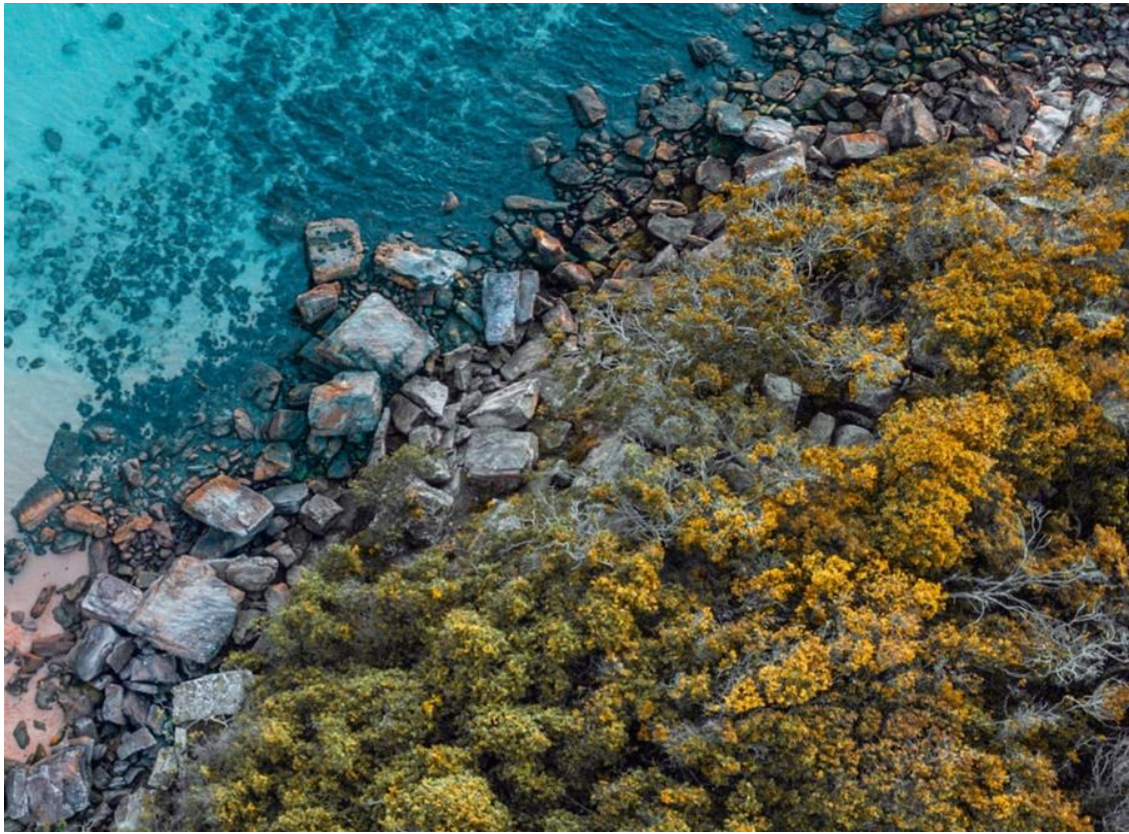
Convergence: Harmonising Security, Privacy, Federation, and Common Data Models in Medical Research.

PRESENTED BY

Roger Ward

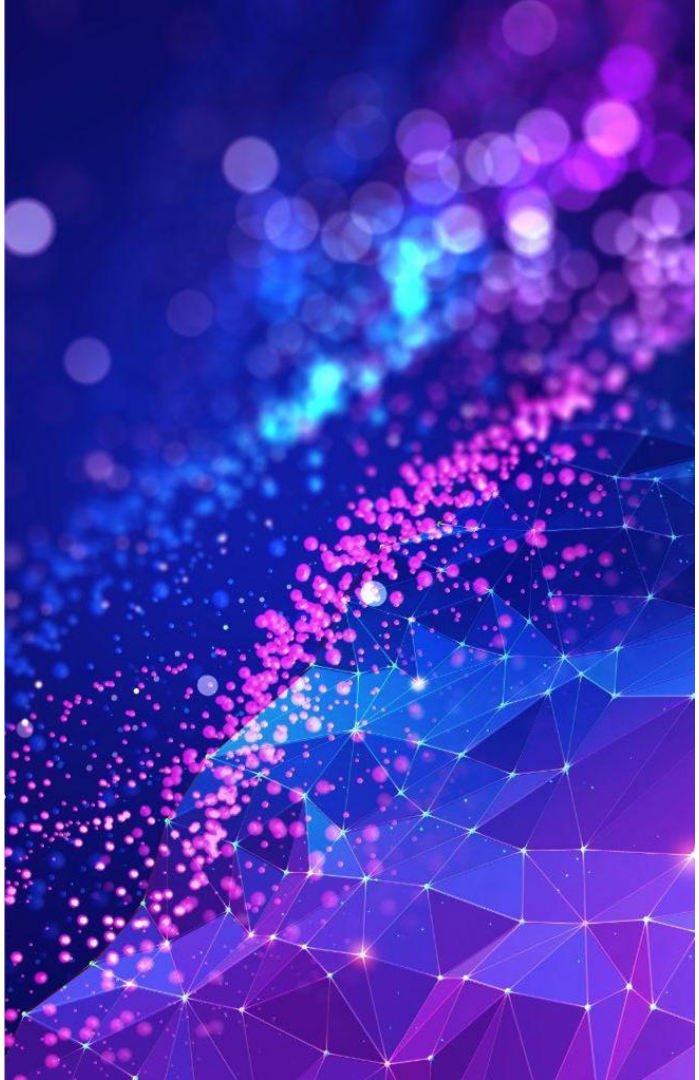
ACKNOWLEDGEMENT OF COUNTRY

We acknowledge and celebrate the First Australians on whose traditional lands we meet, and we pay our respect to their elders past, present and emerging.



True integration is about creating a whole that is greater than the sum of its parts, where each element enhances the value of the others

– Stephen Covey



Key Focus Areas

1. Trusted Research Environments
1. Data Integration
1. Advanced Analytics for Healthcare

Australian Research Data Commons

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Trusted Research Environments

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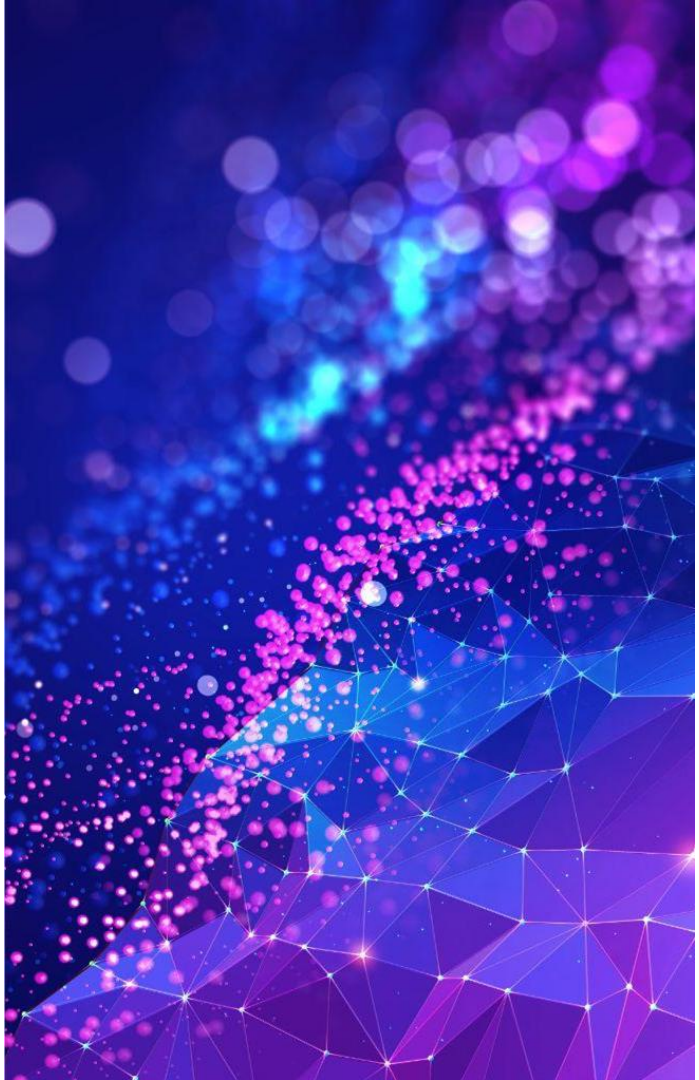
The “Five Safes” Framework



Data Integration

Secondary use of medical data for research

Credit: Lancaster Farming

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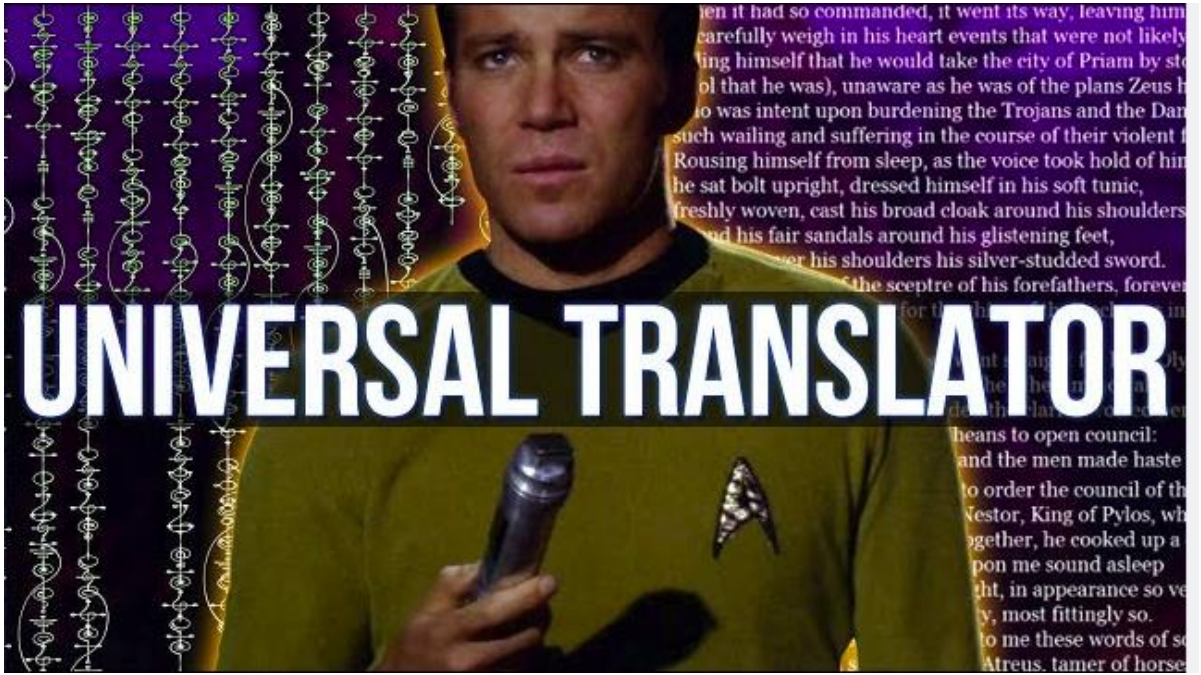
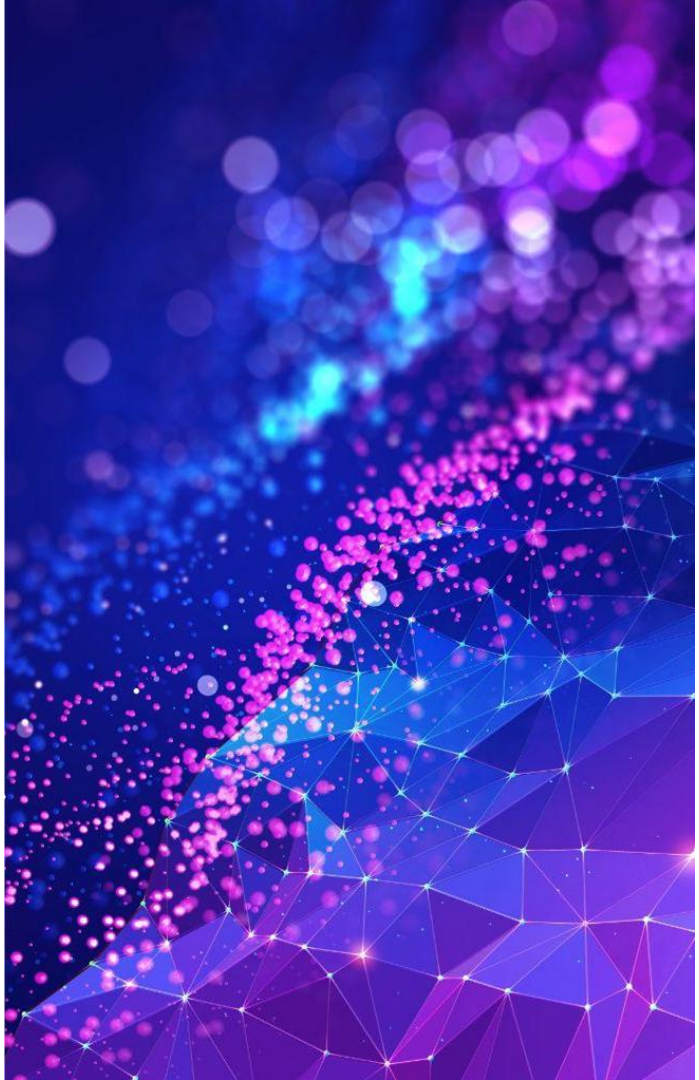
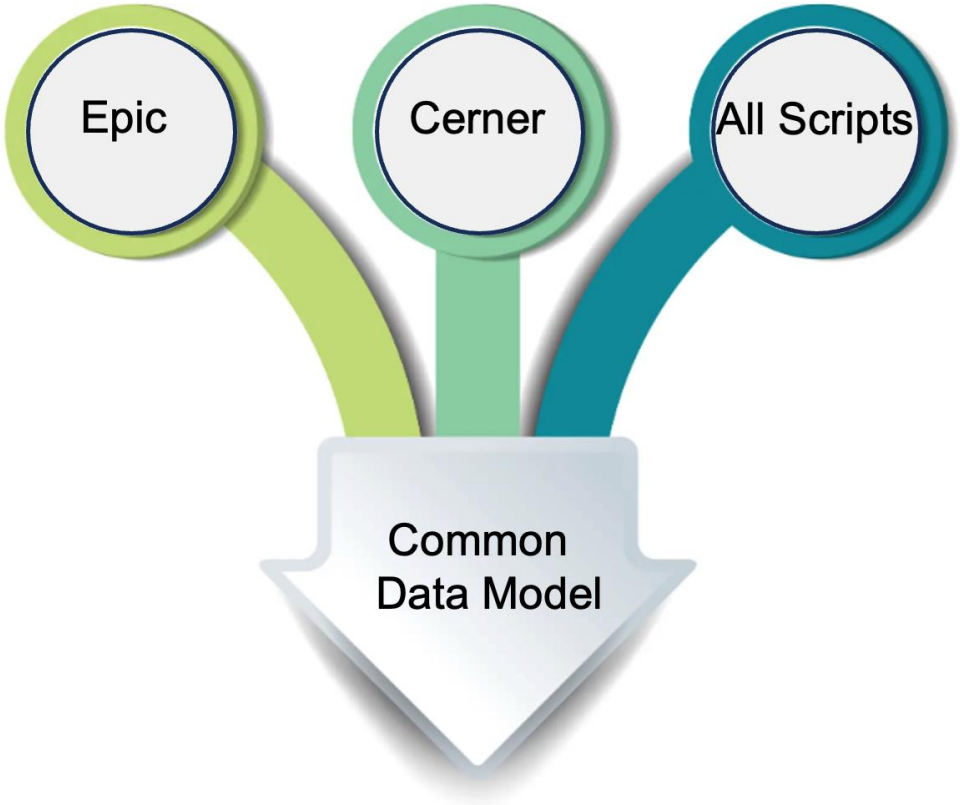
What we need is a ……..





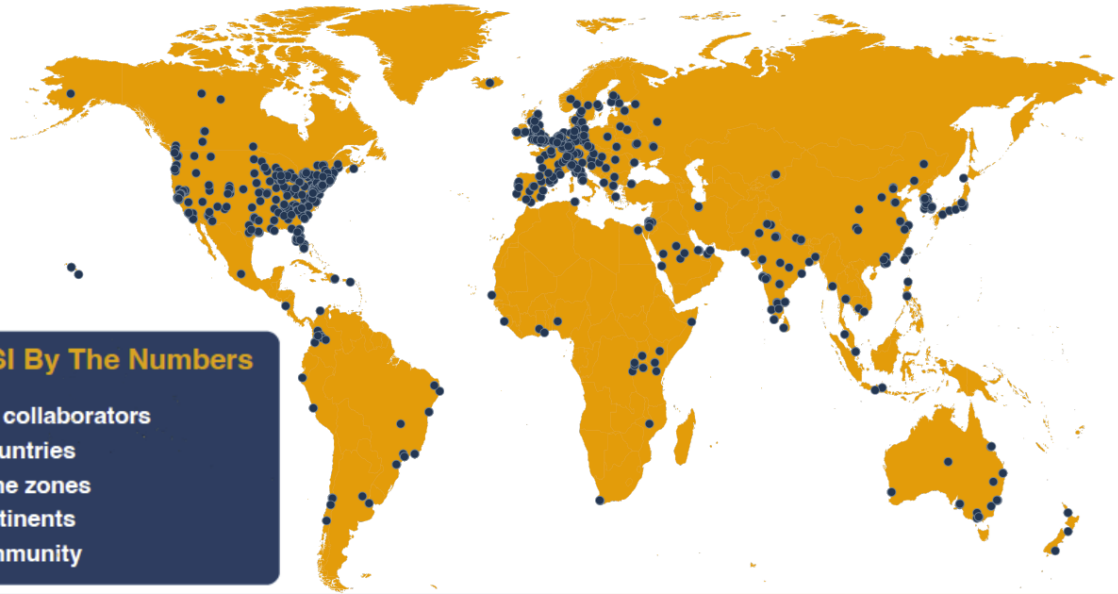
More Than Just a Common Data Model:

Building Common Ground



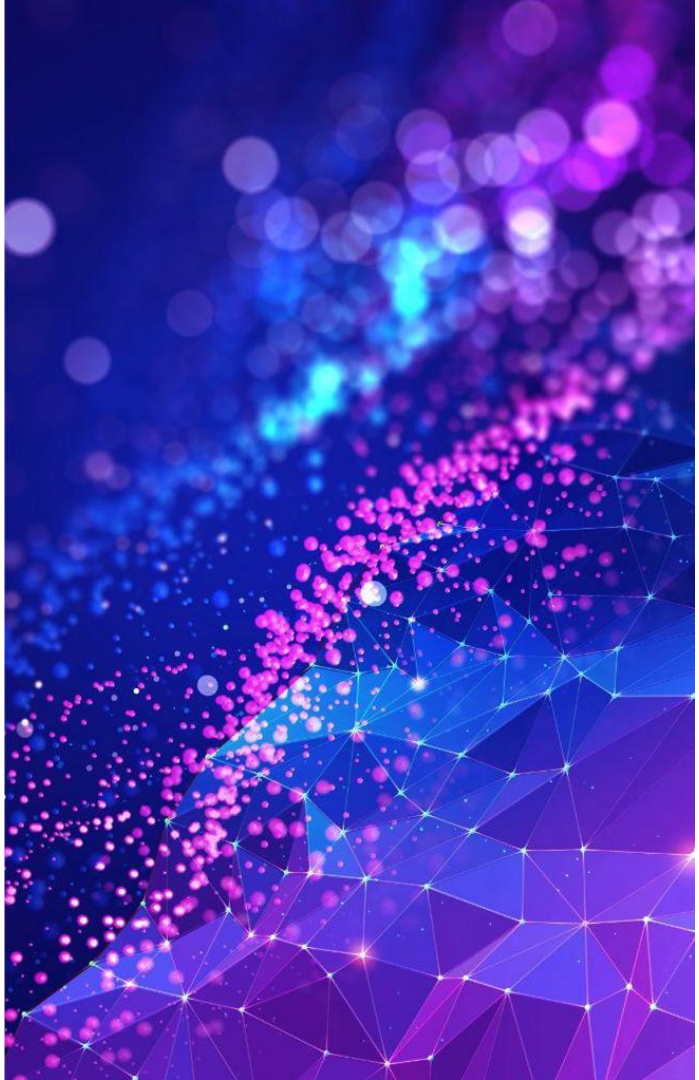
Data Integration (October 2023)

Map of collaborators



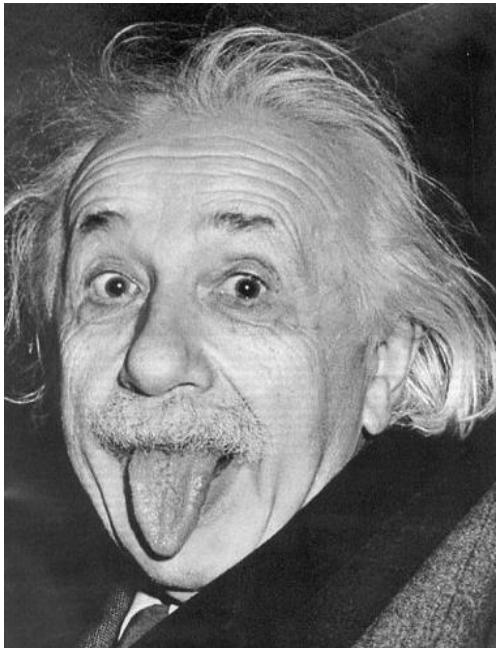
OHDSI By The Numbers

- 3,758 collaborators
- 83 countries
- 21 time zones
- 6 continents
- 1 community



Advanced Analytics for Healthcare

Federated Data Analysis



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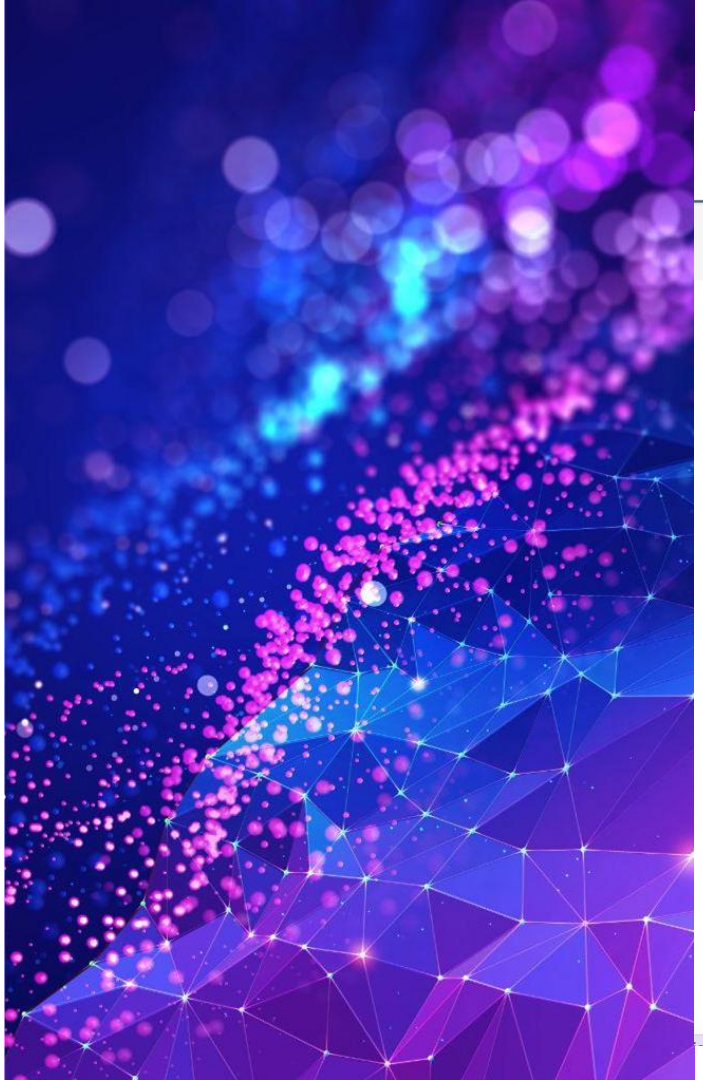

THE LANCET

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

Prof Marc A Suchard, MD [a,b] · Martijn J Schuemie, PhD [a,c] · Prof Harlan M Krumholz, MD [d] · Seng Chan You, MD [e] · RuiJun Chen, MD [f,g] · Nicole Pratt, PhD [h] · et al. Show more

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Show Outline

Summary

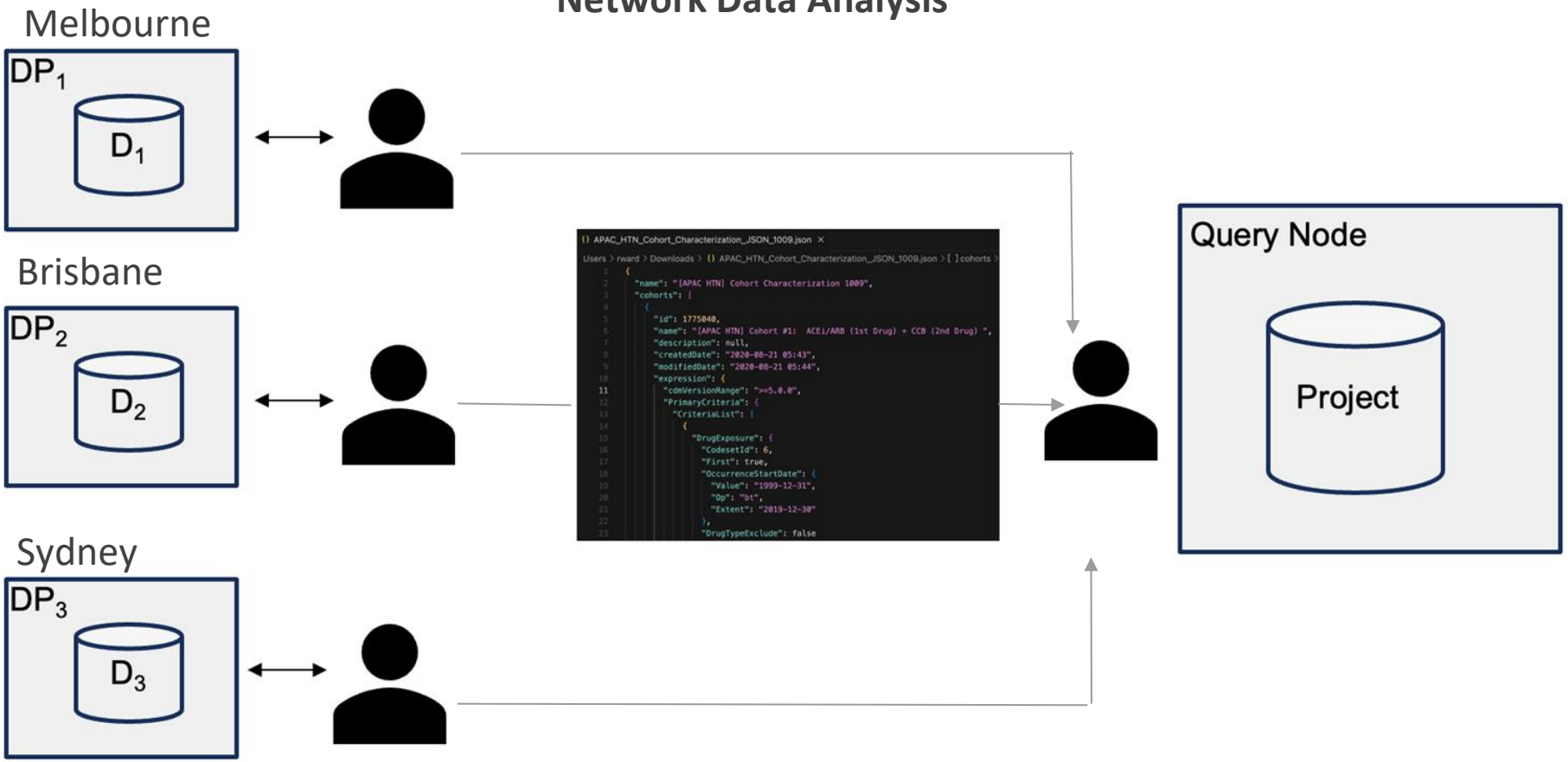
Background

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

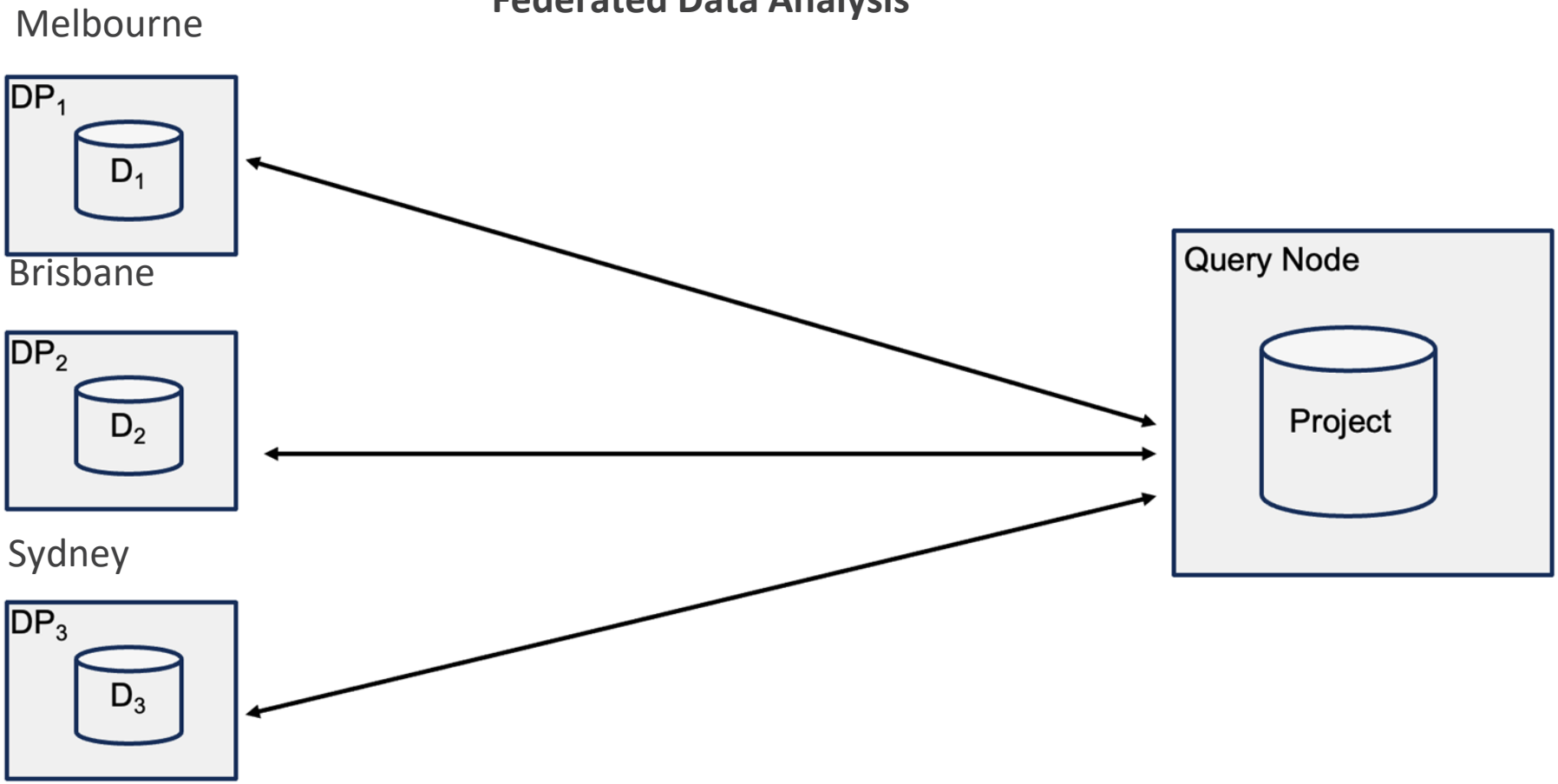
Methods

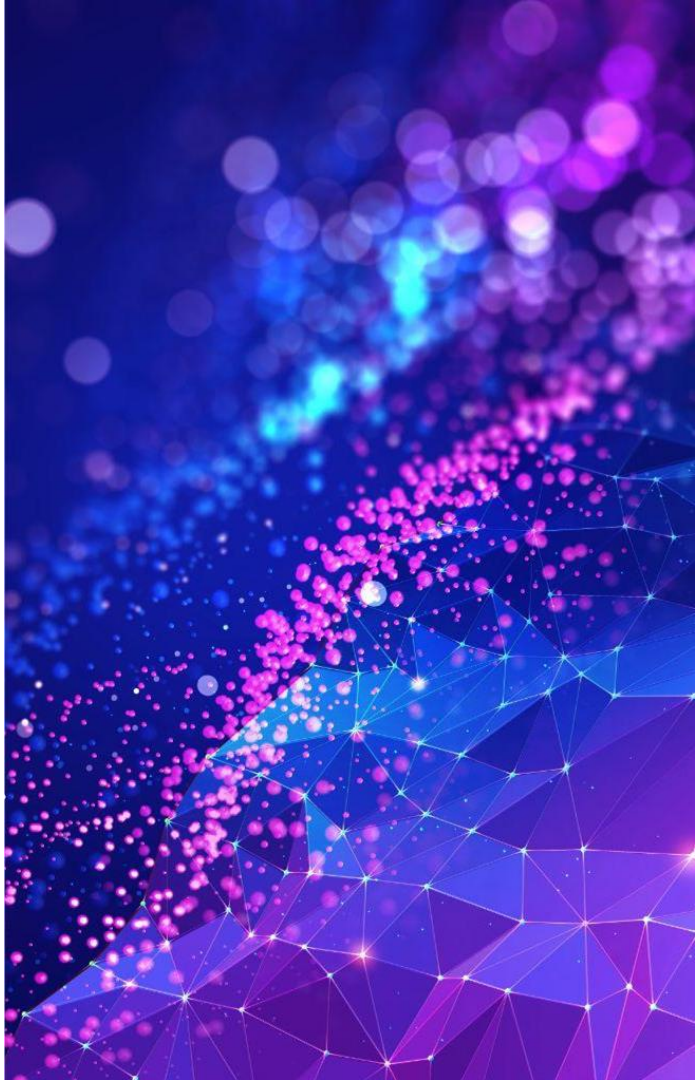
We developed a comprehensive framework for real-world evidence that enables comparative effectiveness and safety evaluati

Network Data Analysis



Federated Data Analysis





Thanks

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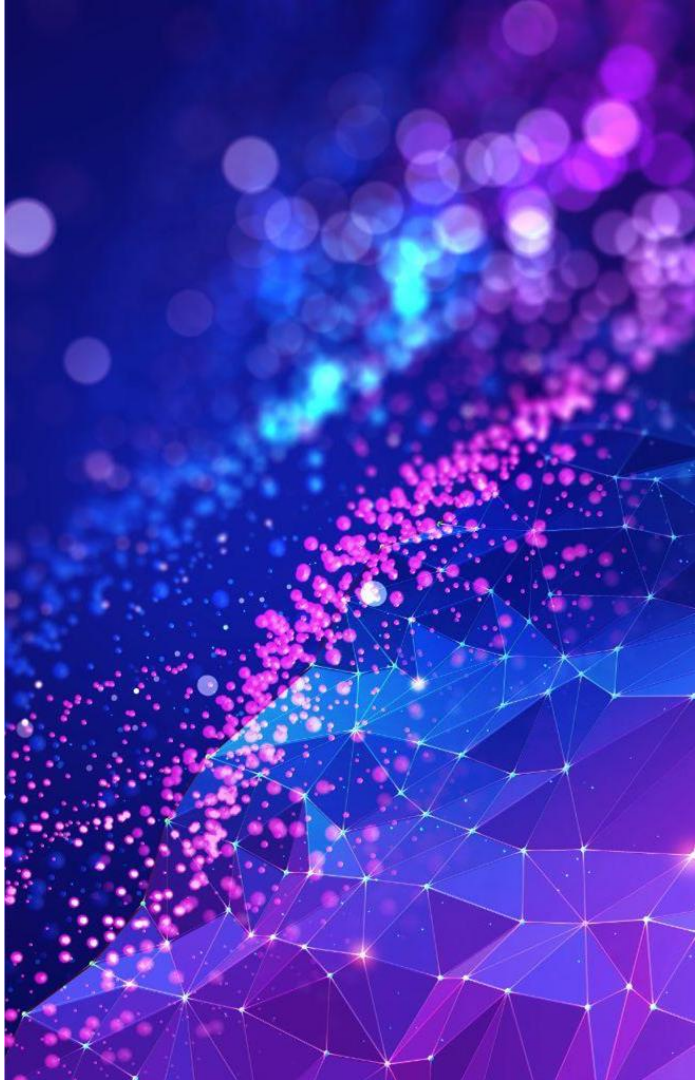

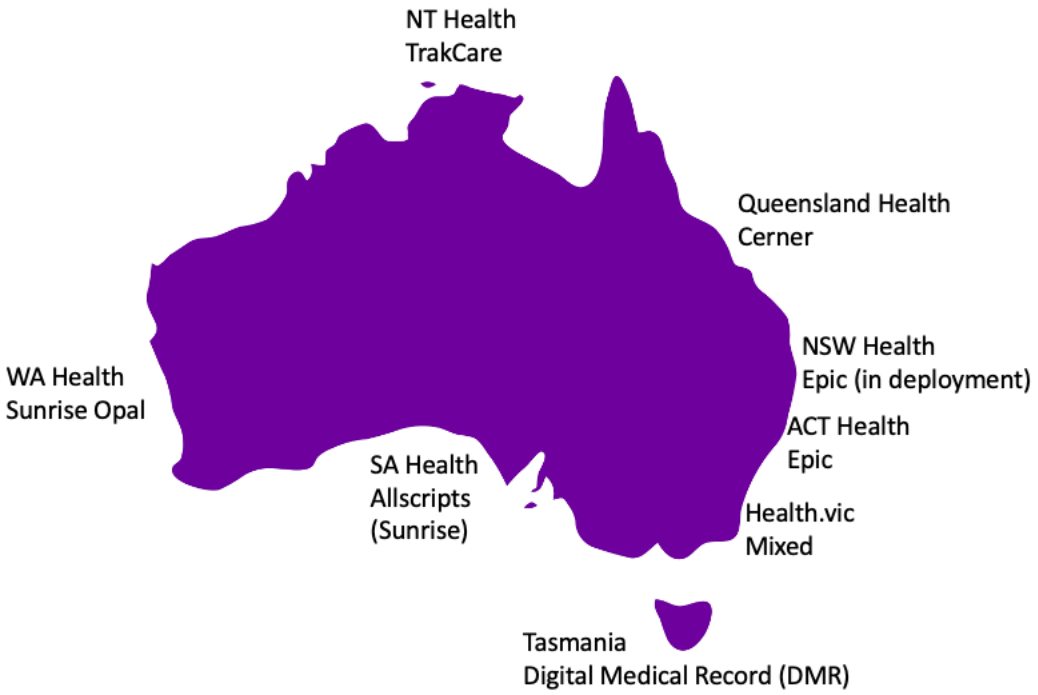

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Medical research today sits at the intersection of two powerful forces: the need for secure and private data handling, and the opportunity for large-scale, collaborative research.

TREs offer a solution by addressing these forces in a balanced, cohesive manner. Through this concept of *convergence*,

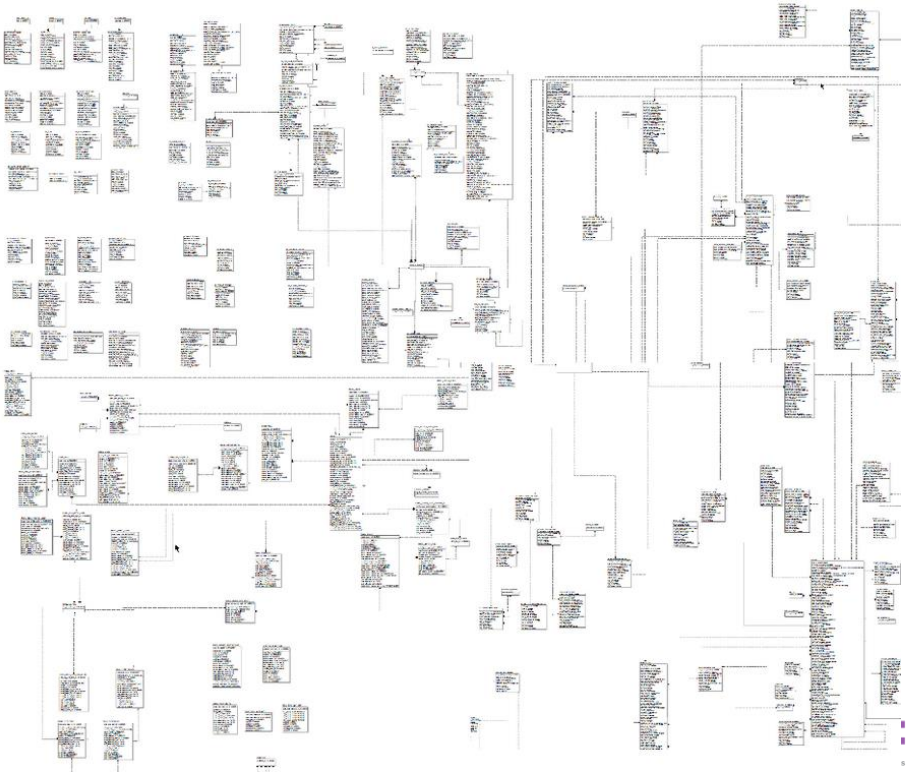
TREs allow us to uphold the highest standards of data protection, while facilitating meaningful, large-scale medical analyses.

Federation: The Power of Distributed Analysis (2 minutes)**
Federation is the ability to run analyses across multiple TREs without centralising data. In medical research, data often exists in silos—across hospitals, research centres, and regions. Traditionally, merging these datasets required cumbersome and risky transfers. With TREs that support federation, we change that.

Federated querying allows researchers to access data across institutions without moving it. This means that researchers can run analyses on distributed datasets, reducing the risks associated with large-scale data transfers. Data sovereignty is preserved—each institution maintains control over its own data while allowing approved researchers to perform analyses on a broader scale.

This approach mitigates risks like data breaches, ensures compliance with regional data regulations, and provides a scalable model for collaborative research. To make this truly effective, however, we need a common language for data—and that's where OMOP comes in.

Data Integration: Cerner Millennium Data Model



The OMOP Common Data Model: Standardising Data for Research (2 minutes)**
The Observational Medical Outcomes Partnership (OMOP) Common Data Model plays a critical role in this convergence. It standardises how healthcare data is structured and stored, which makes federated analysis across different TREs feasible and reliable.

OMOP ensures that data from various sources—whether from a hospital in Sydney or a research centre in Melbourne—can be queried and interpreted in the same way. This harmonisation allows researchers to execute complex queries with consistency, ensuring that insights derived from the data are both accurate and comparable across institutions.

By integrating OMOP with TREs and federated learning, we can significantly accelerate medical discoveries. Researchers no longer need to worry about inconsistencies between datasets; they can focus on the science.

Ongoing Work and Future Goals (1 minute)**

This work is still in progress, but the aim is to establish a comprehensive national framework for TREs. Ideally, we will see widespread adoption across the country, with standardised agreements among data custodians at both state and federal levels.

The potential here is enormous. By aligning privacy, security, federation, and common data models, we create a research ecosystem where advanced analyses can be done securely, across institutions, without compromising patient confidentiality.

Conclusion (0.5 minutes)**

In conclusion, the convergence of security, privacy, federation, and common data models within TREs represents a paradigm shift in how we conduct medical research. This integrated approach empowers researchers with the tools they need for collaborative, secure, and large-scale medical analysis, while ensuring that data integrity and privacy are never compromised.

The Concept of Trusted Research Environments (2 minutes)**
TREs function as secure enclaves where sensitive health data can be analysed without compromising confidentiality. They adhere to the Five Safes principles:

1. **Safe People** – ensuring only authorised individuals access the data.
2. **Safe Projects** – data is used for legitimate, ethical research.
3. **Safe Settings** – secure infrastructure where data is stored.
4. **Safe Data** – appropriate levels of anonymisation or de-identification.
5. **Safe Outputs** – ensuring results don't compromise privacy.

These principles safeguard patient information and build trust among stakeholders. Researchers can perform comprehensive analyses without handling the raw, sensitive data directly.

By implementing these principles within TREs, we address some of the most critical concerns in medical research today—privacy and security. But TREs are not just about secure data; they are about enabling research without friction, and that brings us to the concept of federation.

			the value of keeping humans-in-the-loop, Alexis Tindall
12:20 – 12:40		Empowering Cloud-Ready Researchers: Insights from 30+ Training Experiences Emma Arrigo	Applied GenAI for Scientific Research Jasper Wang
			Convergence: Harmonising Security, Privacy, Federation, and Common Data Models in Medical Research Roger Ward, Gnana Bharathy