OHDSI Community in Action: Where have we been in 2019? Where should we go in 2020?

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OHDSI's mission

To improve health by empowering a community to collaboratively generate the evidence that promotes better health decisions and better care

OHDSI's areas of focus:
Recapping our journey in 2019…

| Methodological research | Open-source analytics development | Clinical applications |

- Observational data management
- Clinical characterization
- Population-level estimation
- Patient-level prediction

- Maintain and evolve open community data and vocabulary standards
- Develop and improve tools to enable large-scale analysis
- Establish and promote community best practices
- Strengthen and expand collaborations across OHDSI research network
- Advance scholarship in observational data science through publication, presentations, and education
- **Generate and disseminate more clinical evidence**

Case Western Reserve University :
OHDSI face-to-face documentation-a-thon

OHDSI China Symposium 2019

The Journey From Data to Evidence OHDSI Europe 2019

- A platform to stimulate community building: 250 participants from **27** countries
- OHDSI Europe in action: 35 posters, 8 software demos
- Educate and train the community: 5 full day tutorials

www.ohdsi-europe.org

Fudan University – OHDSI tutorials

OHDSI Korea – Study design datathon

2019 OHDSI Symposium
Sept. 15-17, 2019
Bethesda North Marriott
Hotel and Conference Center

OHDSI Korea Symposium

KONJIAM Resort, Gwangju, Gyeonggi-Do, Republic of Korea

Building the LHC of observational data science?

ICMJE guidelines

The ICMJE recommends that authorship be based on the following 4 criteria:

- Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND

- Drafting the work or revising it critically for important intellectual content; AND

- Final approval of the version to be published; AND

- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

OHDSI in action

Observational Health Data Sciences and Informatics (OHDSI): Opportunities for Observational Researchers

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2015:
17 authors
1 promise

OHDSI in action:
Treatment Pathways

Characterizing treatment pathways at scale using the OHDSI network

George Hripcsak[a,b,c,1], Patrick B. Ryan[c,d], Jon D. Duke[c,e], Nigam H. Shah[c,f], Rae Woong Park[c,g], Vojtech Huser[c,h], Marc A. Suchard[c,i,j,k], Martijn J. Schuemie[c,d], Frank J. DeFalco[c,d], Adler Perotte[a,c], Juan M. Banda[c,f], Christian G. Reich[c,l], Lisa M. Schilling[c,m], Michael E. Matheny[c,n,o], Daniella Meeker[c,p,q], Nicole Pratt[c,r], and David Madigan[c,s]

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2016:
17 authors
11 data sources

OHDSI in action:
Safety surveillance

BRIEF COMMUNICATION

Risk of angioedema associated with levetiracetam compared with phenytoin: Findings of the observational health data sciences and informatics research network

*†Jon D. Duke, *‡§Patrick B. Ryan, *¶Marc A. Suchard, *§George Hripcsak, *§Peng Jin, *#Christian Reich, *#Marie-Sophie Schwalm, ***††Yuriy Khoma, *‡‡Yonghui Wu, *‡‡Hua Xu, *§§Nigam H. Shah, *§§Juan M. Banda, and *‡Martijn J. Schuemie

Dr. Jon Duke is Director of the Center for Health Analytics and Informatics at the Georgia Tech Research Institute.

SUMMARY

Recent adverse event reports have raised the question of increased angioedema risk associated with exposure to levetiracetam. To help address this question, the Observational Health Data Sciences and Informatics research network conducted a retrospective observational new-user cohort study of seizure patients exposed to levetiracetam (n = 276,665) across 10 databases. With phenytoin users (n = 74,682) a comparator group, propensity score-matching was conducted and hazard rati computed for angioedema events by per-protocol and intent-to-treat analyse Angioedema events were rare in both the levetiracetam and phenytoin groups (54 v 71 in per-protocol and 248 vs. 435 in intent-to-treat). No significant increase in angio dema risk with levetiracetam was seen in any individual database (hazard ratios ran ing from 0.43 to 1.31). Meta-analysis showed a summary hazard ratio of 0.72 (95 confidence interval [CI] 0.39–1.31) and 0.64 (95% CI 0.52–0.79) for the per-protoc and intent-to-treat analyses, respectively. The results suggest that levetiracetam h the same or lower risk for angioedema than phenytoin, which does not currently car a labeled warning for angioedema. Further studies are warranted to evaluate angio dema risk across all antiepileptic drugs.

KEY WORDS: Angioedema, Levetiracetam, Anticonvulsant hypersensitivity syndrome, Pharmacovigilance, Observational research, Adverse drug reactions.

2017:
13 authors
10 data sources

OHDSI in action:
Comparative effectiveness

Original Investigation | Diabetes and Endocrinology

Association of Hemoglobin A$_{1c}$ Levels With Use of Sulfonylureas, Dipeptidyl Peptidase 4 Inhibitors, and Thiazolidinediones in Patients With Type 2 Diabetes Treated With Metformin
Analysis From the Observational Health Data Sciences and Informatics Initiative

Rohit Vashisht, PhD; Kenneth Jung, PhD; Alejandro Schuler, MS; Juan M. Banda, PhD; Rae Woong Park, MD, PhD; Sanghyung Jin, MS; Kipp W. Johnson, MD, PhD; Mark M. Shervey, PhD; Hua Xu, PhD; Yonghui Wu, PhD; Karthik Natrajan, PhD; George Hripcsak, MD, MS; Anthony Reckard, BS; Christian G. Reich, MD; James Weaver, MPH, MS; Martijn J. Schuemie, PhD; Patrick B. Ryan, PhD; Alison Callaha

2018:
22 authors
8 data sources

OHDSI in action: LEGEND-HTN

Comprehensive comparative effectiveness and safety of first-line antihypertensive drug classes: a systematic, multinational, large-scale analysis

Marc A Suchard, Martijn J Schuemie, Harlan M Krumholz, Seng Chan You, RuiJun Chen, Nicole Pratt, Christian G Reich, Jon Duke, David Madigan, George Hripcsak, Patrick B Ryan

Summary

Background Uncertainty remains about the optimal monotherapy for hypertension, with current guidelines recommending any primary agent among the first-line drug classes thiazide or thiazide-like diuretics, angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, dihydropyridine calcium channel blockers, and non-dihydropyridine calcium channel blockers, in the absence of comorbid indications. Randomised trials have not further refined this choice.

Methods We developed a comprehensive framework for real-world evidence that enables comparative effectiveness and safety evaluation across many drugs and outcomes from observational data encompassing millions of patients, while minimising inherent bias. Using this framework, we did a systematic, large-scale study under a new-user cohort design to estimate the relative risks of three primary (acute myocardial infarction, hospitalisation for heart failure, and stroke) and six secondary effectiveness and 46 safety outcomes comparing all first-line classes across a global network of six administrative claims and three electronic health record databases. The framework addressed residual confounding, publication bias, and p-hacking using large-scale propensity adjustment, a large set of control outcomes, and full disclosure of hypotheses tested.

Findings Using 4·9 million patients, we generated 22 000 calibrated, propensity-score-adjusted hazard ratios (HRs) comparing all classes and outcomes across databases. Most estimates revealed no effectiveness differences between classes; however, thiazide or thiazide-like diuretics showed better primary effectiveness than angiotensin-converting enzyme inhibitors: acute myocardial infarction (HR 0·84, 95% CI 0·75–0·95), hospitalisation for heart failure (0·83,

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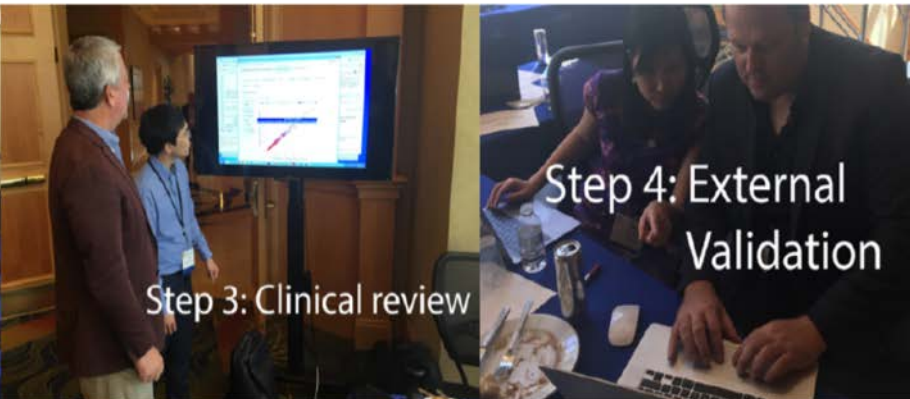School of Medicine,
New Haven, CA, USA

Oct2018→2019:
11 authors
9 sources
1.4m TCOs

OHDSI In Action:
Patient-Level Prediction Live at OHDSI'18

Step 1: Problem Specificaton and cohort definition

OHDSI
OBSERVATIONAL HEALTH DATA SCIENCES AND INFORMATICS
Patient-Level Prediction Team Work

Step 2: Model building and internal validation

Step 3: Clinical review
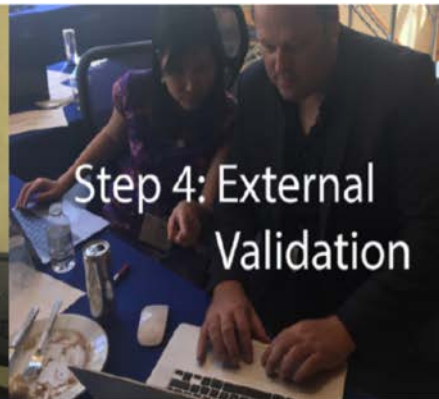
Step 4: External Validation

From question to preliminary results in 1 day!

PLOS | ONE *accepted*

Development and Validation of a Prognostic Model Predicting Symptomatic Hemorrhagic Transformation in Acute Ischemic Stroke at Scale in the OHDSI Network

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Oct2018→2019:
23 authors
11 data sources

OHDSI in action:
Oxford study-a-thon

WE CAN DO THIS IN ONE WEEK (STUDY-A-THON)??

"To compare the risk of post-operative complications and mortality between unicompartmental *vs* total knee replacen

Monday
Group consensus on the problem
Draft cohort definitions

Wednesday
Review patient-level prediction results
Externally validate prediction model

Tuesday
Review clinical characterisation
Draft patient-level prediction design

Thursday
Draft population-lev
Review population-l

efpia OHDSI

**Dec2018→2019:
26 authors
5 sources**

THE LANCET
Rheumatology

Articles

Opioid use, postoperative complications, and implant survival after unicompartmental versus total knee replacement: a population-based network study

Edward Burn*, James Weaver*, Daniel Morales, Albert Prats-Uribe, Antonella Delmestri, Victoria Y Strauss, Ying He, Danielle E Robinson, Rafael Pinedo-Villanueva, Spyros Kolovos, Talita Duarte-Salles, William Sproviero, Dahai Yu, Michel Van Speybroeck, Ross Williams, Luis H John, Nigel Hughes, Anthony G Sena, Ruth Costello, Belay Birlie, David Culliford, Caroline O'Leary, Henry Morgan, Theresa Burkard, Daniel Prieto-Alhambra†, Patrick Ryan†

Summary
Background There is uncertainty around whether to use unicompartmental knee replacement (UKR) or total knee replacement (TKR) for individuals with osteoarthritis confined to a single compartment of the knee. We aimed to emulate the design of the Total or Partial Knee Arthroplasty Trial (TOPKAT) using routinely collected data to assess whether the efficacy results reported in the trial translate into effectiveness in routine practice, and to assess comparative safety.
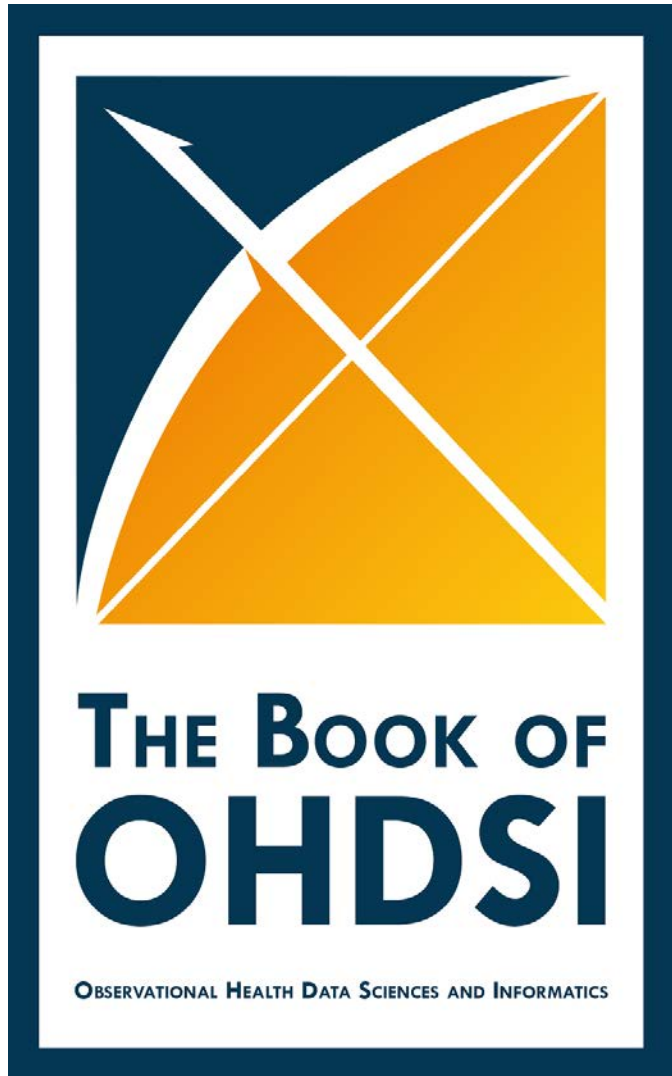
OHDSI in Action:
Book of OHDSI

Contributors

Each chapter lists one or more chapter leads. These are the people who [...] the chapter. However, there are many others that have contributed to [...] would like to acknowledge here:

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2019:
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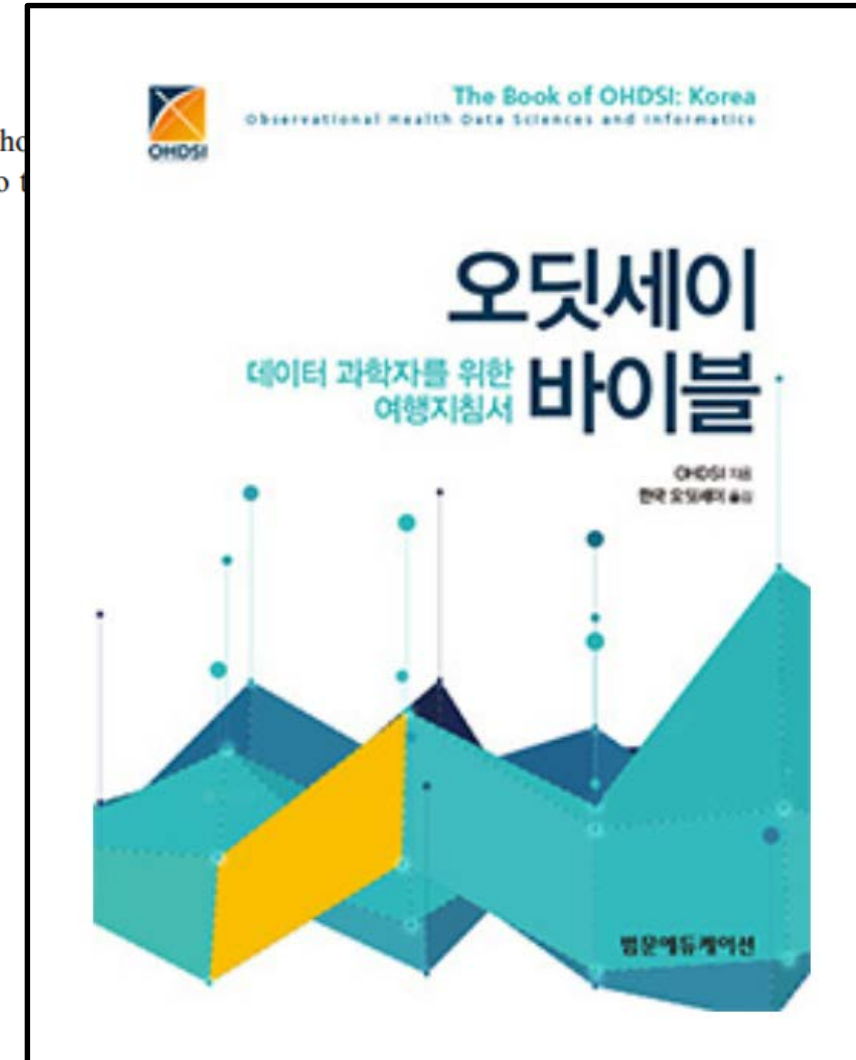
Why do we need more collaboration?

- We want to learn from as many data sources as the world as possible (replicability, generalizability, heterogeneity)
  - Each data partner contributes source data understanding and shares in interpreting their results in the context of the entire network
- As we grow the number of data partners, it is likely that the number of patient records per source will become smaller, which introduces new methodological challenges to overcome → METIS
- Large scale evidence generation requires large scale collaboration for interpretation
  - LEGEND : One causal evidence system → Many clinical insights to inform different health decisions

Building the LHC of observational data science?

CERN Document Server

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TLAS Publication Drafts Final > Measurement of the transverse momentum distribution of Drell-Yan lepton pairs in proton-proton collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector

Information **Discussion (0)** **Files**

Preprint

Report number	arXiv:1912.02844 ; CERN-EP-2019-223
Title	**Measurement of the transverse momentum distribution of Drell-Yan lepton pairs in proton-proton collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector**
Related	
Author(s)	ATLAS Collaboration *Show all 2948 authors*
Corporate author(s)	ATLAS Collaboration
Imprint	05 Dec 2019. - 39 p.
Note	39 pages in total, author list starting page 23, 6 figures, 4 tables, to be submitted to Eur. Phys. J. C. All figures including auxiliary figures are available at https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/PAPERS/STDM-2018-14/
Subject category	Particle Physics - Experiment
Accelerator/Facility,	CERN LHC : ATLAS

What will be the research we do together that generates >1000 co-author papers?

- Methods research:

  "Examining data heterogeneity across a global health network"

  "Development and evaluation of methods for integrating causal inference design and machine learning algorithms for patient-level estimation"

- Open-source development:

  "Implementation of a large-scale analytics ecosystem to enable evidence generation within health systems and across a global health network"

  "Validation of a international phenotype library to define and identify disease across electronic health record systems"

- Clinical applications:

  "Characterization of disease incidence and treatment utilization patterns across the world"

  "Comprehensive comparative safety and effectiveness of treatments for <every disease>: an OHDSI LEGEND study"
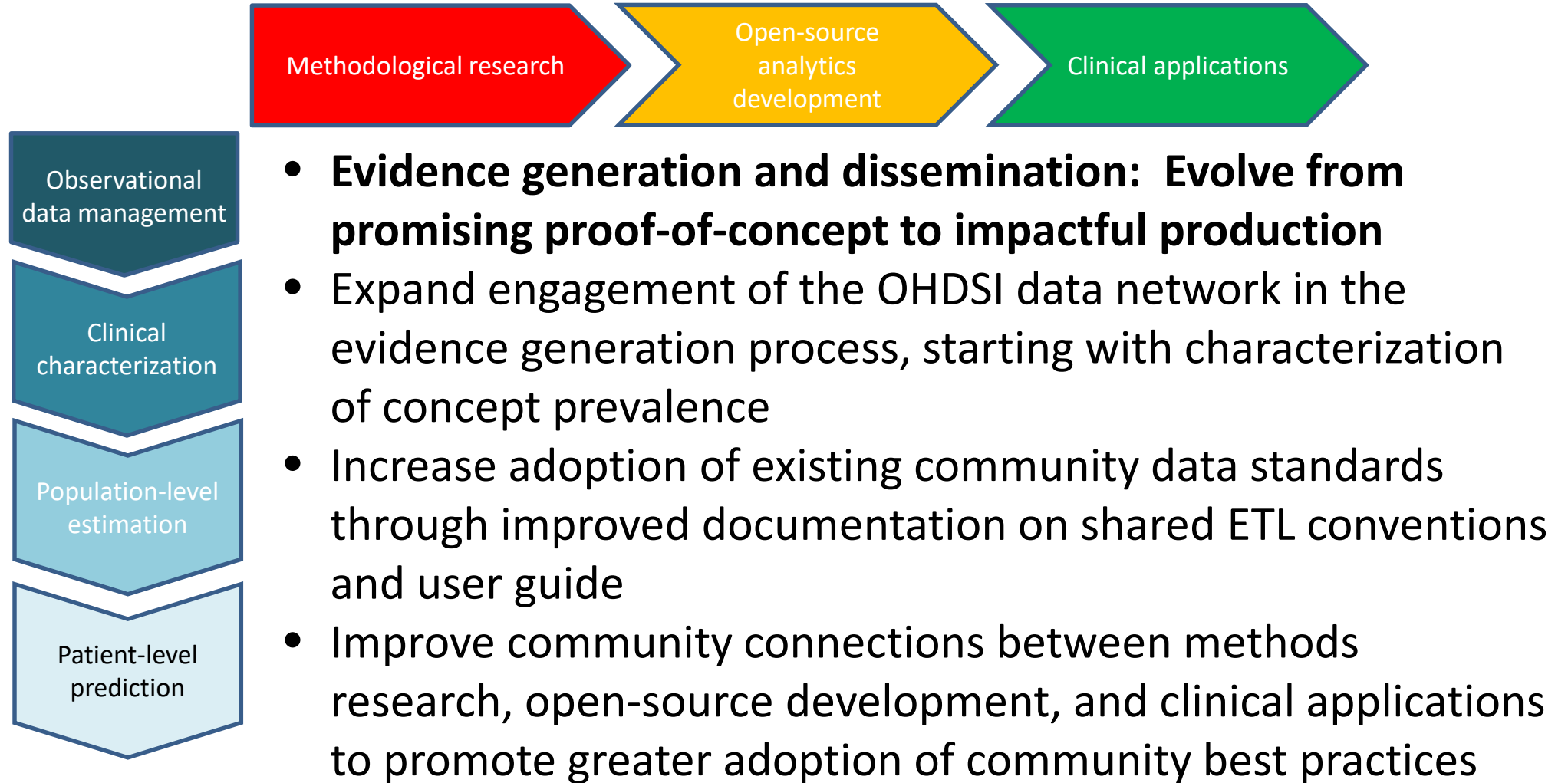
OHDSI strategic priorities in 2020

1. Finish publications from completed research before initiating new research
2. Execute the world's largest network study – characterizing concept prevalence
   - simple yet impactful research
   - allow us to know who is (currently) interested and able to participate in network research moving forward
   - target: get >67 of 133 databases participating
3. Collaboration on shared goals
   - Phenotype library
   - CDM documentation - ETL conventions, use guide
   - Open-source development – expand community design, implementation and testing
4. Community Education through EHDEN Academy
   - more materials provided in public forum in structured curriculum
   - less requirement of in-person tutorial sessions
   - coordination of materials with EHDEN and Book of OHDSI
5. Cultivate other network studies which follow OHDSI best practices

OHDSI's areas of focus:
Continuing our journey in 2020…

Methodological research → **Open-source analytics development** → **Clinical applications**

Observational data management

Clinical characterization

Population-level estimation

Patient-level prediction

- **Evidence generation and dissemination: Evolve from promising proof-of-concept to impactful production**
- Expand engagement of the OHDSI data network in the evidence generation process, starting with characterization of concept prevalence
- Increase adoption of existing community data standards through improved documentation on shared ETL conventions and user guide
- Improve community connections between methods research, open-source development, and clinical applications to promote greater adoption of community best practices

OHDSI Collaboration activities in 2020

OHDSI events on the books:

- EHDEN Study-a-thon – Barcelona ESP Jan13-18
- CMS AI Health Outcomes Challenge
- OHDSI Europe – Oxford UK Mar27-29
- OHDSI US - Bethesda MD Oct 18-21

Face-to-face sessions being considered:

- Phenotype development and validation
- ATLAS design-a-thon
- OHDSI Asia

Join the journey

More info: ohdsi.org

Discussion: forums.ohdsi.org

Code: github.com/OHDSI

contact@ohdsi.org