HDA

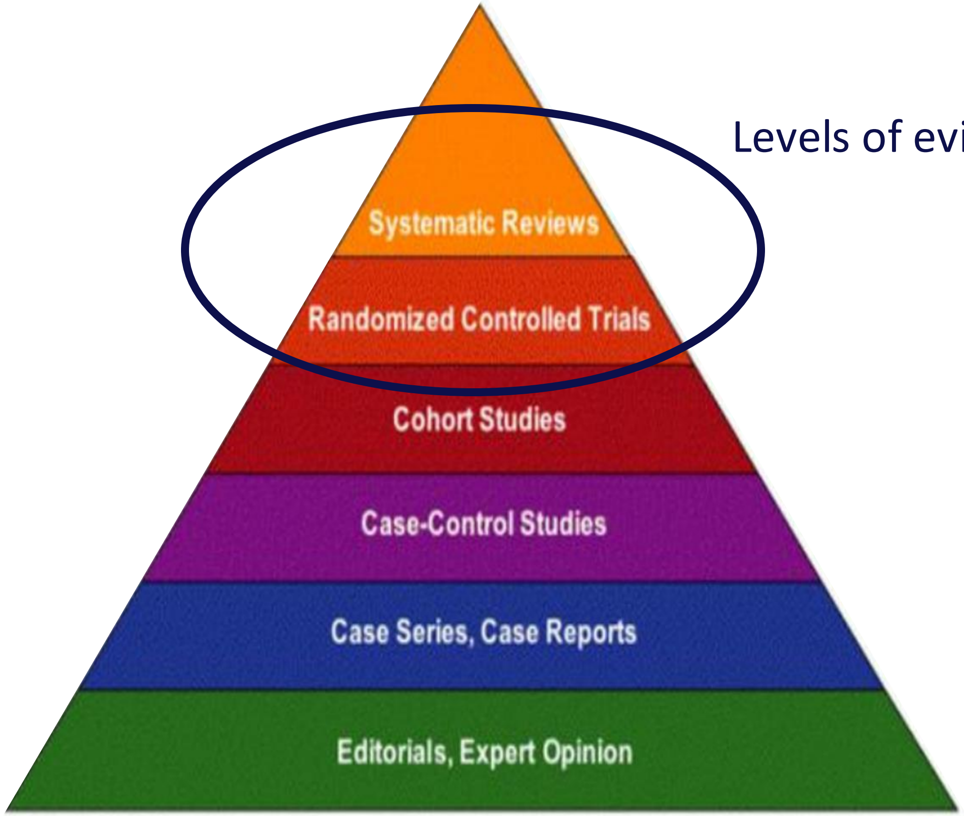
FHIN

Federated Health Innovation Network

Annelies Verbiest MD PhD

On behalf of FHIN ngo

HDA



Levels of evidence

What if…

FHIN

The care for every citizen/patient is personalized, based on all known information about the patient and the outcomes of billions of patients around the world?

Population-Level Effect Estimation

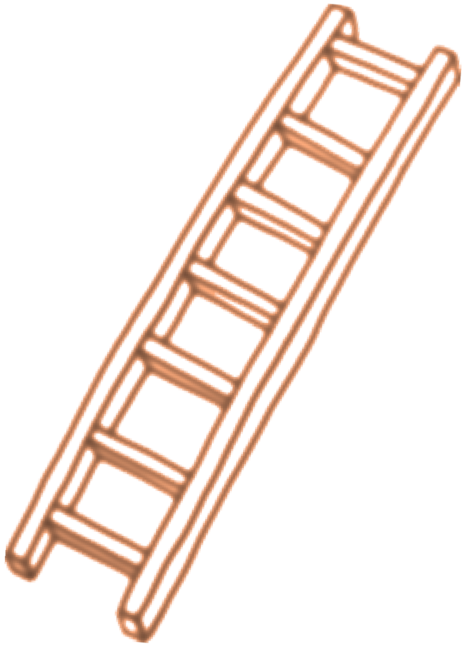
- What are the causal effects?

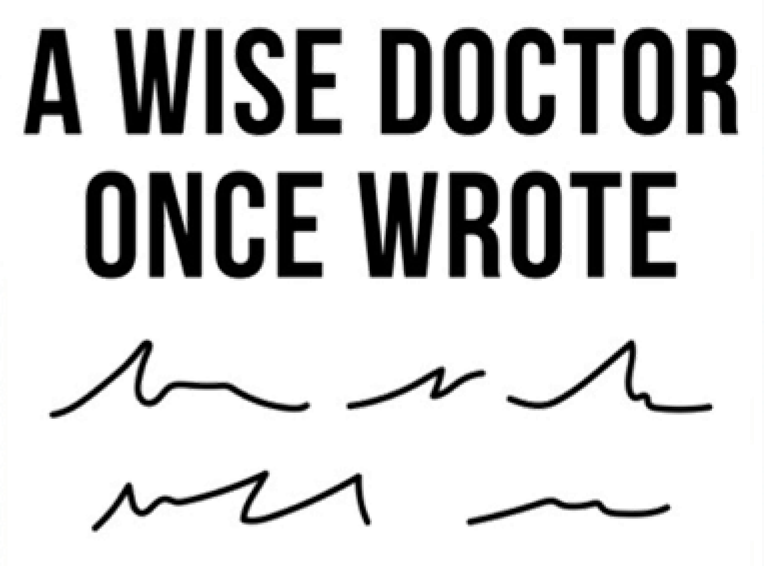
Patient-Level Prediction

- What will happen to me?

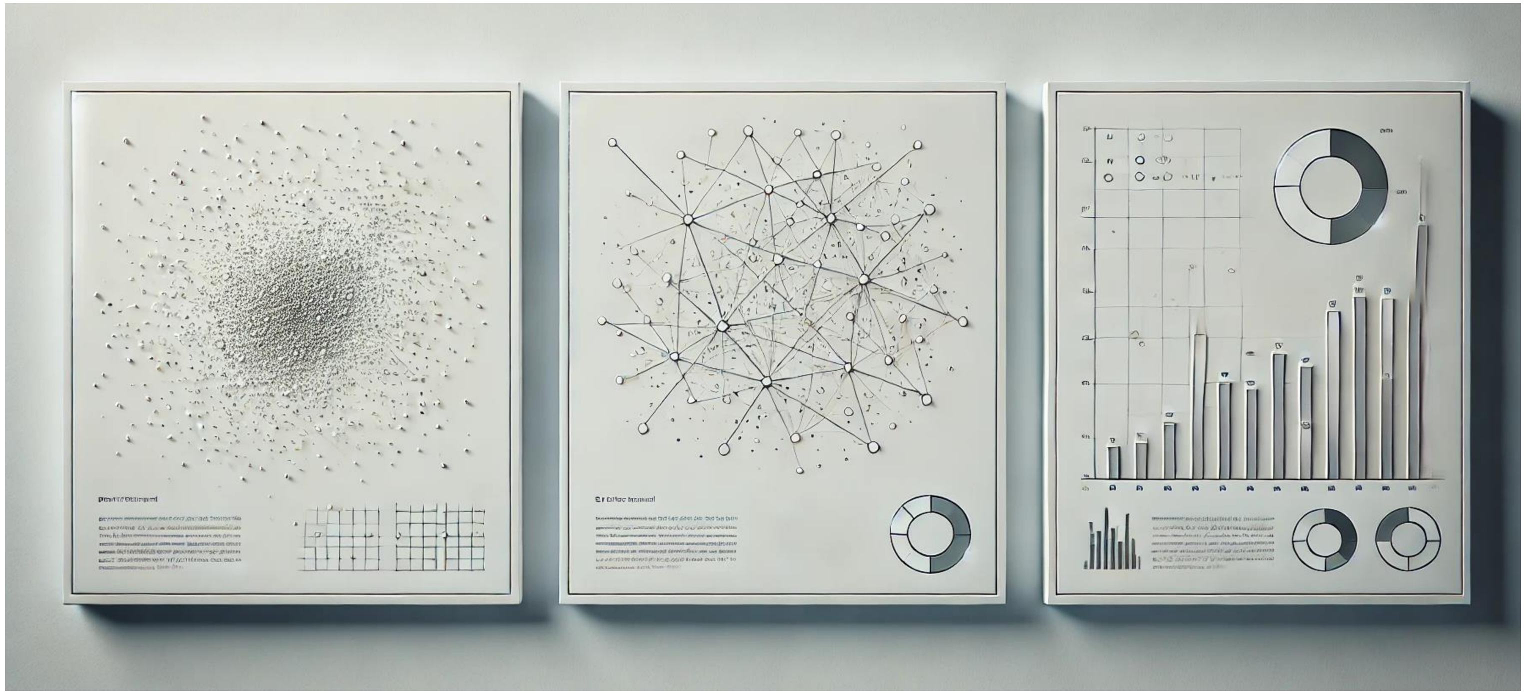
Clinical Characterisation

- What happened to the patients?

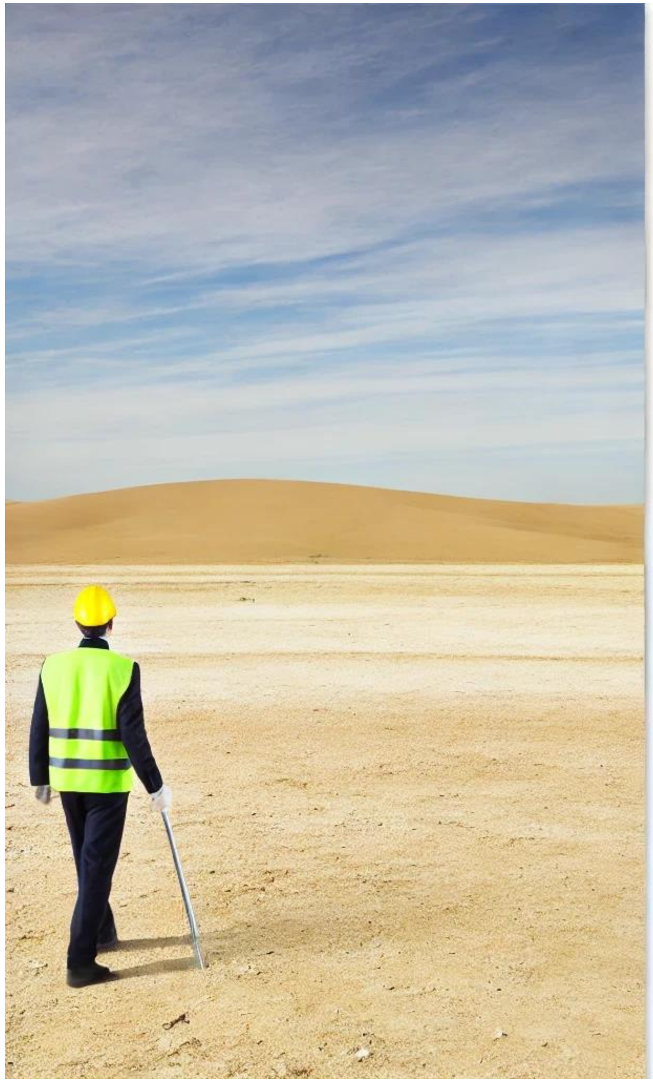



A WISE DOCTOR
ONCE WROTE

Information
≠
Wisdom



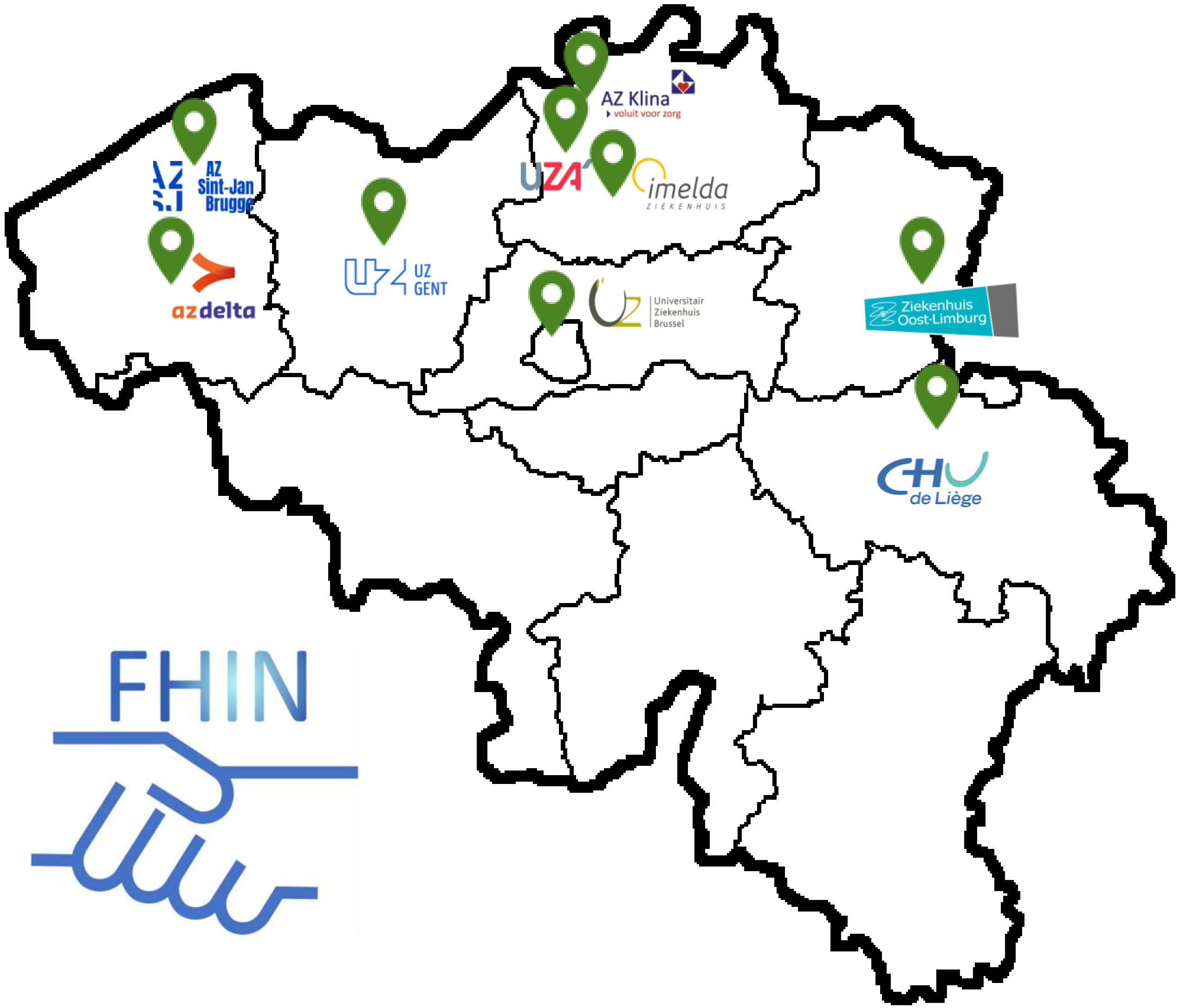
HDA



Fit-for-purpose data and standardized analytics are crucial

2023 FOD CALL DATA CAPABILITIES

1million EUR



FHIN

HDA

FHIN mission

FHIN aims to improve the use and reuse of healthcare data beyond the individual caregiver context to create innovative solutions in order to obtain the best possible outcomes for patients at the lowest cost, with accessible healthcare for all.

FHIN SCOPE

NEED

The massive piles of data that healthcare providers are storing makes healthcare one of the best sectors to learn new insights and **make computers enable early disease detection**, **support decision making** based on all historical medical data, introduce more **personalized and precision care** and foster **disease prevention**.

GOAL

1 **standardization** on multiple levels;
-data quality enhancement
-contextual relationship standardization
-unified tooling (unified open-source software tools)
-bias reduction through collaboration
2 drift-free & FAIR exchange for enhanced patient outcomes
3 quality assurance for context & clinical data linked OMOP CDM
4 **efficient multicentric data platform**
5 **equal partnership** to foster trust among 9 partners
6 alignment with certification and MDR compliance
7 **internationally scalable** network

ACTION

*9 hospitals with standardized and automated ETL (Extract, Transform, Load) tool RiaB® [1], transforming EMP (Electronic Medical Record) data into OMOP CDM (Observational Medical Outcomes Partnership Common Data Model) format.
*Each hospital maintains its own OMOP instance & shares insights via federated learning.
*Submit your project proposals to our FHIN data network where we address all data-related questions.

RESTRICTION & BOUNDARIES

Convert more than minimal dataset to showcase scalability

PROJECT WORKFLOW

FHIN

1
UNLOCKING HEALTHCARE DATA

- DATA ACCESS
- INFRASTRUCTURE & DATABASE SETUP → blueprint for cloud setup

RABBIT IN A BLENDER

2
CREATING A SHARED LANGUAGE

- GENERATE & DOWNLOAD VOCABULARIES
- PERFORM VOCABULARY UPLOAD TO OMOP → DATA CAN BE TRANSLATED

RABGIN

3
WRITING RULES TO MOVE DATA

- WRITE INSTRUCTIONS (QUERIES) TO TRANSFORM DATA & DETERMINE DESTINATION

4
CONNECTING THE DOTS

- CONNECTS DATA FROM YOUR SOURCES TO THE OMOP VOCABULARY
- SEMANTIC CHALLENGE
- FIT INTO STANDARD VOC
- CREATE MAPS OR TRANSLATIONS FOR UNIQUE TERMS

KEUN

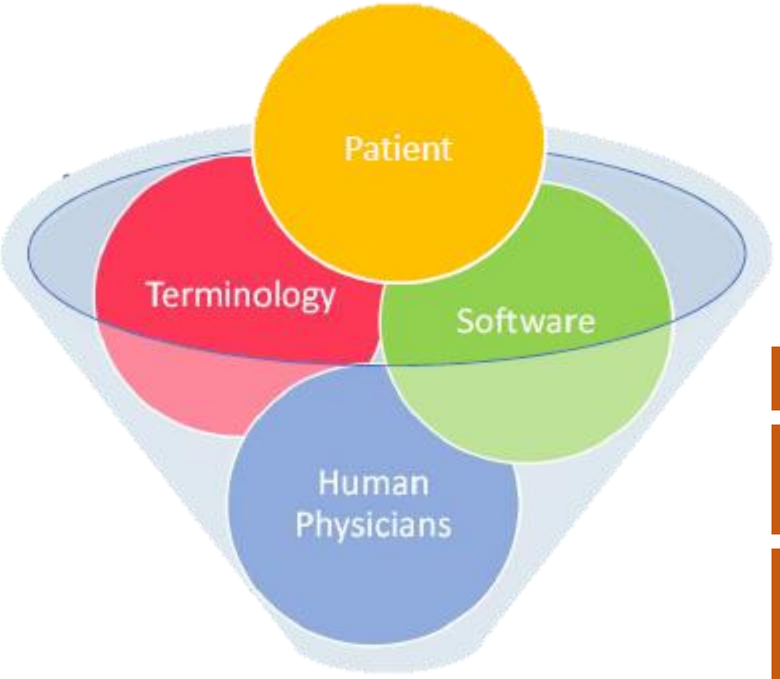
5
FINALIZING THE TRANSFORMATION

- APPLY RULES (3) & MAPS (4) TO TRANSFORM RAW DATA INTO OMOP CDM
- DATA IN OMOP TABLES READY FOR RESEARCH
- DATA QUALITY

RABBIT IN A BLENDER

SEMANTIC CHALLENGE

PATIENT SITUATION



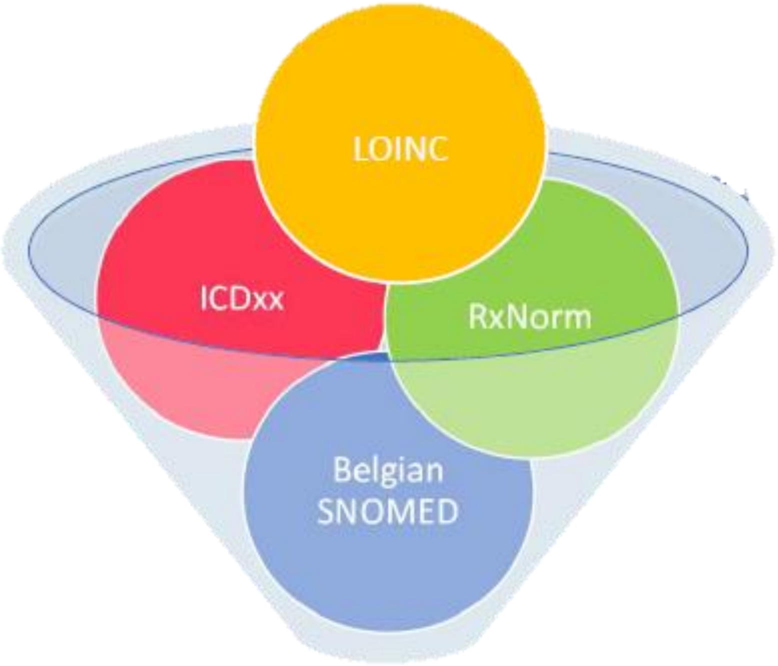
N REGISTRATION VARIATIONS

MAPPING

1 WHEN ARE REGISTRATIONS SEMANTICALLY SIMILAR?

2 WHEN ARE REGISTRATIONS SEMANTICALLY SIMILAR TO A STANDARDIZED CONCEPT?

MEDICAL TERMINOLOGIES



LIST OF M STANDARDIZED CONCEPTS

PROJECT WORKFLOW RESTRICTING THE TARGETS

- Hyperthesaurus (UMLS, OMOP)
- Disease Refsets
  - * https://www.ehealth.fgov.be/standards/fhir/index.html
  - * Belgian SNOMED diagnosis refset
- Structure in a pre-defined framework for:
  - Data definition: what is it?
  - Data retrieval: where is it stored?

PROJECT WORKFLOW example LUNG

PERSON TABLE
- AGE

DEATH TABLE

PROCEDURE OCCURRENCE
- RADIOTHERAPY

CONDITION OCCURRENCE
- LUNG DIAGNOSES
- COMORBIDITIES

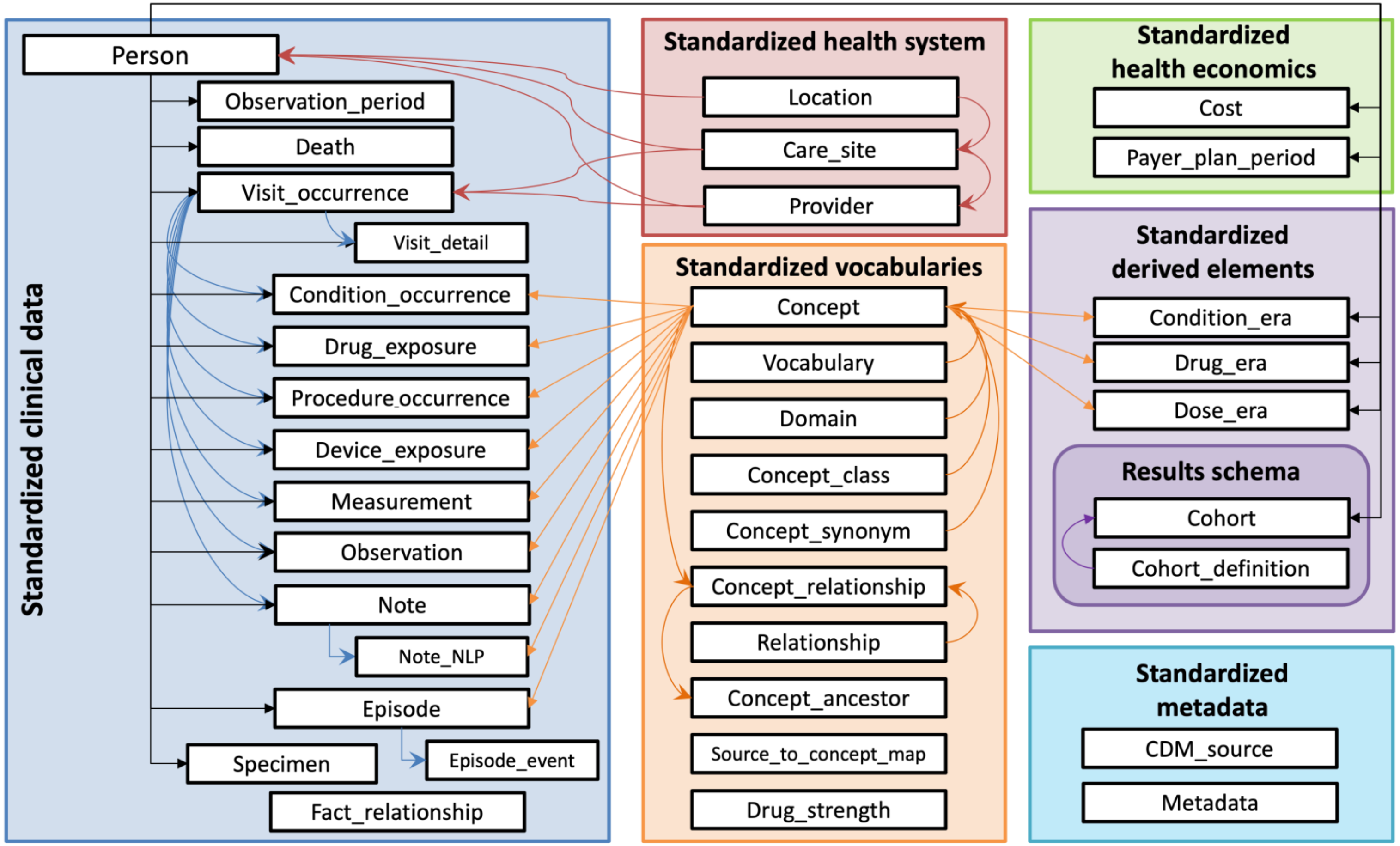
MEASUREMENT TABLE
- LAB RESULTS
- BMI

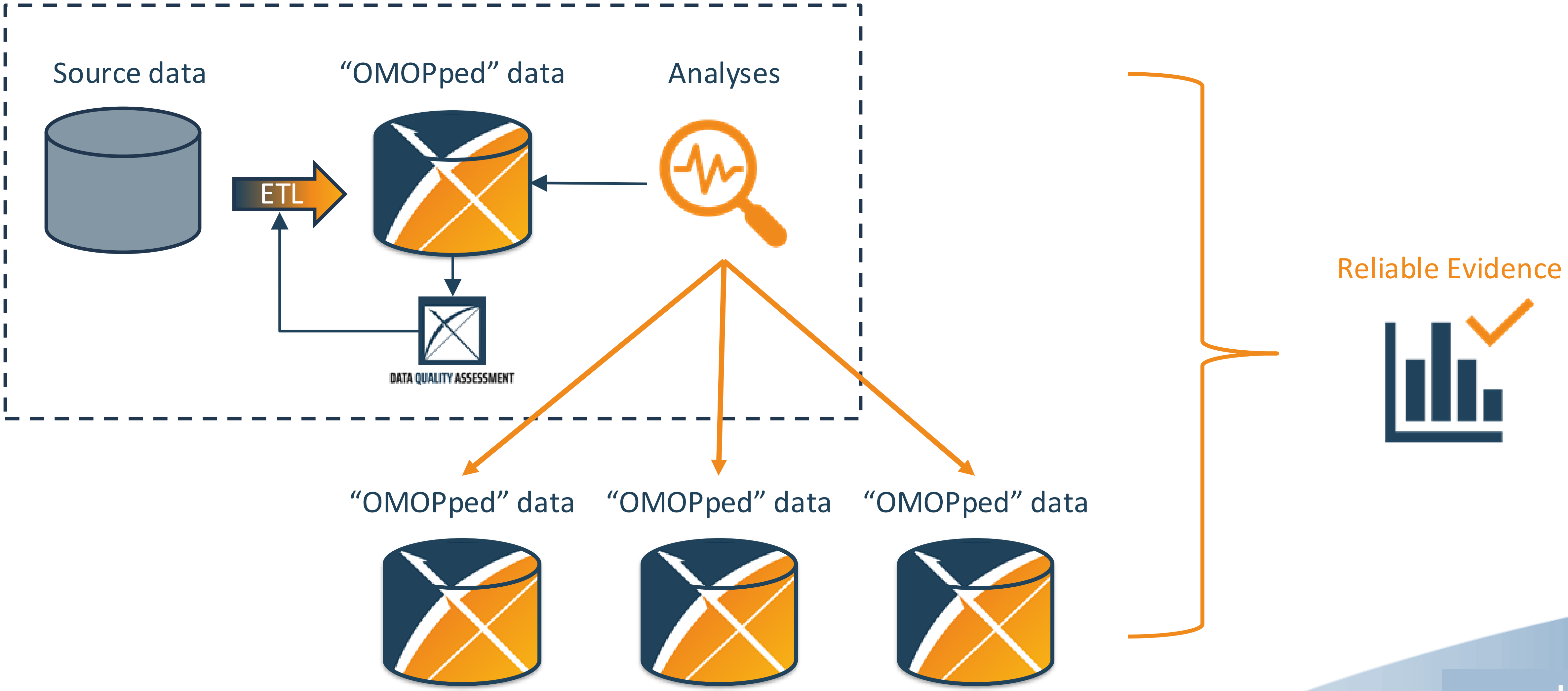
DRUG EXPOSURE TABLE
- CHEMOTHERAPY
- IMMUNO THERAPY
- TARGETED THERAPY

OBSERVATION TABLE
- SMOKING STATUS
- WHO SCORE
- CLINICAL TNM

OMOP Common Data Model (CDM) v5.4

> Ingests existing standardized vocabularies.
> Allows analyses across vocabularies, disease areas and perspectives (drugs, health economics…)




Source data
"OMOPped" data
Analyses
ETL
DATA QUALITY ASSESSMENT
"OMOPped" data
"OMOPped" data
"OMOPped" data
Reliable Evidence

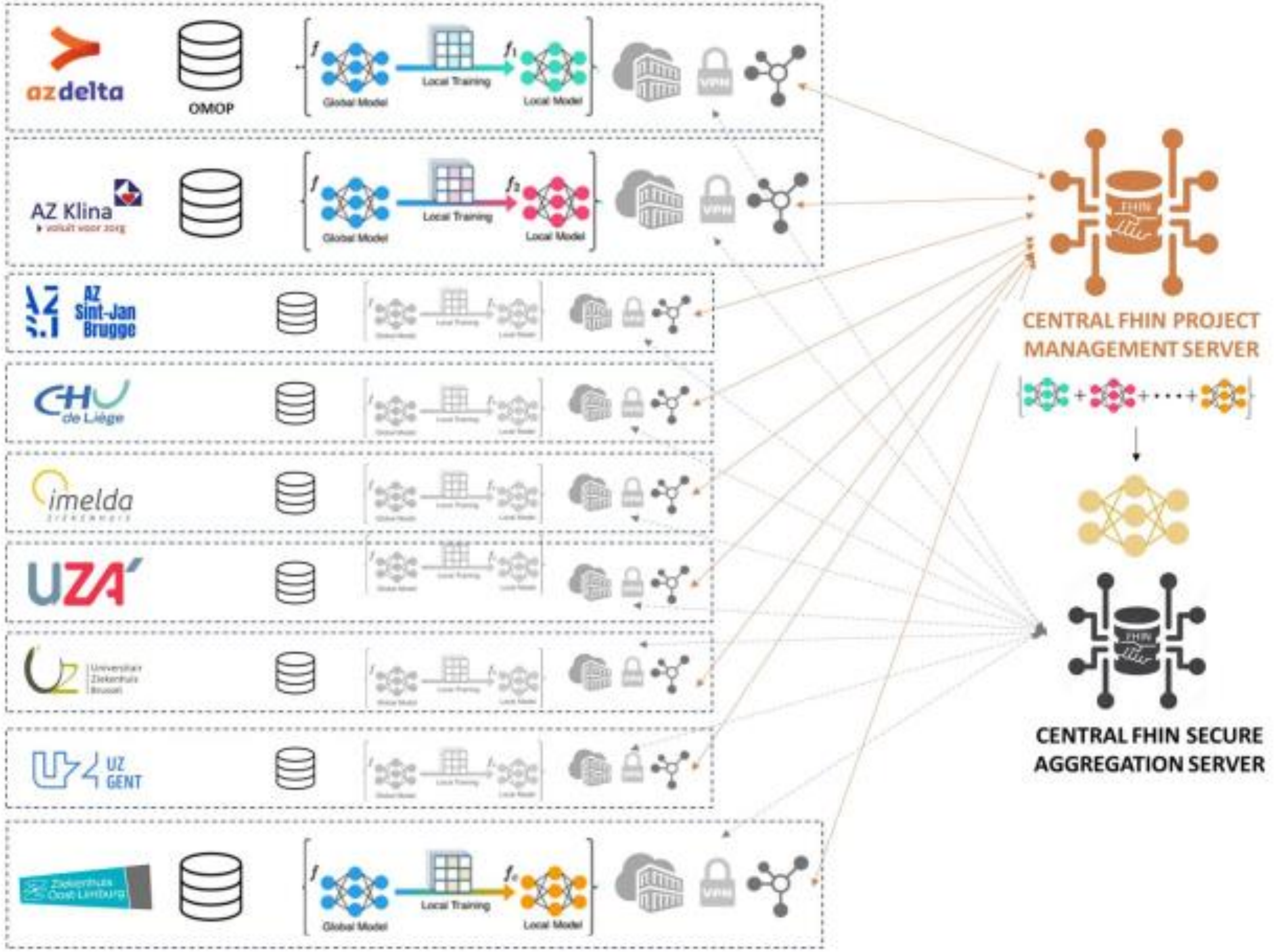
And please note…

SNOMED-CT	→	Medical terminology
FHIR	→	Data exchange
OMOP-CDM	→	Data analytics

[Powering clinical data analytics with SNOMED CT (youtube.com)]

By OHDSI community using OMOP-CDM tooling

Federated Data Platform – privacy by design



FEDERATED TECHNOLOGY: TRAIN AI MODEL

- TECHNICAL NODE SETUP
- CLINICAL PROTOCOL
- ALGORITHM WORKFLOW
  - DEVELOPMENT
    - DATA RELATED TASKS
      - 1 DEFINE COHORT
      - 2 GATHER BASELINE DATE
      - 3 FEATURE EXTRACTION
      - 4 DEFINE TARGET VARIABLE
      - 5 DATASET READY FOR AI
    - MODEL RELATED TASKS
    - AGGREGATION TASKS
    - WORKFLOW ORIENTED TASKS
  - DOCKERIZATION
  - TASK SUBMISSION
  - APPROVAL NODES
  - LOCALLY EXECUTION
  - AGGREGATION
  - ITERATIONS
  - RESULTS

FHIN SCOPE

NEED

The massive piles of data that healthcare providers are storing makes healthcare one of the best sectors to learn new insights and **make computers enable early disease detection**, **support decision making** based on all historical medical data, introduce more **personalized and precision care** and foster **disease prevention**.

GOAL

1 **standardization** on multiple levels;

-data quality enhancement

-contextual relationship standardization

-unified tooling (unified open-source software tools)

-bias reduction through collaboration

2 drift-free & FAIR exchange for enhanced patient outcomes

3 quality assurance for context & clinical data linked OMOP CDM

4 **efficient multicentric data platform**

5 **equal partnership** to foster trust among 9 partners

6 alignment with certification and MDR compliance

7 **internationally scalable** network

ACTION

*9 hospitals with standardized and automated ETL (Extract, Transform, Load) tool RiaB® [1], transforming EMP (Electronic Medical Record) data into OMOP CDM (Observational Medical Outcomes Partnership Common Data Model) format.

*Each hospital maintains its own OMOP instance & shares insights via federated learning.

*Submit your project proposals to our FHIN data network where we address all data-related questions.

RESTRICTION & BOUNDARIES

Convert more than minimal dataset to showcase scalability

It’s all about collaboration!

OHDSI community

- ➢ Standardized analytical tooling
- ➢ Broad community support

OHDSI Belgium community

- ➢ 170 subscribers mailing list
  Ilse.vermeulen@uhasselt.be
- ➢ 70 institutions
- ➢ 15 EHDEN data partners

DARWIN EU

levilo Health
Hefboom voor betere kwaliteit van zorg

inah
Institute of Analytics for Health

FHIN

HDA

FHIN

Federated Health Innovation Network

Formal establishment FHIN VZW
18 december 2024 - Roeselare

DATA IS A MEANS, NOT A GOAL
HEALTHCARE OF THE FUTURE: NURSING, MEDICINE and AI

ESTABLISHMENT FHIN VZW

REAL WORLD USE CASES

- LUNG CANCER

Predict six-week mortality at start of first treatment as a binary outcome (died/survived)

Enter patientnumber SEARCH

Patient information

General		Comorbidities		Lab results	
Variable	Value	Variable	Value	Variable	Value
Age	67	Other cancer	no	Haemoglobin (g/dl)	12.3
Gender	V	Heart disease	yes	Calcium (mmol/l)	2.37
Stage	IV	Chronic kidney disease	yes	LDH (u/l)	879
Histology	Squamous cell carcinoma	Chronic pulmonary disease	no	CRP (mg/l)	8.6
WHO performance score	2	Cerebrovasculair accident	no	Thrombocytes (10^3/µl)	365
Mutation	None	Diabetes	no	Leukocytes (10^3/µl)	10.73
BMI	16.4	Liver disease	no	CKD EPI (ml/min)	79
Smoking status	Smoker	Peripheral vascular disease	no		
Used strong opioids during the past month	no	Hypertension	yes		

Predictions

	Mortality prediction
Probability for negative outcome 6 weeks after treatment start	74.98%
Probability for negative outcome 3 months after treatment start	50.49%
Probability for negative outcome 6 months after treatment start	21.95%
Probability for negative outcome 1 year after treatment start	50.99%

Therapy options

B-6W	6W-3M	3M-6M	6M-1Y	
				Probability for negative outcome 6 weeks after treatment start
				Probability for negative outcome 3 months after treatment start
				Probability for negative outcome 6 months after treatment start
				Probability for negative outcome 1 year after treatment start

REAL WORLD USE CASES

- LUNG CANCER

Feasibility project with FHIN and pharma consortium

“To explore the feasibility to describe the NSCLC patient care pathway follow-up at the hospital using existing structured data and hardcoded milestones and secondly to identify the areas of improvement through benchmarking versus best practices, guidelines and waiting time standards. To ultimately improve patient care and outcomes.”

REAL WORLD USE CASES

- PROSTATE CANCER

PREDICT GLEASON SCORE (grade; aggressiveness; guiding treatment decisions)

Algemeen		Screening		Laboresultaten	
Variabele	Waarde	Variabele	Waarde	Variabele	Waarde
Leeftijd (jaren)	72	DRE	Abnormaal	PSA (ng/ml)	3.9
BMI (kg/m^2)	29.06	TRUS	Normaal	PSA densiteit (ng/ml^2)	0.144
Genetisch risico		MR volume prostaat (ml)	27	PHI	81.7
Vorig biopt	Neen	PI-RADS (max)	4	PHI densiteit (ml^-1)	3.026
		Risico op PCa (%)	72		
		Risico op hooggradig PCa (%)	35		

2014012207 ZOEK

START SUMMERSCHOOL 2023

PHIDESS
Predictive Health Informatics and Data Engineering
Summer School

HDA

FHIN wants to achieve the best patient outcomes

→ Standardized data, processes and analytics
→ Privacy preservation

But also

- Human-centric
- Community & equal partnership
- Transparancy
- Open science

Only-once approach at the level of data capture allows for short feed-back loops to the care teams, as well as broad reuse and self-correction by all stakeholders

HDA

CALL TO ACTION

FHIN

Federated Health Innovation Network

FHIN Welcomes
Non-Profit Healthcare Organizations

Mail fhin@fhin.be to join the FHIN initiative

HDA