OHDSI Eye Care and Vision Research

ARVO In Person Meeting

5/7/2024

Sign in Sheet: https://tinyurl.com/OHDSI-SignIn

Agenda: https://tinyurl.com/ohdsi-arvo

Help us cover cost of food!

Agenda

- Announcements
- Workgroup overview
- Breakout sessions
- Discussion & next steps

THANK YOU!!

- Aaron and Cecilia Lee for letting us use their space.
- All of you!

Announcements

- Observational Health Data Science and Informatics (OHDSI) Global Symposium is Oct. 22 – 24, 2024 in New Brunswick, NJ
  - Registration is open: https://www.ohdsi.org/ohdsi2024/
  - Abstracts due June 21, 2024
- Eye Care and Vision Research workgroup virtual meetings are monthly and alternate between Mondays at 4:00 pm ET and Tuesday at 6:00 pm ET
  - Poll for setting new meeting time
  - Changing format of meeting
  - Cancel next meeting on April 14?

Poll for new meeting time. Note: all times are Eastern Time

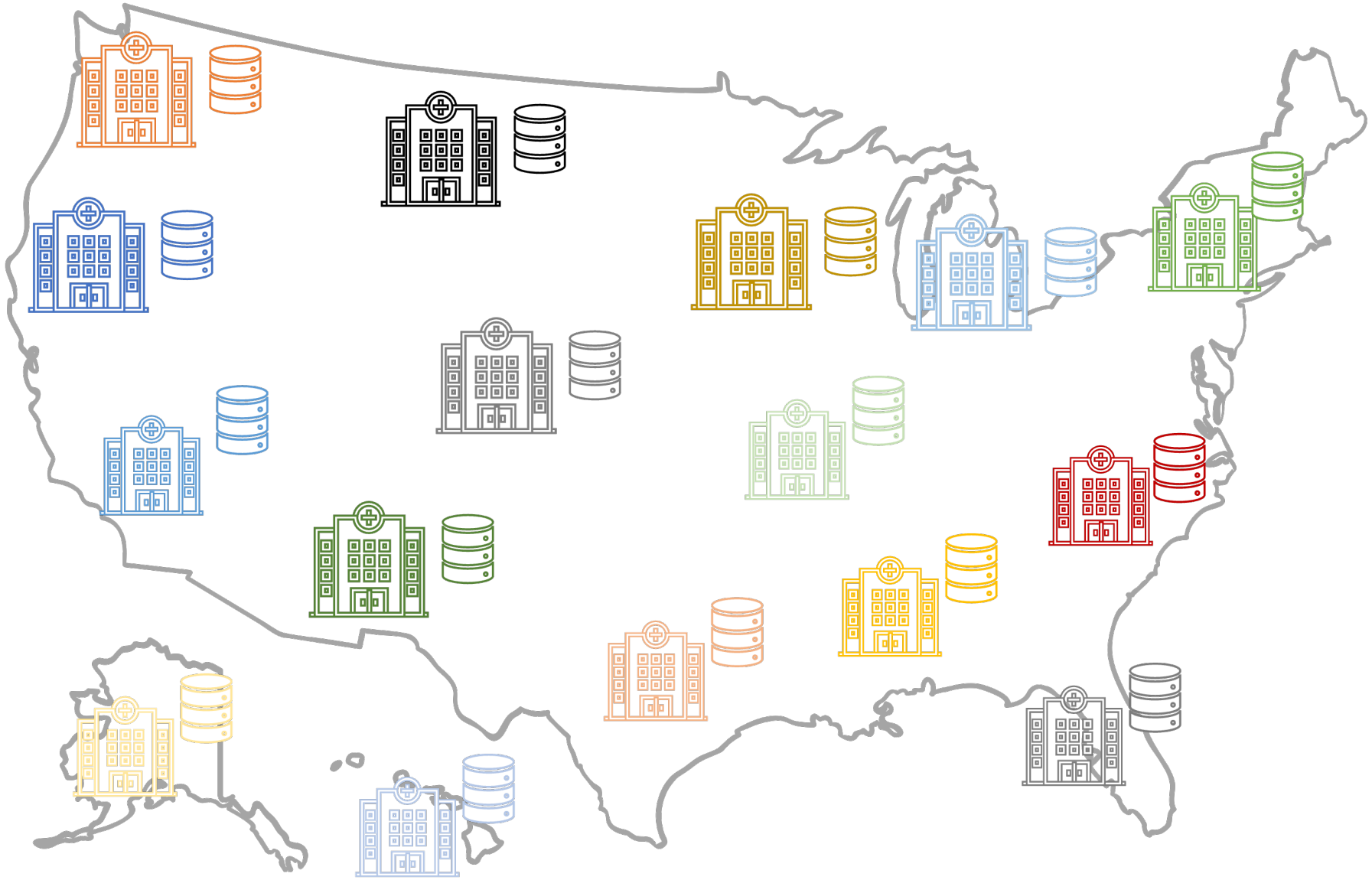
ECAVR Meetings: Proposed Changes

- Have a theme/topic for each meeting
  - Subgroups
  - External speakers/collaborators
  - Brainstorming sessions
- Post summaries, slides, recordings (if possible) on github site
  - Available to all—not just workgroup members
  - Encourage asynchronous participation/collaboration
- Soliciting ideas for themes/topics
  - What do you want to discuss or learn?
  - What will encourage more engagement?

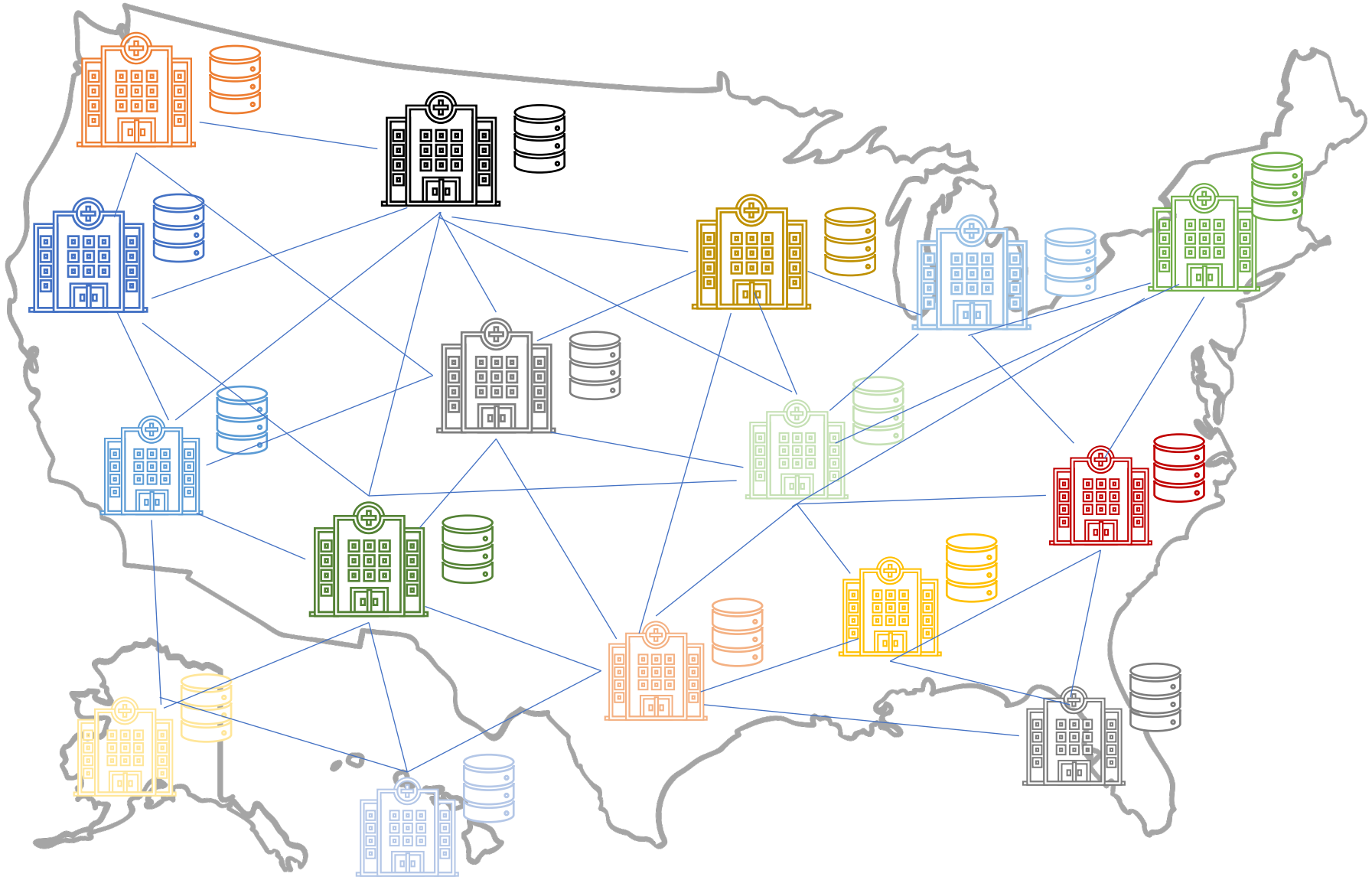
ECAVR Overview

- Started in spring 2022 from AAO Data Standards workgroup
  - Missing eye exam data in *All of Us* dataset
  - Ophthalmic data concepts missing in OMOP common data model and standardized terminologies
  - Co-leaders: Kerry Goetz, Sally Baxter, and Michelle Hribar
- Part of the Observational Health Data Science (OHDSI) Community focusing on standardizing and using observational health data in research
  - EHR data, claims data
  - Imaging

Lots of Data, but Siloed



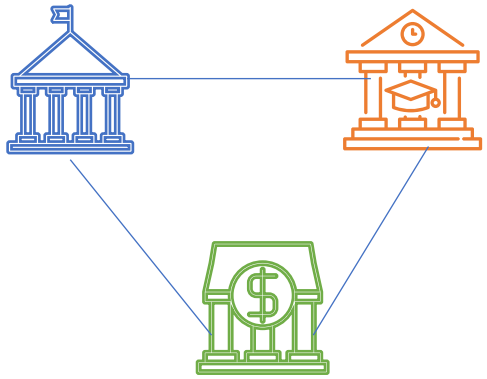
How Do We Talk to Each Other?

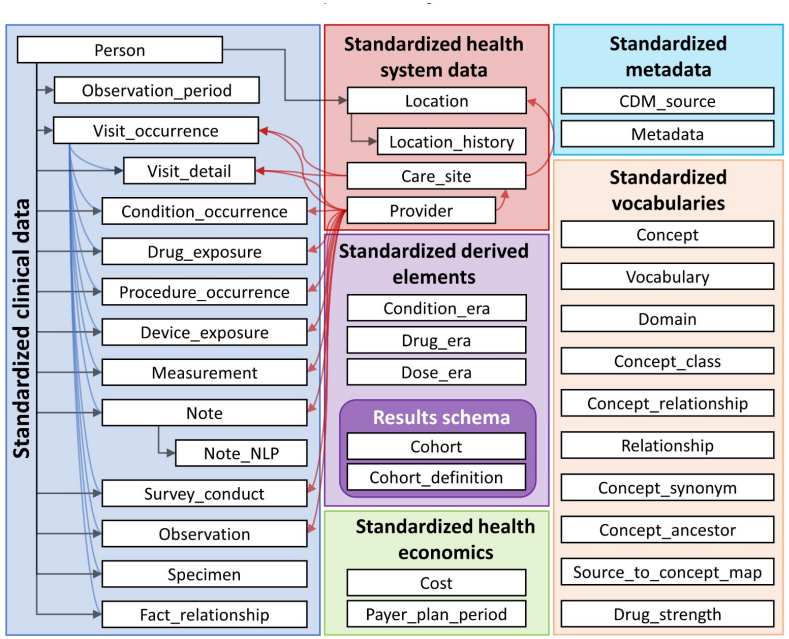


Data Harmonization & Integration

- Data standardization is key
  - Multiple standardized terminologies in biomedicine
  - E.g. RxNorm for medications, CPT codes for procedures, etc.
- Common data models standardize the storage schema and conventions for data from diverse sources
- Several common data models in the biomedical space
  - PCORnet
  - i2b2
  - OMOP

OMOP: Observable Medical Outcomes Partnership





Public – private partnership (2009-2014)

- Goal: study effects of medical products
- Use observational health data
  - Claims data
  - Electronic health record data (EHR)

OMOP Common Data Model (CDM)

- CDM standardized structure, content, and semantics of observational data
- Used in NIH data generation projects such as All of Us, N3C, Bridge2AI

OHDSI: Observational Health Data Sciences and Informatics

- Open source community aims to improve health by collaboratively generating evidence for better health decisions and care
- Maintains/updates OMOP CDM
- Develops/maintains tools for appropriate use of observational health data
- Has supported thousands of studies

OHDSI
OBSERVATIONAL HEALTH DATA SCIENCES AND INFORMATICS

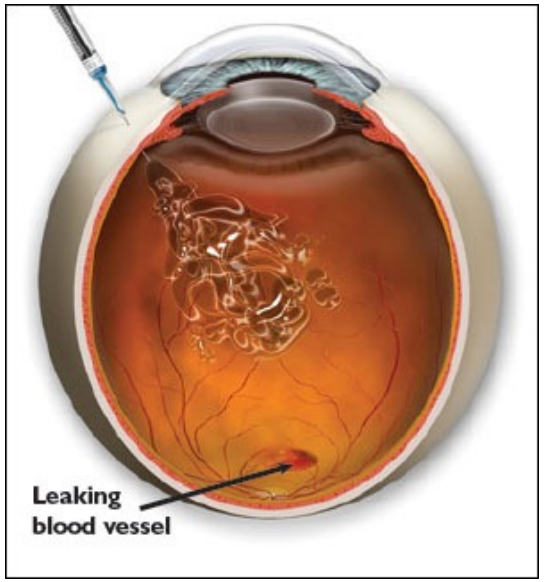
OHDSI By The Numbers

- 3,266 collaborators
- 80 countries
- 21 time zones
- 6 continents
- 1 community

Pilot Study (OHDSI SOS Challenge): Intravitreal anti-VEGF and Kidney Failure

Cindy X. Cai MD, MS
Johns Hopkins Univ.

- Is the risk of **kidney failure** associated with **intravitreal anti-VEGF** exposure in patients with blinding diseases (DR/DME, AMD, VO) different among patients who receive **ranibizumab, aflibercept, and bevacizumab**?
  - Ranibizumab has much shorter serum elimination (half-life)

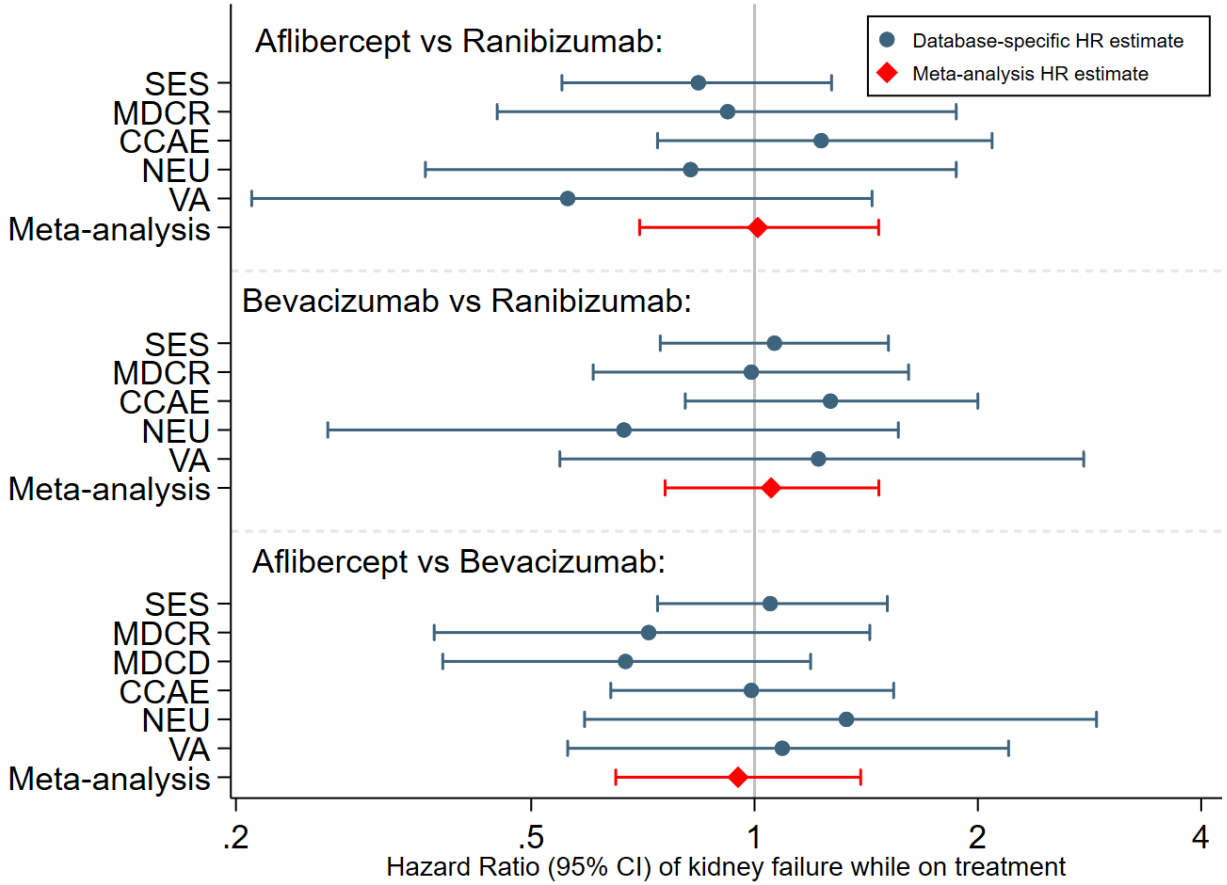


Question: Is there evidence for preferentially choosing ranibizumab to lower the risk of kidney failure?

Hypothesis: in pairwise comparisons, lower risk of kidney failure in patients with blinding diseases who are exposed to ranibizumab

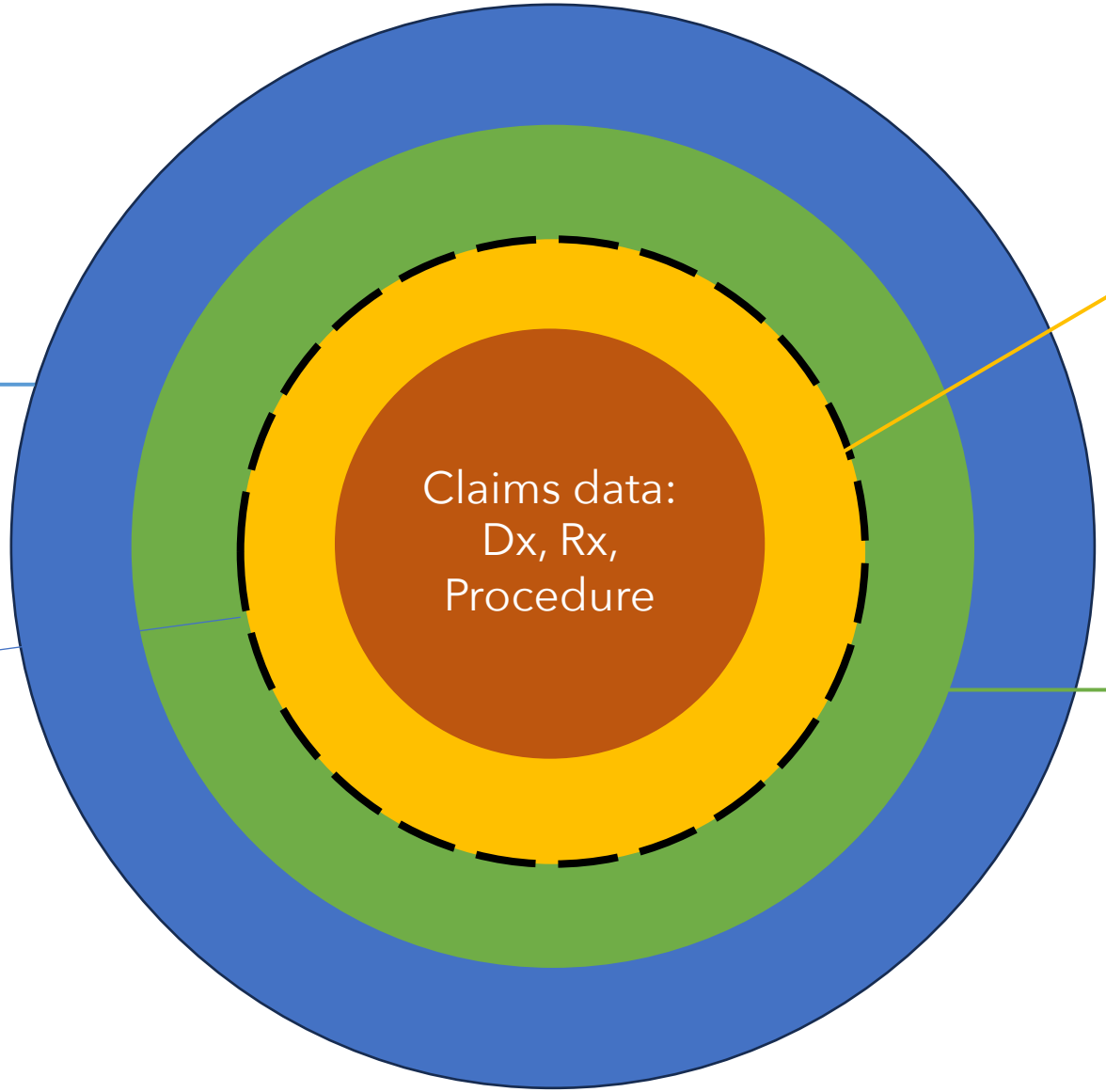
Anti-VEGF OHDSI Study: Results

- 12 databases (6 administrative claims and 6 EHR): 485 million patients
- 6.1 million patients with blinding diseases
  - 37,189 received ranibizumab
  - 39,447 aflibercept
  - 163,611 bevacizumab
  - 1209 kidney failure outcomes
- Standardized incidence proportion of kidney failure: 680 per 100,000 persons
- **In all pairwise comparison, the hazard ratio was around 1.0**



Speed and scale of clinical research projects with data standardization across multiple sites

“Layers” of Data in OMOP



Ophthalmic Imaging Data

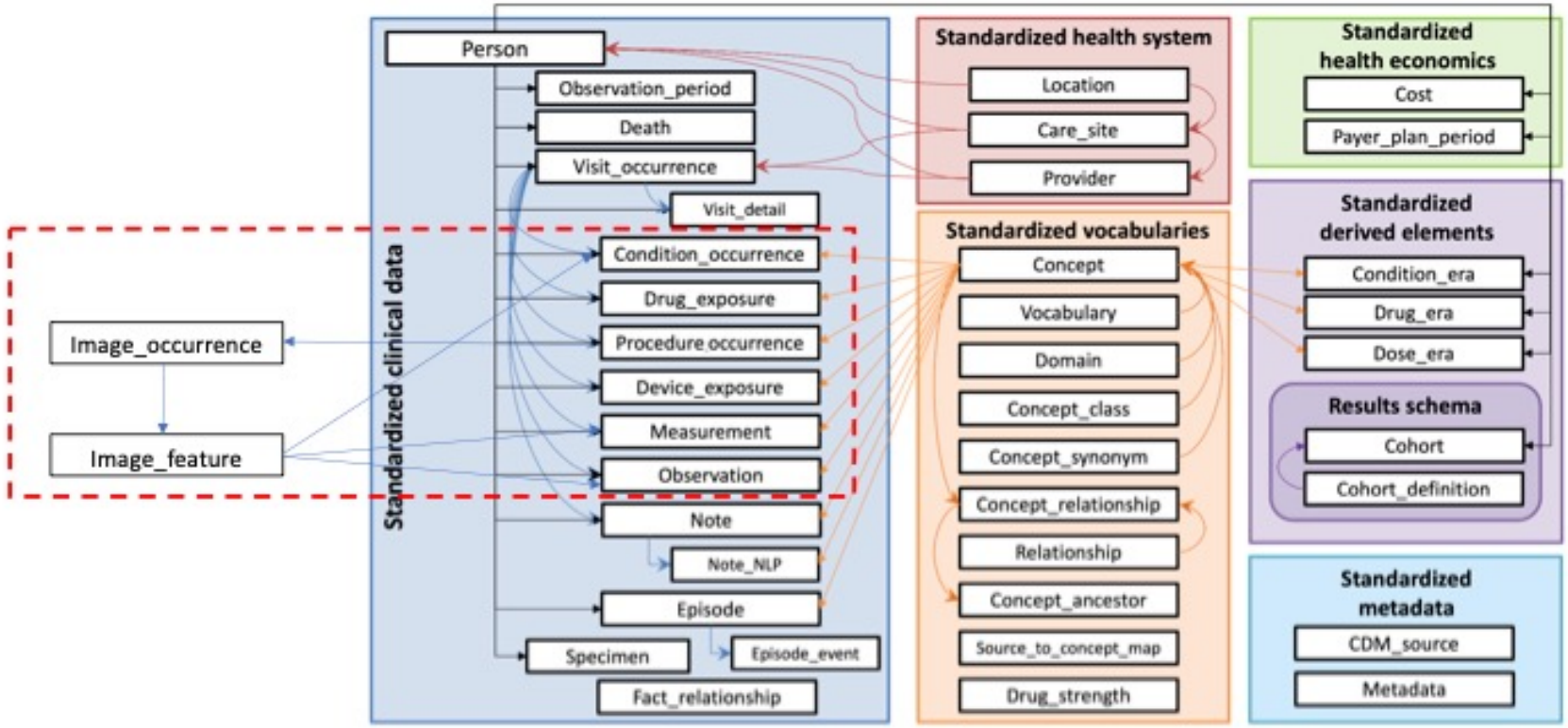
Current OMOP “Vanilla OMOP”

EHR Data:
Vitals, labs, visits, etc.

Ophthalmic Data:
Visual acuity, intraocular pressure, refraction, etc.

Each expansion of data enables more research!

OHDSI Proposed Imaging Integration Reference Standard



Challenges for Ophthalmic Data

- EHR Data
  - Data is named and stored differently in different EHRs/institutions
  - Ophthalmic data is not completely represented in standardized terminologies or OMOP
  - Free text field needs processing to extract values
  - Data may only be entered in notes, which requires natural language processing to extract
- Imaging
  - Most ophthalmic imaging is not standardized/fully compliant with the DICOM standard
  - Volumetric scans are large and difficult to share
  - Tools are needed to use this data in a distributed network

OHDSI Eye Care and Vision Research Workgroup

- Multidisciplinary group of researchers in eye care and vision research
  - > 140 Ophthalmologists, optometrists, trainees, data scientists, informaticists
- Working to standardize data
  - Mapping eye exam and imaging metadata to standardized terminologies
  - Adding ophthalmic data & imaging to OMOP
- Standardize use of data
  - Phenotype/cohort definitions
  - Analysis & models
- Goal is to support:
  - Data sharing/interoperability
  - Data harmonization
  - **Ophthalmic data in pooled datasets such as All of Us and Bridge2AI**
  - **A distributed network of high quality ophthalmic EHR data & imaging for research**

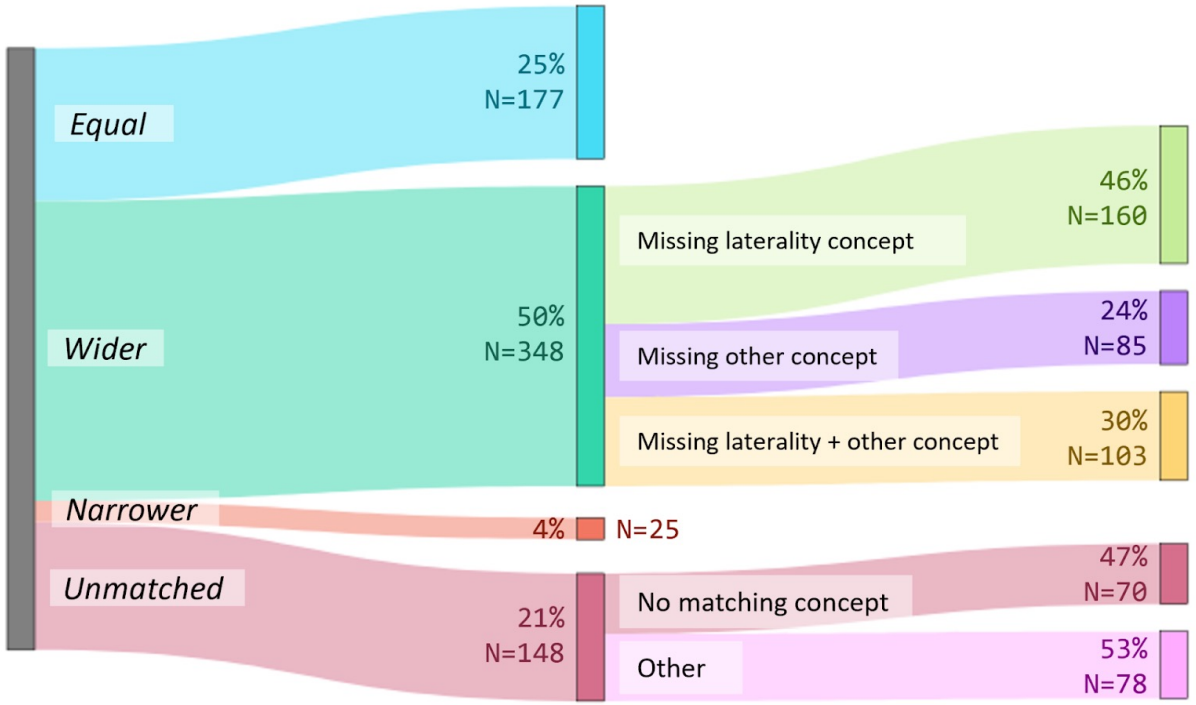
Workgroup Subgroups

- Retina: Cindy Cai
- Glaucoma: Brian Stagg
- Uveitis: Brian Toy
- Pediatric: Gayathri Srinivasan
- Imaging: Kavi Thakoor
- Implementation (ETL): Will Halfpenny

First Year Workgroup Accomplishments: Mapping

- Analyzed and mapped > 3700 ophthalmic data elements
- 11 retina condition codes submitted to SNOMED International
- Several glaucoma concepts in discussion with SNOMED
- > 200 visual acuity concepts submitted to LOINC

Epic EHR Eye Exam Concept Analysis

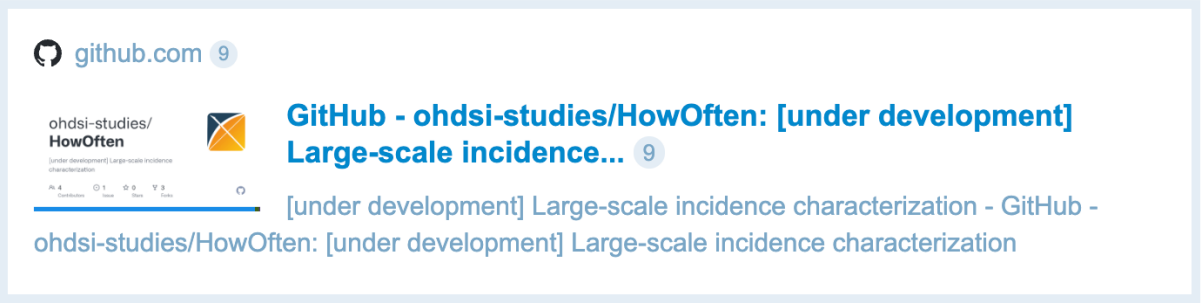


Cai C.X., Halfpenny W., Boland M.V., Lehmann H.P., Hribar M., Goetz K.E. & Baxter S.L., Advancing toward a common data model in ophthalmology: gap analysis of general eye examination concepts to standard OMOP concepts, Ophthalmology Science (2023), doi: https://doi.org/10.1016/j.xops.2023.100391.

First Year Workgroup Accomplishments: Phenotyping

- OHDSI provides tools for defining, using, and publishing patient cohorts or phenotypes
- Our workgroup developed multiple phenotypes:
  - 3 visual impairment
  - 5 diabetic retinopathy
  - 6 uveitis*
  - 3 new anti-VEGF users*
  - 1 blinding eye disease*

*Submitted to HowOften



Including Ophthalmic Data in NIH Large Dataset Generation Projects

Bridge2AI: AI-READI

- Collect triple balanced prospective dataset of 4000 diabetic patients
- Working with OHDSI workgroup on adding elements to OMOP
- https://aireadi.org/

All of Us Dataset

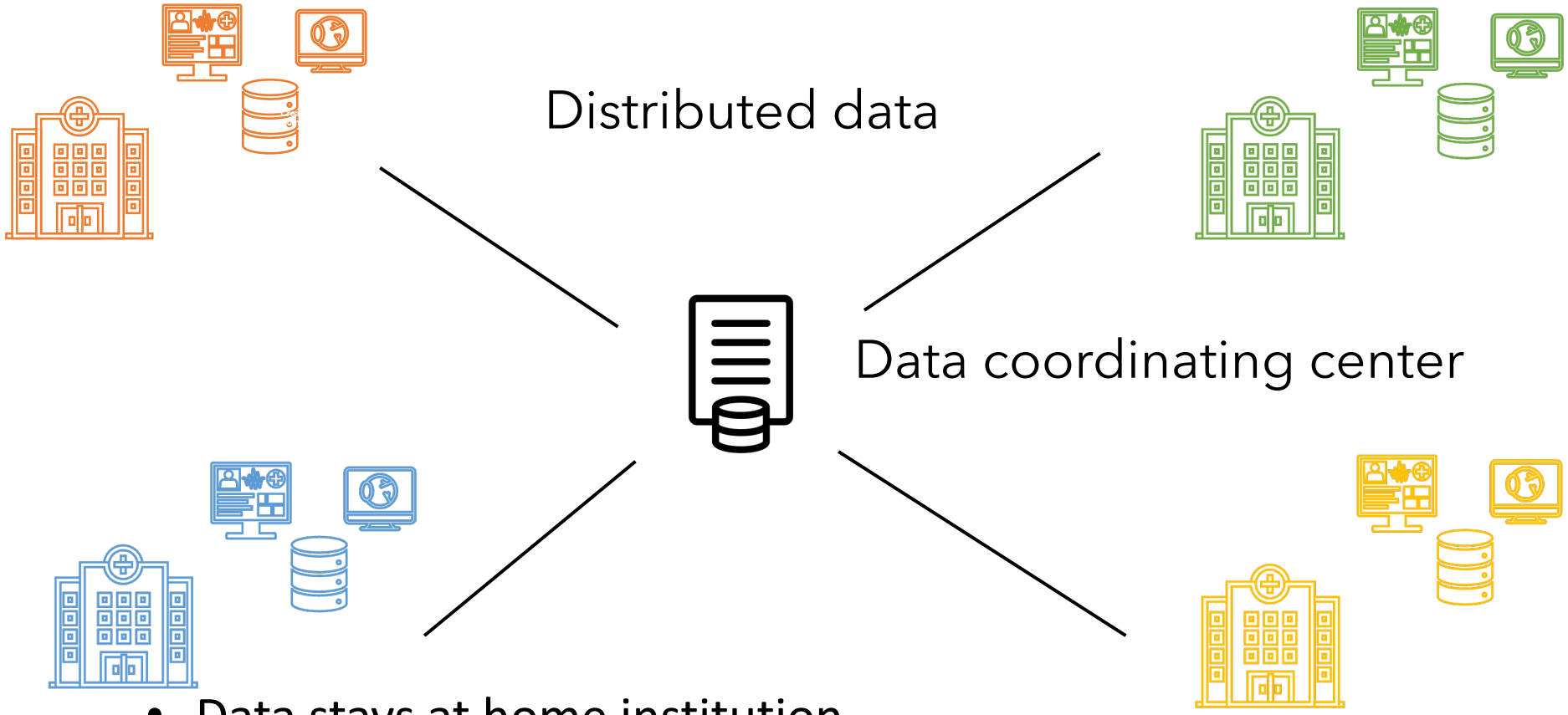
- NEI-NIBIB All of Us Workshop 2023 was initial step towards integrating ocular data & imaging into All of Us
- Proposing a pilot study at 4 sites

BRIDGE2AI

AI-READI
AI Ready and Equitable Atlas for Diabetes Insights

All of Us

Goal: Build OHDSI Ophthalmic Data Network



- Data stays at home institution
  - Avoids legal & privacy challenges of sharing data
  - Data is accessed through tools & federated learning
- Multimodal: Systemic & Ocular EHR data + Ocular imaging

Potential Use Cases of Standardized Ophthalmic Data

- Extension of clinical trials
- Validation of AI models
- Real world outcomes of treatments
- Systemic risk factors for eye disease and its progression
- Oculomics
- Rare disease studies
- Prevalence of eye disease
- Health care access/equity

Impact of Data Standardization

- Ophthalmic data & imaging is in data generation projects such as All of Us, Bridge2AI
- Ophthalmic data network allows for discovery beyond clinical trials
- Large, diverse dataset supports the breadth, quality, & reliability of research
- Distributed data network supports FAIR principles & NIH Data Science Strategic Plan
- Data and image standardization improve data interoperability for clinical care, quality measurement, as well as research

Get Involved!

- Join our OHDSI workgroup
- Join the weekly OHDSI community calls

OHDSI Workgroup Page

www.ohdsi.org

OHDSI Community Calls Page

Breakout Sessions

- Imaging
- Network studies brainstorming
- Grant & funding planning

Imaging

- Overview of proposed reference standard
- Challenges for implementing standard, using images
  - Consistent pre-processing, segmentation, cropping
  - Harmonization of metadata and measurements
  - Viewing images at different sites
- Opportunities for innovation
  - Tools
  - Infrastructure for federated learning
  - Pilot projects (e.g. putting datasets into standard)
- Guiding use cases

Action items: Pilot project idea, tools needed, initial steps

Network Studies Brainstorming

- Overview of network studies
  - Steps of study
  - Examples of studies
- Brainstorm ideas
  - “Vanilla” OMOP
  - + eye exam data
  - + eye exam data & imaging
- Next steps
  - Phenotypes
  - Identify missing concepts

Action items: List of possible network studies

Grant & Funding Planning

- Funding opportunities
- What would funding allow us to do?
- Who is interested? What institutions?
- Ideas
  - Small size
  - Large size
- Timeline

Action items: Mechanisms, what budget items need funding

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FHIR Workshop

- Hands-on workshop for learning FHIR
- Registration is open for the **May 30, 1:00pm EST** event at https://bit.ly/2024-05-fhir-workshop.

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