Welcome to the Journey!

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Vice President, Real World Solutions
IQVIA

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OHDSI is
an open science community
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 values

- **Innovation**: Observational research is a field which will benefit greatly from disruptive thinking. We actively seek and encourage fresh methodological approaches in our work.
- **Reproducibility**: Accurate, reproducible, and well-calibrated evidence is necessary for health improvement.
- **Community**: Everyone is welcome to actively participate in OHDSI, whether you are a patient, a health professional, a researcher, or someone who simply believes in our cause.
- **Collaboration**: We work collectively to prioritize and address the real world needs of our community’s participants.
- **Openness**: We strive to make all our community’s proceeds open and publicly accessible, including the methods, tools and the evidence that we generate.
- **Beneficence**: We seek to protect the rights of individuals and organizations within our community at all times.
The journey to real-world evidence

Patient-level data in source system/schema

Reliable evidence
### Desired attributes for reliable evidence

<table>
<thead>
<tr>
<th>Desired attribute</th>
<th>Question</th>
<th>Researcher</th>
<th>Data</th>
<th>Analysis</th>
<th>Result</th>
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<tr>
<td>Repeatable</td>
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<td>Generalizable</td>
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<td>Same or different</td>
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<td>Similar</td>
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<tr>
<td>Robust</td>
<td>Identical</td>
<td>Same or different</td>
<td>Same or different</td>
<td>Different</td>
<td>Similar</td>
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<tr>
<td>Calibrated (controls)</td>
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<td>Identical</td>
<td>Identical</td>
<td>Identical</td>
<td>Statistically consistent</td>
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</tbody>
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**Why reliable evidence requires a community effort**

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<td>Evidence sharing across community</td>
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- **Community of researchers with important public health questions**
- **Data network using community standards**
- **Analyses sharing community open-source tools**
- **Application of community best practices for evaluation**
OHDSI is an international data network
OHDSI community

We’re all in this journey together...
OHDSI’s community engagement

- Active community online discussion: [forums.ohdsi.org](http://forums.ohdsi.org)
  - 3,997 distinct users have made 25,117 posts with 4,705,098 pageviews
  - Implementers, Developers, Researchers, CDM Builders, Vocabulary users, OHDSI in Korea, OHDSI in China, OHDSI in Europe

- Weekly community meetings for all collaborators to share their research ideas and progress

- 10 workgroups for solving shared problems of interest

- 5 regional chapters fostering local collaborations: Korea, Japan, China, Europe, Australia

- Tutorials in OHDSI tools and best practices, taught by OHDSI collaborators for OHDSI collaborators, ‘live’ and through EHDEN Academy

- OHDSI Symposiums held annually in North America, Europe and Asia to provide the community ‘face-to-face’ opportunities to showcase research collaborations

- Follow us on Twitter @OHDSI and LinkedIn

- New: OHDSI Microsoft Teams environment created to further enable collaboration
Data across the OHDSI community

- 205 self-reported entries on [2020 OHDSI Data Network inventory](#)
- **166** different databases with patient-level data from various perspectives:
  - Electronic health records, administrative claims, hospital systems, clinical registries, health surveys, biobanks
- **23** different countries with at least one database in the community
- **>578 million** distinct patients (as determined by max per country)
  - >250m in US, >100m in Europe, >100m in South America, >50m in Asia
- **>2.7 billion** patient records across all databases who reported to be part of the network

All using one open community data standard: **OMOP Common Data Model**
OHDSI’s standardized vocabularies

• 153 Vocabularies across 41 domains
  – MU3 standards: SNOMED, RxNorm, LOINC
  – Disparate sources: ICD9CM, ICD10(CM), Read, NDC, Gemscript, CPT4, HCPCS...

• >9 million concepts
  – >3.3 million standard concepts
  – >5.1 million source codes
  – >629,000 classification concepts

• >55 million concept relationships

• >84 million ancestral relationships

As of v10Sept2020
Publicly available for download at: http://athena.ohdsi.org/
Vocabularies Mapped to OMOP Standards: APAC
Condition, Procedure, Drug, Measurement

**Condition**
- Source Vocabulary
  - ICD10CN (34,491), mapped to standard 98.5%
  - KCD7 (22,508), mapped to standard 71%
- Standard Vocabulary – SNOMED

**Drug**
- Source Vocabulary
  - China NCCD (51,309), mapped to standard 91%
  - Korea EDI (313,431), mapped to standard 0.51%
  - Japan JMDC (35,962), mapped to standard 82%
- Standard Vocabulary – RxNorm, RxNorm Ext

**Procedure**
- Source Vocabulary
  - ICD9ProcCN (13,385), mapped to standard 99.9%
  - Standard Vocabulary – SNOMED, ICD9Proc, CPT4, HCPCS

**Measurement**
- Source Vocabulary
  - LOINC-CN
- Added synonyms in Chinese
- Standard Vocabulary – LOINC
Common data model to enable standardized analytics

Source 1 raw data
- Electronic health records

Source 2 raw data
- Administrative claims

Source 3 raw data
- Clinical data

Transformation to OMOP common data model

Source 1 CDM

Source 2 CDM

Source 3 CDM

Open-source analysis code

Open evidence
Driving agenda of full transparency

• All artifacts of our analytics pipeline are made available to the public
• In doing so, we are encouraging others to do the same
• Transparency is key to
  – Reproducibility
  – Interpretability
  – Trustworthiness
OHDSI generates evidence
OHDSI: an open science community

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

OHDSI COVID-19 Study-a-Thon (3/2020)
Snapshot of the OHDSI COVID-19 Data Network

USA (11)
- Columbia University (NY – EHR)
- Department of Veterans Affairs (National – EHR)
- HealthVerity (Claims linked to diagnostic testing)
- IQVIA Open Claims (National – Administrative Claims)
- Optum EHR (National – EHR)
- Optum SES (National – administrative claims)
- Premier (National – Hospital Billing)
- Stanford University (CA – EHR)
- Tufts University (MA – EHR)
- University of Colorado Anschutz Medical Campus (CO – EHR)
- University of Washington Medicine COVID Research Dataset (WA – EHR)

EUROPE (8)
- CPRD (UK – EHR)
- DA Germany (Germany – EHR)
- HM Hospitales (Spain – Hospital Billing)
- IPCI (Netherlands – EHR)
- LPD France (France – EHR)
- LPD Italy (Italy – EHR)
- SIDIAP (Spain – EHR)
- SIDIAP-H (Spain – EHR Hospital linkage)

ASIA-PACIFIC (3)
- HIRA (South Korea – Administrative Claims)
- DCMC (South Korea – EHR)
- Nanfang Hospital (China – EMR)

Together, OHDSI has studied:

- >7.4m patients tested for SAR-COV-2
- >1.6m patients diagnosed or tested positive for COVID-19
- >300k patients hospitalized with COVID-19

As of 12Oct2020
Complementary evidence to inform the patient journey

Clinical characterization: What happened to them?

Patient-level prediction: What will happen to me?

Population-level effect estimation: What are the causal effects?

Observation

Inference

Causal inference
Disease Natural History of COVID-19

Findings:

- Patients hospitalized with COVID are systematically different from those hospitalized with flu
- COVID hospitalized patients, when compared those hospitalized for influenza:
  - Greater proportion are male and slightly younger
  - Fewer comorbidities and lower medication use

- Utilized claims and electronic medical records from 10 databases across 3 different countries

Characterization

Describe baseline characteristics for those hospitalized for COVID-19 as compared to those hospitalized for influenza
Disease Natural History of COVID-19

Characterization

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Medication use</th>
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<tbody>
<tr>
<td>CUIMC (n: 1,759)</td>
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<tr>
<td>HIRA (n: 7,341)</td>
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<tr>
<td>HM (n: 2,078)</td>
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<tr>
<td>PHD (n: 5,257)</td>
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<tr>
<td>SIDIAP (n: 16,347)</td>
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<tr>
<td>UC HDC (n: 769)</td>
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<tr>
<td>VA (n: 577)</td>
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</tbody>
</table>

- Blood disease
- Cardiovascular disease
- Congenital disease
- Digestive disease
- Endocrine or metabolic disease
- ENT disease
- Eye disease
- Genitourinary disease
- Iatrogenic condition
- Infection
- Injury and poisoning
- Mental disease
- Neoplasm
- Nerve disease and pain
- Respiratory disease
- Skin disease
- Soft tissue or bone disease
- Blood and blood forming organs
- Nervous system
- Cardiovascular system
- Dermatologicals
- Genito urinary system and sex hormones
- Musculo-skeletal system
- Sensory organs
- Systemic hormonal preparations excl. sex hormones and insulin
- Various
- Uncategorised
CHARYBDIS Results Viewer

Interactive application for exploring disease natural history:

- [https://data.ohdsi.org/Covid19CharacterizationCharybdis/](https://data.ohdsi.org/Covid19CharacterizationCharybdis/)
Objective: develop and externally validate COVID-19 Estimated Risk scores that quantify a patient’s risk of hospital admission, hospitalization requiring intensive services or fatality.
COVER: COVID risk prediction

- COVER interactive website to provide live risk scores

- Impact: Health minister of Catalonia Spain explicitly mentions the COVER index as one of the indicators they will use to measure the impact of a given outbreak.
Interactive application for exploring prediction:

- [https://data.ohdsi.org/Covid19CoverPrediction/](https://data.ohdsi.org/Covid19CoverPrediction/)
Evidence was needed around the use of hydroxychloroquine (HCQ) alone and in combination with azithromycin (AZ). We examined the use of these drugs in rheumatoid arthritis (RA) patients.

Findings:
– In history use in RA population, HCQ alone is generally safe but in combination with AZ it shows a doubling of risk of 30-day cardiovascular mortality.
ACE Inhibitors and susceptibility to COVID-19

- Patients with cardiovascular diseases and hypertension treated with angiotensin converting enzyme inhibitors (ACEs) angiotensin-II receptor blockers (ARBs) may influence susceptibility to COVID-19 and worsen its severity.

As stated by Watson et al., in relation to one of the published studies, lack of transparency and uncertainties about research standards applied raise doubts about published results. Morales et al. supported the reproducibility of their study by publishing the study protocol in the EU PAS Register ahead of time, providing a start-to-finish executable code, facilitating the sharing and exploration of the complete result set with an interactive web application and asking clinicians and epidemiologists to perform a blinded evaluation of propensity score diagnostics for the treatment comparisons.
Insights from LEGEND

• We are able to generate **high-quality** real-world evidence at large scale
  – **Advanced methods** to address confounding
  – Wide array of **study diagnostics**
  – Negative and positive **controls**
  – **Full transparency** negates p-hacking and publication bias

• Thus augmenting evidence from **clinical trials**

• Importance of **cross-organizational collaboration**
  - Janssen
  - UCLA
  - Yale
  - Columbia University
  - Ajou University
  - University of South Australia
Perspective

Principles of Large-scale Evidence Generation and Evaluation across a Network of Databases (LEGEND)

Martijn J. Schuemie 1,2, Patrick B. Ryan 1,3, Nicole Pratt 4, RuiJun Chen 5,6, Seng Chan You 7, Harlan M. Krumholz 7, David Madigan 8, George Hripcsak 9,8, and Marc A. Suchard 9,10

Research and Applications

Large-scale evidence generation and evaluation across a network of databases (LEGEND): assessing validity using hypertension as a case study

Martijn J Schuemie 1,2, Patrick B Ryan 1,3, Nicole Pratt 4, RuiJun Chen 5,6, Seng Chan You 7, Harlan M Krumholz 7, David Madigan 8, George Hripcsak 9,8, and Marc A Suchard 9,10
Leadership role of APAC

Research

JAMA | Original Investigation

Association of Ticagrelor vs Clopidogrel With Net Adverse Clinical Events in Patients With Acute Coronary Syndrome Undergoing Percutaneous Coronary Intervention

Seng Chan You, MD, MS; Yeunsook Rho, PhD; Behnoood Bikdeli, MD, MS; Jiwoo Kim, MS; Anastasios Siapos, MSc; James Weaver, MSc; Ajit Londhe, MPH; Jaehyeong Cho, BS; Jimyung Park, BS; Martijn Schuemie, PhD; Marc A. Suchard, MD, PhD; David Madigan, PhD; George Hripcsak, MD, MS; Aakriti Gupta, MD, MS; Christian G. Reich, MD; Patrick B. Ryan, PhD; Rae Woong Park, MD, PhD; Harlan M. Krumholz, MD, SM

IMPORTANCE Current guidelines recommend ticagrelor as the preferred P2Y12 platelet inhibitor for patients with acute coronary syndrome (ACS), primarily based on a single large randomized clinical trial. The benefits and risks associated with ticagrelor vs clopidogrel in routine practice merits attention.

OBJECTIVE To determine the association of ticagrelor vs clopidogrel with ischemic and hemorrhagic events in patients undergoing percutaneous coronary intervention (PCI) for ACS in clinical practice.

DESIGN, SETTING, AND PARTICIPANTS A retrospective cohort study of patients with ACS who underwent PCI and received ticagrelor or clopidogrel was conducted using 2 United States electronic health record-based databases and 1 nationwide South Korean database from...
# OHDSI APAC 2020 Symposium Agenda

<table>
<thead>
<tr>
<th>Korean Time</th>
<th>OHDSI APAC 2020 Session and Title - Dec 5th</th>
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<tbody>
<tr>
<td>10:00 - 10:30</td>
<td>OHDSI Welcome Session</td>
</tr>
<tr>
<td>10:30 - 11:30</td>
<td>Panel – OHDSI Community in Action – COVID19 Global effort</td>
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<tr>
<td>11:30 - 12:30</td>
<td>Network Session</td>
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<td>APAC Study - Comprehensive comparative effectiveness and safety of second line antihypertensive agents; utilising the LEGEND principles to mobilize collaboration across the OHDSI APAC network</td>
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<td>12:30 - 13:30</td>
<td>DOAC Study - Comparative effectiveness and safety of direct ORal Anticoagulants in patients with atrial fibrillation: a standardiZed Observational data Network study (CORAZON)</td>
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<td>13:30 - 14:00</td>
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<th>Korean Time</th>
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<tr>
<td>10:00 - 10:30</td>
<td>OHDSI APAC State of the Community</td>
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<tr>
<td>10:30 - 13:00</td>
<td>OHDSI Chapter Breakout – China/Hong Kong, Australia, Singapore, Korea, Taiwan, Japan</td>
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<tr>
<td>13:00 - 13:30</td>
<td>Fun with the Community</td>
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<tr>
<td>13:30 - 14:00</td>
<td>Closing Ceremony</td>
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<tr>
<td>Name</td>
<td>Affiliation</td>
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<tr>
<td>Zachary Monge</td>
<td>Covance</td>
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<td>Guy Tsafnat</td>
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Community in Action Panel