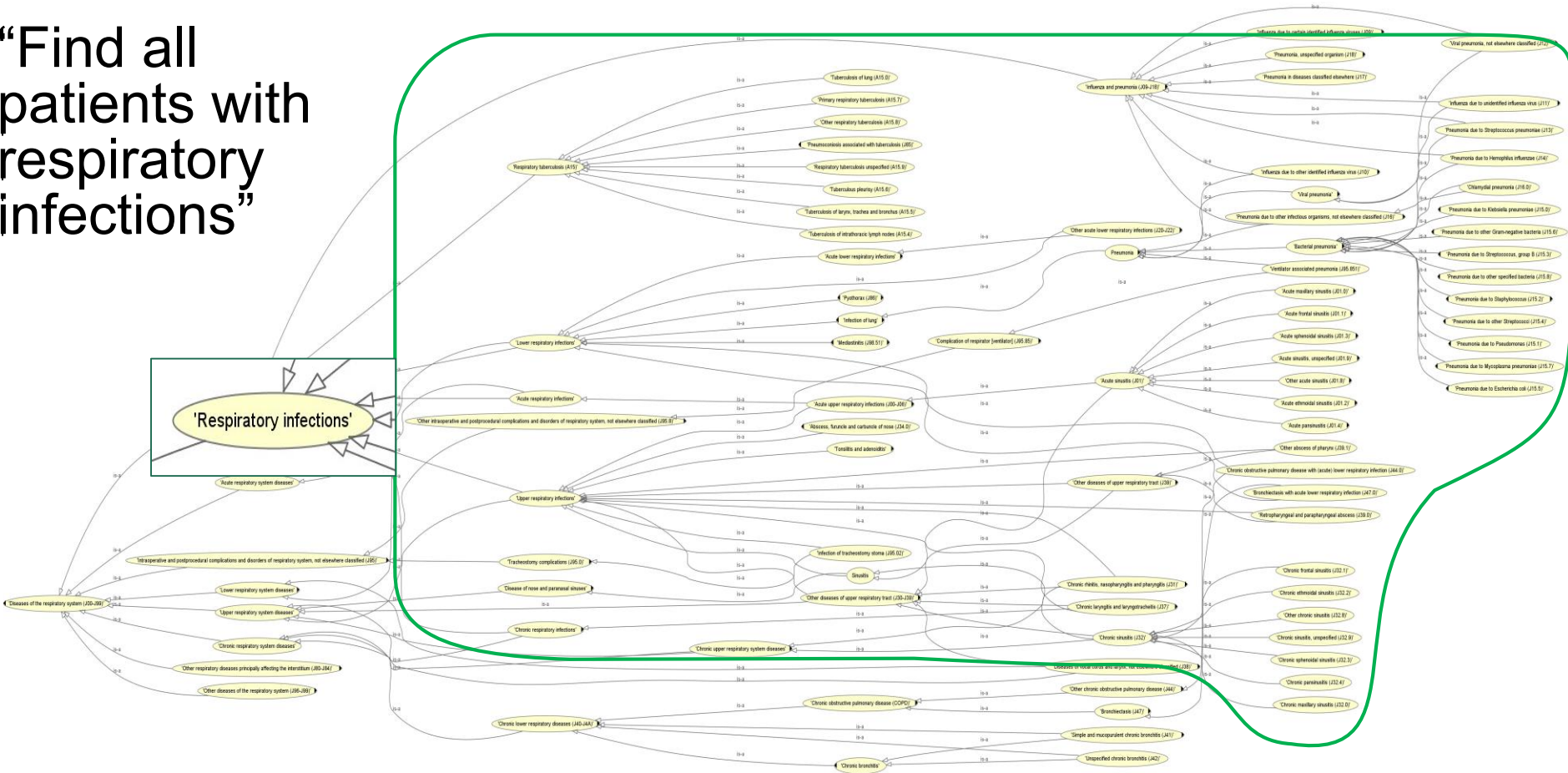
UAB Foundational Ontology (UFO)

“Find all patients with respiratory infections”



UAB Foundational Ontology (UFO)

“Find all patients with respiratory infections”



Clinical Data Access for UAB Users

System Use Metrics

Year	i2b2 Access Requests	Distinct i2b2 users	Distinct i2b2 Sessions	Distinct DataLENS
2016	158	113	14,784	N/A
2017	296	281	48,486	N/A
2018	152	250	40,928	N/A
2019	219	248	58,381	96
2020	164	247	66,364	72
2021	124	221	73,059	109
2022	143	234	48,609	192
2023	156	241	74814	226

Data Request and Self Service Data Access Metrics

Year	EDW	Self Service LDS	i2b2 Aggregate
2016	91	269	3,263
2017	229	608	7,830
2018	281	484	10,436
2019	250	462	16,920
2020	146	610	13,630
2021	270	315	6,533
2022	492	482	5,120
2023	546	383	5,587

Clinical Data Sharing

	N3C	N3C PPRL	All Of Us	All Of Us - Cooper Green
first submission date	7/1/2020	12/4/2021	9/1/2018	10/28/2020
frequency	weekly	weekly	bi-weekly	varies
last submission	1/16/2024	1/16/2024	1/11/2024	8/29/2023
period	2018 - present	2018 - present	2010 - present	NA
period for this submission	2018 - present	2018 - present	2010 - present	NA
patients	176,134	176,127	12,389	1,631
encounters	7,982,317	NA	868,955	41,395
diagnoses	32,378,790	NA	5,345,319	86,254
labs/vitals	321,432,808	NA	27,719,176	377,584
medications	61,228,143	NA	2,051,666	43,695

	One Florida	One Florida PP	TriNetX PPRL	SPARC
first submission date	5/25/2022	6/23/2022	5/11/2022	1/1/2023
frequency	quarterly	quarterly	weekly	varies
last submission	11/13/2023	11/13/2023	1/15/2024	10/19/2023
period	1/1/2012 - pres	1/1/2012 - pres	2000 - present	2000 - present
period for this submission	7/1/2022 - 7/31	7/1/2022 - 7/31	2000 - present	2000 - present
patients	1,297,363	1,297,476	1,485,684	40
encounters	2,170,336	NA	NA	2,481
diagnoses	15,855,549	NA	NA	11,758
labs/vitals	120,462,582	NA	NA	89,910
medications	7,776,207	NA	NA	7,009

Current Service

- Bioinformatics analytics
- i2b2 and the Enterprise Data Warehouse
- Data sharing
 - SHRINE
 - ACT/ENACT
 - TriNetX
 - One Florida+ (PCORI)
 - CRITICAL (Northwestern)
 - N3C



National COVID Cohort Collaborative

Collaborating Institutions

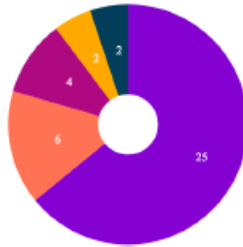
25 CTSA

6 UNAFFILIATED

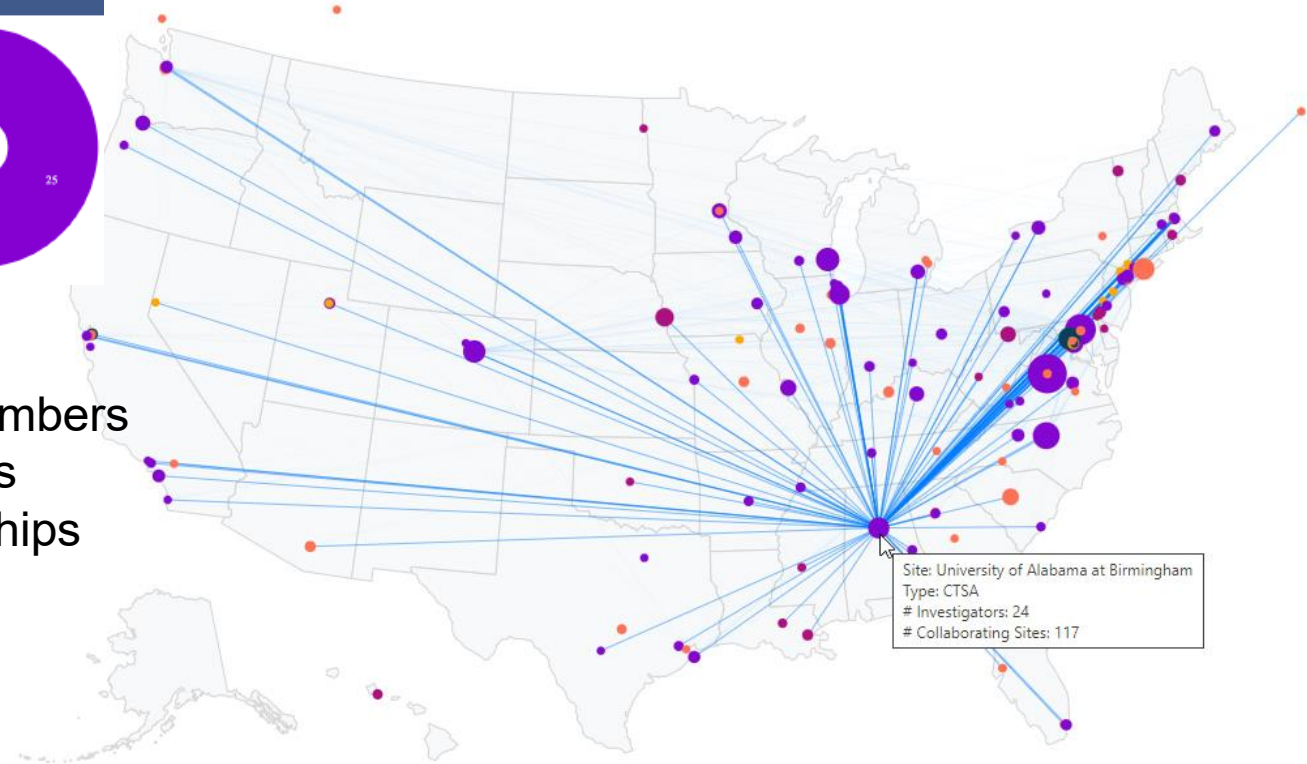
4 CTR

2 COM

2 GOV



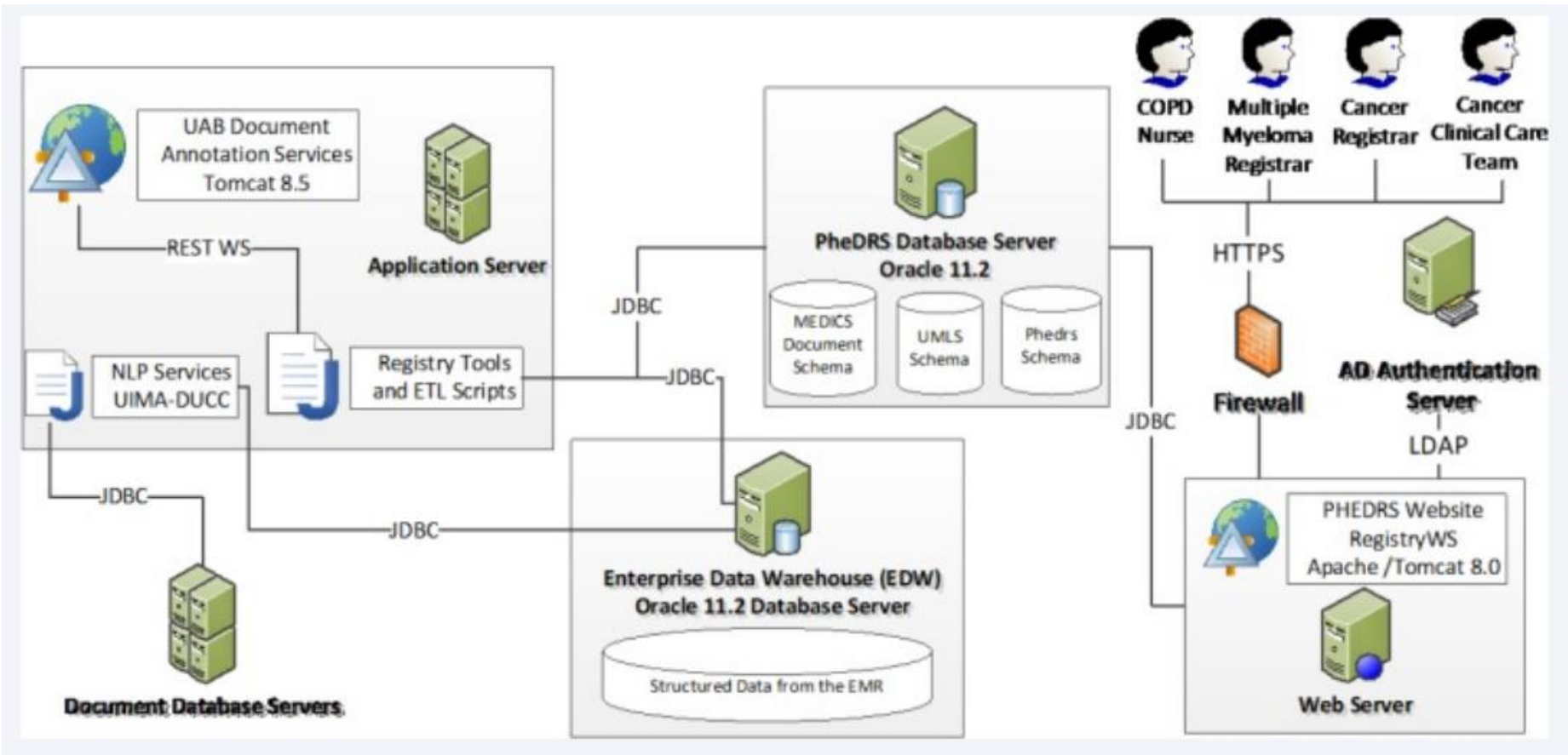
- 15 Enclave projects
 - 74 N3C Enclave members
 - 27 local investigators
 - 45 project memberships
- 2 awards (\$355,287)
- 40 publications
 - 31 local authors
 - 72 authorships



Current Service

- Bioinformatics analytics
- i2b2 and the Enterprise Data Warehouse
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 - ACT/ENACT
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 - CRITICAL (Northwestern)
 - N3C
- Natural language processing
- Virtual patient registries

Phenotype Detection Registry System (PheDRS)

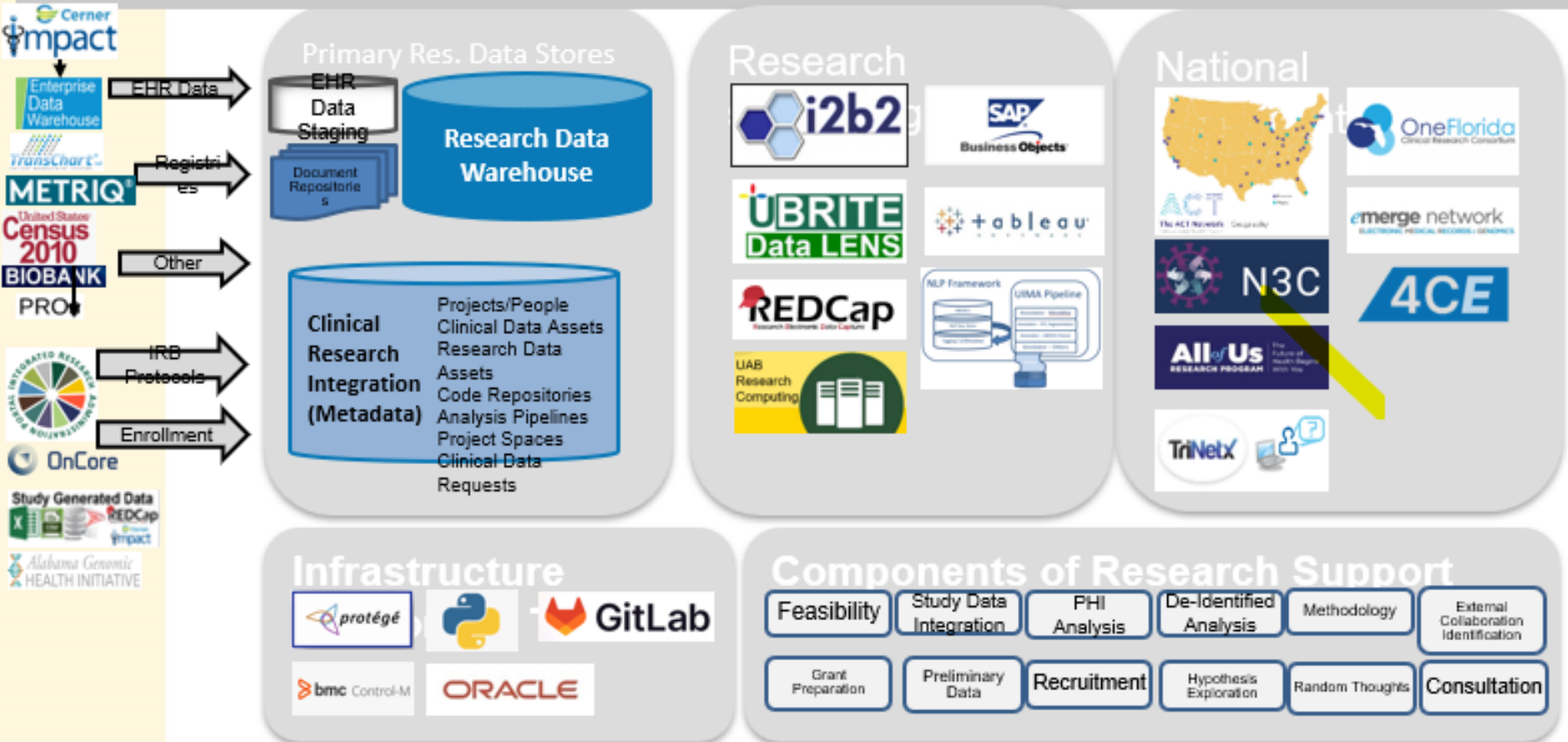


Current Service

- Bioinformatics analytics
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 - SHRINE
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 - One Florida+ (PCORI)
 - CRITICAL (Northwestern)
 - N3C
- Natural language processing
- Virtual patient registries
- Notification of radiographic “incidentalomas”

Clinical Data – The Big Picture

Tools and Services to provide EHR Data so support clinical and biomedical research



Vision

The Department of Biomedical Informatics and Data Science envisions the sharing of data between biomedical research and patient care that results in greater knowledge and improved health for people everywhere.

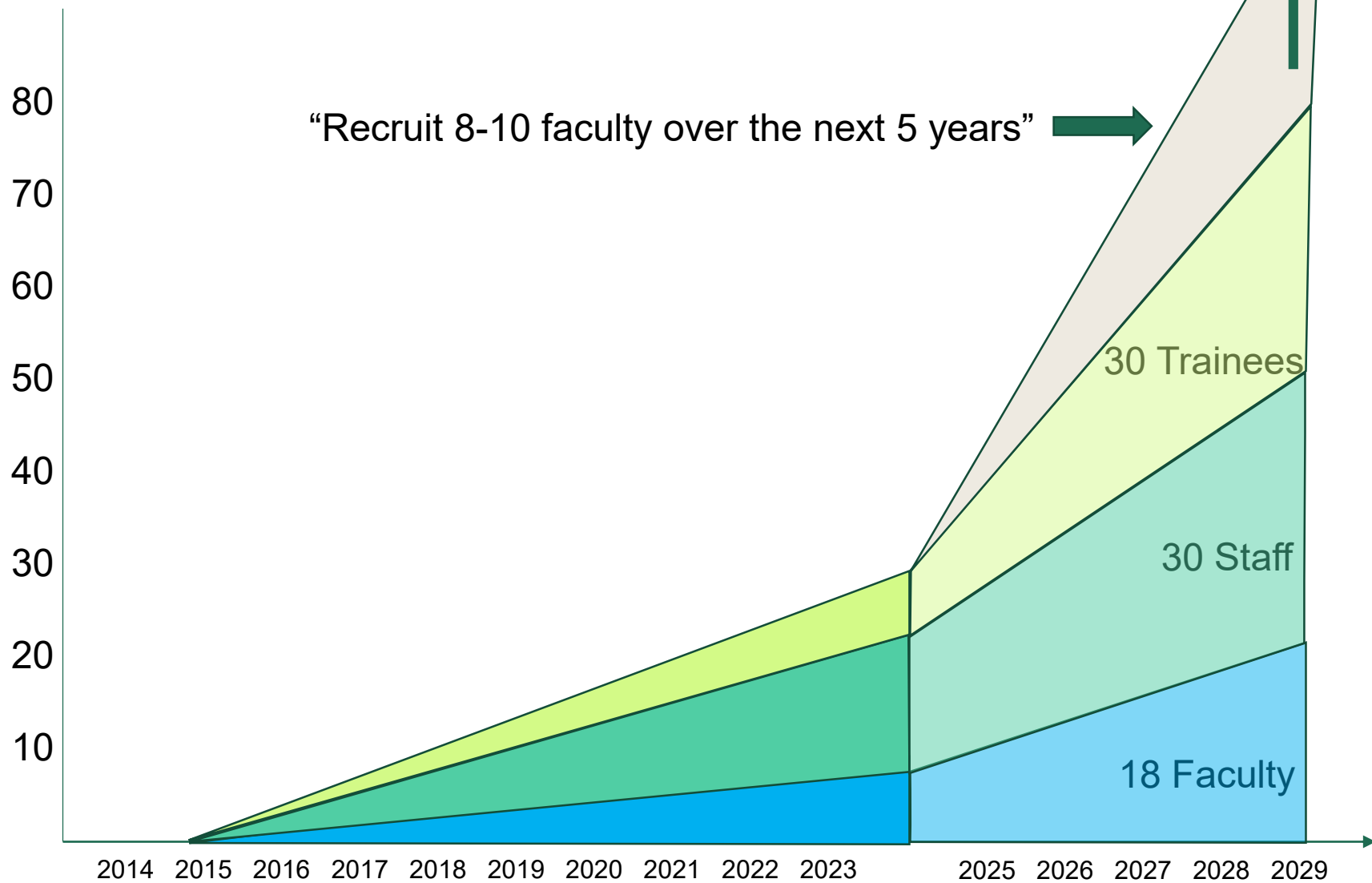
Mission

From data to knowledge to better health, the Department of Biomedical Informatics and Data Science researchers will apply their tools and techniques to the problems facing the researchers, practitioners, and patients at UAB and its partners, while conducting our own hypothesis-driven informatics research to develop the tools, and train the informatics researchers, of tomorrow.

Plans

- Recruitment

Recruitment Plans



Plans

- Recruitment
- Education

Education Plans

- PhD in Biomedical and Health Informatics
- Postdoctoral Training

Plans

- Recruitment
- Education
- Clinical and Translational Research – U-BRITE

Characteristics of

Inpatient	1
Visits Per Patient	1
Number of	1
Concepts	
Used	
Number of	7,237
Concepts	
Number of Total	6,553
Concepts	
Number of Visits	15

Patient Volume - Last Month

Ambulatory Visits	115,342
Emergency Visits	7,942
Inpatient Visits	6,025
Observations (Total Facts)	3,247,522
Unique Patients	72,378
Visits/Encounters	129,309

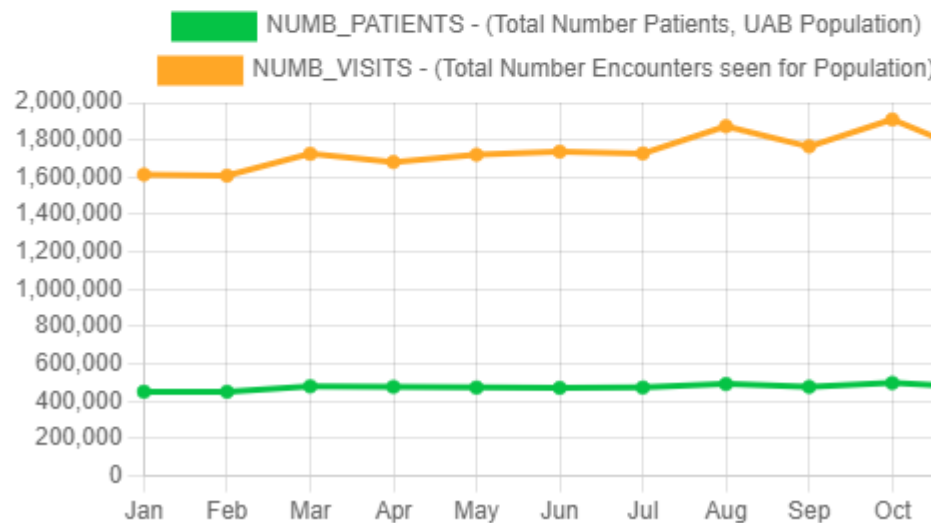
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Observations (Total Facts)	707,550,176
Unique Patients	345,490
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Overview of Research Data Available

Additional information can be found in the Data Dictionary.

Admit Date Distribution by Month





- Dashboard
- Standard Dataset Builder
- Data Dictionary
- User Dashboard
- Work Queue
- Demo Dashboard
- Myproject**
- Learning-Resources
- Analysis-Portal
- Research-Computing
- Data-Resources
- Institutional Data Manage...
- pheders-Resources
- Global-Search
- Data Science Platform (DSP)
- DSP Admin

Project Overview

Project Number: UB202308045

Title: Smith GMB Sequencing 1 R01 CA 123456-01A1

Description: Lorem Ipsum is simply dummy text of the printing and typesetting industry. Lorem Ipsum has been the industry's standard dummy text ever since the 1500s.

Owner: Alex Raven

Created on: September 2, 2023

Last Updated: Jan 4, 2024

Status: Active

Member + 👤

Name	Role	Edit/Delete
mathew	Developer	Edit Delete
Prashant	Designer	Edit Delete
Nick	Manager	Edit Delete
Rahul	Analyst	Edit Delete
Adward Davis	Tester	Edit Delete
Rohan Das	Tester	Edit Delete

[Manage Member link](#)

Protocol and Information Card +

Protocol	IRB-0975 Glioblastoma
IRB CLASSIFICATION	HUMAN SUBJECT RESEARCH
Active	Jan 20, 2024
Expires	Jan 20, 2025
Principle Investigator	Matt Wyatt MD
Department	DBIDS
Version	1

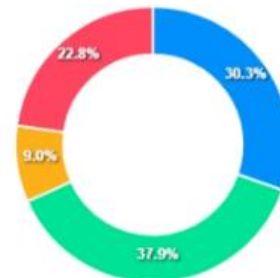
[Display Full IRB Protocol Details](#)

Assets and Documentation

Title	Resource
JPG IMAGE	Box
JPG IMAGE	Box
JPG IMAGE	Box
JPG IMAGE	Box
JPG IMAGE	Box
JPG IMAGE	Box

[Manage Assets and Documentation](#)

Member Contribution



Integrated WorkSpaces for the Project: UB202308045

Workspace Name	Date	Owner
Dr.Abc Workspace	2024-01-15	James J. Cimino
Dr.Abc Workspace	2024-02-01	Jake Chen
Dr.Abc Workspace	2024-02-01	Zechen Chong
Dr.Abc Workspace	2024-02-01	Tiago K
Dr.Abc Workspace	2024-02-01	John D. Osborne
Dr.Abc Workspace	2024-02-01	Amy Wang

Plans

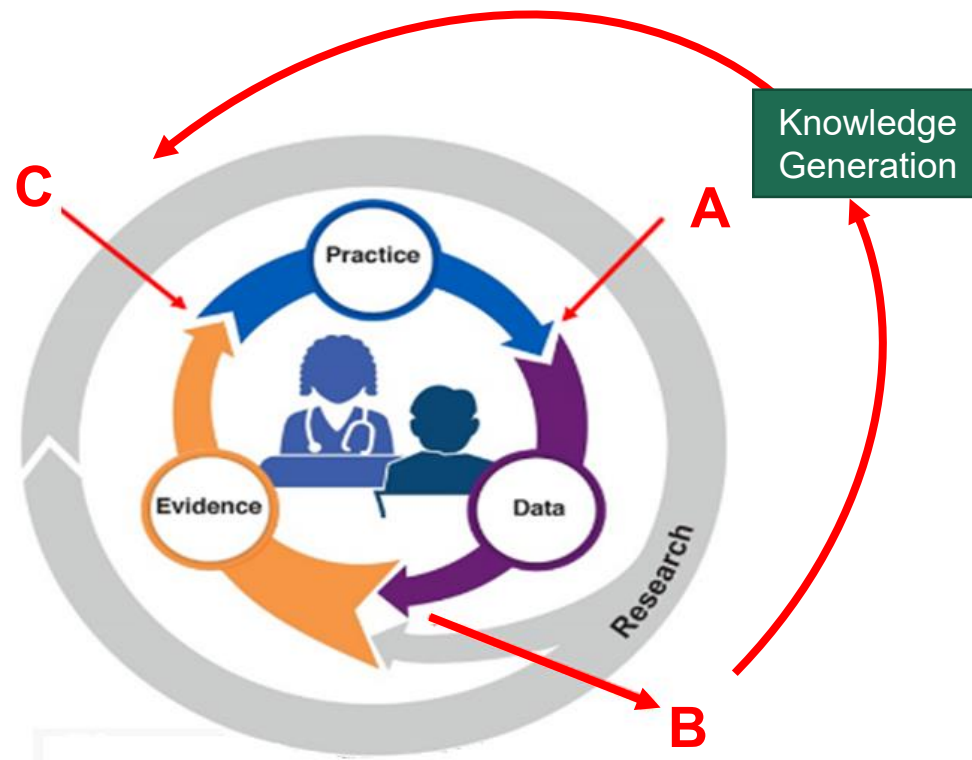
- Recruitment
- Education
- Clinical and Translational Research – U-BRITE
- Clinical Informatics – the Learning Health System

Clinical Informatics - Learning Health System

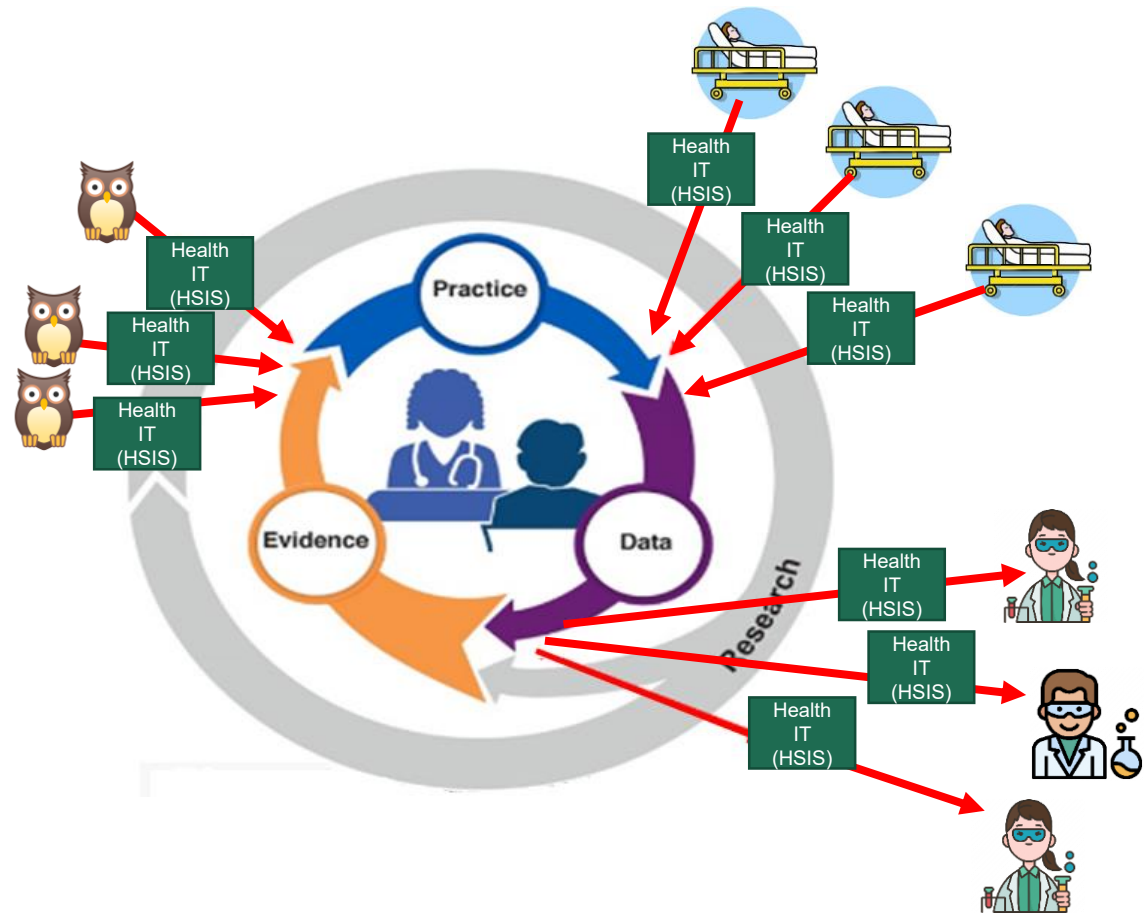
The LHS Cycle

- A. Patient care data entered into the EHR
- B. Data extracted from the EHR
- C. Knowledge injected into patient care workflow

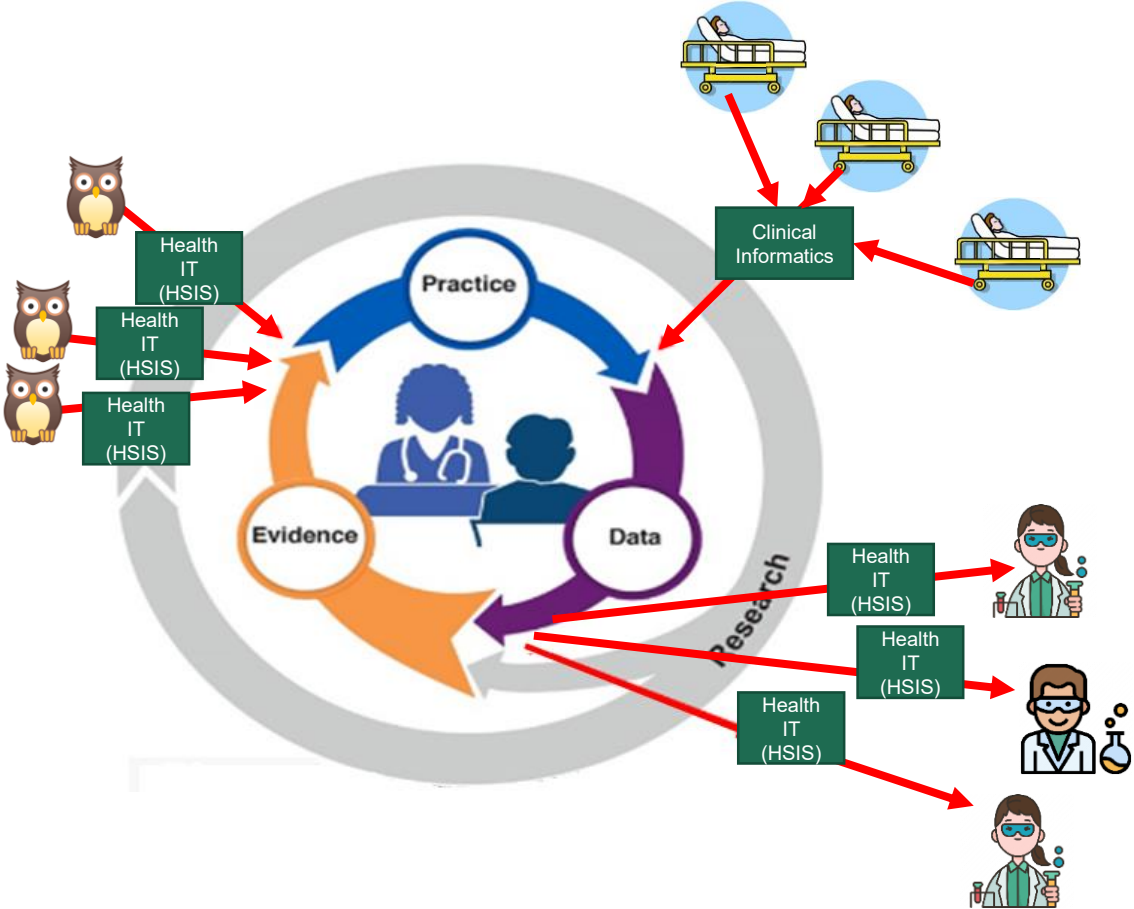
Knowledge generation through logistic regression, machine learning, etc.



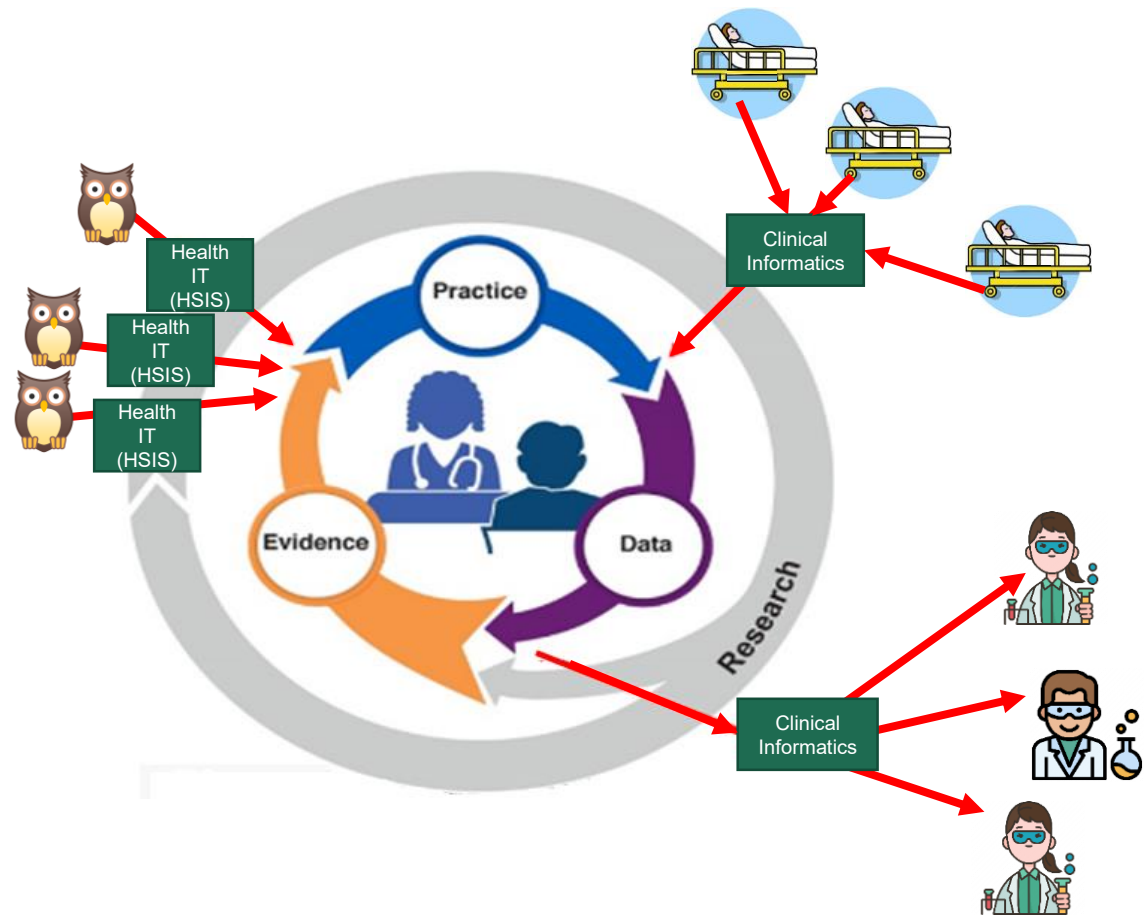
Clinical Informatics - Learning Health System



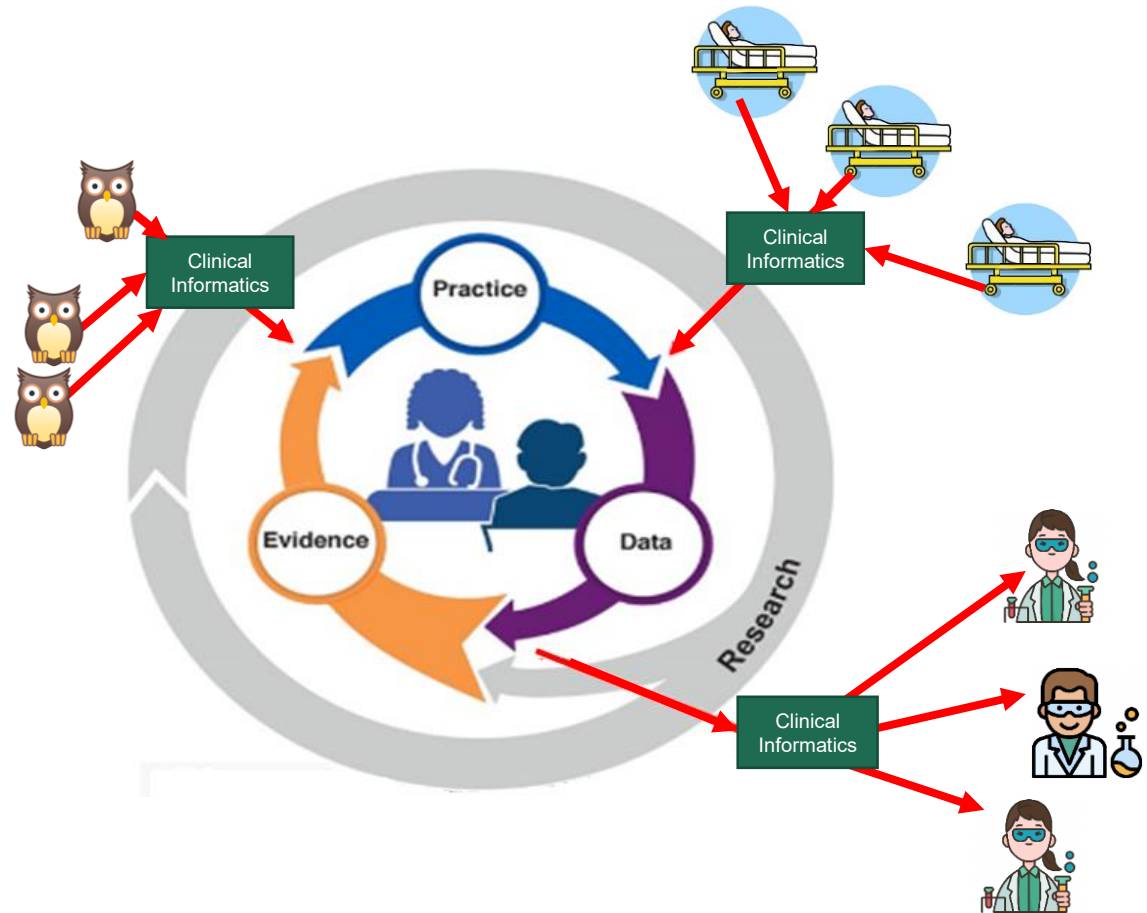
Clinical Informatics - Learning Health System



Clinical Informatics - Learning Health System



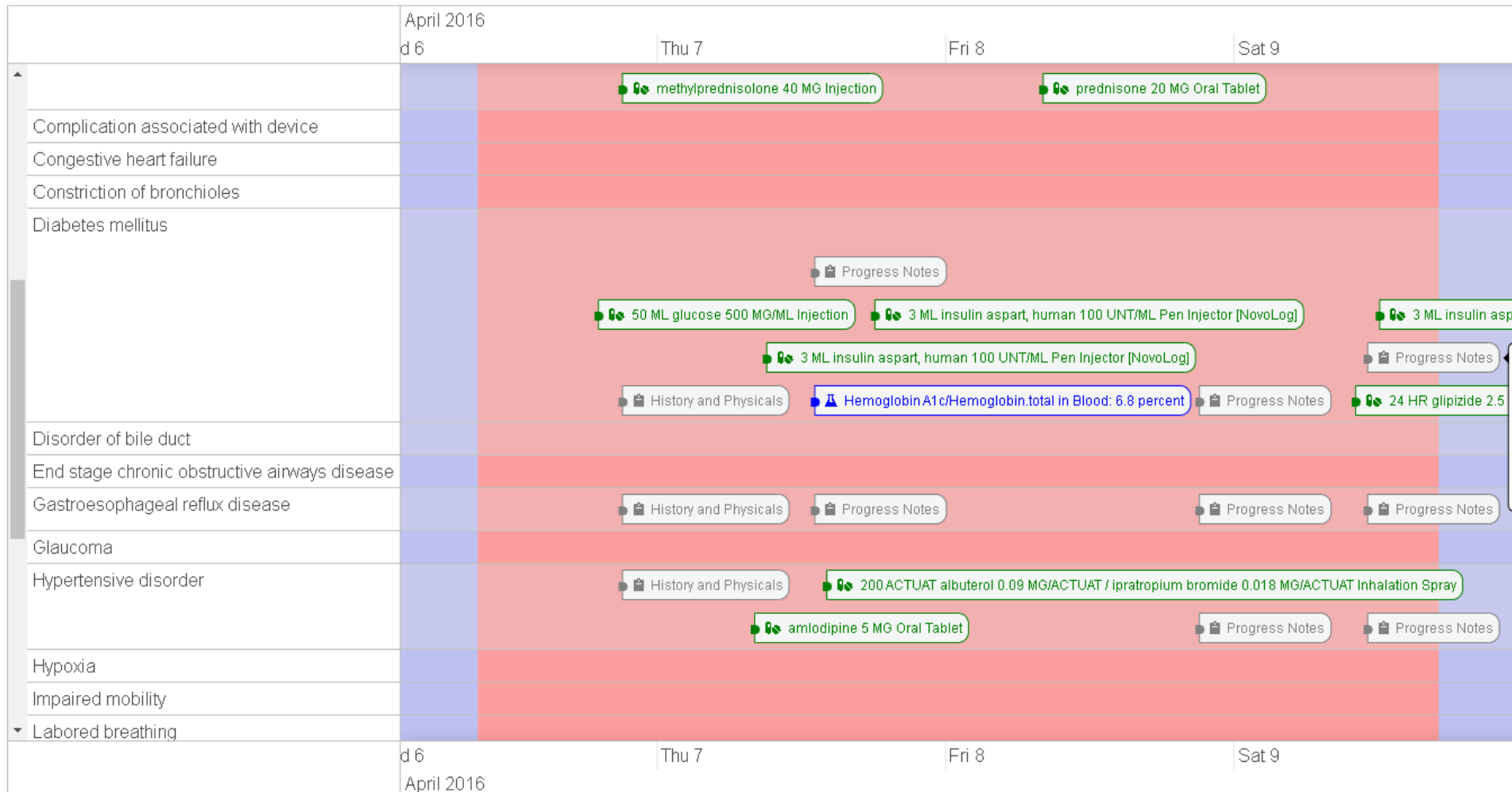
Clinical Informatics - Learning Health System



Clinical Informatics – Semantic EHR Navigation

Sample, Patient MRN: 1234-5678

Past Problems: [Lung Cancer](#)



Progress Notes

Physician status report: Progress Notes

2016-04-09 11:04:00

Reason for Visit: dyspnea,Chest pain,Dyspnea

nitroglycerin 0.4 MG

Chest pain

- has_onset: "Symptom onset 2 weeks ago"
- has_value: "Location left chest with radiation d
- has_value: "Described as \n"sob, flushed, nause
- has_value: "Pain is intermittent"
- has_finding_or_condition: "currently denies CP
- has_frequency: "CP occurs 4-5 times daily and
- has_value: "Being upset" \nexacerbates pain"
- has_value: "pleuritic in nature and associated w
- Clinical course: "improving with current treatme
- Interventions
 - "SL nitroglycerin"
 - "telemetry"
 - "CM neg"
 - "MIBI 4/8/15 negative, EF >74%"
 - "on admit BNP 13.7"

s Notes

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ysicals

Progress Notes

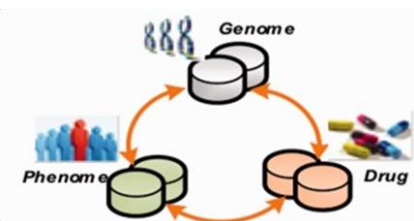
Progress Notes

10 MG/ML Injection

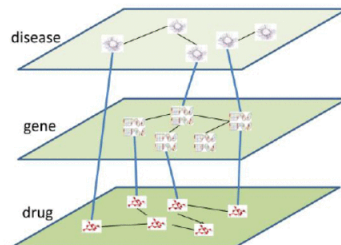
Plans

- Recruitment
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- Clinical and Translational Research – U-BRITE
- Clinical Informatics – the Learning Health System
- Systems Pharmacology Artificial Intelligence Research Center (SPARC)

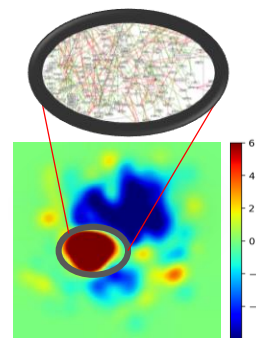
Systems Pharmacology Artificial Intelligence Research Center (SPARC)



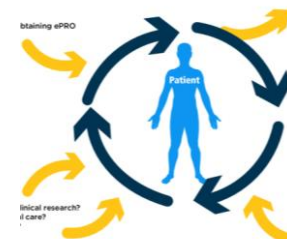
Multi-omics data



Network Modeling



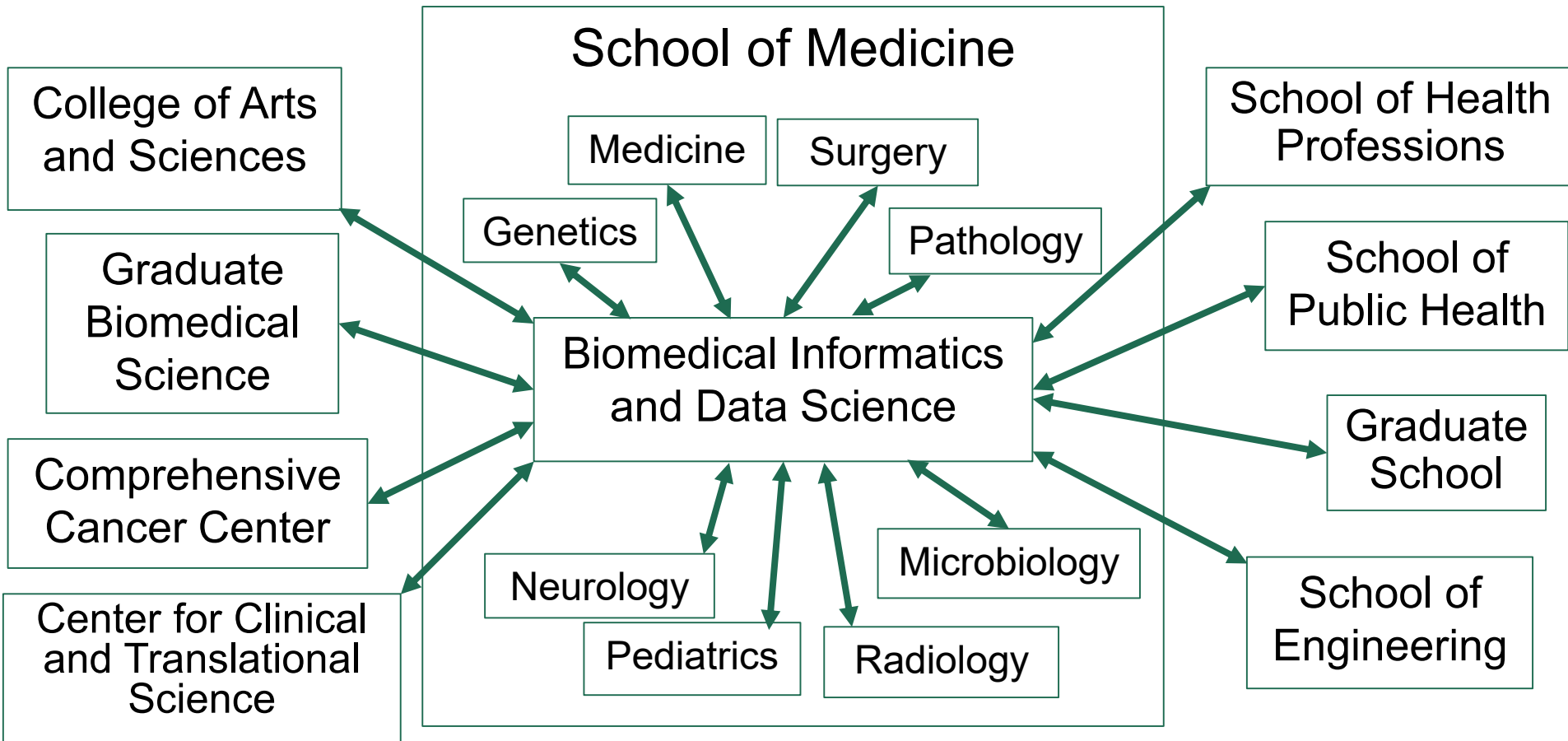
Model Simulations



Precision Therapeutics



Collaborations



Conclusions

- UAB needs an informatics department in biomedicine
- The Informatics Institute has laid the groundwork
- Reinvestment will allow us to expand faculty, research and education
- Collaborations reflect the interdisciplinary nature of the field
- Stay tuned for advances in tools and methods for:
 - Healthcare
 - Clinical and translational research
 - Education

Thank You!

- Selwyn Vickers
- Anupam Agarwal
- Bob Kimberly
- Jennifer Croker
- Elliot Lefkowitz
- Richard Hines
- Jamye Hester
- Joan Hicks
- Jorge Alsip
- Tika Benveniste
- Lakisha Mack
- Alex Boles
- Nita Limdi
- Bruce Korf
- Sue Feldman
- Seth Landefeld
- Carlos Estrada
- Frances Lund
- Eta Berner
- Jake Chen
- Alex Rosenberg
- Zechen Chong
- John Osborne
- Amy Wang
- Tiago Colicchio
- Min Gao
- Wayne Liang
- Amanda Carballo
- Geoff Gordon
- Matt Wyatt
- Brian McCain
- Jin Chen
- Ryan Melvin

Contact us

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