

OHDSI APAC Symposium Welcome to the Journey!

Patrick Ryan, PhD

Vice President, Observational Health Data Analytics, Janssen Research and Development Assistant Professor, Adjunct, Department of Biomedical Informatics, Columbia University Irving Medical Center Christian Reich, MD PhD 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

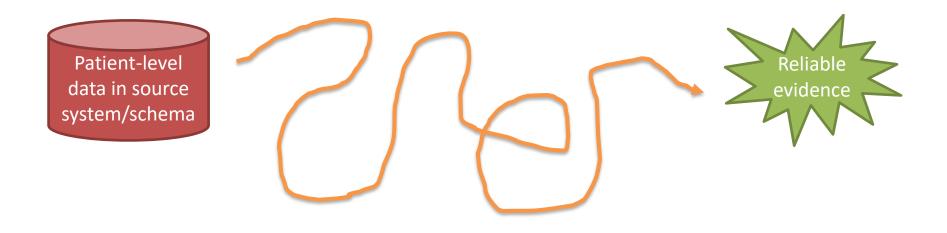


OHDSI's values

- 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



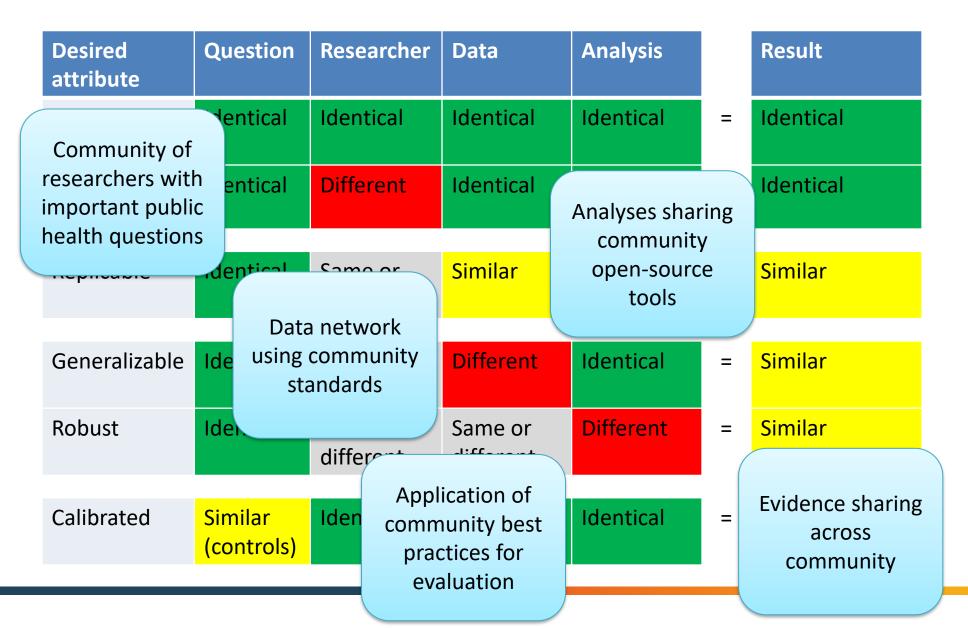


Desired attributes for reliable evidence

Desired attribute	Question	Researcher	Data	Analysis		Result
Repeatable	Identical	Identical	Identical	Identical	=	Identical
Reproducible	Identical	Different	Identical	Identical	=	Identical
Replicable	Identical	Same or different	Similar	Identical	=	Similar
Generalizable	Identical	Same or different	Different	Identical	=	Similar
Robust	Identical	Same or different	Same or different	Different	=	Similar
Calibrated	Similar (controls)	Identical	Identical	Identical	=	Statistically consistent



Why reliable evidence requires a community effort





OHDSI is

an international data network



OHDSI community

We're all in this journey together...





OHDSI's community engagement

- Active community online discussion: <u>forums.ohdsi.org</u>
 - 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

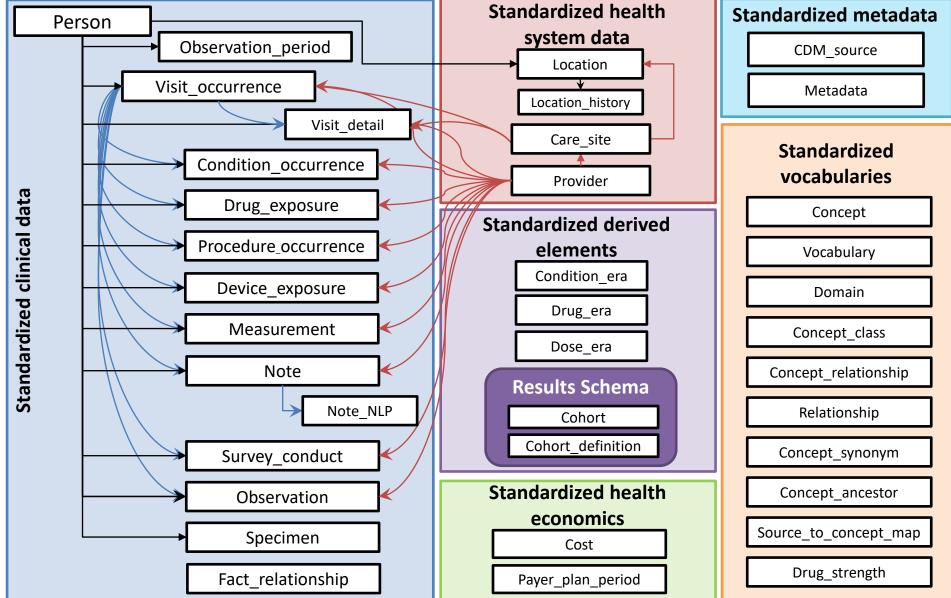
- 205 self-reported entries on <u>2020 OHDSI Data Network inventory</u>
- **166** different databases with patient-level data from various perspectives:
 - Electronic health records, administrative claims, hospital systems, clinical registries, health surveys, biobanks
- 23 different countries with at 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



Open community data standard:

OMOP CDM





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



Vocabularies Mapped to OMOP Standards: APAC Condition, Procedure, Drug, Measurement

3

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

2

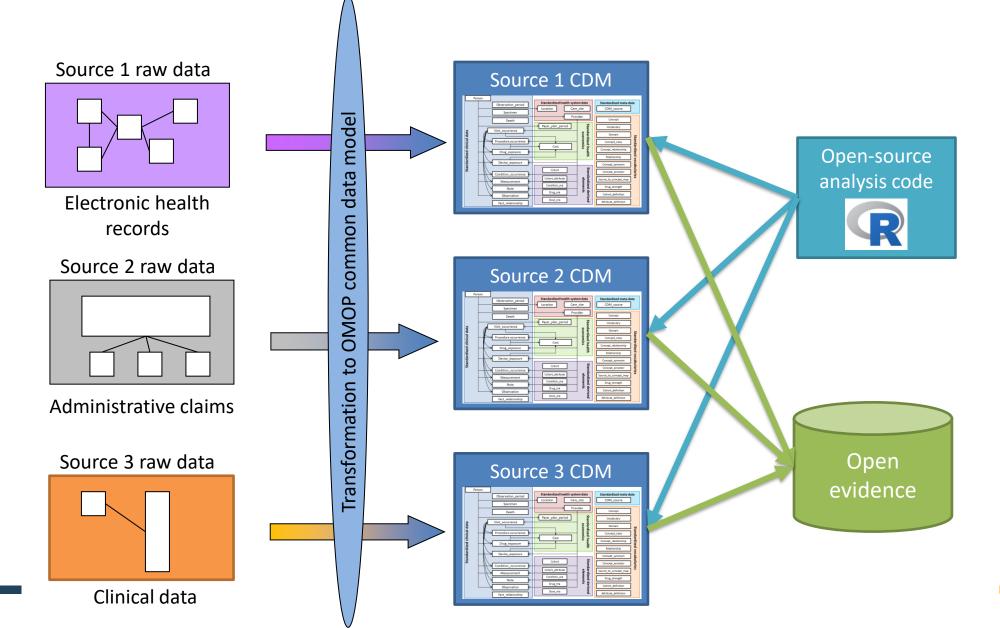
- Source Vocabulary
 - ICD9ProcCN (13,385), mapped to standard 99.9%
 - Standard Vocabulary SNOMED, ICD9Proc, CPT4, HCPCS

Measurement

- Source Vocabulary
 - LOINC-CN
- Added synonyms in Chinese
- Standard Vocabulary LOINC



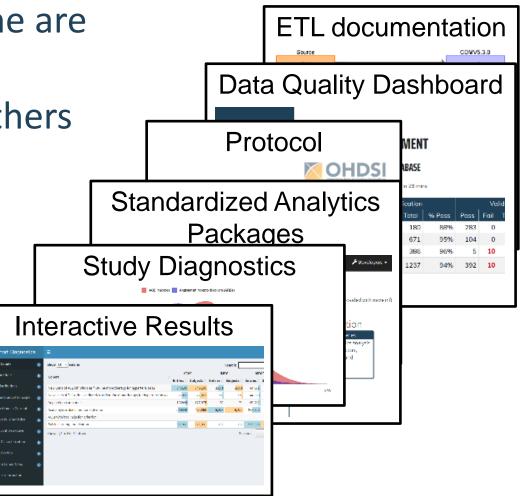
Common data model to enable standardized analytics





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

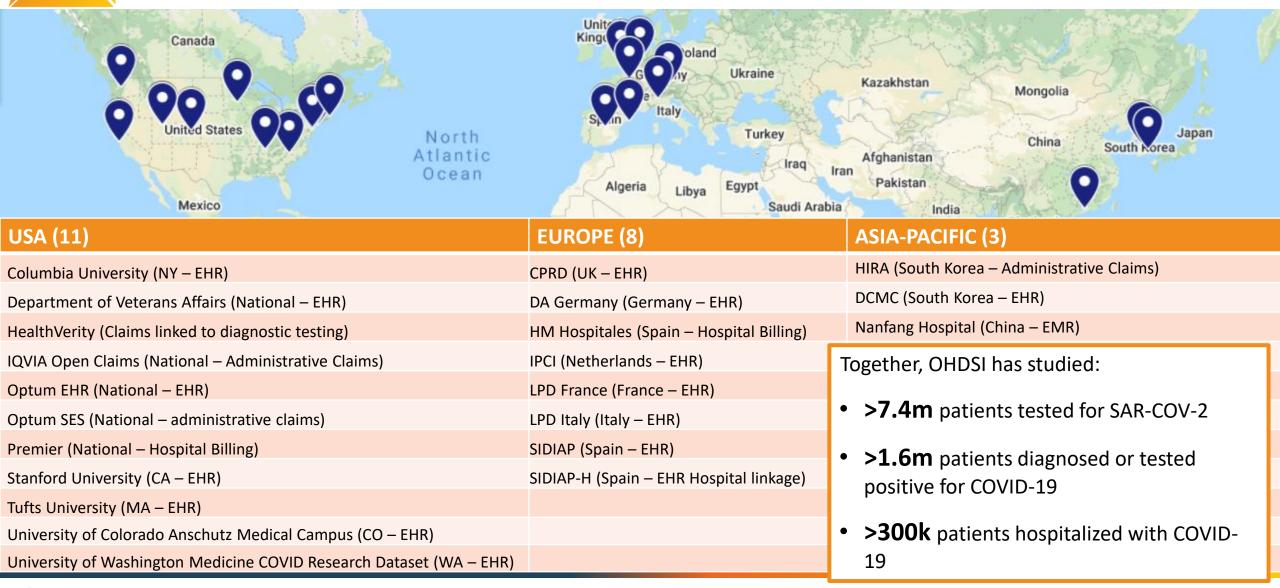
Mission:

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

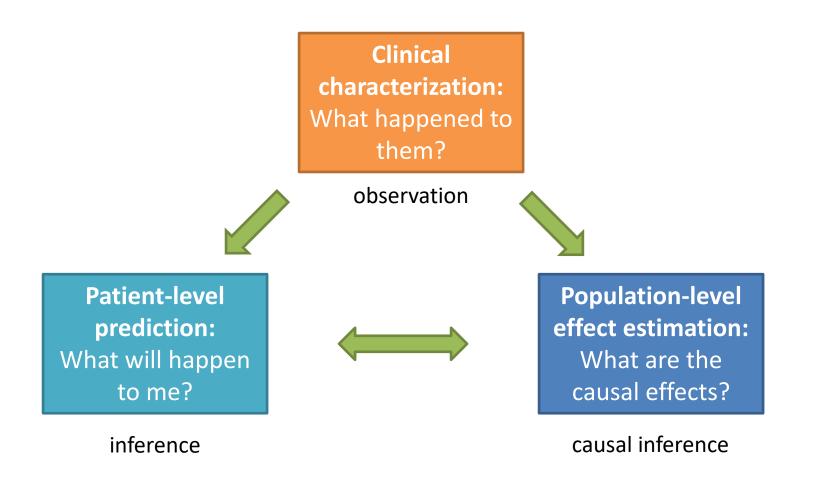


#OHDSICOVID19 EHR = Electronic Health Records, EMR = Electronic Medical Records

As of 12Oct2020



Complementary evidence to inform the patient journey



Disease Natural History of COVID-19

 Describe baseline characteristics for those hospitalized for COVID-19 as compared to those hospitalized for influenza

Findings:

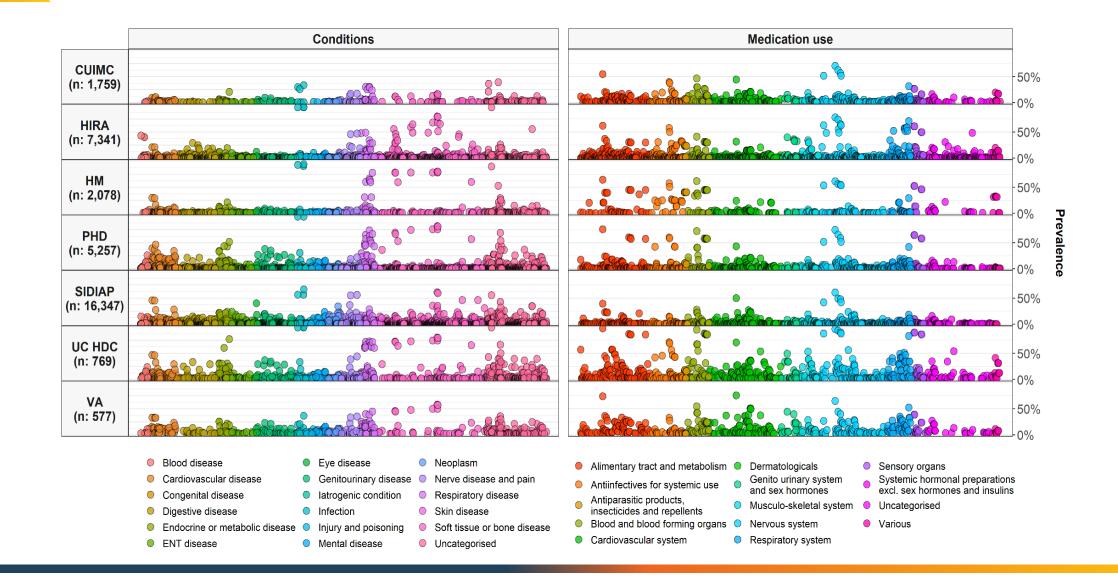
- Patients hospitalized with COVID are systematically different from those hospitalized with flu
- COVID hospitalized patients, when compared those hospitalized for influenza:
- Greater proportion are male and slightly younger

Characterization

- Fewer comorbidities and lower medication use
- Utilized claims and electronic medical records from 10 databases across 3 different countries

nature	
ARTICLE	Check for updates
https://doi.org/10.1038/s41467-020-18849-z OPEN	
Deep phenotyping of 34,128 adult patients	
hospitalised with COVID-19 in an internation	
•	Ullai
network study	
Edward Burn@ et al.#	
Comorbid conditions appear to be common among individuals hospitalised with coronavirus disease 2019 (COVID-19) but estimates of prevalence vary and little is known about the prior	
medication use of patients. Here, we describe the characteristics of adults hospitalised with	
COVID-19 and compare them with influenza patients. We include 34,128 (US: 8362, South	
Korea: 7341, Spain: 18,425) COVID-19 patients, summarising between 4811 and 11,643 unique aggregate characteristics. COVID-19 patients have been majority male in the US and	
Spain, but predominantly female in South Korea. Age profiles vary across data sources.	
Compared to 84,585 individuals hospitalised with influenza in 2014-19, COVID-19 patients	
have more typically been male, younger, and with fewer comorbidities and lower medication	
use. While protecting groups vulnerable to influenza is likely a useful starting point in the	
response to COVID-19, strategies will likely need to be broadened to reflect the particular characteristics of individuals being hospitalised with COVID-19.	
characteristics of individuals being nospitalised with COVID-19.	

Disease Natural History of COVID-19



Characterization



CHARYBDIS Results Viewer

Interactive application for exploring disease natural history:

<u>https://data.ohdsi.org/Covid19CharacterizationCharybdis/</u>

THE PREPRINT SERVER FOR HEALTH SCIENCES	THE PREPRINT SERVER FOR HEALTH SCIENCES	SH) Spring BMJ Yale HOME ABOUT	THE PREPRINT SERVER FOR HEALTH SCIENCES	CSH) Spring Home ABO Laboratory BMJ Yale
Comment on this paper Baseline characteristics, management, and outcomes of 55,270 children and adolescents diagnosed with COVID-19 and 1,952,693 with influenza in France, Germany, Spain, South Korea and the United States: an international network cohort study	Heterogeneity and temporal variation in COVID-19: a multinational drug utilization patients from China, South Korea, Spain, Albert Prats-Uribe, Anthony G. Sena, Lana Yin Hui La	on study including 71,921 hospitalized , and the United States of America	with real-time PCR and >219,000 teste Spain and the United States	ohort including >3.32 million people tested ed positive for SARS-CoV-2 in South Korea,
 Talita Duarte-Salles, David Vizcaya, Andrea Pistillo, Paula Casajust, Anthony G. Sena, Lana Yin Hui Lai, Albert Prats-Uribe, Waheed-Ul-Rahman Ahmed, Thamir M Alshammari, Heba Alghoul, Osaid Alser, Edward Burn, Seng Chan You, Carlos A Sergio Fernandez-Bertolin, Stephen Fo Pablo Iveli, Daniel R. Morales, Fredrik Nigam H. Shah, Karishma Shah, MarcA George Hripcsak, Peter Rijnbeek, Patr doi: https://doi.org/10.1101/2020.10.2 The PREPRINT SERVER FOR HEALTH SCIENCES 	Ablert Prats-Unbe, Anthony G. Sena, Lana Yin Hui L Osaid Alser, O Thamir M Alshammari, Carlos Areia, Asieh Golozar, D Jitendra Jonnagaddala, Paras Mehta, G Hena Roel, Karishma S HOME ABOU D Lin Zhang, Ying Zhar Christian Reich, Marc A Search 09.15.20195545	William Carter, Paula Casajust, [©] Dalia Dawoud, ong Menchung, Daniel R Morales, Fredrik Nyberg, ht	© Fredrik Nyberg, © Scott L. Duvall, Daniel R. Mora Waheed-Ul-Rahman Ahmed © Osaid Aker © Heha	a, [©] David Vizcaya, [©] Lisa M. Schilling, [©] Vojtech Huser, les, [©] Thamir M Alshammari, [©] Hamed Abedtash, Alghoul, Ying Zhang, Mengchun Gong, Yin Guan, la Shah, Jennifer C.E. Lane, Albert Prats-Uribe, hang, Maria Tereza Fernandes Abrahão, [©] Peter R. Rijnbeek, tina Recalde, Sergio Fernández-Bertolín, Alan Andryc, [©] Clair Blacketer, [©] Frank DeFalco, Karthik Natarajan, ropolets, [®] George Hripcsak, [©] Marc Suchard, iams, [©] Christian Reich, [©] Talita Duarte-Salles, Ihambra
 "Clinical characteristics, symptoms, management and he outcomes in 8,598 pregnant women diagnosed with CO 27,510 with seasonal influenza in France, Spain and the U analysis" © Lana Yin Hui Lai, Asieh Golozar, © Anthony Sena, © Andrea V. Margulis, Neus Valveny, © Albert Prats-Uribe, Evan R Minty, © Waheed-Ul-Rahman Albert Prats-Uribe, Evan R Minty, © Management Rahman Albert Prats-Uribe, Evan R Minty, © Management Rahman Albert Prats-Uribe, Evan R Minty, © Waheed-Ul-Rahman Albert Prats-Uribe, Evan R Minty, © Management Rahman Albert Prats-Uribe, Evan R Minty, © Management Rah	VID-19 compared to JS: a network cohort Juria Haro, [©] Paula Casajust,	Characteristics and outcomes of 627 044 C with and without obesity in the United Stat Martina Recalde, Elena Roel, Andrea Pistillo, Anthony Waheed UI-Rahman Ahmed, Heba Alghoul, Thamii Edward Burn, Paula Casajust, Dalia Dawoud, Sc	G Sena, [©] Albert Prats-Uribe, r M Alshammari, [©] Osaid Alser, [©] Carlos Areia, cott L DuVall, [©] Thomas Falconer,	
Daniel R. Morales, Heba Alghoul, © Osaid Alser, Dalia Dawoud, © Lin Zhang Clair Blacketer, Carlos Areia, Vignesh Subbian, © Fredrik Nyberg, Jennifer C Mengchun Gong, © Martina Recalde, Jitendra Jonnagaddala, Karishma Shah, © Stephen Fortin, Ru-fong Joanne Cheng, Christian Reich, George Hripcsak, Pet Kristin Kostka, Talita Duarte-Salles, © Daniel Prieto-Alhambra doi: https://doi.org/10.1101/2020.10.13.20211821	; Jose D. Posada, 💿 Nigam H. Shah, E Lane, Marc A Suchard, D Elena Roel, David Vizcaya,	Sergio Fernandez-Bertolin, Asieh Golozar, ¹⁰ Mengchun Go Kristine E Lynch, Michael E Matheny, Paras P Mehta, Daniel Jose D Posada, Christian G Reich, Lisa M Schilling, Karishma Hong Zhu, Patrick Ryan, ¹⁰ Daniel Prieto-Alhambra, Kristin doi: https://doi.org/10.1101/2020.09.02.20185173	R Morales, Karthik Natarjan, Fredrik Nyberg, a Shah, Nigham H Shah,Vignesh Subbian, 🔟 Lin Zhang,	

COVER: COVID risk prediction

Objective: develop and externally validate **COV**ID-19 **E**stimated **R**isk scores that quantify a patient's risk of hospital admission, hospitalization requiring intensive services or fatality.

	COVER-H Flat of	COVER-I Risk of	COVER-F	2		J Risk Score probabi	ity distributions in ClinFormatics	calculator is available in: http://evidence.ondsi.org/ Covid19CoverPrediction
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ancer	•2	•1	+3			Hospitalization	Intensive Services	Fatality
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labeles	+3	-46	+2	90 -	- 40%	90 - 1	1	- 40%
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yperlipidemia	.3	12 1	.7	80 -	- 20%	80 -		- 20%
Summer .		132 2		75		75		
idney Disease	+2	44 ()	+2	75 -	197.97	75 -		
			10000	70 -	- 10%	70 -		- 10%
GE GROUPS				70-				
- 19 years	-7	-10	-15	65 -		85 -		
- 24 years	-4	-2	-8	00 -5	- 5%			- 5%
5 - 29 years	-2	-1	-20	C 60 -	- 4%	60 -		-4% -3%
- 34 years	-2	+0	-5	0 - 00 - 55 - 55 -	- 3% - 2%			- 3%
5 - 39 years	+0	+0	+0	8 55 -	0	55 -		
0 - 44 years	+3	+3	-6	200	- 2%			- 2%
5 - 49 years	+6	+5	+1	50 -	0	50 -		
0 - 54 years	+9	+10	+15	10000	- 1% 6			-1%
5 - 59 years	+13	+12	+12	45 -	- 1 %	45 -		110
0 - 64 years	+15	+16	+16	B 45 - 40 -	100 C			
5 - 69 years	+19	+22	+27	O 40 -	- 0.5% 🔜	40 -		- 0.5%
0 - 74 years	+20	+21	+31	0	- 0.5% 🜄			
5 - 79 years	+23	+22	+35	35 -	*	35 -		
0 - 84 years	+24	+21	+40	and a second				
5 - 89 years	+27	+25	+45	30 -		30 -		
0 - 94 years	+25	+21	+30					
e Score				25 -	- 0.1%	25 -		-0.1%
					-0.176			0.176
EX				20 -		20 -		
male	+43	+27	+27			242		
ale	+46		+31	15 -		15 -		
x Score		0.0		10 -		10 -		
	10000					Yest		
	COVER-H	COVER-I	COVER-F	5 -		5.		
OTAL SCORE	Sector Sector	A CONTRACTOR	A CONTRACTOR		- 0.01%	0-		-0,013

Prediction

medRχiv 💮

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Spring Harbor Laboratory BMJ Yale

Search

HOME | ABO

Seek COVER: Development and validation of a personalized risk calculator for COVID-19 outcomes in an international network

Ross D. Williams, Aniek F. Markus, Cynthia Yang, Talita Duarte Salles, Scott L Duvall, Thomas Falconer, Jitendra Jonnagaddala, Chungsoo Kim, Yeunsook Rho, Andrew Williams, Amanda Alberga, Min Ho An, María Aragón, Carlos Areia, Edward Burn, Young Choi, Iannis Drakos, Maria Fernandes Abrahão, Sergio Fernández-Bertolín, George Hripcsak, Benjamin Kaas-Hansen, Prasanna Kandukuri, Jan A. Kors, Kristin Kostka, Siaw-Teng Liaw, Kristine E Lynch, Michael E Matheny, Gerardo Machnicki, Daniel Morales, Fredrik Nyberg, Rae Woong Park, O Albert Prats-Uribe, Nicole Pratt, Gowtham Rao, Christian G. Reich, Marcela Rivera, Tom Seinen, Azza Shoaibi, Matthew E. Spotnitz, Ewout W. Steyerberg, Marc A Suchard, Seng Chan You, Lin Zhang, Lili Zhou, Patrick B. Ryan, O Daniel Prieto-Alhambra, Jenna M. Reps, Peter R. Rijnbeek doi: https://doi.org/10.1101/2020.05.26.20112649

COVER: COVID risk prediction

• COVER interactive website to provide live risk scores

Prediction

- 0 🗷 A 🛪 🖸 Multiple PLP Viewer Constants Leads a tool to callo, see the raik of two to outcome DOM: NO 🖹 arank 101.0 COVER. Heley of CAL Minimum Physics Universitäten dellare Reformed incertibleship Hatery of receivers of Halanced Kalass Dis Coloriste No. This substitution are well also exactly all approximations in the second statement in The Theorem Integration in the probability of a solid advantation (2007) (2), regular internative pervises (contrasting / concession) at the metric following contrasts diagnosis
- 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.

3. Indicadors



En la interpretació dels indicadors s'aplicaran factors de correcció com: índex socioeconòmic complex, envelliment de la població o la densitat poblacional.





COVER: COVID risk prediction

Interactive application for exploring prediction:

<u>https://data.ohdsi.org/Covid19CoverPrediction/</u>



https://www.ohdsi.org/2020-ohdsi-global-symposium/

Safety of hydroxychloroquine

- 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:

Estimation

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

Insights from LEGEND



Estimation

Research

JAMA Internal Medicine | Original Investigation

Comparison of Cardiovascular and Safety Outcomes of Chlorthalidone vs Hydrochlorothiazide to Treat Hypertension

George Hripcsak, MD, MS; Marc A. Suchard, MD, PhD; Steven Shea, MD; RuiJun Chen, MD; Seng Chan You, MD; Nicole Pratt, PhD; David Madigan, PhD; Harfan M. Krumholz, MD, SM Patrick B. Ryan, PhD; Martijn J. Schuemie, PhD

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
 - Columbia University - Janssen
 - UCLA
 - Ajou University - University of South Australia - Yale



Journal of the American Medical Informatics Association, 0(0), 2020, 1331–1337 doi: 10.1093/jamia/ocaa103

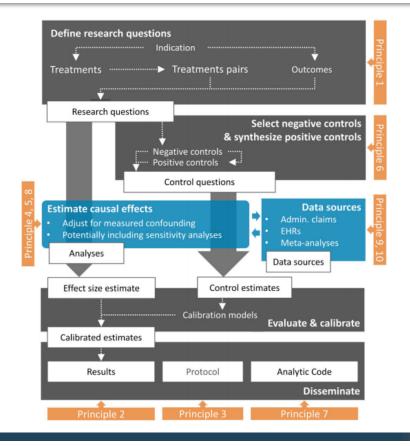


Perspective

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 Pratt⁴, RuiJun Chen ^{3,5}, Seng Chan You⁶, Harlan M. Krumholz⁷, David Madigan⁸, George Hripcsak^{3,9}, and Marc A. Suchard^{2,10}

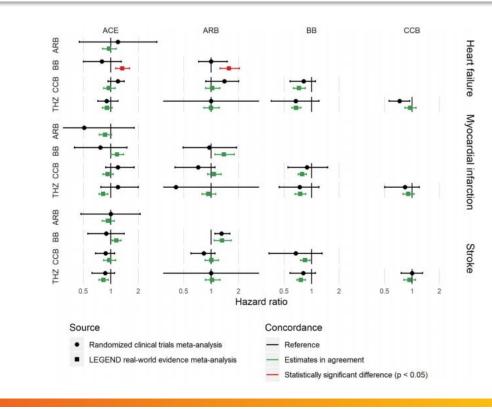




Research and Applications

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

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



Leadership role of APAC

Research

Estimation

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; Behnood 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

Editorial page 1613

JAMA Patient Page page 1690

Audio and Supplemental content

CME Quiz at jamacmelookup.com and CME Questions page 1672



OHDSI APAC 2020 Symposium Agenda

Korean Time OHDSI APAC 2020 Session and Title - Dec 5th

- 10:00 10:30 OHDSI Welcome Session
- 10:30 11:30 Panel OHDSI Community in Action COVID19 Global effort
- 11:30 12:30 Network Session

APAC Study - Comprehensive comparative effectiveness and safety of second line

12:30 - 13:30 antihypertensive agents; utilising the LEGEND principles to mobilize collaboration across the OHDSI APAC network

DOAC Study - Comparative effectiveness and safety of direct ORal Anticoagulants in

13:30 - 14:00 patients with atrial fibrillation: a standardiZed Observational data Network study (CORAZON)

Korean Time OHDSI APAC 2020 Session and Title - Dec 6th

- 10:00 10:30 OHDSI APAC State of the Community
- 10:30 13:00 OHDSI Chapter Breakout China/Hong Kong, Australia, Singapore, Korea, Taiwan, Japan
- 13:00 13:30 Fun with the Community
- 13:30 14:00 Closing Ceremony



COLLABORATOR SHOWCASE - POSTERS

Name	Affiliation	Poster		
Zachary Monge	Covance	A Hybrid Statistical-Machine Learning Approach to Anomaly Detection in Clinical Trial Data		
Ty Stanford	University of South Australia	Mapping to standardised vocabularies: a process for drug codes in Australia		
Guy Tsafnat	Evidentli	AI-powered data mapping		
Jason C. Hsu	Taipei Medical University	Taipei Medical University Clinical Research Database (TMUCRD): A New Application Platform that Integrates Multi-center Electronic Medical Record Systems in Taiwan		
Gang Wang	Beijing Anding Hospital affiliated to Capital Medical University	Treatment Patterns and Risk of Switch to Mania in Bipolar Depressive Patients Treated with Antidepressants: A real world study using the OHDSI Network		
Gang Wang	Beijing Anding Hospital affiliated to Capital Medical University	Transforming the Psychiatric Hospital Database to the OMOP Common Data Model in China		
Preetham Kadappu	School of Medical Sciences, University of New South Wales	Statin Prescribing Patterns and Residual CRP Risk on Hospitalisation in a South-Western Sydney Population		



Community in Action Panel









