# OMOP Common Data Model and Standardized Vocabularies

15- September-2019

Christian Reich, MD, PhD, Mui van Zandt
Erica A. Voss, MPH, PMP, Hamed Abedtash, PharmD, PhD
Dmitry Dymshyts, MD, Melanie Philofsky, RN, MS
Don Torok, MS

OHDSI
OBSERVATIONAL HEALTH DATA SCIENCES AND INFORMATICS


# After the Tutorials, you will know…

1. History of OMOP, OHDSI
2. How the Standardized Vocabulary works
3. How to find codes and Concepts
4. How to navigate the concept hierarchy
5. The OMOP Common Data Model (CDM)
6. How to use the OMOP CDM

# Agenda

| Section | Speaker | Time | Item(s) |
|---|---|---|---|
| Registration | - | 8:00- 9:00<br>(1 hour) | |
| Introduction | Christian | 9:00 - 10:00<br>(1 hour) | Introductions and Ground Rules<br>Foundational<br>• History of OMOP<br>• Why and How<br>• Birth of OHDSI<br>Introduction to OMOP Common Data Model<br>OHDSI Community<br>Example of Remote Study<br>VM Overview |
| Vocabulary –<br>Part 1 | Hamed | 10:00 – 10:30<br>(30 min) | Basic Relationship |
| Break | - | 10:30 - 10:45<br>(15 min) | |
| Vocabulary –<br>Part 2 | Dima | 10:45- 12:30<br>(1 hour & 45 min) | Ancestors & Descendants<br>How does it work for Drugs<br>SQL Examples |

# Agenda (cont.)

| Section | Speaker | Time | Item(s) |
|---|---|---|---|
| Lunch | - | 12:30 - 13:30<br>(1 hour) | - |
| Vocabulary –<br>Part 3 | Melanie | 13:30 - 14:00<br>(30 min) | Continued |
| Common<br>Data Model | Don | 14:00 - 15:35<br>(1 hour & 30 min) | History of the model<br>In depth discussion of model<br>Era discussion<br>Real World Scenario<br>ETL Pitfalls |
| Break | - | 15:30 - 15:45<br>(15 min) | - |
| CDM Examples | Mui / Erica | 15:45 - 17:00<br>(1 hour & 16 min) | Leveraging OHDSI Tools (GitHub/Forums/ Working Group)<br>Exercises<br>OHDSI Community<br>Conclusion Game |

# Instructors

| Christian Reich, MD, PhD | Mui van Zandt | Erica A. Voss, MPH, PMP | Hamed Abedtash, PharmD, PhD |
|---|---|---|---|
|  |  |  |  |
| **Dmitry Dymshyts, MD** | **Melanie Philofsky, RN, MS** | **Don Torok, MS** | |
|  |  |  | |

# Ground Rules

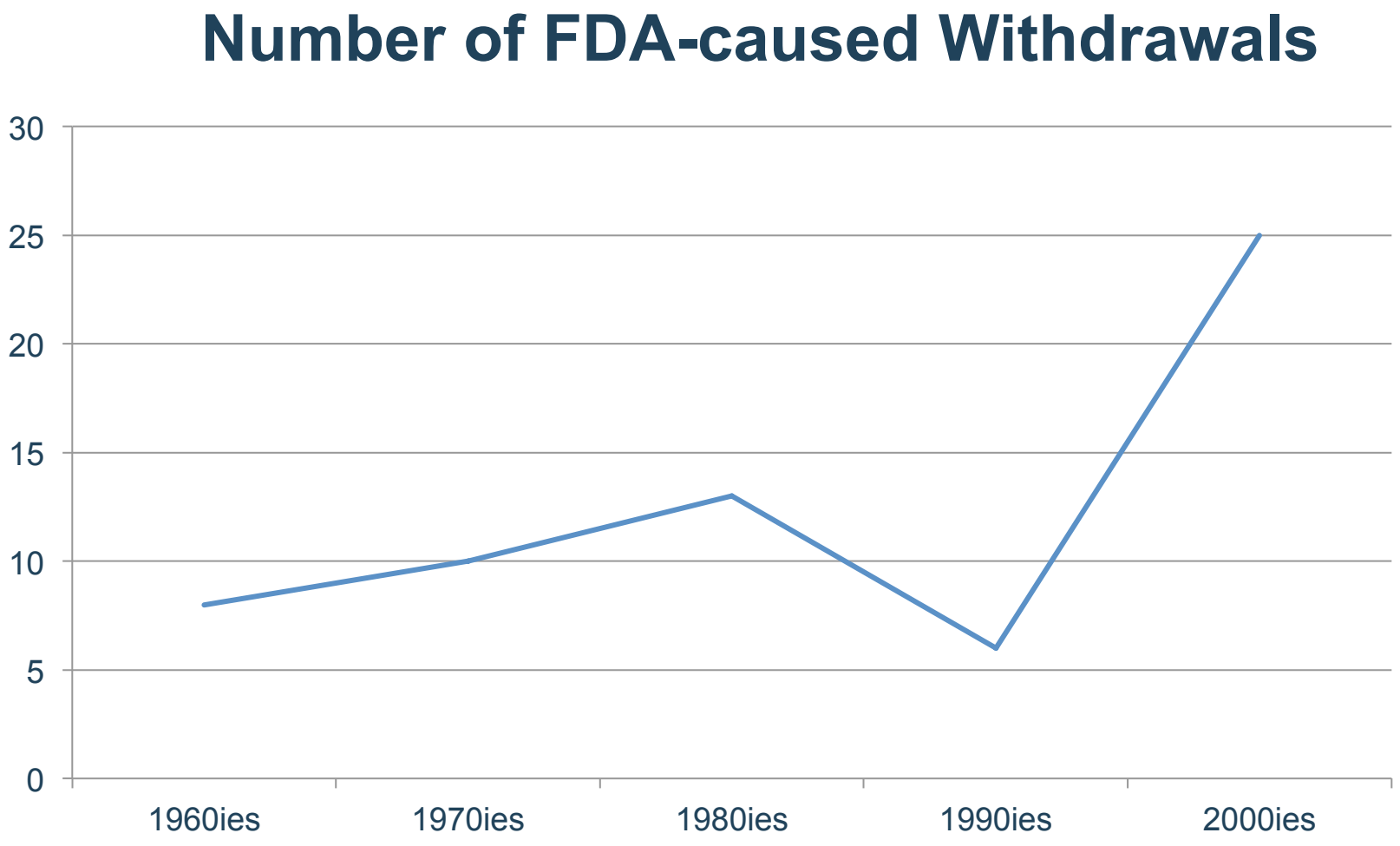
- We are recording today's session.
- We may table some questions if they are too specific.
- If we cannot get the remote desktop working on your machine let's try to buddy you up.  Do not worry the presentation will still walk you through the content.


# Foundational

## What is OMOP/OHDSI? OMOP Common Data Model (CDM) – Why and How

Observational Medical Outcomes Partnership

# FDA Regulatory Action over Time



Observational Medical Outcomes Partnership

# FDAAA calls for establishing Risk Identification and Analysis System

**SEC. 905. ACTIVE POSTMARKET RISK IDENTIFICATION AND ANALYSIS.**

(a) IN GENERAL.—Subsection (k) of section 505 of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 355) is amended by adding at the end the following:

"(3) ACTIVE POSTMARKET RISK IDENTIFICATION.—

"(A) DEFINITION.—In this paragraph, the term 'data' refers to information with respect to a drug approved under this section or under section 351 of the Public Health Service Act, including claims data, patient survey data, standardized analytic files that allow for the pooling and analysis of data from disparate data environments, and any other data deemed appropriate by the Secretary.

"(B) DEVELOPMENT OF POSTMARKET RISK IDENTIFICATION AND ANALYSIS METHODS.—The Secretary shall, not later than 2 years after the date of the enactment of the Food and Drug Administration Amendments Act of 2007, in collaboration with public, academic, and private entities—

"(i) develop methods to obtain access to disparate data sources including the data sources specified in subparagraph (C);

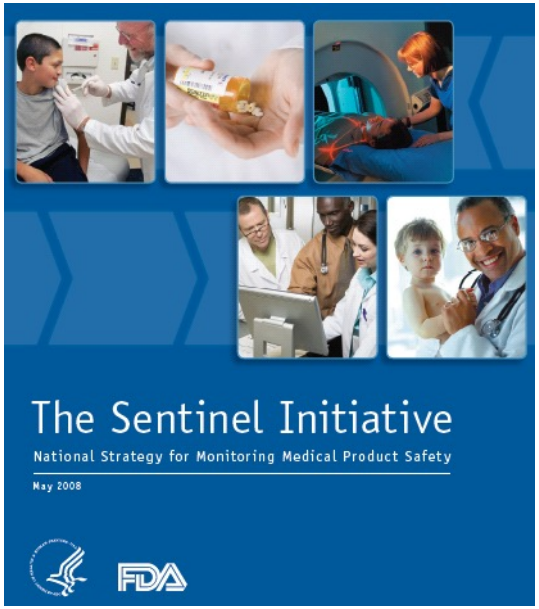
"(ii) develop validated methods for the establishment of a postmarket risk identification and analysis system to link and analyze safety data from multiple sources, with the goals of including, in aggregate—

"(I) at least 25,000,000 patients by July 1, 2010; and

"(II) at least 100,000,000 patients by July 1, 2012; and

"(iii) convene a committee of experts, including individuals who are recognized in the field of protecting data privacy and security, to make recommendations to the Secretary on the development of tools and methods for the ethical and scientific uses for, and communication of, postmarketing data specified under subparagraph (C), including recommendations on the development of effective research methods for the study of drug safety questions.

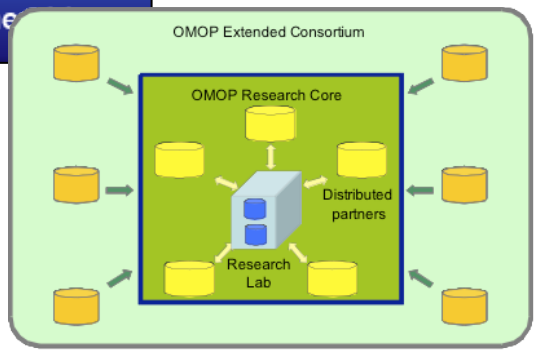
"(C) ESTABLISHMENT OF THE POSTMARKET RISK IDENTIFICATION AND ANALYSIS SYSTEM.—




**Risk Identification and Analysis System:**

a systematic and reproducible process to efficiently generate evidence to support the characterization of the potential effects of medical products from across a network of disparate observational healthcare data sources

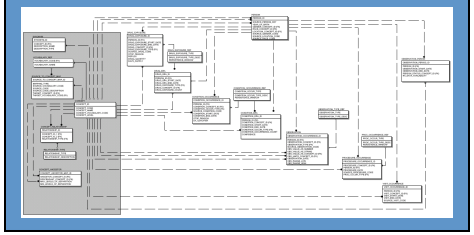
# OMOP Experiment 1 (2009-2010)




- 10 data sources
- Claims and EHRs
- 200M+ lives

- Open-source
- Standards-based

**Common Data Model**



**OMOP Methods Library**

Inception cohort
Case control
Logistic regression

- 14 methods
- Epidemiology designs
- Statistical approaches adapted for longitudinal data

Drug

| Outcome | ACE Inhibitors | Amphotericin B | Antibiotics: erythromycins, sulfonamides, tetracyclines | Antiepileptics: carbamazepine, phenytoin | Benzodiazepines | Beta blockers | Bisphosphonates: alendronate | Tricyclic antidepressants | Typical antipsychotics | Warfarin |
|---|---|---|---|---|---|---|---|---|---|---|
| Angioedema | | | | | | | | | | |
| Aplastic Anemia | | | | | | | | | | |
| Acute Liver Injury | | | | | | | | | | |
| Bleeding | | | | | | | | | | |
| Hip Fracture | | | | | | | | | | |
| Hospitalization | | | | | | | | | | |
| Myocardial Infarction | | | | | | | | | | |
| Mortality after MI | | | | | | | | | | |
| Renal Failure | | | | | | | | | | |
| GI Ulcer Hospitalization | | | | | | | | | | |

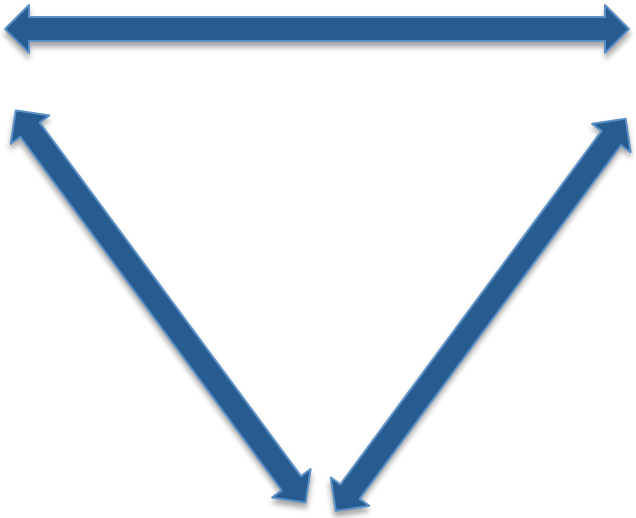
Observational Medical Outcomes Partnership

# OMOP Experiment 2 (2011-2012)

## Observational Data

4 claims databases

1 ambulatory EMR



## Methods

- Case-Control
- New User Cohort
- Disproportionality methods
- ICTPD
- LGPS
- Self-Controlled Cohort
- SCCS

## Drug-outcome pairs

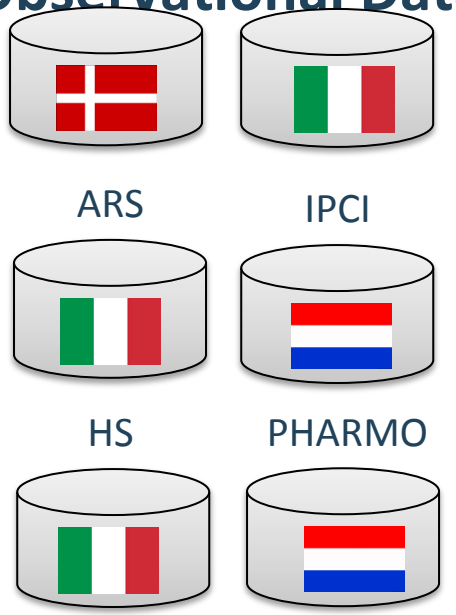
| | Positives | Negatives |
|---|---|---|
| **Total** | 165 | 234 |
| Myocardial Infarction | 36 | 66 |
| Upper GI Bleed | 24 | 67 |
| Acute Liver Injury | 81 | 37 |
| Acute Renal Failure | 24 | 64 |

Observational Medical Outcomes Partnership

# European OMOP Experiment

eu-adr

## Observational Data




## Methods

- Case-Control
- New User Cohort
- Disproportionality methods
- ICTPD
- LGPS
- Self-Controlled Cohort
- SCCS

## Drug-outcome pairs

| | Positives | Negatives |
|---|---|---|
| **Total** | 165 | 234 |
| Myocardial Infarction | 36 | 66 |
| Upper GI Bleed | 24 | 67 |
| Acute Liver Injury | 81 | 37 |
| Acute Renal Failure | 24 | 64 |

Observational Medical Outcomes Partnership

# Ground Truth for OMOP Experiment

isoniazid

fluticasone

indomethacin

clindamycin

| | Positive controls | Negative controls | Total |
|---|---|---|---|
| **Acute Liver Injury** | 81 | 37 | 118 |
| **Acute Myocardial Infarction** | 36 | 66 | 102 |
| **Acute Renal Failure** | 24 | 64 | 88 |
| **Upper Gastrointestinal Bleeding** | 24 | 67 | 91 |
| **Total** | 165 | 234 | 399 |

ibuprofen

loratadine

sertraline

pioglitazone

Criteria for positive controls:

- Event listed in Boxed Warning or Warnings/Precautions section of active FDA structured product label
- Drug listed as 'causative agent' in Tisdale et al, 2010: Drug-Induced Diseases
- Literature review identified no powered studies with refuting evidence of effect

Criteria for negative controls:

- Event not listed anywhere in any section of active FDA structured product label
- Drug not listed as 'causative agent' in Tisdale et al, 2010: Drug-Induced Diseases
- Literature review identified no powered studies with evidence of potential positive association


# Results

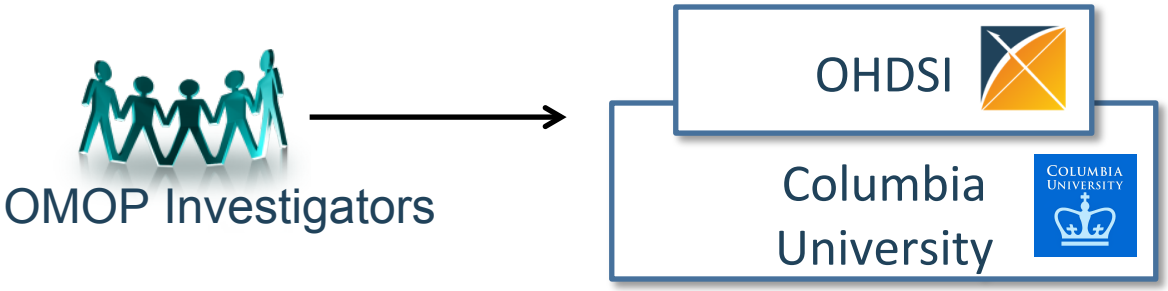
Observational Medical Outcomes Partnership

# Main findings in OMOP experiment

- Heterogeneity in estimates due to choice of database
- Heterogeneity in estimates due to analysis choices
- Except little heterogeneity due to outcome definitions
- Good performance (AUC > 0.7) in distinguishing positive from negative controls for optimal methods when stratifying by outcome and restricting to powered test cases
- Self controlled methods perform best for all outcomes


# Observational Health Data Sciences and Informatics (OHDSI)
# Plans and Ambitions

# Fate of OMOP - OHDSI




- The Observational Health Data Sciences and Informatics (OHDSI) program is a **multi-stakeholder, interdisciplinary collaborative** to create **open-source** solutions that bring out the value of observational health data through large-scale analytics

- OHDSI has established **an international network of researchers and observational health databases** with a central coordinating center housed at Columbia University
  - –Public, Open
  - –Not Pharma-funded
  - –International

http://ohdsi.org

# OHDSI's Mission & Vision

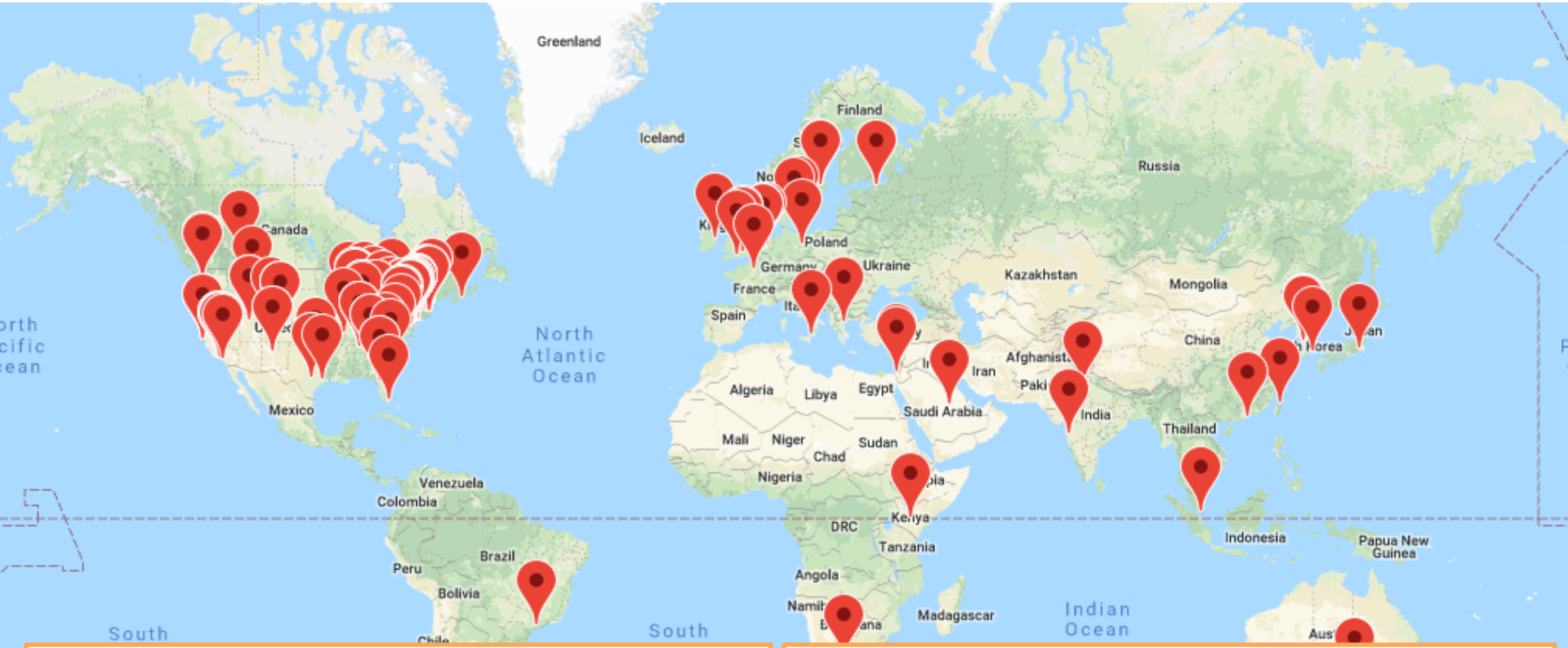
To improve health by empowering a community to collaboratively generate the evidence that promotes better health decisions and better care.

A world in which observational research produces a comprehensive understanding of health and disease.

Join us on the journey

http://ohdsi.org

# OHDSI: a global community




OHDSI Collaborators:

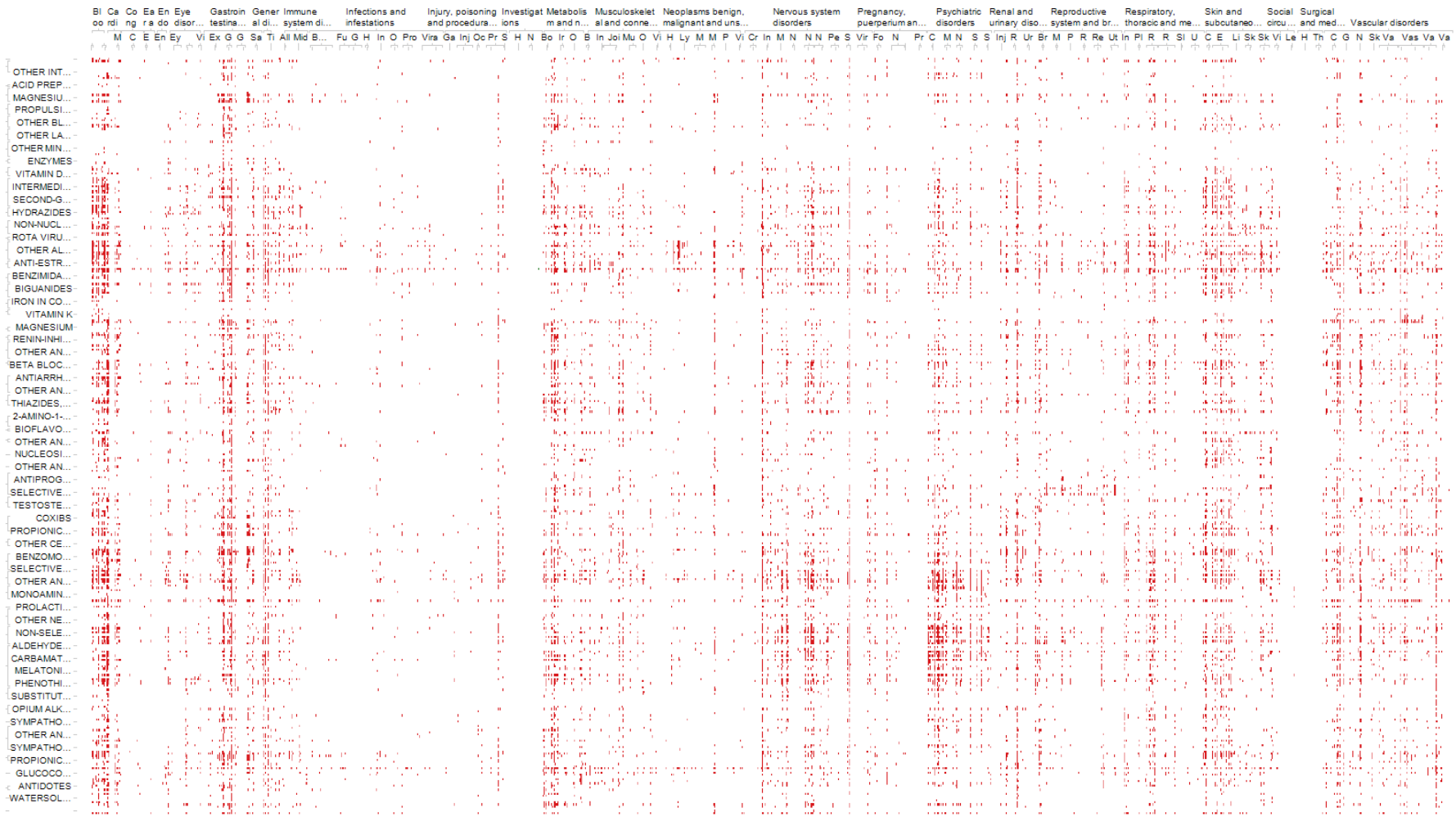
- >220 researchers in academia, industry and government
- >21 countries

OHDSI Data Network:

- >114 databases from 19 countries
- 1.9 billion patients records (duplicates)
- ~222 million non-US patients

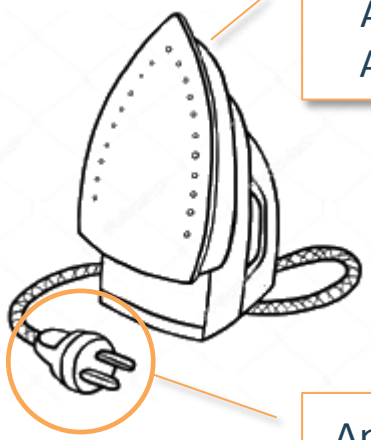
# Current pace of evidence generation in healthcare

## All health outcomes of interest



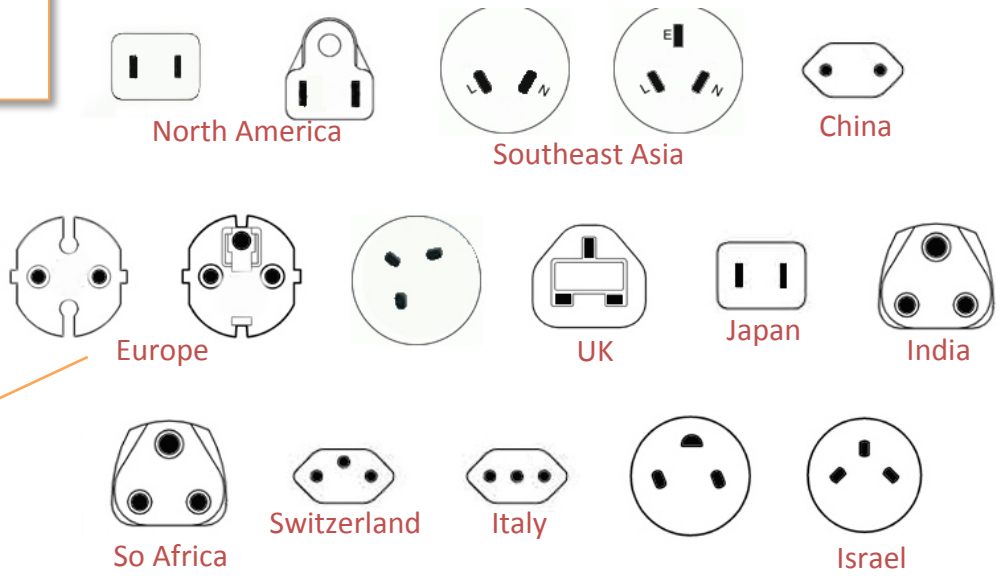
# Current Approach: “One Study – One Script“

"What's the adherence to my drug in the data assets I own?"

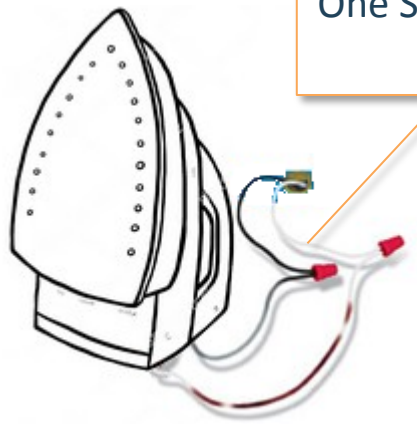


Analytical method: Adherence to Drug

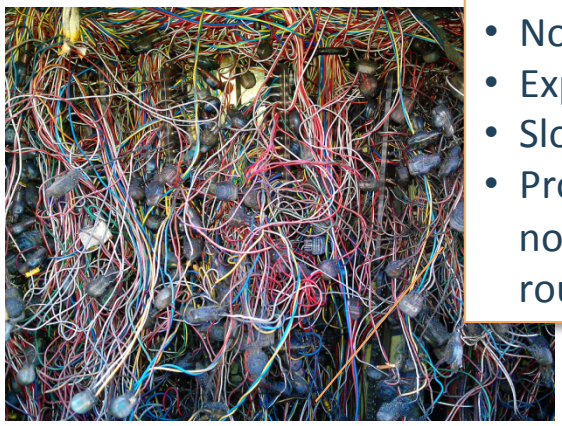
Application to data




Current solution:

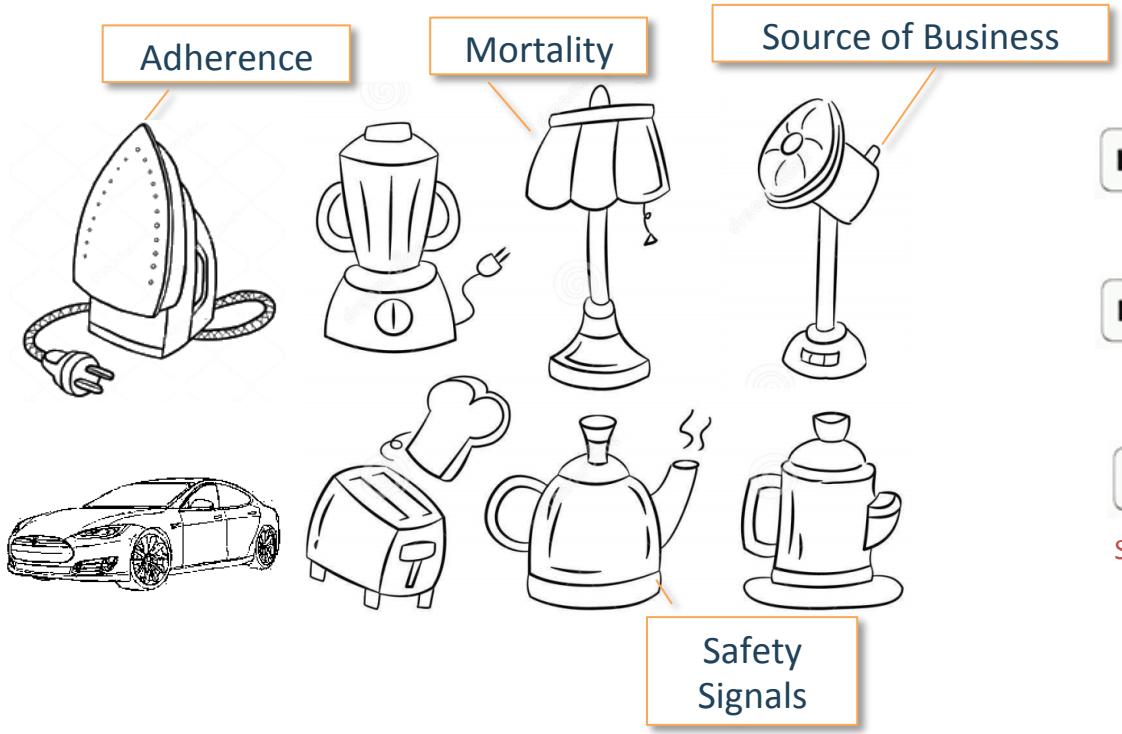


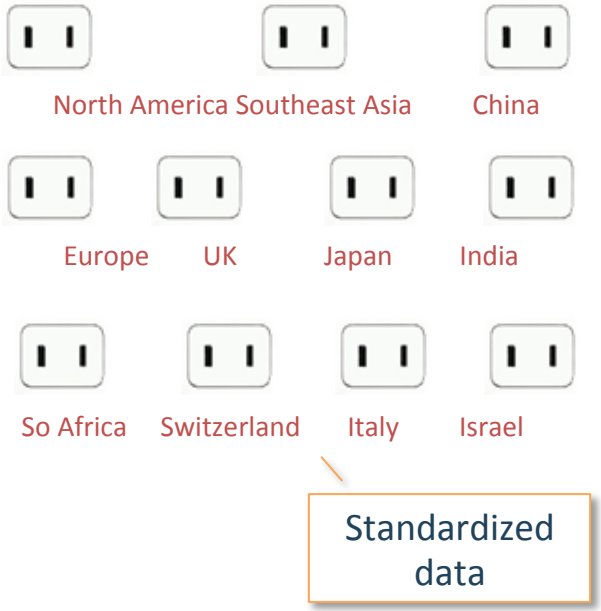
One SAS or R script for each study



- Not scalable
- Not transparent
- Expensive
- Slow
- Prohibitive to non-expert routine use

# Solution: Data Standardization Enables Systematic Research

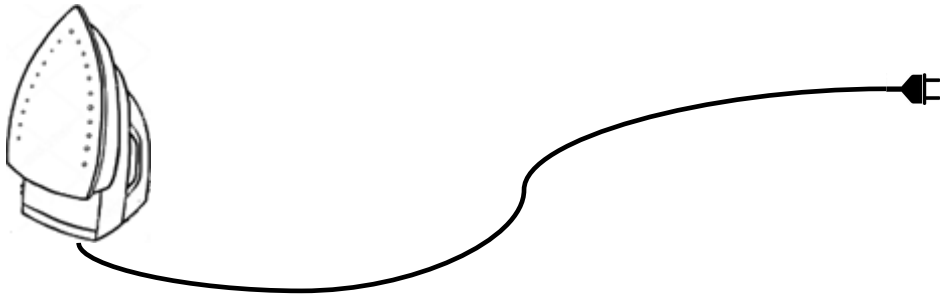


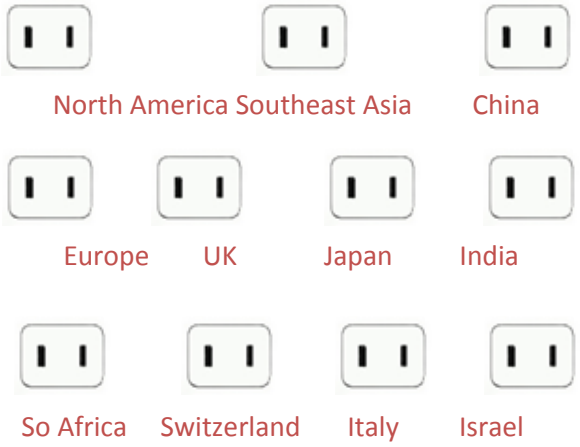




OHDSI Tools

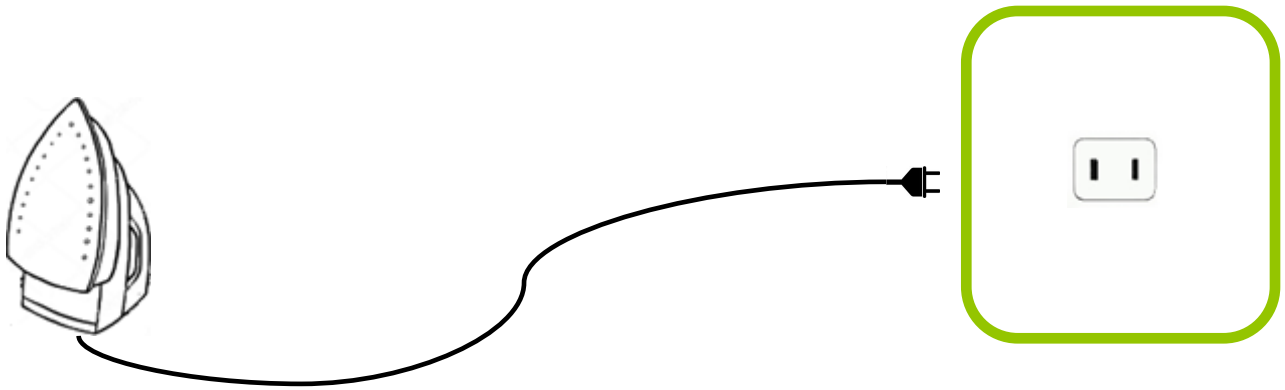
OMOP CDM

# Analytics can be remote

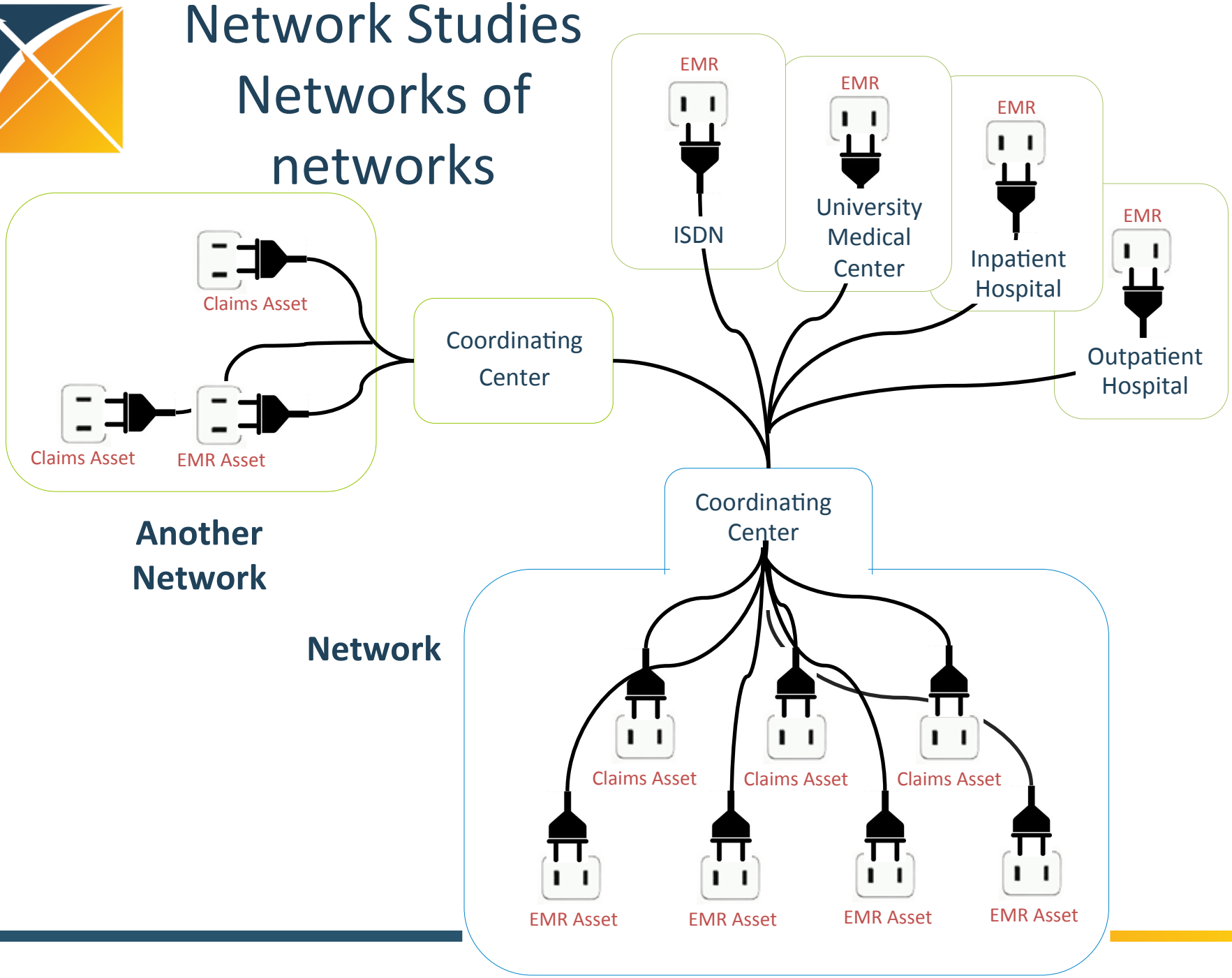




# Analytics can be behind firewall



# Network Studies Networks of networks




# Virtual Machine

# OHDSI in a Box

amazon web services | EC2

PostgreSQL

cdm

webapi

PGAdmin4

Atlas

WebAPI

Tomcat

**Methods Library**

R

OHDSI R packages

R Studio

Raw Lauren

CDM Lauren (EMPTY)

Raw Synthea

CDM Synthea

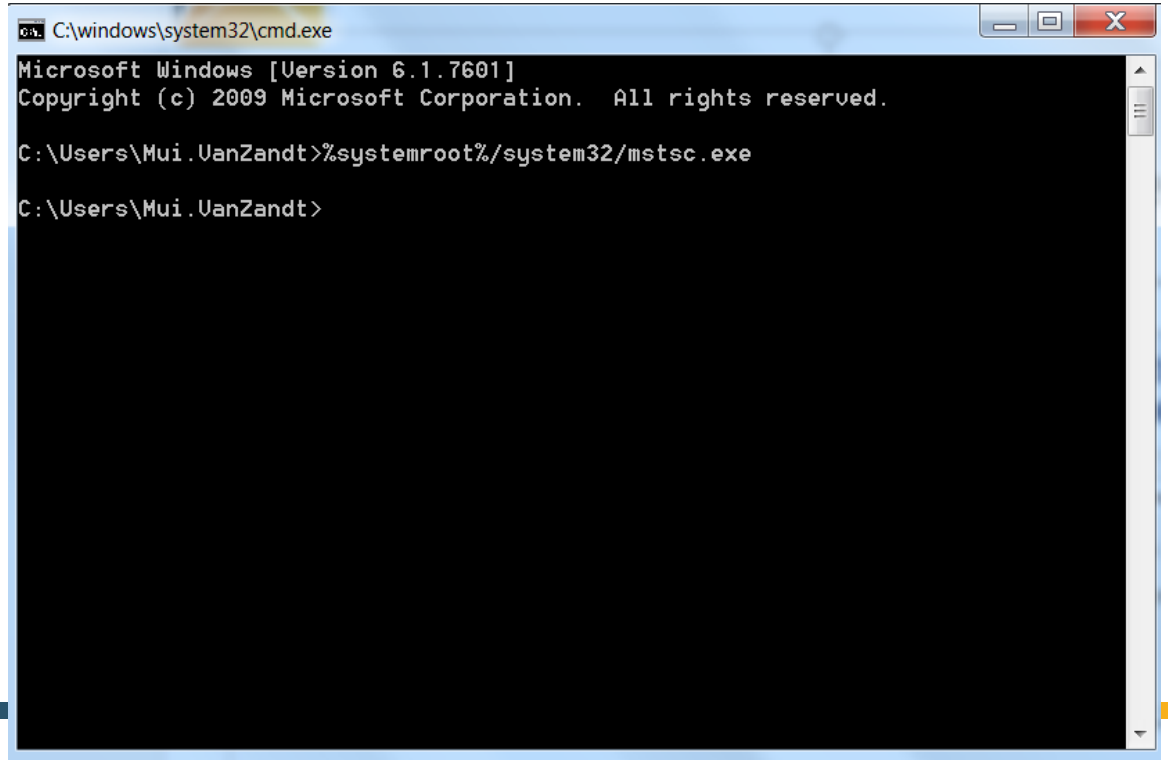
CDM Synpuf (100K)

WhiteRabbit

Usagi

# How to Sign into the Remote Desktop

From your command prompt, type `%systemroot%/system32/mstsc.exe` to launch Remote Desktop



# How to Sign into the Remote Desktop

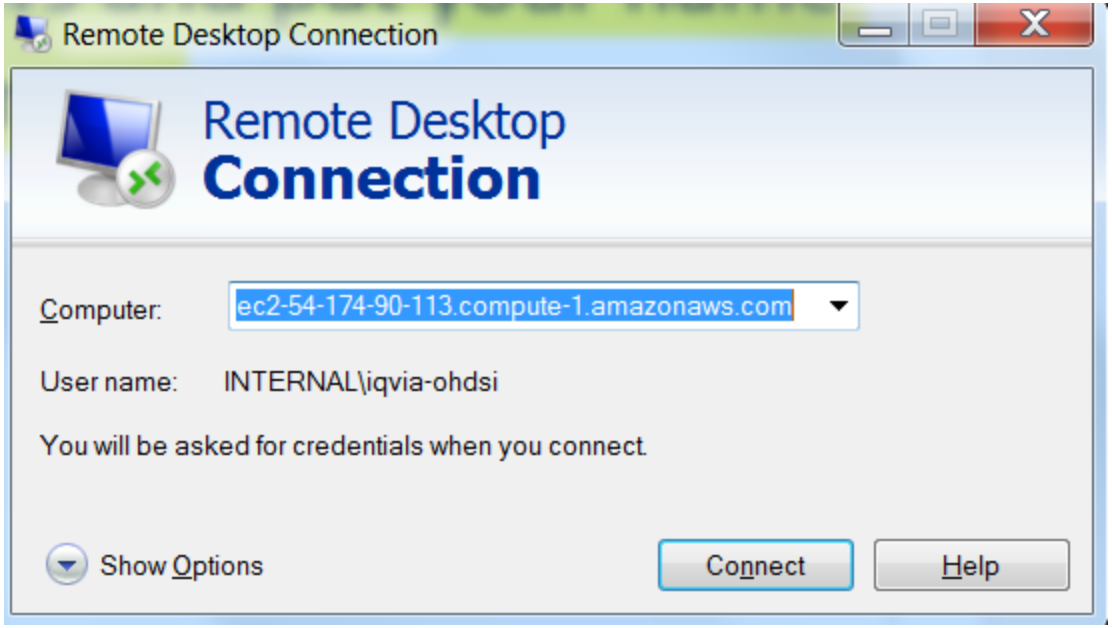
- Use the shortcut on the desktop named “Remote Desktop”

UPDATED LATER

- Pick one of the rows and put your name on the second column

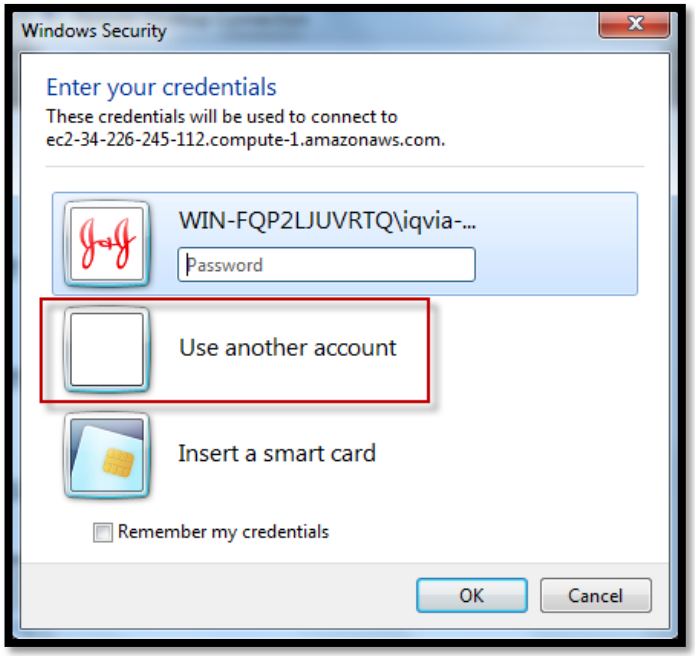
# How to Sign into the Remote Desktop

- Take Column A from spreadsheet and copy into the “Computer” field



# How to Sign into the Remote Desktop

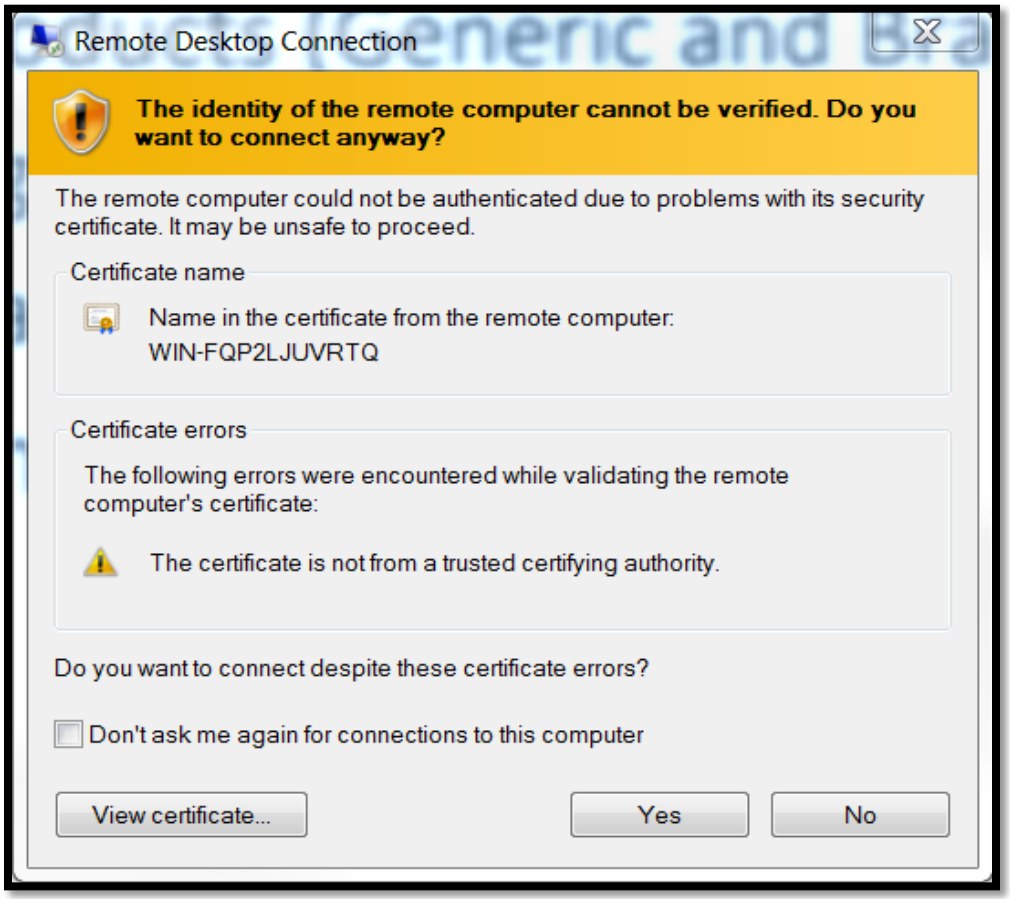
- Pick ‘Use Another Account’
- Copy username from Column C
- Copy password from Column D



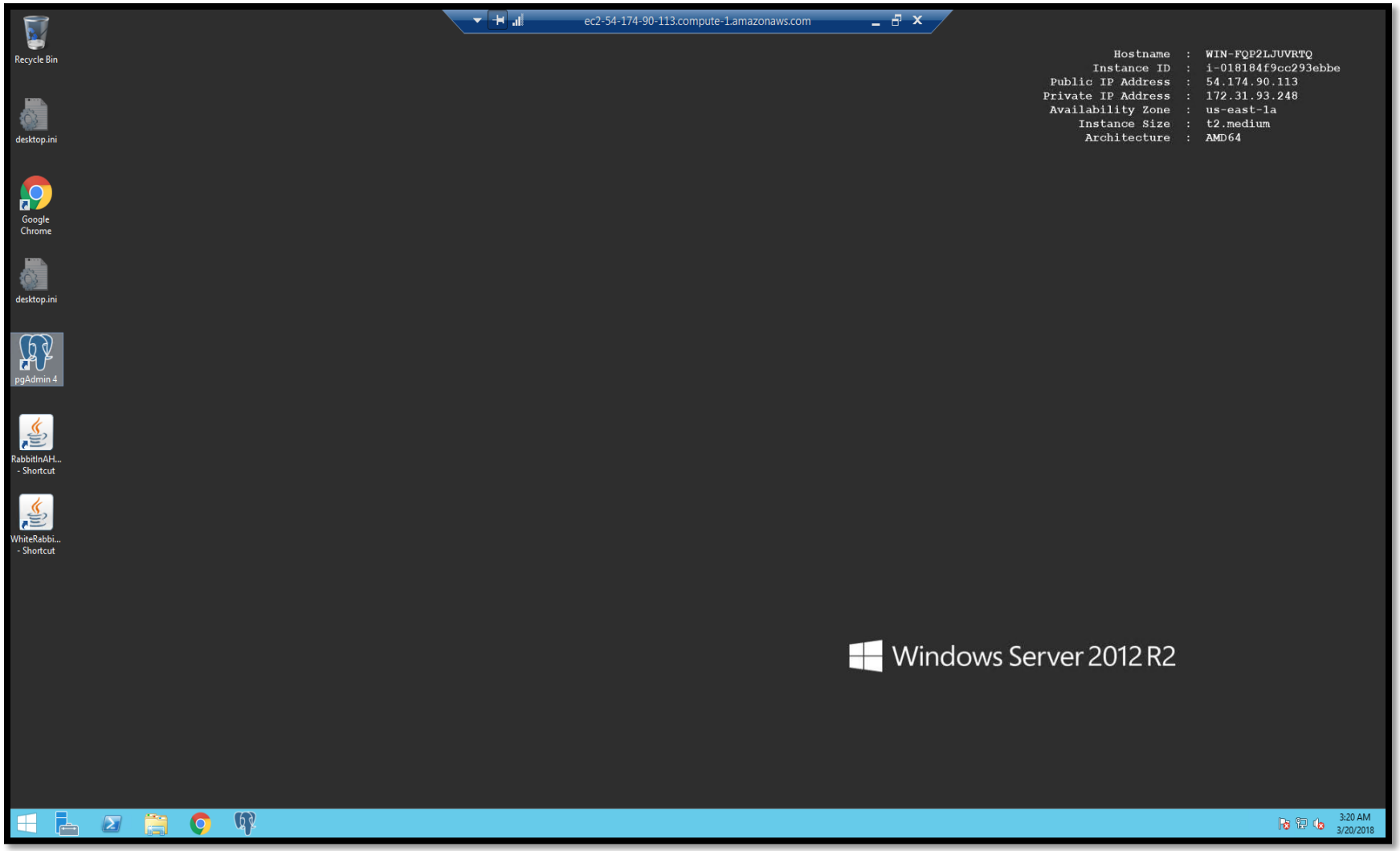

| A | B | C | D |
|---|---|---|---|
| **RDP URL** | **Name** | **Username** | **Password** |
| ec2-34-226-245-112.compute-1.amazonaws.com | Erica Voss | iqvia-ohdsi | I!QViAOH@DSI18 |
| ec2-52-87-207-197.compute-1.amazonaws.com | Mui Van Zandt | iqvia-ohdsi | I!QViAOH@DSI18 |

# How to Sign into the Remote Desktop

- If you get this page, select “Yes”

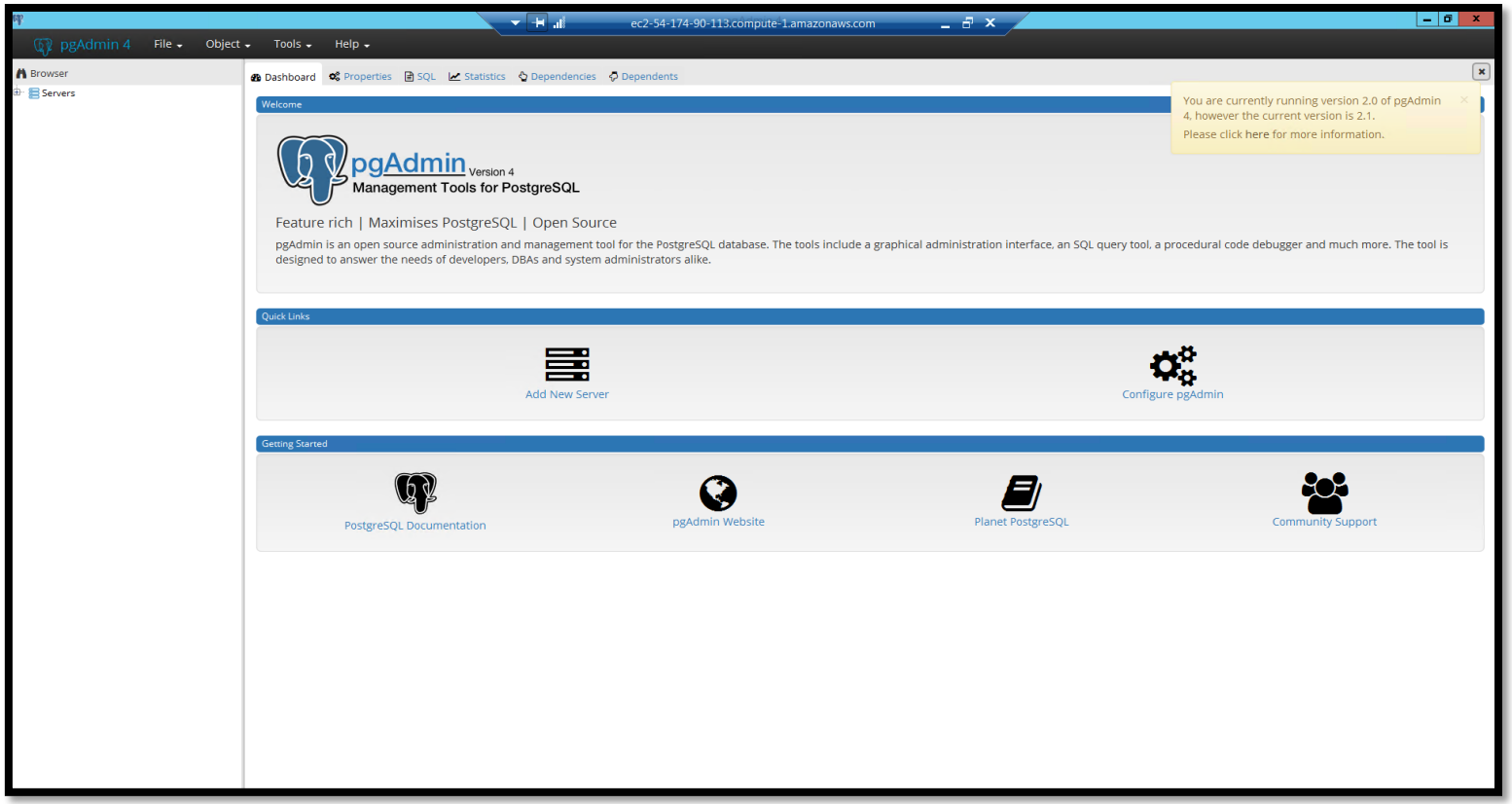


# OHDSI in a Box – Ready

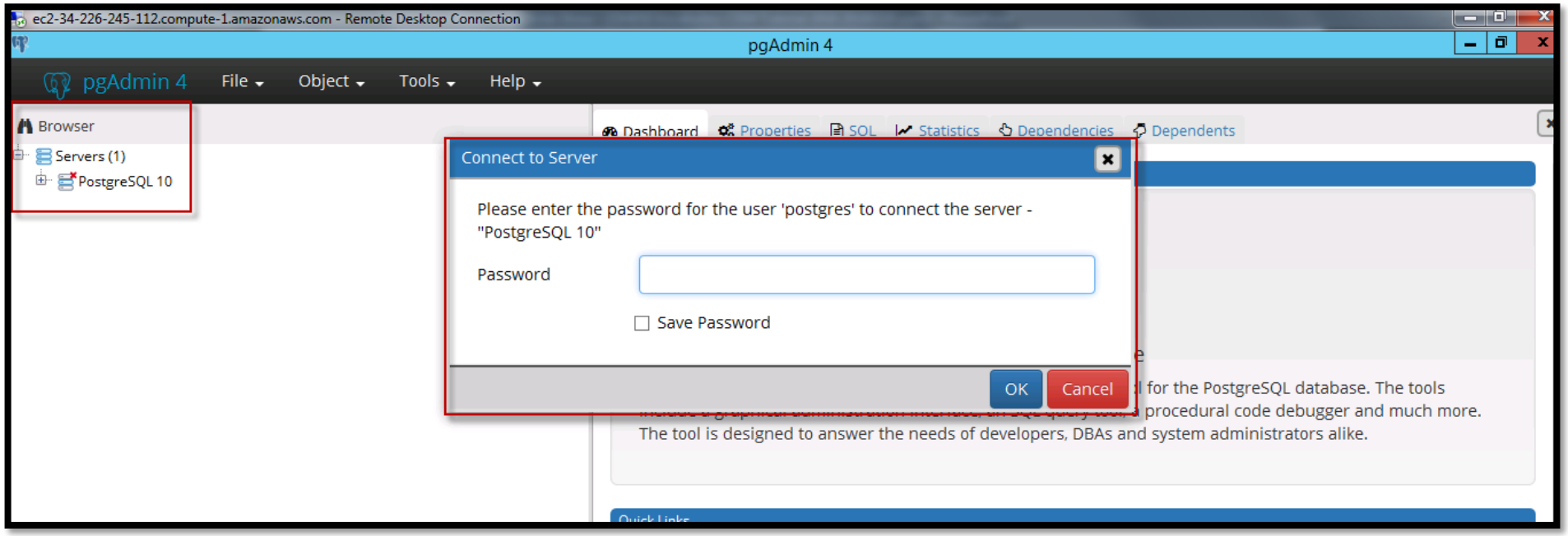


# CDM Database: pgAdmin III New Server

- Click on pgAdmin

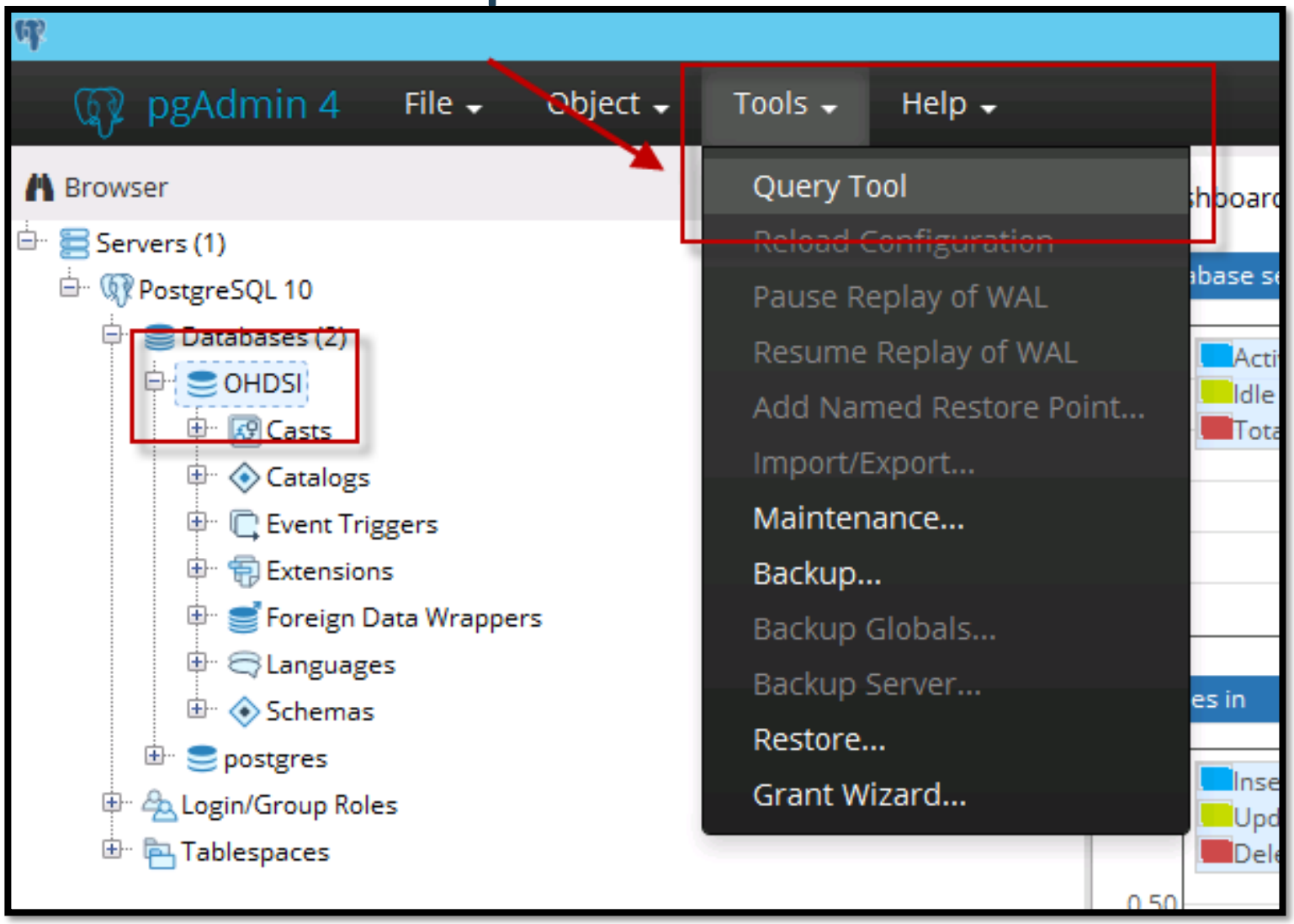


# CDM Database: Connect



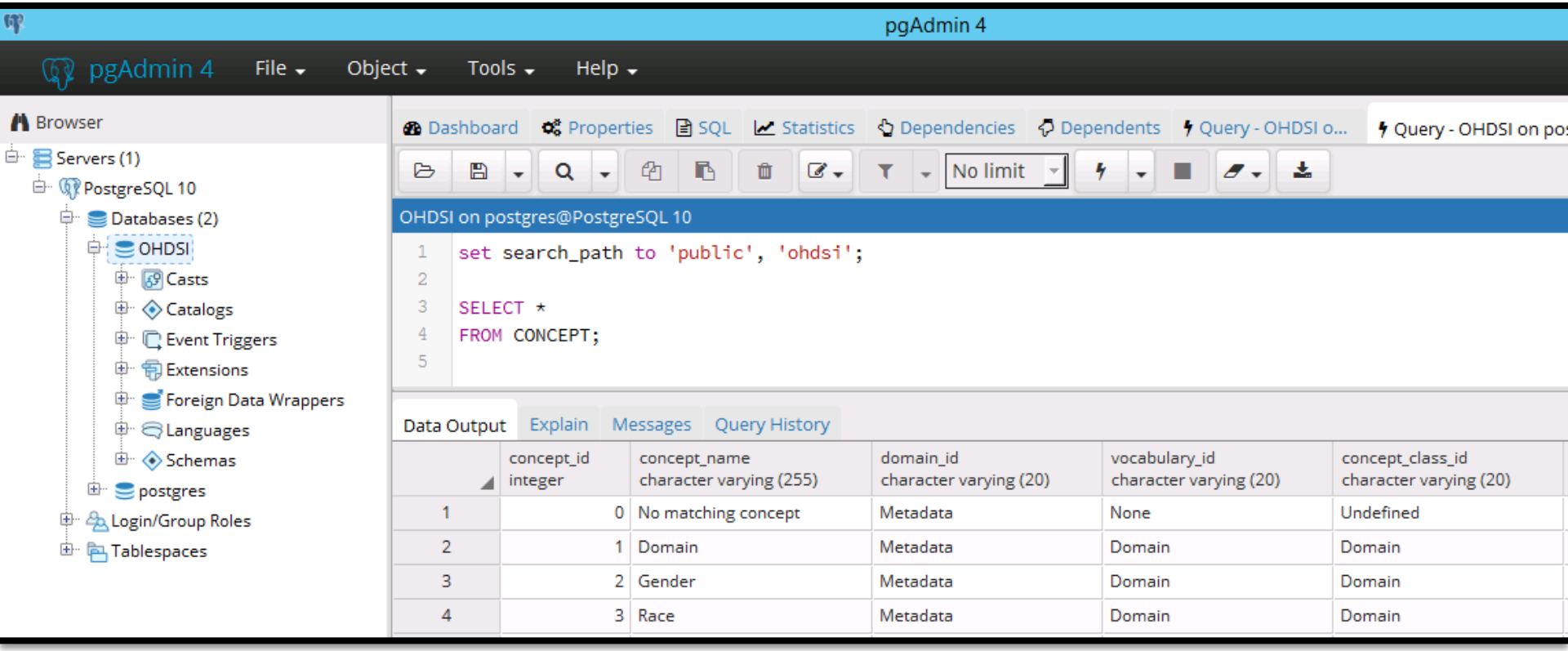

- Password: `ohdsi`

# CDM Database: Open SQL Sheet



# CDM Database: Ready

```
set search_path to 'ohdsi';
```



# Vocabulary


Basic Relationship, Ancestors, & Descendants

How does it work for Drugs

SQL Examples

# OMOP Common Vocabulary Model

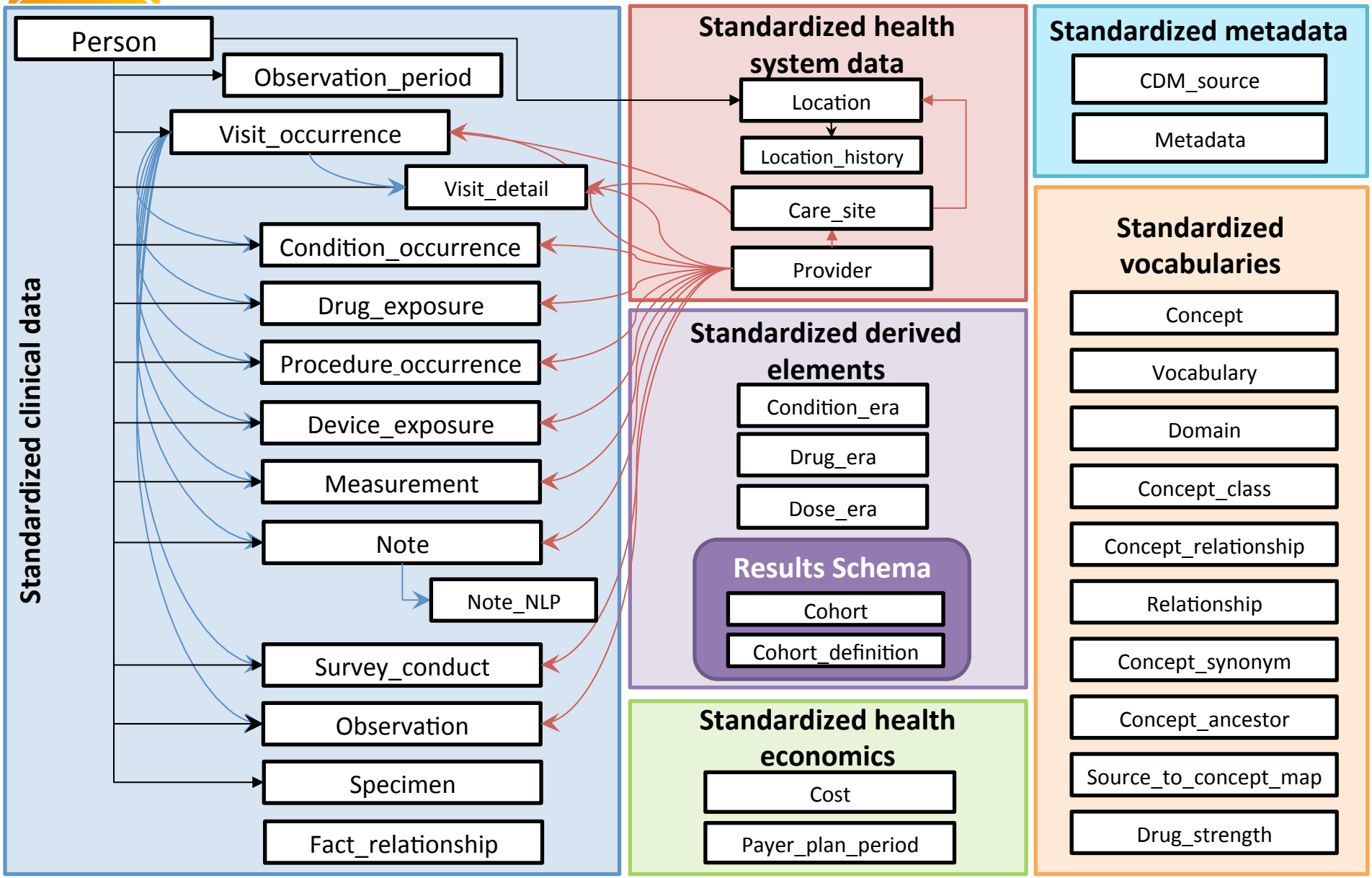
**What it is**

- **Standardized structure** to house existing vocabularies used in the public domain
- **Compiled standards** from disparate public and private sources and some OMOP-grown concepts

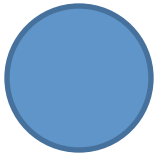
**What it's not**

- **Static dataset** – the vocabulary updates regularly to keep up with the continual evolution of the sources
- **Finished product** – vocabulary maintenance and improvement is ongoing activity that requires community participation and support

# CDM Version 6 Key Domains

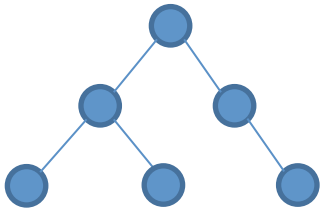


# Structure of OMOP Vocabulary



All content: concepts in **`concept`**

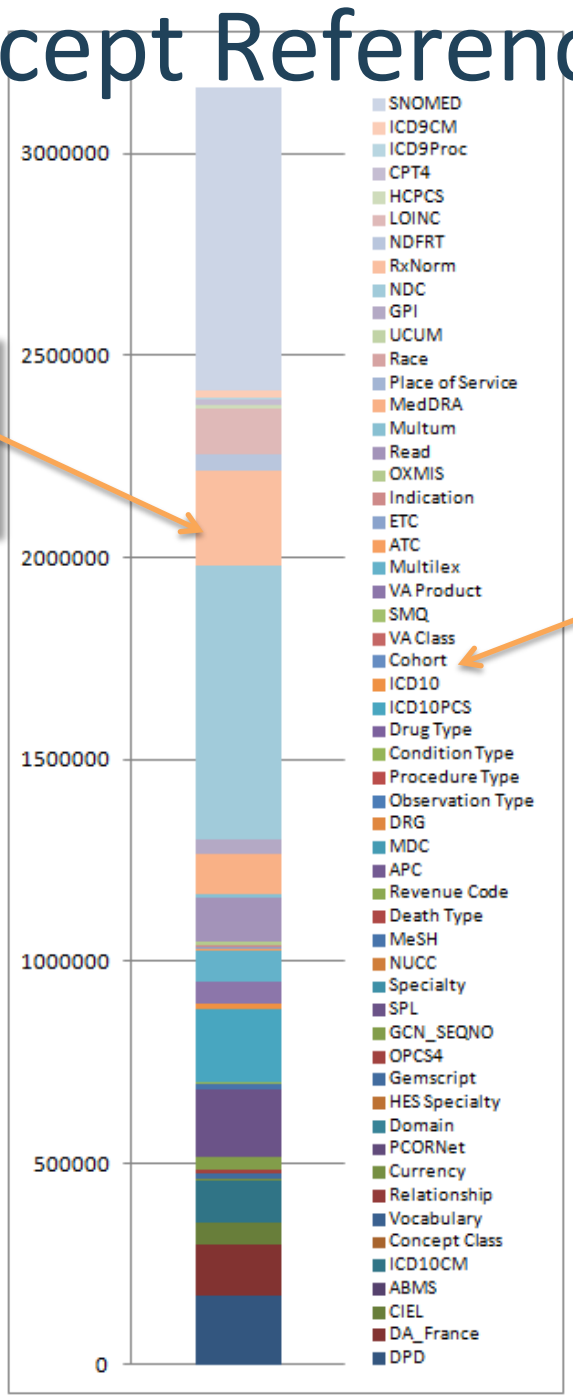
Direct relationships between concepts in **`concept_relationship`**



Multi-step hierarchical relationships pre-processed into **`concept_ancestor`**

# Single Concept Reference Table

All vocabularies stacked up in one table




Vocabulary ID

# Dozens of schemes, formats, rules

LOINC_248_MULTI-AXIAL_HIERARCHY.CSV

| PATH_TO_ROOT | SEQUENCE | IMMEDIATE_PARENT | CODE | CODE_TEXT |
|---|---|---|---|---|
| | 1 | | LP31755-9 | Microbiology |
| LP31755-9 | 1 | LP31755-9 | LP14559-6 | Microorganism |
| LP31755-9.L | 1 | LP14559-6 | LP98185-9 | Bacteria |
| LP31755-9.L | 1 | LP98185-9 | LP14082-9 | Bacteria |
| LP31755-9. | | | | |
| LP31755-9. | | | | |
| LP31755-9. | | | | |
| LP31755-9. | | | | |
| LP31755-9. | | | | |
| LP31755-9. | | | | |
| LP31755-9. | | | | |
| LP31755-9. | | | | |

loinc.csv

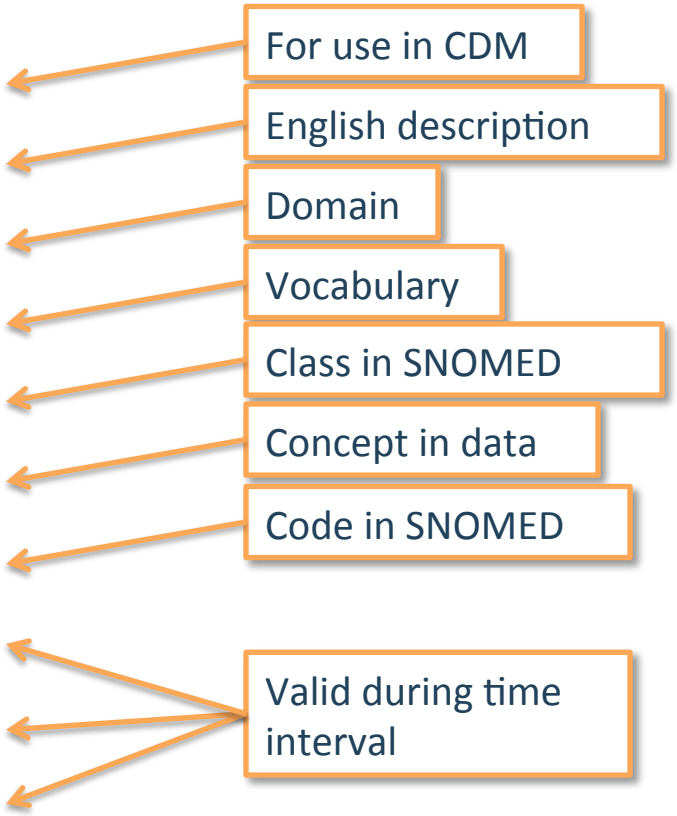
| LOINC_NU | COMPONENT | PROPERTY | TIME_ASPCT | SYSTEM | SCALE_TYP | METHOD_TYP | CLASS | SOURCE | DATE_LAST_CH | CHNG_TYP | COMM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10454-7 | Xylose^2H post 25 g xylose PO | MCnc | Pt | Ser/Plas | Qn | | CHAL | SH | 19961220 | ADD | |
| 10455-4 | Xylose^30M post 25 g xylose PO | MCnc | Pt | Ser/Plas | Qn | | CHAL | SH | 19961220 | ADD | |
| 10456-2 | Xylose^post 6H CFst | MCnc | Pt | Ser/Plas | Qn | | CHAL | SH | 19961220 | ADD | |
| 10457-0 | Actin Ag | | | | | | PATH | SH;DL-M | 20060706 | MIN | |
| 10458-8 | Alkaline phosphatase.placer | | | | | | PATH | DL-M | 20060706 | MIN | |
| 10459-6 | Alpha-1-Fetoprotein Ag | | | | | | | | | | |
| 10460-4 | Lactalbumin alpha Ag | | | | | | | | | | |
| 10461-2 | Alpha-1-Antichymotrypsin | | | | | | | | | | |
| 1046-2 | H NOS Ab | | | | | | | | | | |
| 10462-0 | Alpha 1 antitrypsin Ag | | | | | | | | | | |
| 10463-8 | Amyloid A component Ag | | | | | | | | | | |
| 10464-6 | Amyloid P component Ag | | | | | | | | | | |
| 10465-3 | Amyloid.prealbumin Ag | | | | | | | | | | |
| 10466-1 | Anion gap 3 | | | | | | | | | | |

CMS32_DESC_LONG_SHORT_DX.xlsx

| DIAGNOSIS CODE | LONG DESCRIPTION | SHORT DESCRIPTION |
|---|---|---|
| 0010 | Cholera due to vibrio cholerae | Cholera d/t vib cholerae |
| 0011 | Cholera due to vibrio cholerae el tor | Cholera d/t vib el tor |
| 0019 | Cholera, unspecified | Cholera NOS |
| 0020 | Typhoid fever | Typhoid fever |
| 0021 | Paratyphoid fever A | Paratyphoid fever a |
| 0022 | Paratyphoid fever B | Paratyphoid fever b |
| 0023 | Paratyphoid fever C | Paratyphoid fever c |
| 0029 | Paratyphoid fever, unspecified | Paratyphoid fever NOS |
| 0030 | Salmonella gastroenteritis | Salmonella enteritis |
| 0031 | Salmonella septicemia | Salmonella septicemia |
| 00320 | Localized salmonella infection, unspecified | Local salmonella inf NOS |
| 00321 | Salmonella meningitis | Salmonella meningitis |
| 00322 | Salmonella pneumonia | Salmonella pneumonia |
| 00323 | Salmonella arthritis | Salmonella arthritis |
| 00324 | Salmonella osteomyelitis | Salmonella osteomyelitis |
| 00329 | Other localized salmonella infections | Local salmonella inf NEC |

# What's in a Concept

| | |
|---|---|
| CONCEPT_ID | 313217 |
| CONCEPT_NAME | Atrial fibrillation |
| DOMAIN_ID | Condition |
| VOCABULARY_ID | SNOMED |
| CONCEPT_CLASS_ID | Clinical Finding |
| STANDARD_CONCEPT | S |
| CONCEPT_CODE | 49436004 |
| VALID_START_DATE | 01-Jan-1970 |
| VALID_END_DATE | 31-Dec-2099 |
| INVALID_REASON | |



# MiniSentinel in use: Dabigatran and bleeding



## Dabigatran and Postmarketing Reports of Bleeding

Mary Ross Southworth, Pharm.D., Marsha E. Reichman, Ph.D., and Ellis F. Unger, M.D.

N Engl J Med 2013; 368:1272-1274

**Intracranial and Gastrointestinal Bleeding Events in New Users of Dabigatran and Warfarin from the Mini-Sentinel Distributed Database, October 2010 through December 2011.***

| Analysis | Dabigatran | | | Warfarin | | |
|---|---|---|---|---|---|---|
| | No. of Patients | No. of Events | Incidence (no. of events/ 100,000 days at risk) | No. of Patients | No. of Events | Incidence (no. of events/ 100,000 days at risk) |
| **Gastrointestinal hemorrhage** | | | | | | |
| Analysis with required diagnosis of atrial fibrillation | 10,599 | 16 | 1.6 | 43,541 | 160 | 3.5 |
| Sensitivity analysis without required diagnosis of atrial fibrillation | 12,195 | 19 | 1.6 | 119,940 | 338 | 3.1 |
| **Intracranial hemorrhage** | | | | | | |
| Analysis with required diagnosis of atrial fibrillation | 10,587 | 8 | 0.8 | 43,594 | 109 | 2.4 |
| Sensitivity analysis without required diagnosis of atrial fibrillation | 12,182 | 10 | 0.9 | 120,020 | 204 | 1.9 |

# All Content in CDM is Coded as Concepts

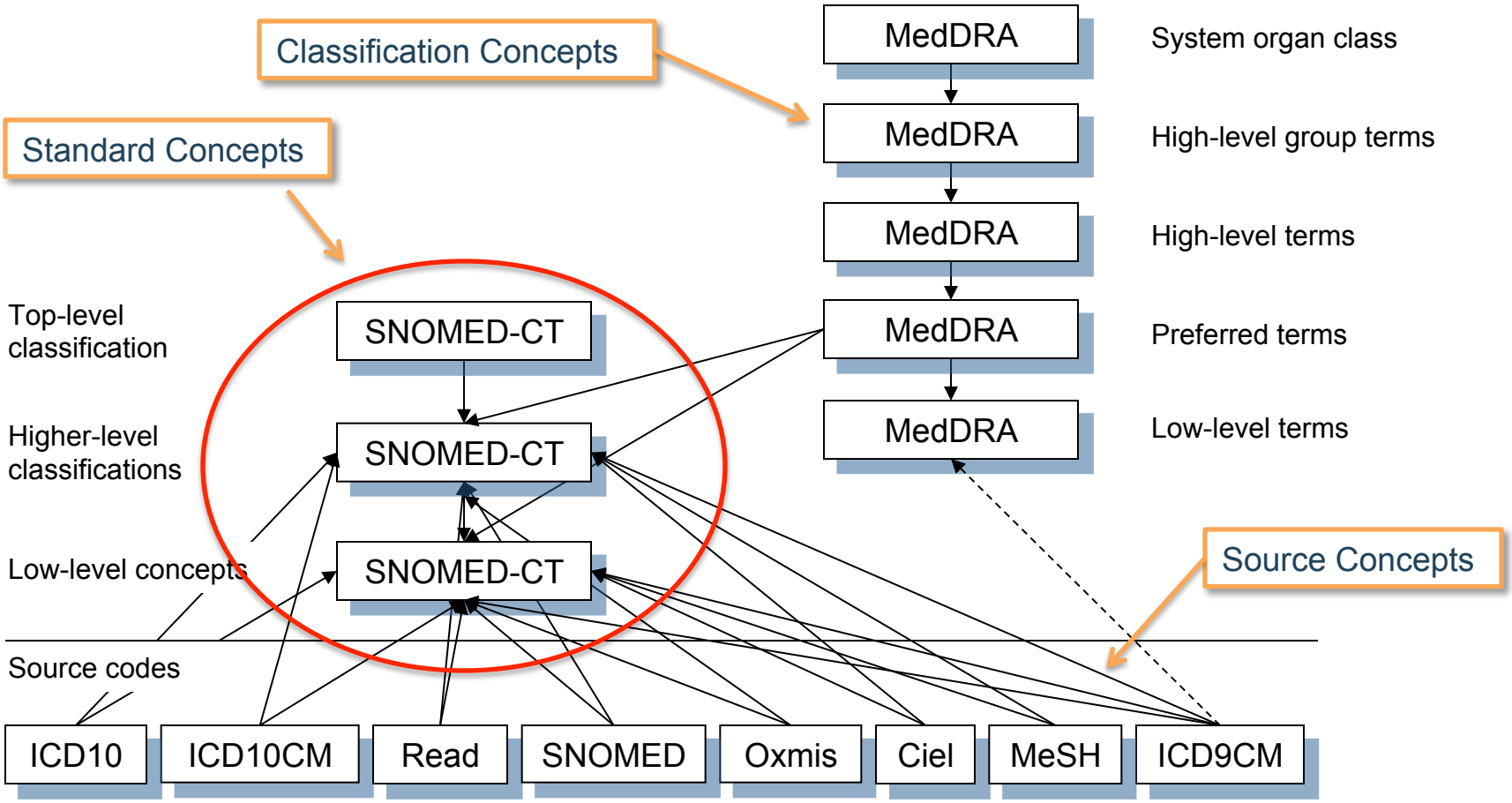
- Concepts are referred to by concept_id

- All details are in the **CONCEPT** table:

```
SELECT *
FROM concept
WHERE concept_id = 313217
```

| concept_id | concept_name | domain_id | vocabulary_id | concept_class_id | standard_concept | concept_code | valid_start_date | valid_end_date | invalid_reason |
|---|---|---|---|---|---|---|---|---|---|
| 313217 | Atrial fibrillation | Condition | SNOMED | Clinical Finding | S | 49436004 | 1970-01-01 | 2099-12-31 | NULL |

# Condition Concepts



# Finding the Right Concept #1

1. ..if I know the **ID**

```
SELECT * FROM concept WHERE concept_id = 313217
```

| CONCEPT_ID | CONCEPT_ NAME | DOMAIN_ID | VOCABULARY _ID | CONCEPT_ CLASS_ID | STANDARD_ CONCEPT | CONCEPT_ CODE | VALID_START _DATE | VALID_END _DATE | INVALID _REASON |
|---|---|---|---|---|---|---|---|---|---|
| 313217 | Atrial fibrillation | Condition | SNOMED | Clinical Finding | S | 49436004 | 01-Jan-1970 | 31-Dec-2099 | |

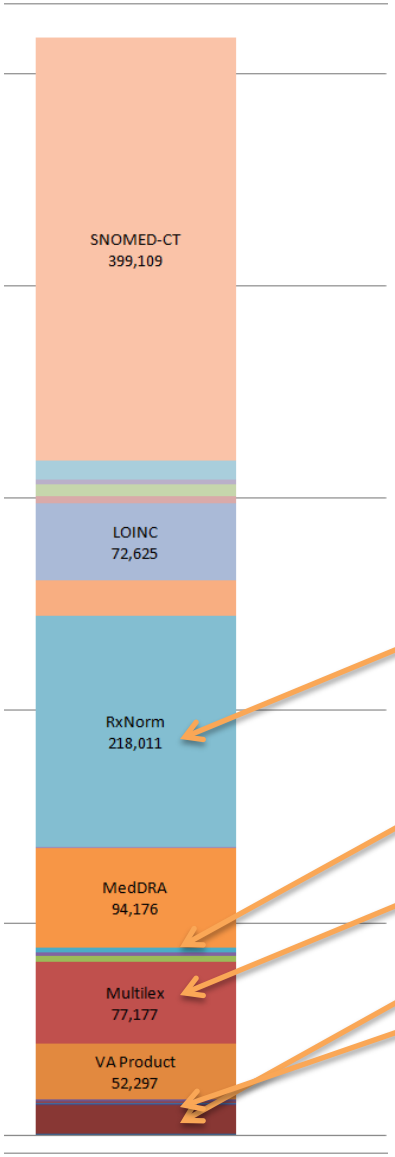
SNOMED code

2. ..if I know the **code**

```
SELECT * FROM concept WHERE concept_code = '49436004'
```

| CONCEPT_ID | CONCEPT_ NAME | DOMAIN_ID | VOCABULARY _ID | CONCEPT_ CLASS_ID | STANDARD_ CONCEPT | CONCEPT_ CODE | VALID_START _DATE | VALID_END _DATE | INVALID _REASON |
|---|---|---|---|---|---|---|---|---|---|
| 313217 | Atrial fibrillation | Condition | SNOMED | Clinical Finding | S | 49436004 | 01-Jan-1970 | 31-Dec-2099 | |

# Concept ID versus Concept Code




```
SELECT *
FROM concept
WHERE concept_code = '1001';
```

Same code

| Concept_Name | Concept Class | Vocabulary_ID | Concept_Code |
|---|---|---|---|
| Antipyrine | Ingredient | RxNorm | 1001 |
| Aceprometazine maleate | Ingredient | BDPM | 1001 |
| Serum | Specimen | CIEL | 1001 |
| methixene hydrochloride | Ingredient | Multilex | 1001 |
| Brompheniramine Maleate, 10 mg/mL injectable solution | Multum | Multum | 1001 |
| ABBOTT COLD SORE BALM 4%/0.06% W/ | Drug Product | LPD_Australia | 1001 |
| Residential Treatment - Psychiatric | Revenue Code | Revenue Code | 1001 |

# Finding the Right Concept #2

3. ..if I know the **name**

```
SELECT * FROM concept WHERE concept_name = 'Atrial fibrillation';
```

| CONCEPT _ID | CONCEPT_ NAME | DOMAIN _ID | VOCABULARY _ID | CONCEPT_ CLASS_ID | STANDARD_ CONCEPT | CONCEPT_ CODE |
|---|---|---|---|---|---|---|
| 313217 | Atrial fibrillation | Condition | SNOMED | Clinical Finding | S | 49436004 |
| 44821957 | Atrial fibrillation | Condition | ICD9CM | 5-dig billing code | | 427.31 |
| 35204953 | Atrial fibrillation | Condition | MedDRA | PT | C | 10003658 |
| 45500085 | Atrial fibrillation | Condition | Read | Read | | G573000 |
| 45883018 | Atrial fibrillation | Meas Value | LOINC | Answer | S | LA17084-7 |

# Finding the Right Concept #3

1. if don't know any of this, but I know the code in another vocabulary

ICD-9 is not a Standard Concept

```
SELECT * FROM concept WHERE concept_code = '427.31';
```

| CONCEPT _ID | CONCEPT_ NAME | DOMAIN _ID | VOCABULARY _ID | CONCEPT_ CLASS_ID | STANDARD_ CONCEPT | CONCEPT_ CODE |
|---|---|---|---|---|---|---|
| 44821957 | Atrial fibrillation | Condition | ICD9CM | 5-dig billing code | | 427.31 |

```
SELECT * FROM concept_relationship WHERE concept_id_1 = 44821957;
```

Mapping to different vocabularies

Kind of relationship

| _ID_1 | CONCEPT _ID_2 | RELATIONSHIP _ID | VALID_START _DATE | VALID_END _DATE | INVALID _REASON |
|---|---|---|---|---|---|
| 44821957 | 21001551 | ICD9CM - FDB Ind | 01-Oct-13 | 31-Dec-2099 | |
| 44821957 | 35204953 | ICD9CM - MedDRA | 01-Jan-70 | 31-Dec-2099 | |
| 44821957 | 44824248 | Is a | 01-Oct-14 | 31-Dec-2099 | |
| 44821957 | 44834731 | Is a | 01-Oct-14 | 31-Dec-2099 | |
| 44821957 | 313217 | Maps to | 01-Jan-70 | 31-Dec-2099 | |

# Why are we mapping?

LANGUAGES

Supporting language learning and linguistic diversity

European Commission > Languages > Policy > Linguistic diversity

## Official languages of the EU

**What is it?**

The European Union has 24 official and working languages. They are:

| | | |
|---|---|---|
| Bulgarian | French | Maltese |
| Croatian | German | Polish |
| Czech | Greek | Portuguese |
| Danish | Hungarian | Romanian |
| Dutch | Irish | Slovak |
| English | Italian | Slovenian |
| Estonian | Latvian | Spanish |
| Finnish | Lithuanian | Swedish |

**What is the Commission doing?**

With a permanent staff of 1,750 linguists and 600 support staff, the Commission has one of the largest translation services in the world, bolstered by a further 600 full-time and 3,000 freelance interpreters.

# How many different ways do you express one meaning?


Cheers

# Mapping = Translating

## Step 1. Lookup the Source Concept

```
SELECT * FROM concept WHERE concept_code = '427.31';
```

| CONCEPT _ID | CONCEPT_ NAME | DOMAIN _ID | VOCABULARY _ID | CONCEPT_ CLASS_ID | STANDARD_ CONCEPT | CONCEPT_ CODE |
|---|---|---|---|---|---|---|
| 44821957 | Atrial fibrillation | Condition | ICD9CM | 5-dig billing code | | 427.31 |


## Step 2. Translate to Standard

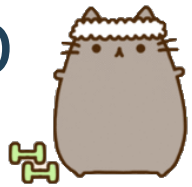
```
SELECT * FROM concept_relationship WHERE concept_id_1 = 44821957 AND
    relationship_id = 'Maps to';
```

| CONCEPT _ID_1 | CONCEPT _ID_2 | RELATIONSHIP _ID | VALID_START _DATE | VALID_END _DATE | INVALID _REASON |
|---|---|---|---|---|---|
| 44821957 | 313217 | Maps to | 01-Jan-1970 | 31-Dec-2099 | |

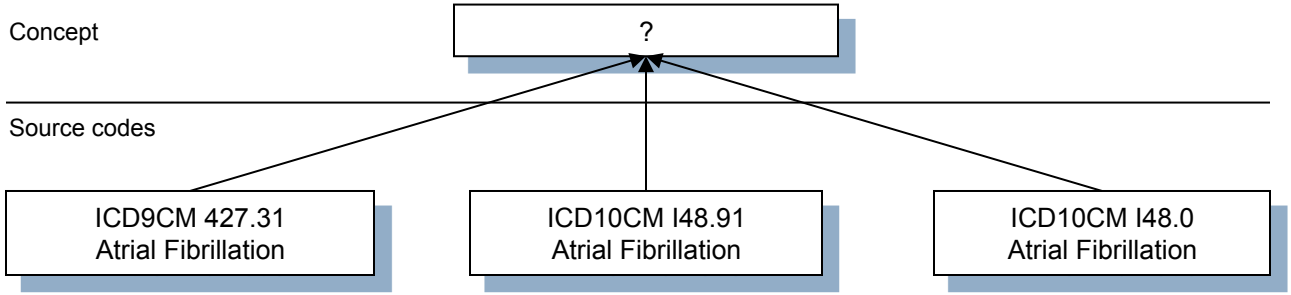
## Step 3. Check out the translated Concept

```
SELECT * FROM concept WHERE concept_id = 313217;
```

# Exercise: Find Standard Concept ID from Source Concept



```
ICD9:    '427.31'  :      313217
ICD10CM: 'I48.91'  :      313217
ICD10:   'I48.0'   :      4154290 'Paroxysmal Atrial Fibrillation'
```




Step 1. Lookup

```
SELECT * FROM concept WHERE concept_code = ...;
```

Step 2. Translate

```
SELECT * FROM concept_relationship WHERE concept_id_1 = ...
AND relationship_id = 'Maps to';
```

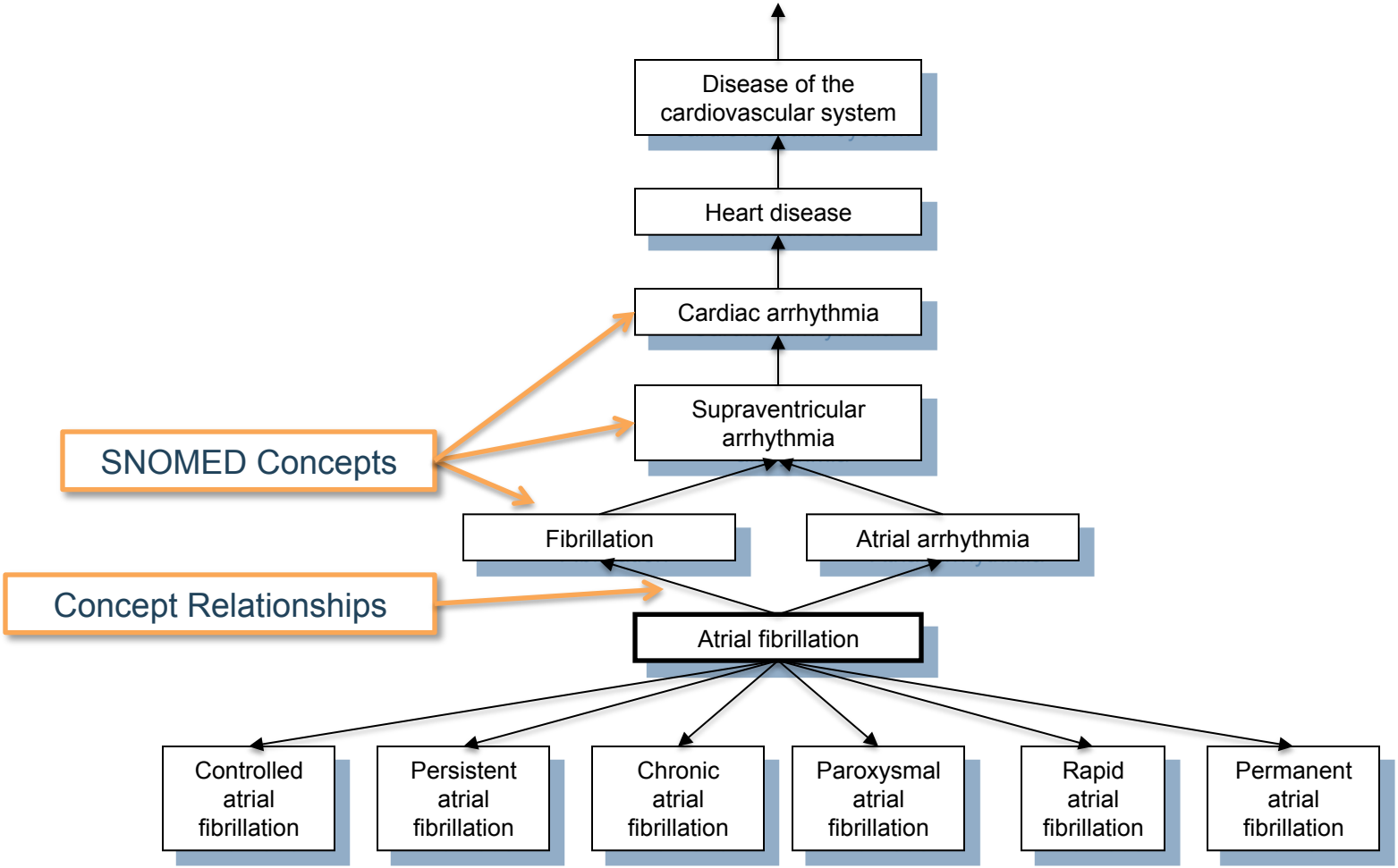
Step 3. Check out

```
SELECT * FROM concept WHERE concept_id = ...;
```

# Break

Please return in 15 minutes

# Reason #2: Disease Hierarchy



# Exploring Relationships

```
SELECT *
FROM concept_relationship
WHERE concept_id_1 = 313217
```

| CONCEPT _ID_1 | CONCEPT _ID_2 | RELATIONSHIP _ID |
|---|---|---|
| 313217 | 4232697 | Subsumes |
| 313217 | 4181800 | Focus of |
| 313217 | 35204953 | SNOMED - MedDRA eq |
| 313217 | 4203375 | Asso finding of |
| 313217 | 4141360 | Subsumes |
| 313217 | 4119601 | Subsumes |
| 313217 | 4117112 | Subsumes |
| 313217 | 4232691 | Subsumes |
| 313217 | 4139517 | Due to of |
| 313217 | 4194288 | Asso finding of |
| 313217 | 44782442 | Subsumes |
| 313217 | 44783731 | Focus of |
| 313217 | 21003018 | SNOMED - ind/CI |
| 313217 | 40248987 | SNOMED - ind/CI |
| 313217 | 21001551 | SNOMED - ind/CI |
| 313217 | 21001540 | SNOMED - ind/CI |
| 313217 | 45576876 | Mapped from |
| 313217 | 44807374 | Asso finding of |
| 313217 | 21013834 | SNOMED - ind/CI |
| 313217 | 21001572 | SNOMED - ind/CI |
| 313217 | 21001606 | SNOMED - ind/CI |
| 313217 | 21003176 | SNOMED - ind/CI |
| 313217 | 4226399 | Is a |
| 313217 | 500001801 | SNOMED - HOI |
| 313217 | 500002401 | SNOMED - HOI |
| 313217 | 4119602 | Subsumes |
| 313217 | 40631039 | Subsumes |
| 313217 | 4108832 | Subsumes |
| 313217 | 21013671 | SNOMED - ind/CI |
| 313217 | 21013390 | SNOMED - ind/CI |
| 313217 | 313217 | Maps to |
| 313217 | 44821957 | Mapped from |
| 313217 | 2617597 | Mapped from |
| 313217 | 45500085 | Mapped from |
| 313217 | 313217 | Mapped from |
| 313217 | 45951191 | Mapped from |
| 313217 | 21013856 | SNOMED - ind/CI |
| 313217 | 21001575 | SNOMED - ind/CI |
| 313217 | 21001594 | SNOMED - ind/CI |

Related Concepts

Relationship ID

# Exploring Relationships

```
SELECT cr.relationship_id, c.*
FROM concept_relationship cr
JOIN concept c ON cr.concept_id_2 = c.concept_id
WHERE cr.concept_id_1 = 313217
```

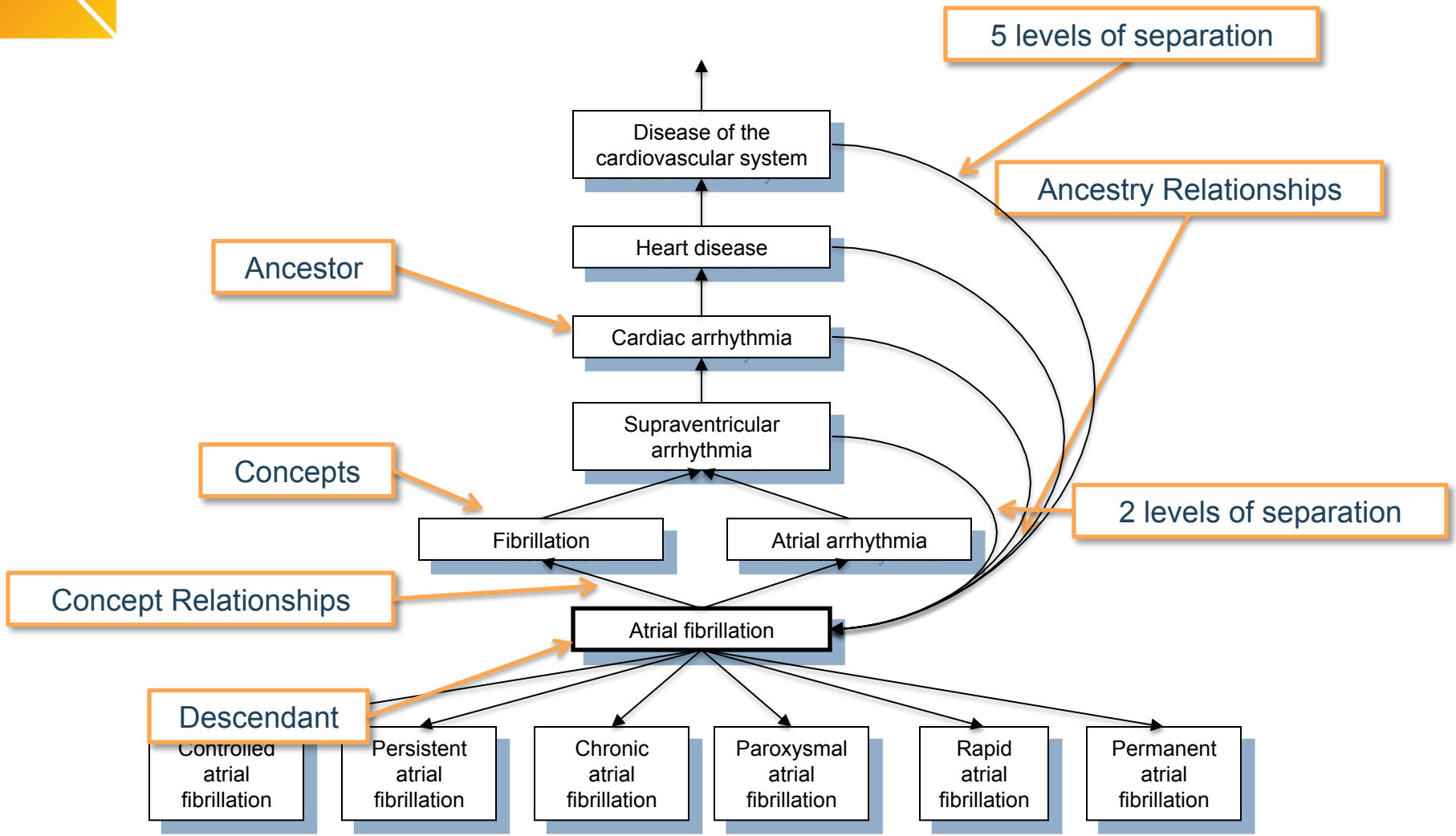
Find out related concept

Ancestor concepts

| relationship_id | concept_id | concept_name | domain_id | vocabulary_id | concept_class_id | standard_concept | concept_code | valid_start_date | valid_end_date | invalid_reason |
|---|---|---|---|---|---|---|---|---|---|---|
| Asso finding of | 4194288 | | Observation | SNOMED | Context-dependent | S | 312442005 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| Asso finding of | 4203375 | | Observation | SNOMED | Context-dependent | S | 433276002 | 1/31/2009 0:00 | 12/31/2099 0:00 | NULL |
| Asso finding of | 42689685 | Atrial fibrillation not d[illegible]cted | Observation | SNOMED | Context-dependent | S | 1.06706E+15 | 4/1/2017 0:00 | 12/31/2099 0:00 | NULL |
| Asso finding of | 44807374 | Atrial fibrillation excluded | Observation | SNOMED | Context-dependent | S | 8.16401E+14 | 4/1/2014 0:00 | 12/31/2099 0:00 | NULL |
| Concept poss_eq from | 40323929 | Fibrillation - atrial | Condition | SNOMED | Clinical Finding | NULL | 155364009 | 1/1/1970 0:00 | 3/11/2016 0:00 | U |
| Concept poss_eq from | 40345197 | Fibrillation - atrial | Condition | SNOMED | Clinical Finding | NULL | 266306001 | 1/1/1970 0:00 | 3/11/2016 0:00 | U |
| Due to of | 4139524 | Transient cerebral ischemia due to atrial fibrillation | Condition | SNOMED | Clinical Finding | S | 426814001 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| Focus of | 4270991 | Insertion of pacemaker for control of atrial fibrillation | Procedure | SNOMED | Procedure | S | 449863006 | 1/31/2012 0:00 | 12/31/2099 0:00 | NULL |
| Has finding site | 4242112 | Atrial structure | Spec Anatomic Site | SNOMED | Body Structure | S | 59652004 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| Is a | 4226399 | Fibrillation | Condition | SNOMED | Clinical Finding | S | 40593004 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| Is a | 4068155 | Atrial arrhythmia | Condition | SNOMED | Clinical Finding | S | 17366009 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| Mapped from | 40323929 | Fibrillation - atrial | Condition | SNOMED | Clinical Finding | NULL | 155364009 | 1/1/1970 0:00 | 3/11/2016 0:00 | U |
| Mapped from | 2617597 | Patient with heart failure and atrial fibrillation documented to be on warfarin therapy | Observation | HCPCS | HCPCS | NULL | G8183 | 1/1/1970 0:00 | 11/11/2014 0:00 | D |
| Mapped from | 45576876 | Unspecified atrial fibrillation | Condition | ICD10CM | 5-char billing code | NULL | I48.91 | 12/30/2006 0:00 | 12/31/2099 0:00 | NULL |
| Mapped from | 45500085 | Atrial fibrillation | Condition | Read | Read | NULL | G573000 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| Mapped from | 45611600 | Atrial Fibrillation | Condition | MeSH | Main Heading | NULL | D001281 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| Mapped from | 40345197 | Fibrillation - atrial | Condition | SNOMED | Clinical Finding | NULL | 266306001 | 1/1/1970 0:00 | 3/11/2016 0:00 | U |
| Mapped from | 45951191 | Atrial Fibrillation | Condition | CIEL | Diagnosis | NULL | 148203 | 11/3/2007 0:00 | 12/31/2099 0:00 | NULL |
| Mapped from | 313217 | Atrial fibrillation | Condition | SNOMED | Clinical Finding | S | 49436004 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| Mapped from | 44821957 | Atrial fibrillation | Condition | ICD9CM | 5-dig billing code | NULL | 427.31 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| Maps to | 313217 | Atrial fibrillation | Condition | SNOMED | Clinical Finding | S | 49436004 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| SNOMED - HOI | 500002401 | OMOP Atrial Fibrillation 1 | Condition | Cohort | Cohort | C | 500002401 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| SNOMED - HOI | 500001801 | OMOP Qt Prolongation/Torsade De Pointes 1 | Condition | Cohort | Cohort | C | 500001801 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| SNOMED - ind/CI | 21005673 | Prevention of Thromboembolism in Chronic Atrial Fibrillation | Drug | Indication | Indication | C | 5673 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| SNOMED - ind/CI | 21003176 | Tachyarrhythmia | Drug | Indication | Indication | C | 3176 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| SNOMED - ind/CI | 21001542 | Supraventricular Tachycardia | Drug | Indication | Indication | C | 1542 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| SNOMED - ind/CI | 21001594 | Disease of Cardiovascular System | Drug | Indication | Indication | C | 1594 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| SNOMED - MedDRA eq | 35204953 | Atrial fibrillation | Condition | MedDRA | PT | C | 10003658 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| Subsumes | 4117112 | Controlled atrial fibrillation | Condition | SNOMED | Clinical Finding | S | 300996004 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| Subsumes | 4119601 | Lone atrial fibrillation | Condition | SNOMED | Clinical Finding | S | 233910005 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| Subsumes | 4232697 | Persistent atrial fibrillation | Condition | SNOMED | Clinical Finding | S | 440059007 | 1/31/2009 0:00 | 12/31/2099 0:00 | NULL |
| Subsumes | 4141360 | Chronic atrial fibrillation | Condition | SNOMED | Clinical Finding | S | 426749004 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| Subsumes | 44782442 | Atrial fibrillation with rapid ventricular response | Condition | SNOMED | Clinical Finding | S | 1.20041E+14 | 1/31/2014 0:00 | 12/31/2099 0:00 | NULL |
| Subsumes | 4199501 | Rapid atrial fibrillation | Condition | SNOMED | Clinical Finding | S | 314208002 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |
| Subsumes | 4119602 | Non-rheumatic atrial fibrillation | Condition | SNOMED | Clinical Finding | S | 233911009 | 1/1/1970 0:00 | 12/31/2099 0:00 | NULL |

Descendant concepts

# Ancestry Relationships: Higher-Level Relationships



# Exploring Ancestors of a Concept

```
SELECT max_levels_of_separation, concept.*
FROM concept_ancestor
JOIN concept ON ancestor_concept_id = concept_id
WHERE descendant_concept_id = 313217 /* Atrial fibrillation */
ORDER BY max_levels_of_separation
```

| max_levels_of_separation | concept_id | concept_name | domain_id | vocabulary_id | concept_class_id | standard_concept |
|---|---|---|---|---|---|---|
| 0 | 313217 | Atrial fibrillation | Co | | | |
| 0 | 35204953 | Atrial fibrillation | Co | | | |
| 1 | 4226399 | Fibrillation | Condition | SNOMED | Clinical Finding | S |
| 1 | 4068155 | Atrial arrhythmia | Condition | SNOMED | Clinical Finding | S |
| 1 | 35204969 | Cardiac fibrillation | Condition | MedDRA | PT | C |
| 2 | 4248028 | Supraventricular arrhythmia | Condition | SNOMED | Clinical Finding | S |
| 2 | 35204952 | Arrhythmia supraventricular | Condition | MedDRA | PT | C |
| 2 | 35202454 | Rate and rhythm disorders NEC | Condition | MedDRA | HLT | C |
| 3 | 44784217 | Cardiac arrhythmia | Condition | SNOMED | Clinical Finding | S |
| 3 | 35202455 | Supraventricular arrhythmias | Condition | MedDRA | HLT | C |
| 4 | 321588 | Heart disease | Condition | SNOMED | Clinical Finding | S |
| 4 | 35204989 | Cardiac disorder | Condition | MedDRA | PT | C |
| 4 | 35202050 | Cardiac arrhythmias | Condition | MedDRA | HLGT | C |
| 5 | 4103183 | Cardiac finding | Condition | SNOMED | Clinical Finding | S |
| 5 | 440142 | Disorder of mediastinum | Condition | SNOMED | Clinical Finding | S |
| 5 | 134057 | Disorder of cardiovascular system | Condition | SNOMED | Clinical Finding | S |
| 5 | 35204998 | Cardiovascular disorder | Condition | MedDRA | PT | C |
| 5 | 37219970 | Mediastinal disorder | Condition | MedDRA | PT | C |
| 5 | 37622411 | Phlebosclerosis | Condition | MedDRA | PT | C |
| 5 | 35202457 | Cardiac disorders NEC | Condition | MedDRA | HLT | C |
| 6 | 4115390 | Mediastinal finding | Condition | SNOMED | Clinical Finding | S |
| 6 | 4023995 | Cardiovascular finding | Condition | SNOMED | Clinical Finding | S |

Hold the descendant

# Exploring Descendants of a Concept

```
SELECT max_levels_of_separation, concept.*
FROM concept_ancestor
JOIN concept ON descendant_concept_id = concept_id
WHERE ancestor_concept_id = 44784217 /* cardiac arrythmia */
ORDER BY max_levels_of_separation
```

Hold the ancestor

| MAX_LEVELS_OF_SEPARATION | CONCEPT_ID | CONCEPT_NAME | DOMAIN_ID | VOCABULARY_ID | CONCEPT_CLASS_ID | STANDARD_CONCEPT |
|---|---|---|---|---|---|---|
| 0 | 44784217 | Cardiac arrhythmia | Condition | SNOMED | Clinical Finding | S |
| 1 | 313224 | Anomalous atrioventricular excitation | Condition | SNOMED | Clinical Finding | S |
| 1 | 315643 | Tachyarrhythmia | Condition | SNOMED | Clinical Finding | S |
| 1 | 316429 | Premature beats | Condition | SNOMED | Clinical Finding | S |
| 1 | 316999 | Conduction disorder of the heart | Condition | SNOMED | Clinical Finding | S |
| 1 | 321042 | Cardiac arrest | Condition | SNOMED | Clinical Finding | S |
| 1 | 4030583 | Pacemaker twiddler's syndrome | Condition | SNOMED | Clinical Finding | S |
| 1 | 4057008 | Accelerated atrioventricular conduction | Condition | SNOMED | Clinical Finding | S |
| 1 | 4086313 | Withdrawal arrhythmia | Condition | SNOMED | Clinical Finding | S |
| 1 | 4088507 | Ventricular escape complex | Condition | SNOMED | Clinical Finding | S |
| 1 | 4088986 | Atrial escape complex | Condition | SNOMED | Clinical Finding | S |
| 1 | 4091901 | Aberrant premature complexes | Condition | SNOMED | Clinical Finding | S |
| 1 | 4092011 | Aberrantly conducted complex | Condition | SNOMED | Clinical Finding | S |
| 1 | 4124704 | Postoperative sinoatrial disease | Condition | SNOMED | Clinical Finding | S |
| 1 | 4143042 | Ectopic beats | Condition | SNOMED | Clinical Finding | S |
| 1 | 4164083 | Ectopic rhythm | Condition | SNOMED | Clinical Finding | S |
| 1 | 4172863 | Fetal dysrhythmia | Condition | SNOMED | Clinical Finding | S |
| 1 | 4173170 | Neonatal dysrhythmia | Condition | SNOMED | Clinical Finding | S |
| 1 | 4175473 | Atrioventricular dissociation | Condition | SNOMED | Clinical Finding | S |
| 1 | 4185572 | Ventricular arrhythmia | Condition | SNOMED | Clinical Finding | S |
| 1 | 4217221 | Nodal rhythm disorder | Condition | SNOMED | Clinical Finding | S |
| 1 | 4226399 | Fibrillation | Condition | SNOMED | Clinical Finding | S |
| 1 | 4228448 | Bradyarrhythmia | Condition | SNOMED | Clinical Finding | S |

# Let Us find Upper Gastrointestinal Bleeding

## 1. Find some initiation concept

```
SELECT * FROM concept WHERE concept_name = 'Upper gastrointestinal bleeding'
```

| concept_id | concept_name | domain_id | vocabulary_id | concept_class_id | standard_concept | concept_code |
|---|---|---|---|---|---|---|
| 42891225 | Upper gastrointest... | Condition | MedDRA | LLT | C | 10071910 |

## 2. Find standard concepts

```
SELECT * FROM concept WHERE lower(concept_name) LIKE '%upper gastrointestinal%'
  AND domain_id = 'Condition' AND standard_concept = 'S'
```

| concept_id | concept_name | domain_id | vocabulary_id | concept_class_id | standard_concept | concept_code |
|---|---|---|---|---|---|---|
| 4308202 | Acute upper gastrointestinal hemorrhage | Condition | SNOMED | Clinical Finding | S | 38938002 |
| 4291649 | Upper gastrointestinal hemorrhage | Condition | SNOMED | Clinical Finding | S | 37372002 |
| 4115581 | Finding of upper gastrointestinal gas | Condition | SNOMED | Clinical Finding | S | 300370006 |
| 4103011 | Chronic upper gastrointestinal hemorrhage | Condition | SNOMED | Clinical Finding | S | 25349007 |
| 4012503 | Excessive upper gastrointestinal gas | Condition | SNOMED | Clinical Finding | S | 162076009 |
| 4000609 | Disorder of upper gastrointestinal tract | Condition | SNOMED | Clinical Finding | S | 119291004 |
| 4332645 | Upper gastrointestinal hemorrhage associated with hypercoagulability state | Condition | SNOMED | Clinical Finding | S | 430349003 |

# Going up the hierarchy: Finding the right concept

```
SELECT max_levels_of_separation, concept.*
FROM concept_ancestor
JOIN concept ON ancestor_concept_id = concept_id
WHERE descendant_concept_id = 4332645 /* Upper gastrointestinal hemorrhage associated...*/
ORDER BY max_levels_of_separation
```

Hold the descendant

| max_levels_of_separation | concept_id | concept_name | domain_id | vocabulary_id | concept_class_id | standard_concept | concept_code |
|---|---|---|---|---|---|---|---|
| 0 | 4332645 | Upper gastrointestinal hemorrhage associated with hypercoag | Condition | SNOMED | Clinical Finding | S | 430349003 |
| 1 | 35708054 | Gastritis haemorrhagic | Condition | MedDRA | PT | C | 10017866 |
| 1 | 4291649 | Upper gastrointestinal hemorrhage | Condition | SNOMED | Clinical Finding | S | 37372002 |
| 1 | 35707871 | Upper gastrointestinal haemorrhage | Condition | MedDRA | PT | C | 10046274 |
| 2 | 35707864 | Gastrointestinal haemorrhage | Condition | MedDRA | PT | C | 10017955 |
| 2 | 4000609 | Disorder of upper gastrointestinal tract | Condition | SNOMED | Clinical Finding | S | 119291004 |
| 2 | 35707858 | Intestinal haemorrhage | Condition | MedDRA | PT | C | 10059175 |
| 2 | 35702752 | Gastritis (excl infective) | Condition | MedDRA | HLT | C | 10017854 |
| 2 | 192671 | Gastrointestinal hemorrhage | Condition | SNOMED | Clinical Finding | S | 74474003 |
| 3 | 37604042 | Gastrointestinal haemorrhages | Condition | MedDRA | HLT | C | 10052742 |
| 3 | 37622518 | Haemorrhage | Condition | MedDRA | PT | C | 10055798 |
| 3 | 437312 | Bleeding | Condition | SNOMED | Clinical Finding | S | 131148009 |
| 3 | 4198525 | Disorder of upper digestive tract | Condition | SNOMED | Clinical Finding | S | 50410009 |
| 3 | 37622515 | Extravasation blood | Condition | MedDRA | PT | C | 10015867 |
| 3 | 4000610 | Disorder of gastrointestinal tract | Condition | SNOMED | Clinical Finding | S | 119292006 |
| 3 | 35702116 | Gastrointestinal inflammatory conditions | Condition | MedDRA | HLGT | C | 10017969 |
| 3 | 35702743 | Intestinal haemorrhages | Condition | MedDRA | HLT | C | 10022653 |
| 3 | 35702744 | Non-site specific gastrointestinal haemorrhages | Condition | MedDRA | HLT | C | 10017958 |
| 4 | 35702114 | Gastrointestinal haemorrhages NEC | Condition | MedDRA | HLGT | C | 10017959 |
| 4 | 4304916 | Gastrointestinal tract finding | Condition | SNOMED | Clinical Finding | S | 386618008 |
| 4 | 35702767 | Nausea and vomiting symptoms | Condition | MedDRA | HLT | C | 10028817 |

# Going down the hierarchy : Checking the right content

```
SELECT max_levels_of_separation, concept.*
FROM concept_ancestor
JOIN concept ON descendant_concept_id = concept_id
WHERE ancestor_concept_id = 4291649 /* Upper gastrointestinal hemorrhage */
ORDER BY max_levels_of_separation
```

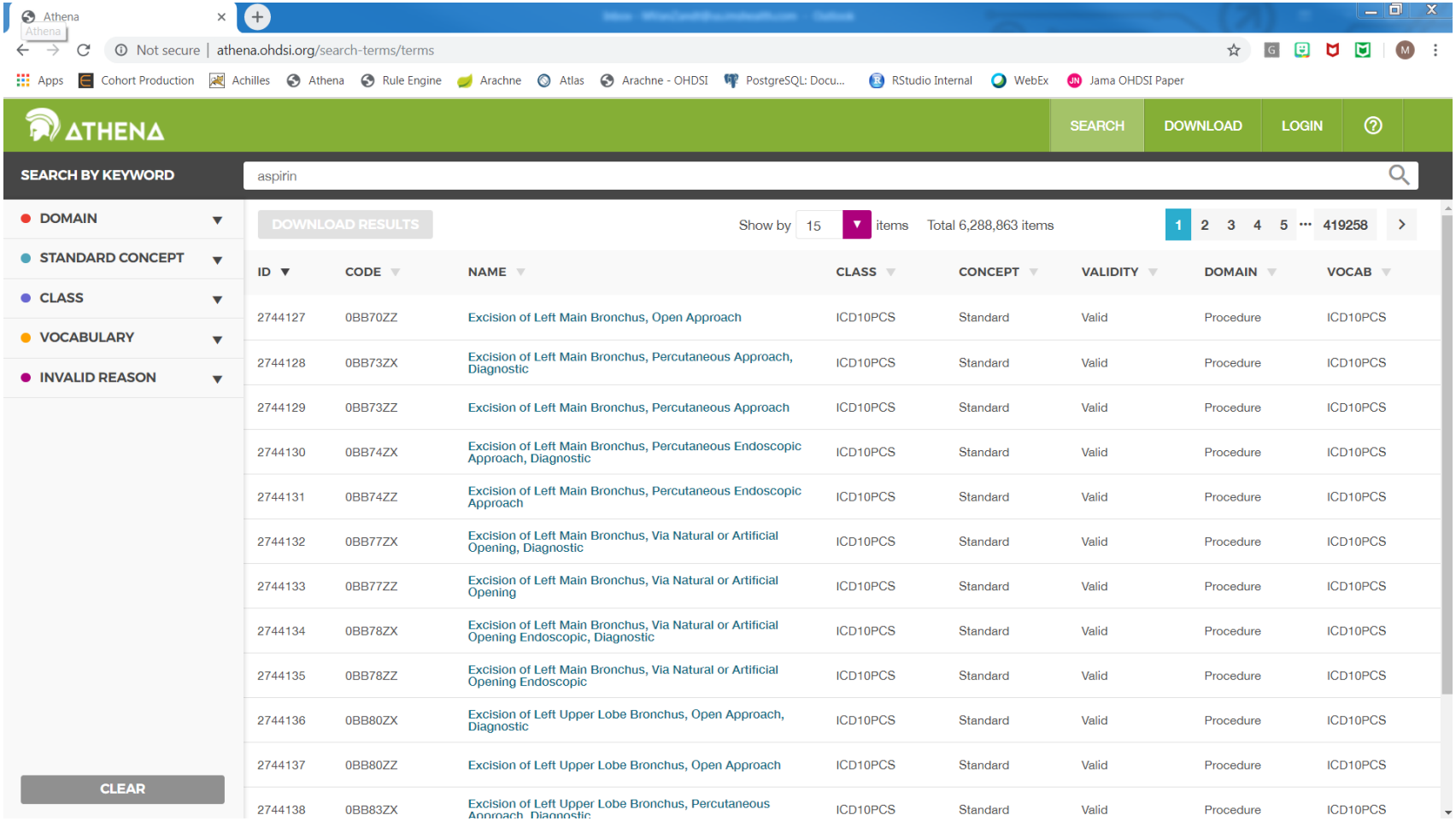
| max_levels_of_separation | concept_id | concept_name | domain_id | vocabulary_id | concept_class_id | standard_concept | concept_code |
|---|---|---|---|---|---|---|---|
| 0 | 4291649 | Upper gastrointestinal hemorrhage | Condition | SNOMED | Clinical Finding | S | 37372002 |
| 1 | 4318535 | Duodenal hemorrhage | | | | | |
| 1 | 23245 | Esophageal bleeding | | | | | |
| 1 | 4308202 | Acute upper gastrointestinal hemorrhage | | | | | |
| 1 | 4271696 | Peptic ulcer with hemorrhage | Condition | SNOMED | Clinical Finding | S | 64121000 |
| 1 | 4103011 | Chronic upper gastrointestinal hemorrhage | Condition | SNOMED | Clinical Finding | S | 25349007 |
| 1 | 26727 | Hematemesis | Condition | SNOMED | Clinical Finding | S | 8765009 |
| 1 | 4332645 | Upper gastrointestinal hemorrhage associated with hypercoag | Condition | SNOMED | Clinical Finding | S | 430349003 |
| 1 | 193250 | Gastric hemorrhage | Condition | SNOMED | Clinical Finding | S | 61401005 |
| 2 | 4131525 | Hemorrhagic gastropathy | Condition | SNOMED | Clinical Finding | S | 413218001 |
| 2 | 4204041 | Hematemesis - cause unknown | Condition | SNOMED | Clinical Finding | S | 308904008 |
| 2 | 4134808 | Hemorrhagic duodenopathy | Condition | SNOMED | Clinical Finding | S | 413212000 |
| 2 | 4260059 | Hemorrhagic gastroenteritis | Condition | SNOMED | Clinical Finding | S | 409506009 |
| 2 | 4099014 | Duodenal ulcer with hemorrhage | Condition | SNOMED | Clinical Finding | S | 27281001 |
| 2 | 46270145 | Gastric hemorrhage due to atrophic gastritis | Condition | SNOMED | Clinical Finding | S | 1.5072E+14 |
| 2 | 4096032 | Duodenal hematoma | Condition | SNOMED | Clinical Finding | S | 262843005 |
| 2 | 4174044 | Chronic peptic ulcer with hemorrhage | Condition | SNOMED | Clinical Finding | S | 49232000 |
| 2 | 4095555 | Esophageal hematoma | Condition | SNOMED | Clinical Finding | S | 262790002 |
| 2 | 46269904 | Hemorrhage of duodenum co-occurrent and due to diverticulo | Condition | SNOMED | Clinical Finding | S | 1.0866E+15 |
| 2 | 45768629 | Gastric hemorrhage due to erosive gastritis | Condition | SNOMED | Clinical Finding | S | 7.071E+12 |

Concept 4291649 and all its descendants comprise Upper GI Bleeding

# Exercise: Find Standard Concept ID for Conditions

- Asthma — 317009
- Plague — 434271
- Ingrown toenail — 4065236, 4290993
- Your favorite condition here

# Athena




| ID | CODE | NAME | CLASS | CONCEPT | VALIDITY | DOMAIN | VOCAB |
|---|---|---|---|---|---|---|---|
| 2744127 | 0BB70ZZ | Excision of Left Main Bronchus, Open Approach | ICD10PCS | Standard | Valid | Procedure | ICD10PCS |
| 2744128 | 0BB73ZX | Excision of Left Main Bronchus, Percutaneous Approach, Diagnostic | ICD10PCS | Standard | Valid | Procedure | ICD10PCS |
| 2744129 | 0BB73ZZ | Excision of Left Main Bronchus, Percutaneous Approach | ICD10PCS | Standard | Valid | Procedure | ICD10PCS |
| 2744130 | 0BB74ZX | Excision of Left Main Bronchus, Percutaneous Endoscopic Approach, Diagnostic | ICD10PCS | Standard | Valid | Procedure | ICD10PCS |
| 2744131 | 0BB74ZZ | Excision of Left Main Bronchus, Percutaneous Endoscopic Approach | ICD10PCS | Standard | Valid | Procedure | ICD10PCS |
| 2744132 | 0BB77ZX | Excision of Left Main Bronchus, Via Natural or Artificial Opening, Diagnostic | ICD10PCS | Standard | Valid | Procedure | ICD10PCS |
| 2744133 | 0BB77ZZ | Excision of Left Main Bronchus, Via Natural or Artificial Opening | ICD10PCS | Standard | Valid | Procedure | ICD10PCS |
| 2744134 | 0BB78ZX | Excision of Left Main Bronchus, Via Natural or Artificial Opening Endoscopic, Diagnostic | ICD10PCS | Standard | Valid | Procedure | ICD10PCS |
| 2744135 | 0BB78ZZ | Excision of Left Main Bronchus, Via Natural or Artificial Opening Endoscopic | ICD10PCS | Standard | Valid | Procedure | ICD10PCS |
| 2744136 | 0BB80ZX | Excision of Left Upper Lobe Bronchus, Open Approach, Diagnostic | ICD10PCS | Standard | Valid | Procedure | ICD10PCS |
| 2744137 | 0BB80ZZ | Excision of Left Upper Lobe Bronchus, Open Approach | ICD10PCS | Standard | Valid | Procedure | ICD10PCS |
| 2744138 | 0BB83ZX | Excision of Left Upper Lobe Bronchus, Percutaneous Approach, Diagnostic | ICD10PCS | Standard | Valid | Procedure | ICD10PCS |

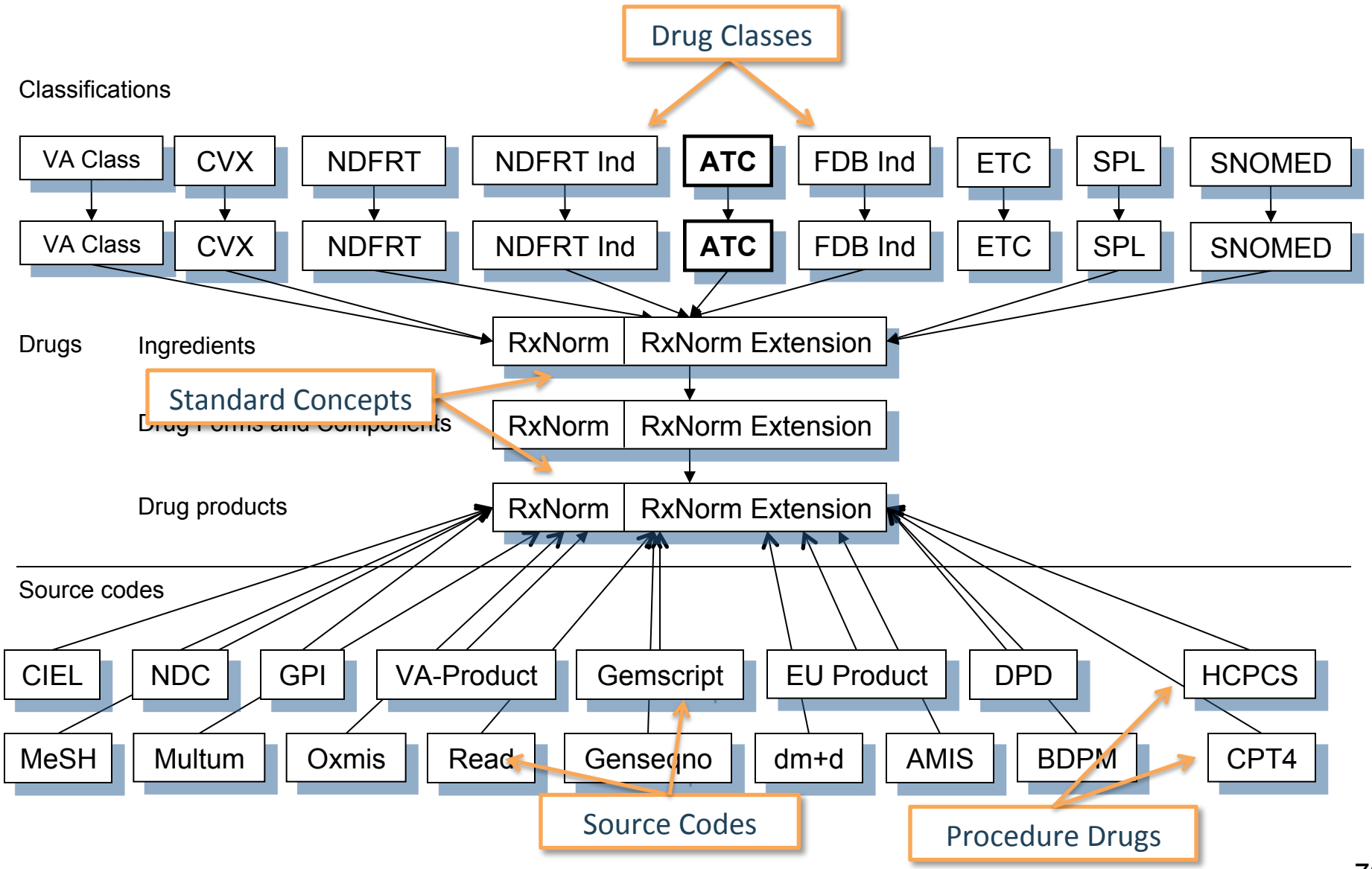
# Lunch

Please return in 1 hour

# Does it Work that Way with Drugs?

- Codes
  - NDC, GPI, Multilex, HCPCS, etc.
- Concepts
  - Drug products (Generic and Brand)
  - Drug ingredients
  - Drug Classes
- Relationships
- Ancestry

# Drug Hierarchy



# Let us find Warfarin

1. Find active compound Warfarin by keyword

```
SELECT * FROM concept WHERE lower(concept_name) = 'warfarin'
```

| concept_id | concept_name | domain_id | vocabulary_id | concept_class_id | standard_concept | concept_code |
|---|---|---|---|---|---|---|
| 21253542 | Warfarin | Drug | dm+d | VTM | NULL | 48603004 |
| 40772658 | Warfarin | Measurement | LOINC | LOINC Hierarchy | C | LP16309-4 |
| 1847834 | WARFARIN | Drug | DA_France | Ingredient | NULL | OMOP13547 |
| 4293218 | WARFARIN | Drug | NDFRT | Pharma Preparation | NULL | N0000148057 |
| 35715898 | WARFARIN | Drug | LPD_Australia | Ingredient | NULL | OMOP582219 |
| 43081820 | warfarin | Drug | Multilex | Ingredient | NULL | 2849 |
| 4187015 | Warfarin | Drug | SNOMED | Substance | NULL | 372756006 |
| 43343324 | Warfarin | Drug | AMT | AU Substance | NULL | 2714011000036109 |
| 4174989 | Warfarin | Drug | SNOMED | Pharma/Biol Product | NULL | 48603004 |
| 4325514 | Warfarin | Drug | NDFRT | Chemical Structure | C | N0000006403 |
| 1310149 | Warfarin | Drug | RxNorm | Ingredient | S | 11289 |
| 21600965 | warfarin | Drug | ATC | ATC 5th | C | B01AA03 |
| 45618204 | Warfarin | Drug | MeSH | Main Heading | NULL | D014859 |

# Let us find Clopidogrel

1. Find drug product containing Clopidogrel by NDC code:

   Bristol Meyer Squibb's  Plavix 75mg capsules: NDC 67544050474

```
SELECT * FROM concept WHERE concept_code = '67544050474'
```

| concept_id | concept_name | domain_id | vocabulary_id | concept_class_id | standard_concept | concept_code | valid_start_date | valid_end_date | invalid_reason |
|---|---|---|---|---|---|---|---|---|---|
| 45867731 | clopidogrel 75 MG Oral Tablet [Plavix] | Drug | NDC | 11-digit NDC | NULL | 67544050474 | 2014-07-01 | 2099-12-31 | NULL |

```
SELECT * FROM concept_relationship WHERE concept_id_1 = 45867731
 AND relationship_id = 'Maps to'
```

| concept_id_1 | concept_id_2 | relationship_id | valid_start_date | valid_end_date | invalid_reason |
|---|---|---|---|---|---|
| 45867731 | 1322185 | Maps to | 2015-01-29 | 2099-12-31 | NULL |

```
SELECT * FROM concept WHERE concept_id = 1322185
```

| concept_id | concept_name | domain_id | vocabulary_id | concept_class_id | standard_concept | concept_code | valid_start_date | valid_end_date | invalid_reason |
|---|---|---|---|---|---|---|---|---|---|
| 1322185 | clopidogrel 75 MG Oral Tablet [Plavix] | Drug | RxNorm | Branded Drug | S | 213169 | 1970-01-01 | 2099-12-31 | NULL |

# Let us find Clopidogrel ingredient

2. Find ingredient Clopidogrel as Ancestor of drug product

```
SELECT max_levels_of_separation, concept.*
FROM concept_ancestor
JOIN concept ON ancestor_concept_id = concept_id
WHERE descendant_concept_id = 1322185 /* clopidogrel 75 MG Oral Tablet [Plavix]*/
ORDER BY max_levels_of_separation
```

| max_levels_of_separation | concept_id | concept_name | domain_id | vocabulary_id | concept_class_id | standard_concept | concept_code |
|---|---|---|---|---|---|---|---|
| 0 | 1322185 | clopidogrel 75 MG Oral Tablet [Plavix] | Drug | RxNorm | Branded Drug | S | 213169 |
| 0 | 19075601 | clopidogrel 75 MG Oral Tablet | Drug | RxNorm | Clinical Drug | S | 309362 |
| 1 | 40095879 | clopidogrel Oral Tablet [Plavix] | Drug | RxNorm | Branded Drug Form | S | 368301 |
| 1 | 19120256 | clopidogrel 75 MG [Plavix] | Drug | RxNorm | Branded Drug Comp | S | 573094 |
| 1 | 1322187 | clopidogrel 75 MG | Drug | RxNo | | S | 329449 |
| 1 | 40095878 | clopidogrel Oral Tablet | Drug | RxNo | | S | 374583 |
| 2 | 36222254 | clopidogrel Oral Product | Drug | RxNorm | | C | 1163766 |
| 2 | 36229332 | Plavix Pill | Drug | RxNorm | Branded Dose Group | C | 1181791 |
| 2 | 36229331 | Plavix Oral Product | Drug | RxNorm | Branded Dose Group | C | 1181790 |
| 2 | 36222255 | clopidogrel Pill | Drug | RxNorm | Clinical Dose Group | C | 1163767 |
| 2 | 1322184 | clopidogrel | Drug | RxNorm | Ingredient | S | 32968 |
| 3 | 46319141 | CLOPIDOGREL - clopidogrel tablet, film coated | Drug | SPL | Prescription Drug | C | 52adfb2c-2062-495c-9954-39eeecae2b41 |
| 3 | 4279519 | PLATELET AGGREGATION INHIBITORS | Drug | VA Class | VA Class | C | BL117 |
| 3 | 45796809 | clopidogrel 75mg/1 ORAL TABLET, FILM COATED [clopidogrel b | Drug | SPL | Prescription Drug | C | b4e53c96-e280-47c6-baa0-ec676e041d8d |
| 3 | 45798740 | clopidogrel bisulfate 75mg/1 ORAL TABLET, FILM COATED | Drug | SPL | Prescription Drug | C | c7fa330d-d8f1-487e-a730-bafae123e9a8 |
| 3 | 21600985 | Platelet aggregation inhibitors excl. heparin | Drug | ATC | | C | B01AC |

Clopidogrel

Drug classes

# Check out Ingredients

3. Check Descendants (other drug products containing Warfarin and Dabigatran)

```
SELECT max_levels_of_separation, concept.*
FROM concept_ancestor
JOIN concept ON descendant_concept_id = concept_id
WHERE ancestor_concept_id = 1310149 /* Warfarin or 1322185 Clopidogrel*/
ORDER BY max_levels_of_separation
```

| concept_id | concept_name | vocabulary_id | concept_class_id |
|---|---|---|---|
| 1310149 | Warfarin | RxNorm | Ingredient |
| 36221229 | Jantoven Pill | RxNorm | Branded Dose Group |
| 40163559 | Warfarin Sodium 6 MG | RxNorm | Clinical Drug Comp |
| 40163544 | Warfarin Sodium 3 MG [Jantoven] | RxNorm | Branded Drug Comp |
| 21134746 | Warfarin 0.2 MG/ML | RxNorm Extension | Clinical Drug Comp |
| 21105414 | Warfarin 5 MG/ML | RxNorm Extension | Clinical Drug Comp |
| 36221228 | Jantoven Oral Product | RxNorm | Branded Dose Group |
| 40163565 | Warfarin Sodium 7.5 MG | RxNorm | Clinical Drug Comp |
| 21115236 | Warfarin 0.3 MG/ML | RxNorm Extension | Clinical Drug Comp |
| 40163509 | Warfarin Sodium 1 MG | RxNorm | Clinical Drug Comp |
| 21156284 | 1 ML Warfarin 0.02 MG/ML Oral Solution | RxNorm Extension | Quant Clinical Drug |
| 21095537 | Warfarin 0.3 MG/ML Oral Solution | RxNorm Extension | Clinical Drug |
| 21105427 | Warfarin 0.4 MG/ML Oral Solution | RxNorm Extension | Clinical Drug |
| 21046557 | Warfarin 1 MG/ML Oral Solution | RxNorm Extension | Clinical Drug |
| 40093133 | Warfarin Oral Tablet [Coumadin] | RxNorm | Branded Drug Form |
| 40093134 | Warfarin Oral Tablet [Jantoven] | RxNorm | Branded Drug Form |
| 21077698 | 1 ML Warfarin 1 MG/ML Oral Solution | RxNorm Extension | Quant Clinical Drug |
| 40163534 | Warfarin Sodium 2.5 MG Oral Tablet | RxNorm | Clinical Drug |
| 40163530 | Warfarin Sodium 2 MG/ML Injectable Solution | RxNorm | Clinical Drug |
| 21066136 | Warfarin 5 MG Oral Tablet [Marevan] | RxNorm Extension | Branded Drug |
| 40163542 | Warfarin Sodium 3 MG Oral Tablet [Jantoven] | RxNorm | Branded Drug |
| 21116822 | 1 ML Warfarin 0.6 MG/ML Oral Suspension | RxNorm Extension | Quant Clinical Drug |
| 21175784 | 1 ML Warfarin 0.1 MG/ML Oral Solution | RxNorm Extension | Quant Clinical Drug |
| 21175783 | 1 ML Warfarin 0.832 MG/ML Oral Solution | RxNorm Extension | Quant Clinical Drug |

| concept_id | concept_name | vocabulary_id | concept_class_id |
|---|---|---|---|
| 1322184 | clopidogrel | RxNorm | Ingredient |
| 21043471 | clopidogrel Oral Suspension | RxNorm Extension | Clinical Drug Form |
| 36229332 | Plavix Pill | RxNorm | Branded Dose Group |
| 21043470 | clopidogrel Oral Solution | RxNorm Extension | Clinical Drug Form |
| 21023802 | clopidogrel Injectable Solution | RxNorm Extension | Clinical Drug Form |
| 21023806 | clopidogrel 5 MG | RxNorm Extension | Clinical Drug Comp |
| 1322187 | clopidogrel 75 MG | RxNorm | Clinical Drug Comp |
| 21141600 | clopidogrel 1 MG/ML | RxNorm Extension | Clinical Drug Comp |
| 36222254 | clopidogrel Oral Product | RxNorm | Clinical Dose Group |
| 21092477 | clopidogrel 5 MG/ML | RxNorm Extension | Clinical Drug Comp |
| 21177192 | 100 ML clopidogrel 1 MG/ML Oral Suspension | RxNorm Extension | Quant Clinical Drug |
| 21047899 | 1 ML clopidogrel 5 MG/ML Oral Suspension | RxNorm Extension | Quant Clinical Drug |
| 21121870 | clopidogrel 5 MG/ML Oral Suspension | RxNorm Extension | Clinical Drug |
| 21063106 | clopidogrel 75 MG Oral Tablet [Grepid] | RxNorm Extension | Branded Drug |
| 1322190 | clopidogrel 300 MG Oral Tablet [Plavix] | RxNorm | Branded Drug |
| 21121869 | clopidogrel 75 MG Injectable Solution | RxNorm Extension | Clinical Drug |
| 21053280 | clopidogrel 6 MG Injectable Solution | RxNorm Extension | Clinical Drug |
| 21023810 | clopidogrel 4 MG Injectable Solution | RxNorm Extension | Clinical Drug |
| 21106783 | 1 ML clopidogrel 1 MG/ML Oral Suspension | RxNorm Extension | Quant Clinical Drug |
| 19075601 | clopidogrel 75 MG Oral Tablet | RxNorm | Clinical Drug |
| 21102364 | clopidogrel 1 MG/ML Oral Suspension | RxNorm Extension | Clinical Drug |
| 40095879 | clopidogrel Oral Tablet [Plavix] | RxNorm | Branded Drug Form |
| 40095878 | clopidogrel Oral Tablet | RxNorm | Clinical Drug Form |
| 21088717 | 100 ML clopidogrel 15 MG/ML Oral Suspension | RxNorm Extension | Quant Clinical Drug |

# Find members of Drug Classes

4. Check Ingredient Descendants of Drug Class Anticoagulants

```
SELECT max_levels_of_separation, concept.*
FROM concept_ancestor
JOIN concept ON descendant_concept_id = concept_id
WHERE ancestor_concept_id =  21600961 /*  ATC Antithromboic Agent */
  AND concept_class_id = 'Ingredient'
ORDER BY max_levels_of_separation
```

| concept_id | concept_name | domain_id | vocabulary_id | concept_class_id |
|---|---|---|---|---|
| 46275677 | cangrelor | Drug | RxNorm | Ingredient |
| 45892847 | edoxaban | Drug | RxNorm | Ingredient |
| 1322184 | clopidogrel | Drug | RxNorm | Ingredient |
| 44818499 | vorapaxar | Drug | RxNorm | Ingredient |
| 43013024 | apixaban | Drug | RxNorm | Ingredient |
| 42898933 | defibrotide | Drug | RxNorm | Ingredient |
| 42801108 | Protein C | Drug | RxNorm | Ingredient |
| 40241331 | rivaroxaban | Drug | RxNorm | Ingredient |
| 1310149 | Warfarin | Drug | RxNorm | Ingredient |
| 40241186 | Ticagrelor | Drug | RxNorm | Ingredient |
| 40228152 | dabigatran etexilate | Drug | RxNorm | Ingredient |
| 40163718 | prasugrel | Drug | RxNorm | Ingredient |
| 35604848 | selexipag | Drug | RxNorm | Ingredient |
| 19136187 | Streptokinase | Drug | RxNorm | Ingredient |

# Exercise:
# Find Standard Concept ID

| | |
|---|---|
| Metformin | 1503297 |
| Tolazamide | 1502809 |
| Telmisartan | 1317640 |

Your favorite ingredient here

# Exercise:
# Find Standard Concept ID

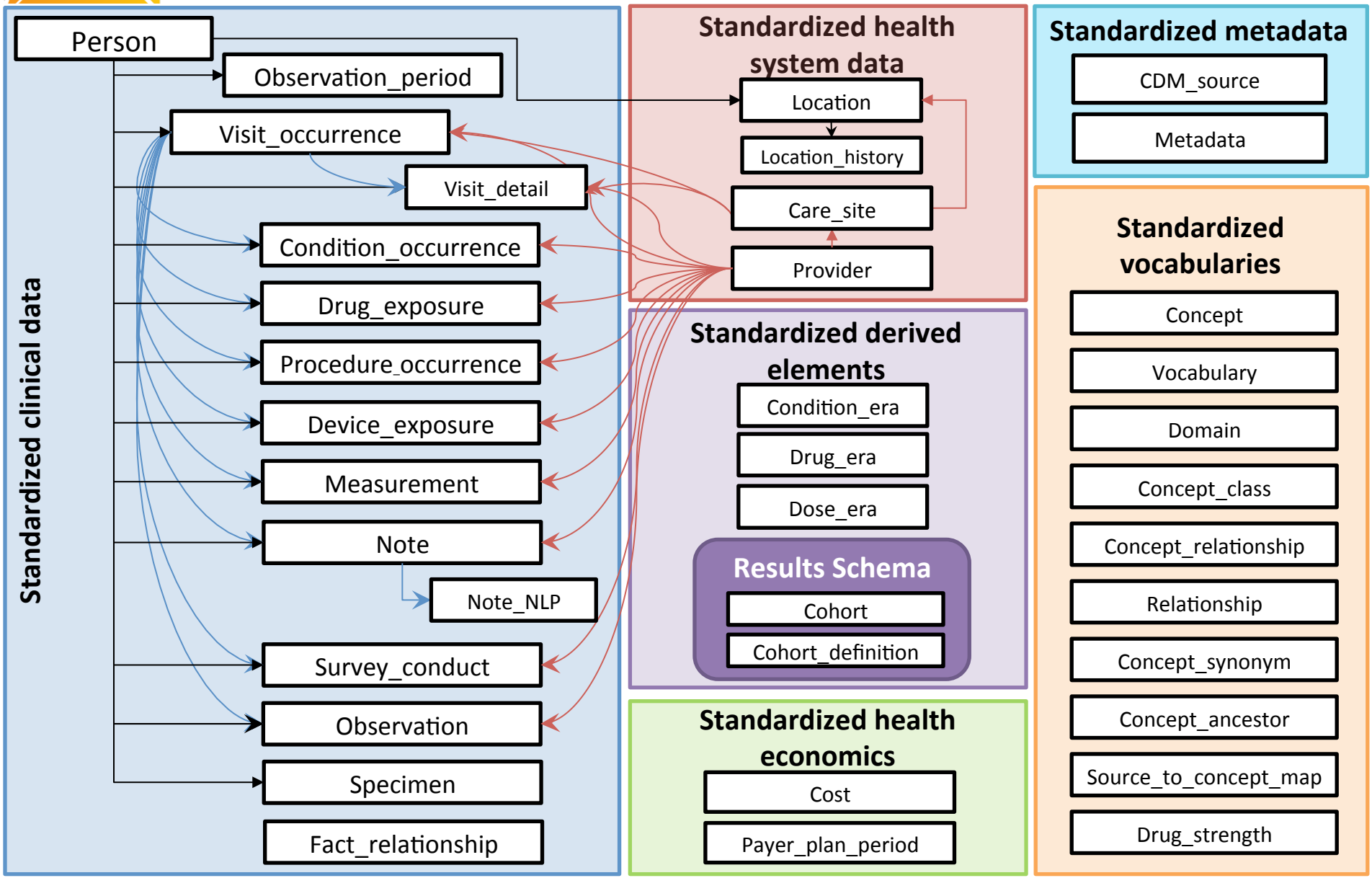
| | |
|---|---|
| A10AE06 | 35602717 |
| 686450400 | 19080217 |
| A10BD14 | ??? |

Your favorite drug here

# Common Data Model


In depth discussion of model & era discussion

# CDM Version 6 Key Domains



# OMOP CDM Principles

- Patient centric
- Vocabulary and Data Model are blended
- Domain-oriented concepts
- Accommodates data from various sources
- Preserves data provenance
- Extendable & Evolving
- Database Platform Independent

# OMOP CDM Standard Domain Features

| Feature | Description & Purpose | Field Name Convention | Example |
|---|---|---|---|
| Patient centric | Every domain table has **patient identifier**. Patient data can be retrieved independently from other domains. | **person_id** | person_id 123 |
| Unique domain identifiers | Ever domain table has a unique primary key to identify domain entities. | <entity>**_id** | condition_occurrence_id 470985 |
| Standard concept from a respective vocabulary domain | Integration with the Vocabulary. Foreign key into the Standard Vocabulary for **Standard Concept.** | <entity>_concept_id | condition_concept_id 313217 (SNOMED "Atrial Fibrillation") |
| Source value | Provenance. Verbatim information from the source data, **not to be used** by any standard analytics. | <entity>**_source_value** | condition_source_value 427.31 (ICD9CM "Atrial Fibrillation") |
| Source concept from a respective vocabulary domain | Provenance. Foreign key into Standard Vocabulary for **Source Concept**. | <entity>**_source_concept_id** | condition_source_concept_id 44821957 (ICD9CM "Atrial Fibrillation") |
| Source type | Provenance. Foreign key into Vocabulary for the **origin of the data.** | <entity>**_type_concept_id** | condition_type_concept_id 38000199 ("Inpatient header – primary") |

# A Patient's Story: Lauren

Lauren's story

endometriosis uk

"Every step of this painful journey I've had to convince everyone how much pain I was in."

"My first surgery taught me that I had to be very patient with my recovery and very patient with myself in general."

https://www.endometriosis-uk.org/laurens-story

# What data do we have?

- Guided Exercise:
  - Where and how do we think Lauren's data is generated?
  - Where do we think Lauren's data could go into the CDM?

# What data do we have?

dysmenorrhea

abdominal pain

missed work

missed work

acetamino phen

acetamino phen

acetamino phen

GP visit

ultrasound

pelvic exam

cyst of ovary

Hospital Visit

severe pain

temp 103°F

ultrasound

ambulance

Bloated abdomen

ascites

surgery

endometrioma

Endometriosis

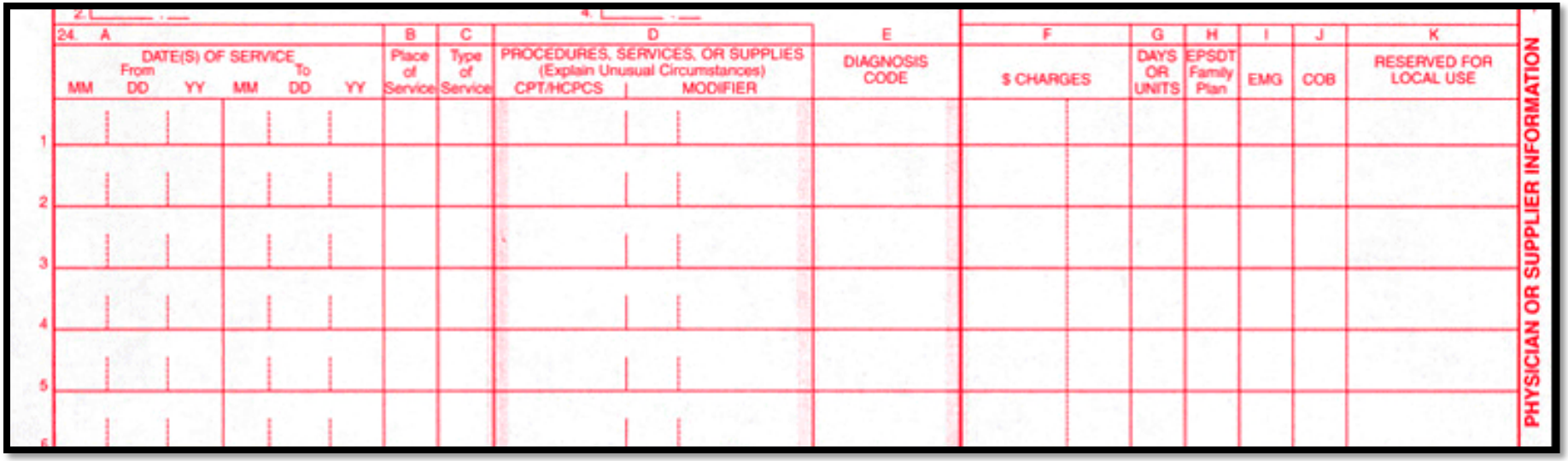
*Lauren's Timeline*

*-3 Years* *-2 Years* *-1 Years* *-2 Weeks* *-3 Days* *Day 0*

# Examples of how Researchers get Lauren's data?

- Health Insurance Claim Form (HCFA-1500)

- Universal Billing form (UB-92)

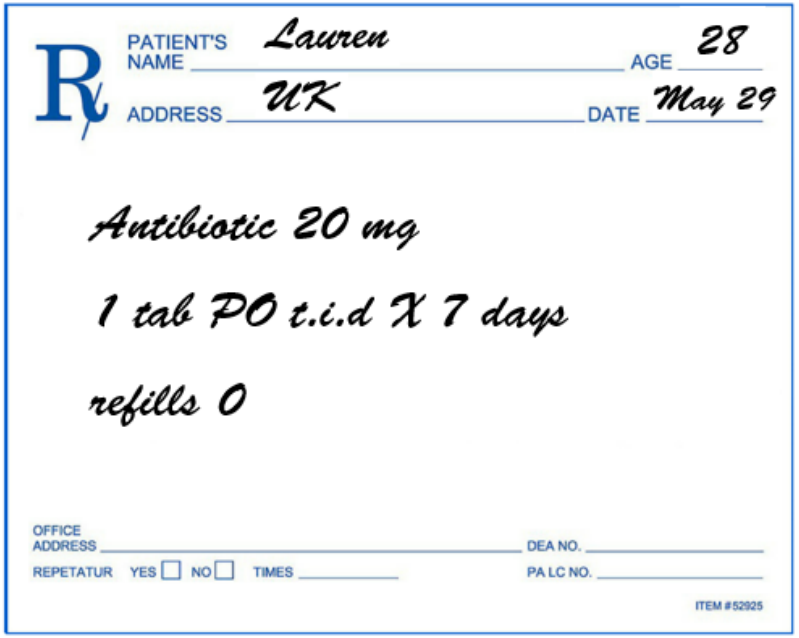


| 24. A DATE(S) OF SERVICE From MM DD YY | To MM DD YY | B Place of Service | C Type of Service | D PROCEDURES, SERVICES, OR SUPPLIES (Explain Unusual Circumstances) CPT/HCPCS | MODIFIER | E DIAGNOSIS CODE | F $ CHARGES | G DAYS OR UNITS | H EPSDT Family Plan | I EMG | J COB | K RESERVED FOR LOCAL USE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | |

PHYSICIAN OR SUPPLIER INFORMATION

# Examples of how Researchers get Lauren's data?

- Health Insurance Claim Form (HCFA-1500)
- Universal Billing form (UB-92)
- Prescriptions



# Examples of how Researchers get Lauren's data?

- Health Insurance Claim Form (HCFA-1500)
- Universal Billing form (UB-92)
- Prescriptions
- Doctors notes

Patient: Lauren

Date of Procedure: 12-March

Surgeon: Dr. Patrick Ryan

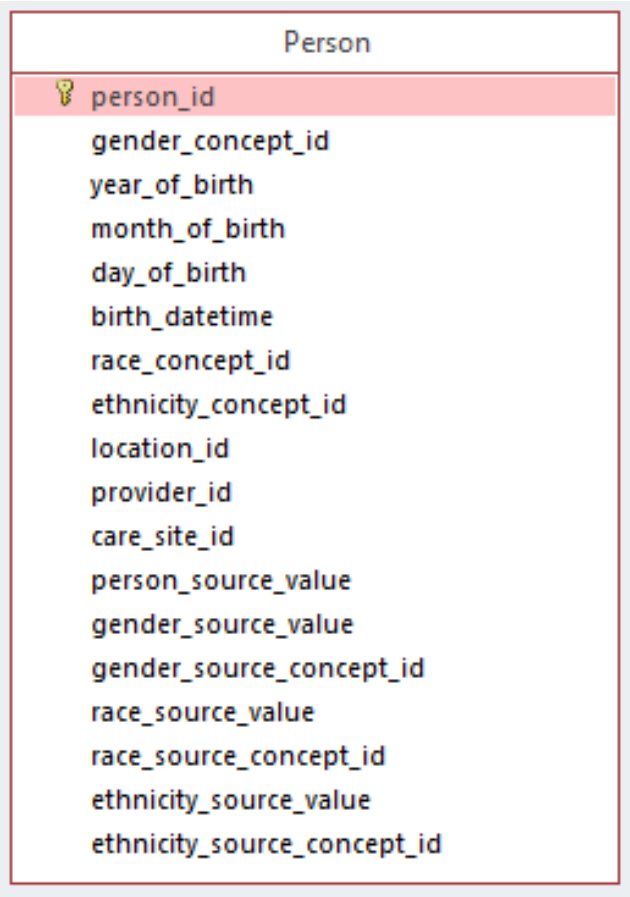
Assistant: Dr. Erica Voss

Procedure: Endometrial biopsy

Operative Summary: Endometrial biopsy performed with sterile technique. Adequate sample.

Presence of endometrial tissues outside the uterus.

# PERSON




- Need to create one unique record per person
  - No history of location/ demographics: need to select latest available
  - Year of birth required…day/month optional
- Foreign key to the LOCATION, PROVIDER, and CARE_SITE table that contains one record

# What data do we have?

dysmenorrhea

abdominal pain

missed work

missed work

acetamino phen

acetamino phen

acetamino phen

GP visit

ultrasound

pelvic exam

cyst of ovary

Hospital Visit

severe pain

temp 103°F

ultrasound

ambulance

Bloated abdomen

ascites

surgery

endometrioma

Endometriosis

*Lauren's Timeline*

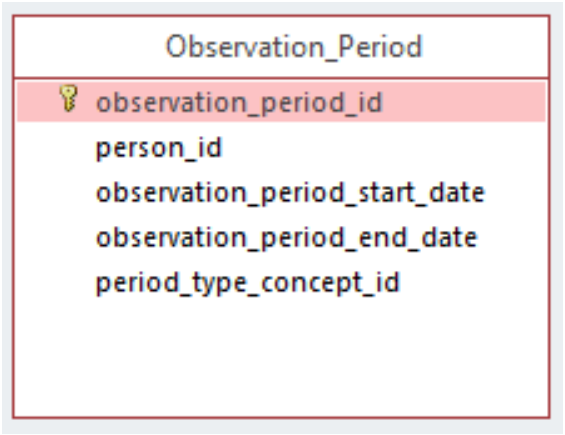
*-3 Years* *-2 Years* *-1 Years* *-2 Weeks* *-3 Days* *Day 0*

# PERSON

| COLUMN | EXAMPLE | |
|---|---|---|
| person_id | 123456 | *Lauren's ID* |
| gender_concept_id | 8532 | *Female* |
| year_of_birth | 1982 | |
| month_of_birth | NULL | |
| day_of_birth | NULL | |
| race_concept_id | 8527 | *White* |
| ethnicity_concept_id | 0 | |
| person_source_value | 123456 | |
| gender_source_value | F | |
| race_source_value | W | |
| ethnicity_source_value | NULL | |

*sample of table's columns*

# OBSERVATION_PERIOD




- Spans of time where data source has capture of data
- One person may have multiple periods if there is interruption in data capture
- Required to run analytical methods
- Challenge: determine observation periods based on the source data

# What data do we have?

dysmenorrhea

abdominal pain

missed work

missed work

acetamino phen

acetamino phen

acetamino phen

GP visit

ultrasound

pelvic exam

cyst of ovary

Hospital Visit

severe pain

temp 103°F

ultrasound

ambulance

Bloated abdomen

ascites

surgery

endometrioma

Endometriosis

*Lauren's Timeline*

*-3 Years* *-2 Years* *-1 Years* *-2 Weeks* *-3 Days* *Day 0*

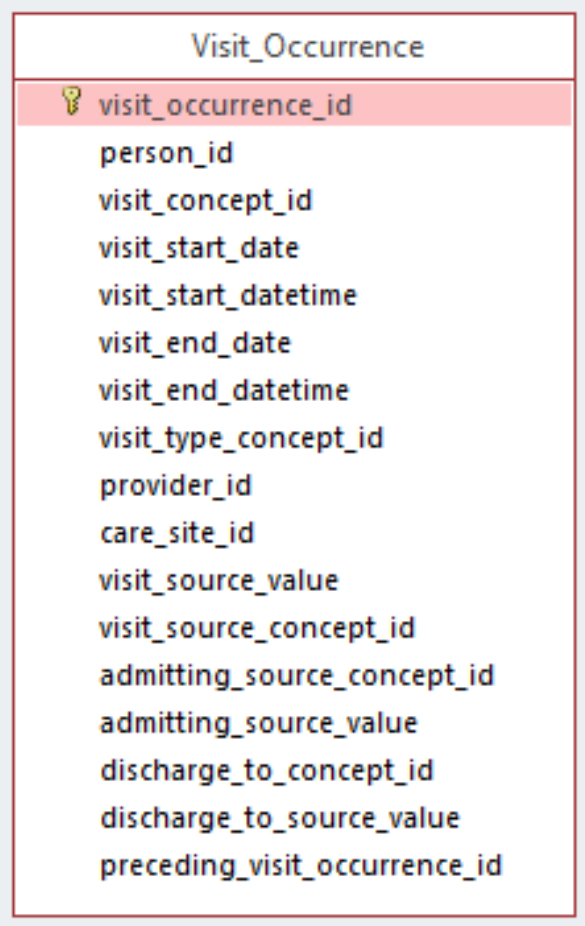
# OBSERVATION_PERIOD

| COLUMN | EXAMPLE | |
|---|---|---|
| observation_period_id | 1 | |
| person_id | 123456 | *Lauren's ID* |
| observation_periods_start_date | 2000-01-01 | |
| observation_periods_start_date | 2010-12-31 | |

| COLUMN | EXAMPLE | |
|---|---|---|
| observation_period_id | 2 | |
| person_id | 123456 | *Lauren's ID* |
| observation_periods_start_date | 2012-01-01 | |
| observation_periods_start_date | 2013-12-31 | |

*sample of table's columns*

# VISIT_OCCURRENCE




- Visits are 'Encounters'
- Contains spans of time where a person receives medical services
- Visit Types
  - –Emergency room
  - –Inpatient
  - –Inpatient/Emergency
  - –Outpatient
  - –Long-term care

# What data do we have?

dysmenorrhea

abdominal pain

missed work

missed work

acetamino phen

acetamino phen

acetamino phen

GP visit

ultrasound

pelvic exam

cyst of ovary

Hospital Visit

severe pain

temp 103°F

ultrasound

ambulance

Bloated abdomen

ascites

surgery

endometrioma

Endometriosis

*Lauren's Timeline*

*-3 Years* *-2 Years* *-1 Years* *-2 Weeks* *-3 Days* *Day 0*

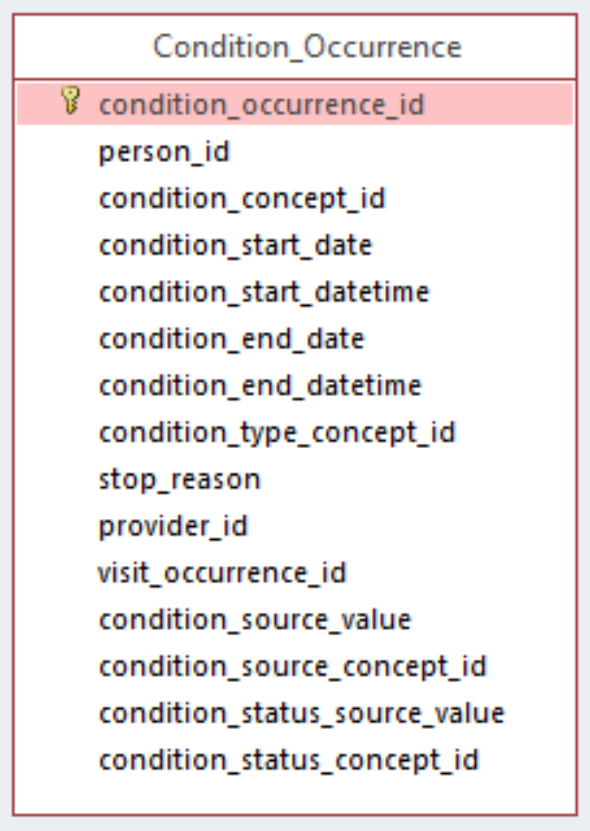
# VISIT_OCCURRENCE

| COLUMN | EXAMPLE | |
|---|---|---|
| visit_occurrence_id | 1 | |
| person_id | 123456 | *Lauren's ID* |
| visit_start_date | 2008-04-07 | |
| visit_end_date | 2008-04-07 | |
| visit_concept_id | 9202 | *Outpatient Visit* |
| visit_source_value | OP | |

| COLUMN | EXAMPLE | |
|---|---|---|
| visit_occurrence_id | 2 | |
| person_id | 123456 | *Lauren's ID* |
| visit_start_date | 2008-04-21 | |
| visit_end_date | 2008-04-26 | |
| visit_concept_id | 9201 | *Inpatient Visit* |
| visit_source_value | IP | |

*sample of table's columns*

# CONDITION_OCCURRENCE




- Records suggesting the presence of a disease or medical condition stated as a diagnosis, a sign or a symptom
- Examples:
  - Billing diagnosis
  - Problem list

# What data do we have?

dysmenorrhea

abdominal pain

missed work

missed work

acetamino phen

acetamino phen

acetamino phen

GP visit

ultrasound

pelvic exam

cyst of ovary

Hospital Visit

severe pain

temp 103°F

ultrasound

ambulance

Bloated abdomen

ascites

surgery

endometrioma

Endometriosis

*Lauren's Timeline*

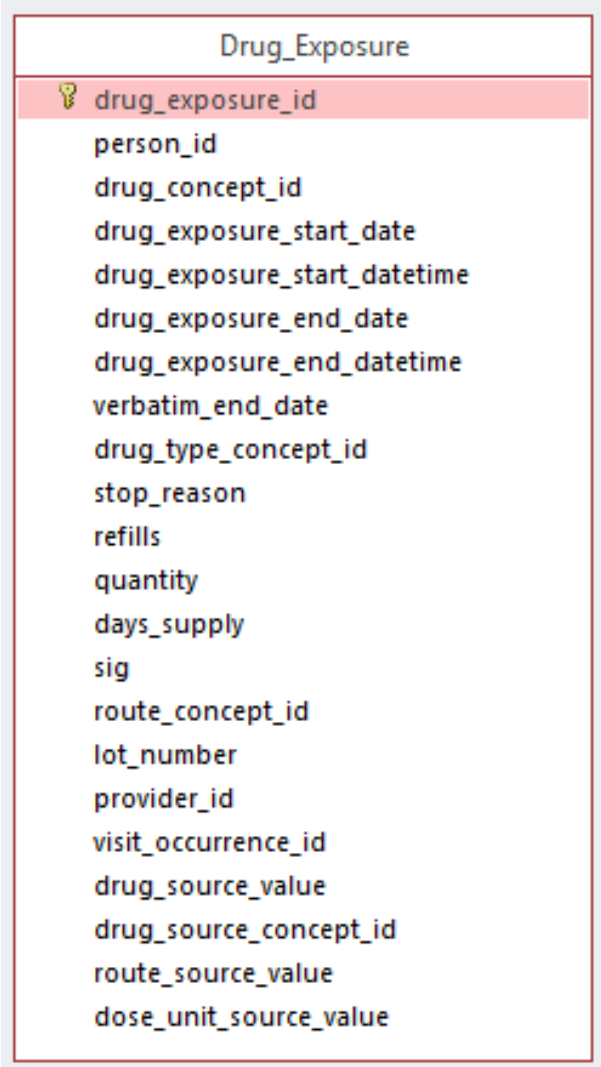
*-3 Years* *-2 Years* *-1 Years* *-2 Weeks* *-3 Days* *Day 0*

# CONDITION_OCCURRENCE

| COLUMN | EXAMPLE | |
|---|---|---|
| condition_occurrence_id | 1 | |
| person_id | 123456 | *Lauren's ID* |
| condition_concept_id | 433527 | *Endometriosis* |
| condtition_start_date | 2008-04-24 | |
| condition_start_datetime | 2008-04-24 00:00:00 | *Inpatient detail - primary* |
| condition_type_concept_id | 38000183 | |
| condition_status_concept_id | 4230359 | *ICD9, missing decimal* |
| visit_occurrence_id | 2 | *Endometriosis of ovary* |
| condition_source_value | 6171 | |
| condition_source_concept_id | 44832501 | |

*sample of table's columns*

# DRUG_EXPOSURE




- Records about the utilization of a drug when ingested or otherwise introduced into the body
- Data sources:
  - Pharmacy dispensing
  - Prescriptions written
  - Medication history
- If drug is represented as a procedure, the OMOP Vocabulary realigns as drug

# What data do we have?

dysmenorrhea

abdominal pain

missed work

missed work

acetamino phen

acetamino phen

acetamino phen

GP visit

ultrasound

pelvic exam

cyst of ovary

Hospital Visit

severe pain

temp 103°F

ultrasound

ambulance

Bloated abdomen

ascites

surgery

endometrioma

Endometriosis

*Lauren's Timeline*

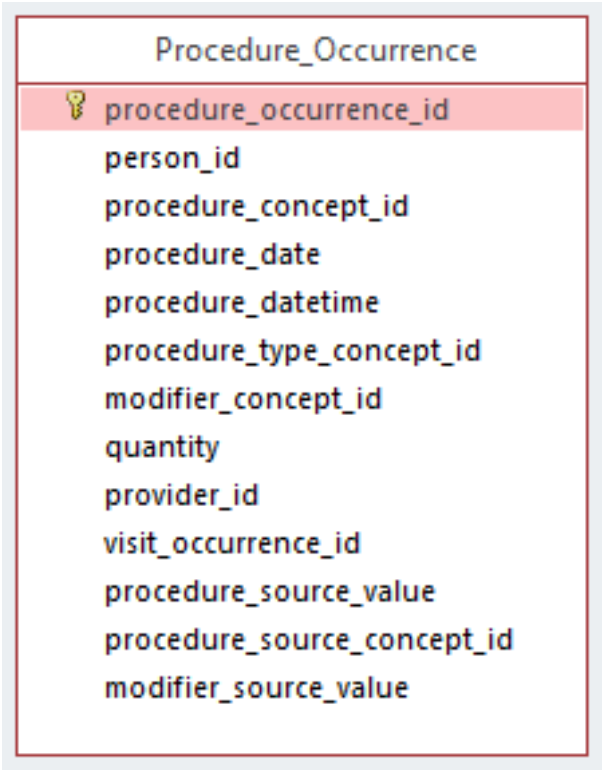
*-3 Years* *-2 Years* *-1 Years* *-2 Weeks* *-3 Days* *Day 0*

# DRUG_EXPOSURE

| COLUMN | EXAMPLE | |
|---|---|---|
| drug_exposure_id | 1 | |
| person_id | 123456 | *Lauren's ID* |
| drug_concept_id | 40162494 | *Acetaminophen 500 MG / Hydrocodone Bitartrate 5 MG Oral Tablet* |
| drug_exposure_start_date | 2007-02-01 | |
| drug_exposure_end_date | 2007-02-08 | *Drug_exposure_start_date + days_supply* |
| verbatim_end_date | NULL | |
| drug_type_concept_id | 38000183 | *Prescription dispensed in pharmacy* |
| refills | 0 | |
| quantity | 14 | |
| days_supply | 7 | |
| drug_source_value | 54348001301 | *NDC 11-digit code* |
| drug_source_concept_id | 45904353 | *Acetaminophen 500 MG / Hydrocodone Bitartrate 5 MG Oral Tablet* |

*sample of table's columns*

# PROCEDURE_OCCURRENCE




- Contains records of activities or processes ordered by, or carried out by, a healthcare provider on the patient to have a diagnostic or therapeutic purpose
- Vocabularies include CPT-4, HCPCS, ICD-9 Procedures, ICD-10 Procedures, LOINC, SNOMED
- Procedures have the least standardized vocabularies that causes some redundancy

# What data do we have?

dysmenorrhea

abdominal pain

missed work

missed work

acetamino phen

acetamino phen

acetamino phen

GP visit

ultrasound

pelvic exam

cyst of ovary

Hospital Visit

severe pain

temp 103°F

ultrasound

ambulance

Bloated abdomen

ascites

surgery

endometrioma

Endometriosis

*Lauren's Timeline*

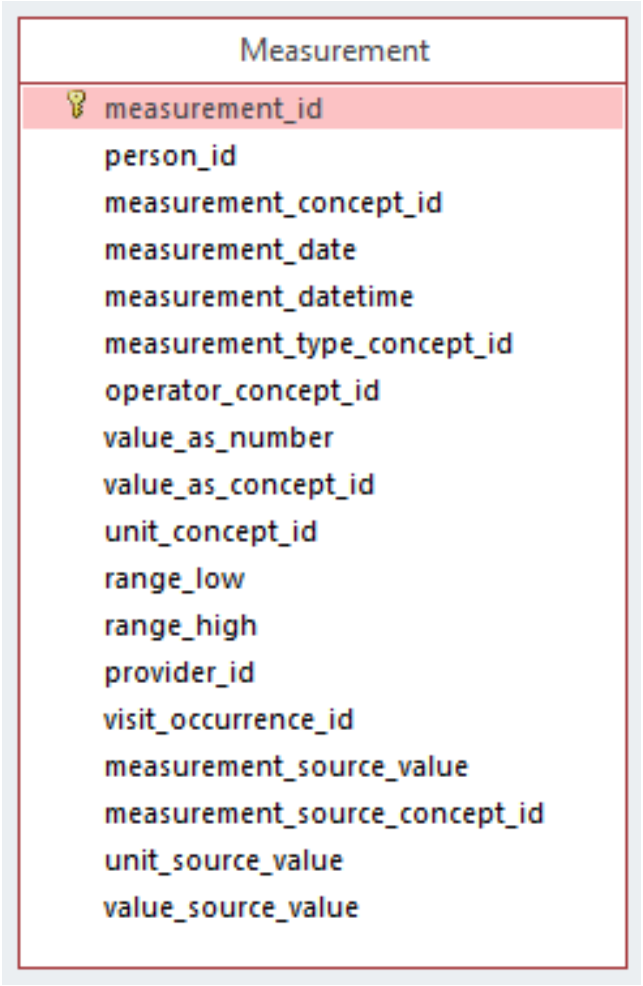
*-3 Years* *-2 Years* *-1 Years* *-2 Weeks* *-3 Days* *Day 0*

# PROCEDURE_OCCURRENCE

| COLUMN | EXAMPLE | |
|---|---|---|
| procedure_occurrence_id | 1 | |
| person_id | 123456 | *Lauren's ID* |
| procedure_concept_id | 2211740 | *Ultrasound, abdominal, real time with image documentation; complete* |
| procedure_date | 2008-04-08 | |
| procedure_type_concept_id | 38000267 | *Outpatient detail - 1st position* |
| visit_occurrence_id | 1 | |
| procedure_source_value | 76700 | *CPT4* |
| procedure_source_concept_id | 2211740 | *Ultrasound, abdominal, real time with image documentation; complete* |

*sample of table's columns*

# MEASUREMENT




- Contains records of Measurement, i.e. structured values (numerical or categorical) obtained through systematic and standardized examination or testing of a Person or Person's sample
- Data sources: structured, quantitative measures, such as laboratory tests
- Measures have associated units

# What data do we have?

dysmenorrhea

abdominal pain

missed work

missed work

acetamino phen

acetamino phen

acetamino phen

GP visit

ultrasound

pelvic exam

cyst of ovary

Hospital Visit

severe pain

temp 103°F

ultrasound

ambulance

Bloated abdomen

ascites

surgery

endometrioma

Endometriosis

*Lauren's Timeline*

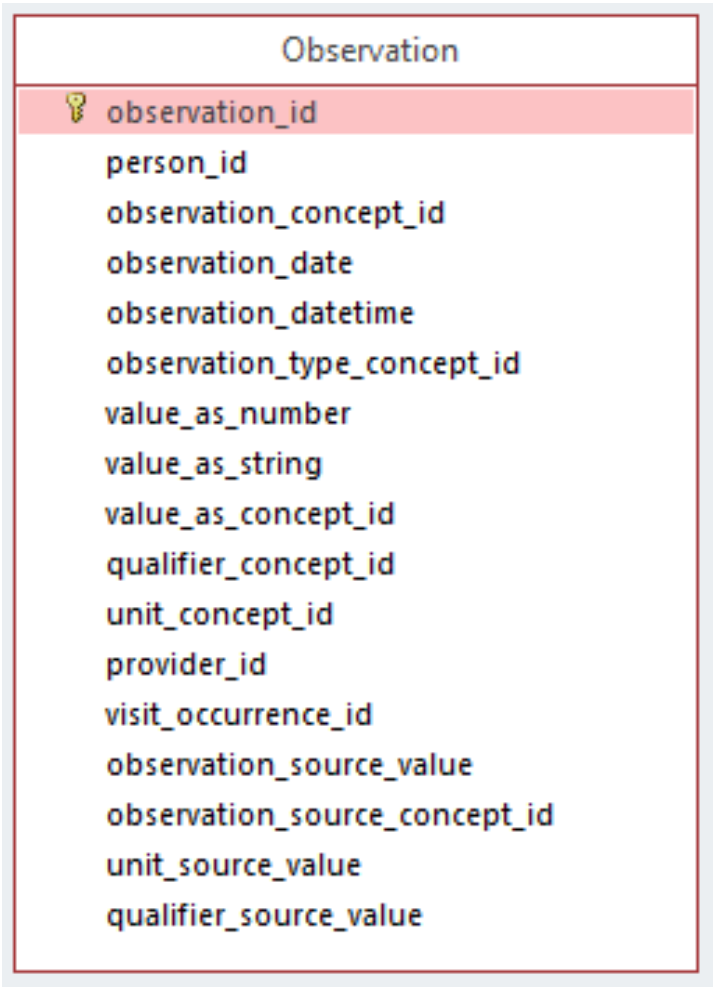
*-3 Years* *-2 Years* *-1 Years* *-2 Weeks* *-3 Days* *Day 0*

# MEASUREMENT

| COLUMN | EXAMPLE | |
|---|---|---|
| measurement_id | 1 | |
| person_id | 123456 | *Lauren's ID* |
| measurement_concept_id | 3020891 | *Body temperature* |
| measurement_date | 2008-04-21 | |
| measurement_type_concept_id | 44818701 | *From physical examination* |
| value_as_number | 103 | |
| unit_concept_id | 9289 | *Degree Fahrenheit* |
| measurement_source_value | 8310-5 | *LOINC* |
| measurement_source_concept_id | 3020891 | *Body temperature* |

*sample of table's columns*

# OBSERVATION




- Captures clinical facts about a Person obtained in the context of examination, questioning or a procedure
- Any data that cannot be represented by any other domains, such as social and lifestyle facts, medical history, family history, etc. are recorded here
- Instrument for CDM extension, playpen

# What data do we have?

dysmenorrhea

abdominal pain

missed work

missed work

acetamino phen

acetamino phen

acetamino phen

GP visit

ultrasound

pelvic exam

cyst of ovary

Hospital Visit

severe pain

temp 103°F

ultrasound

ambulance

Bloated abdomen

ascites

surgery

endometrioma

Endometriosis

*Lauren's Timeline*

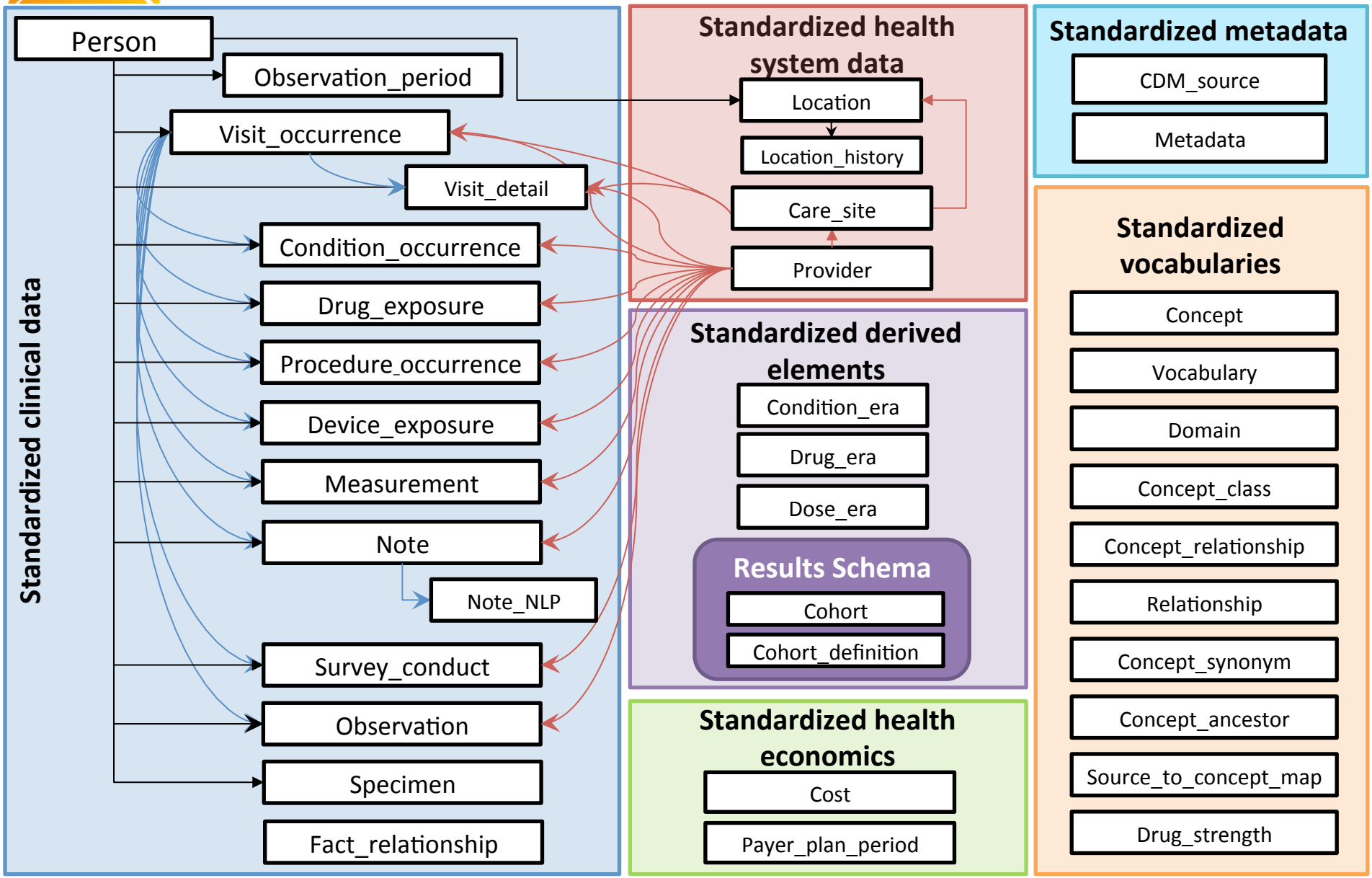
*-3 Years* *-2 Years* *-1 Years* *-2 Weeks* *-3 Days* *Day 0*

# OBSERVATION

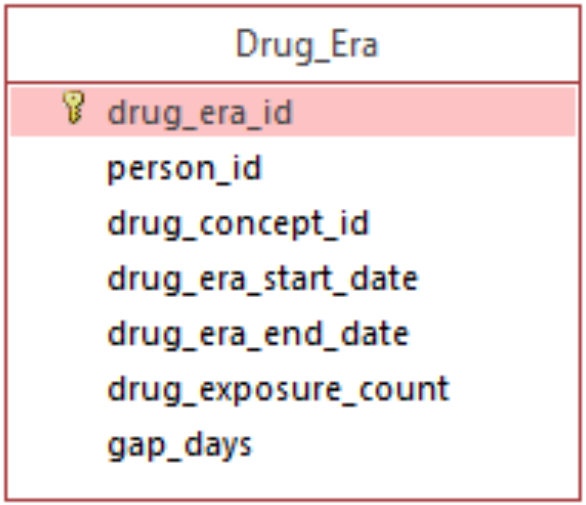
| COLUMN | EXAMPLE | |
|---|---|---|
| observation_id | 1 | |
| person_id | 123456 | *Lauren's ID* |
| observation_concept_id | 0 | *No matching concept* |
| observation_date | 2006-01-20 | |
| observation_type_concept_id | 44814721 | *Patient reported* |
| value_as_number | 8 | |
| value_as_string | Work Hours Missed | |
| observation_source_value | Work Hours Missed | |
| observation_source_concept_id | 0 | *No matching concept* |

*sample of table's columns*

# CDM Version 6 Key Domains



# DRUG_ERA




- Standardized inference of length of exposure to product for all active ingredients
- Derived from records in DRUG_EXPOSURE under certain rules to produce continuous Drug Eras

# DRUG_ERA

DRUG_EXPOSURE
Acetaminophen 500 MG / Hydrocodone Bitartrate 5 MG Oral Tablet

| COLUMN | EXAMPLE |
|---|---|
| drug_exposure_id | 1 |
| person_id | 123456 |
| drug_concept_id | 40162494 |
| drug_exposure_start_date | 2007-02-01 |
| drug_exposure_end_date | 2007-02-08 |

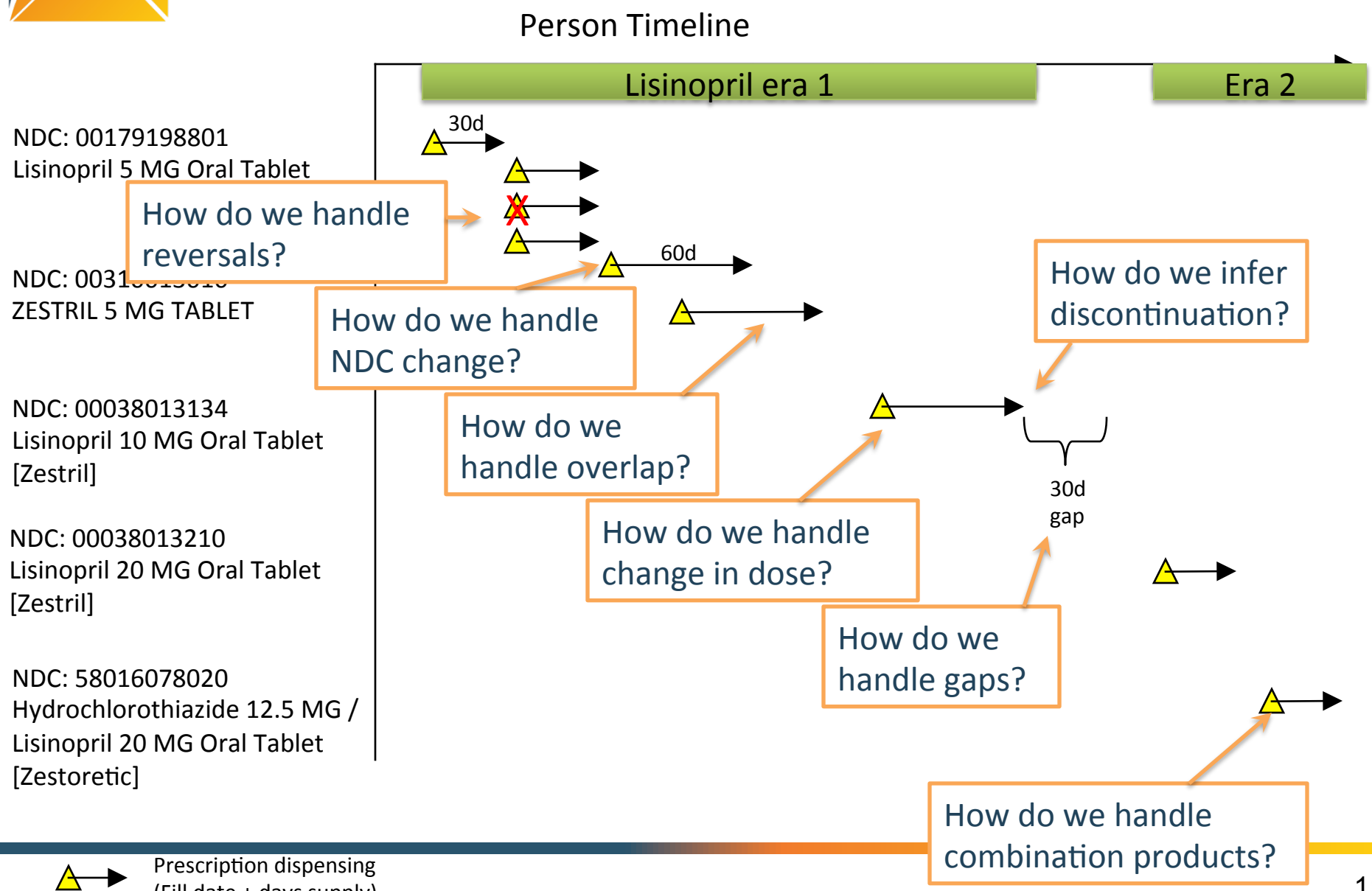
| COLUMN | EXAMPLE |
|---|---|
| drug_exposure_id | 2 |
| person_id | 123456 |
| drug_concept_id | 40162494 |
| drug_exposure_start_date | 2007-02-10 |
| drug_exposure_end_date | 2007-02-17 |

| COLUMN | EXAMPLE |
|---|---|
| drug_era_id | 1 |
| person_id | 123456 |
| drug_concept_id | 1125315 *Acetaminophen* |
| drug_era_start_date | 2007-02-01 |
| drug_era_end_date | 2007-02-17 |

| COLUMN | EXAMPLE |
|---|---|
| drug_era_id | 2 |
| person_id | 123456 |
| drug_concept_id | 1174888 *Hydrocodone* |
| drug_era_start_date | 2007-02-01 |
| drug_era_end_date | 2007-02-17 |

*sample of table's columns*

# Illustrating inferences needed within longitudinal pharmacy claims data for one patient



# CDM Tables Not Covered in Detail

- VISIT_DETAIL
- SPECIMEN
- DEATH
- DEVICE_EXPOSURE
- NOTE
- NOTE_NLP
- FACT_RELATIONSHIP
- LOCATION
- CARE_SITE
- PROVIDER
- PAYER_PLAN_PERIOD
- COST
- COHORT
- COHORT_ATTRIBUTES
- CONDITITION_ERA
- DOSE_ERA
- CDM_SOURCE

# Standards

- Patients without transaction
- Cleaning dirty data
  - Patient IDs reused
  - Bogus code records (e.g. '000')
- How to handle tobacco information

THEMIS

https://github.com/OHDSI/CommonDataModel/wiki

# CDM Version Control

- Working group meets once a month to discuss proposed changes to the CDM
- All CDM documentation, versions, and proposals located on GitHub
  - https://github.com/OHDSI/CommonDataModel
  - Proposals tracked and discussed as GitHub issues
  - https://ohdsi.github.io/TheBookOfOhdsi/CommonDataModel.html
- Meeting information can be found on the working group wiki page
- Please contact Clair Blacketer (mblacke@its.jnj.com) for more information

# Break

Please return in 15 minutes

# CDM Examples


Leveraging OHDSI Tools
(GitHub /Forums/
Working Group)
Exercises

# ETL: Real world scenario

PharMetrics Plus

**CLAIMS**

| pat_id | claimno | from_dt | to_dt | diagprc_ind | Diag_admit | diag1 |
|---|---|---|---|---|---|---|
| 05917921689 | IPA333393946 | 1/5/2006 | 1/5/2006 | 1 | 41071 | 41071 |

LRx/Dx

**MEDICAL_CLAIMS**

| md_clm_id | ims_pat_nbr | dt_of_service | rxer_id | diag_cd |
|---|---|---|---|---|
| 95963982102 | 80445908 | 8/1/2012 0:00 | 680488 | 41071 |

German DA

**Problem Events**

| db_country | international_ practice_num | international_ doctor_num | international_ patient_num | age |
|---|---|---|---|---|
| GE | GE6326 | GE8784 | GE46478747 | |

**Diagnosis**

| db_country | international_dia gnosis_num | diagnosis_num | icd10_4_ |
|---|---|---|---|
| GE | GE2397573 | 2397573 | I21.4 |

Ambulatory EMR

**Problem**

| Patient_id_synth | Diag_dt | Icd10_cd |
|---|---|---|
| 271138 | 4/11/2013 | I214 |

4 real observational databases, all containing an inpatient admission for a patient with a diagnosis of 'acute subendocardial infarction'

- Not a single table name the same…
- Not a single variable name the same….
- Different table structures (rows vs. columns)
- Different conventions (with and without decimal points)
- Different coding schemes (ICD9 vs. ICD10)

# What does it mean to ETL to OMOP CDM? Standardize **structure** and **content**

PharMetrics Plus

**Inpatient Claims**

| pat_id | claimno | from_dt | to_dt | diagprc_ind | Diag_admit |
|---|---|---|---|---|---|
| 05917921689 | IPA333393946 | 1/5/2006 | 1/5/2006 | 1 | 41071 |

Structure optimized for large-scale analysis for clinical characterization, population-level estimation, and patient-level prediction

PharMetrics Plus

**CONDITION_OCCURRENCE**

| PERSON_ID | CONDITION_START_DATE | CONDITION_SOURCE_VALUE | CONDITION_TYPE_CONCEPT_ID |
|---|---|---|---|
| 05917921689 | 1/5/2006 | 41071 | Inpatient claims - primary position |

Content using international vocabulary standards that can be applied to any data source

PharMetrics Plus

**CONDITION_OCCURRENCE**

| PERSON_ID | CONDITION_START_DATE | CONDITION_SOURCE_VALUE | CONDITION _TYPE_CONCEPT_ID | CONDITION_SOURCE_CONCEPT_ID | CONDITION_CONCEPT_ID |
|---|---|---|---|---|---|
| 05917921689 | 1/5/2006 | 41071 | Inpatient claims - primary position | 44825429 | 444406 |

# OMOP CDM = Standardized structure: same tables, same fields, same datatypes, same conventions across disparate sources

PharMetrics Plus

**CLAIMS**

| pat_id | claimno | from_dt | to_dt | diagprc_ind | Diag_admit | diag1 |
|---|---|---|---|---|---|---|
| 05917921689 | IPA333393946 | 1/5/2006 | 1/5/2006 | 1 | 41071 | 41071 |

LRx/Dx

**MEDICAL_CLAIMS**

| md_clm_id | ims_pat_nbr | dt_of_service | rxer_id | diag_cd |
|---|---|---|---|---|
| 95963982102 | 80445908 | 8/1/2012 0:00 | 680488 | 41071 |

German DA

**Problem Events**

| db_country | international_ practice_num | international_ doctor_num | international_ patient_num | age_at_event | date_of_event | international_ diagnosis_nu m |
|---|---|---|---|---|---|---|
| GE | GE6326 | GE8784 | GE46478747 | 20 | 11/19/2014 0:00 | GE2397573 |

**Diagnosis**

| db_country | international_dia gnosis_num | diagnosis_num | icd10_4_code | icd10_3_text | diagnosis_conf idence |
|---|---|---|---|---|---|
| GE | GE2397573 | 2397573 | I21.4 | Non-ST elevation (NSTEMI) myocardial infarction | Confirmed |

Ambulatory EMR

**Problem**

| Patient_id_synth | Diag_dt | icd10_cd |
|---|---|---|
| 271138 | 4/11/2013 | I214 |

- Consistent structure optimized for large-scale analysis
- Structure preserves all source content and provenance

**PharMetrics Plus: CONDITION_OCCURRENCE**

| PERSON_ID | CONDITION_ START_DATE | CONDITION _SOURCE_V ALUE | CONDITION_TYPE_CONCEPT_ID |
|---|---|---|---|
| 157033702 | 1/5/2006 | 41071 | Inpatient claims - primary position |

**LRX/DX: CONDITION_OCCURRENCE**

| PERSON_ID | CONDITION_ START_DATE | CONDITION _SOURCE_V ALUE | CONDITION_TYPE_CONCEPT_ID |
|---|---|---|---|
| 80445908 | 8/1/2012 | 41071 | Primary Condition |

**German DA : CONDITION_OCCURRENCE**

| PERSON_ID | CONDITION_ START_DATE | CONDITION _SOURCE_V ALUE | CONDITION_TYPE_CONCEPT_ID |
|---|---|---|---|
| 46478747 | 11/19/2014 | I21.4 | EHR problem list entry |

**Ambulatory EMR : CONDITION_OCCURRENCE**

| PERSON_ID | CONDITION_ START_DATE | CONDITION _SOURCE_V ALUE | CONDITION_TYPE_CONCEPT_ID |
|---|---|---|---|
| 271138 | 4/11/2013 | I214 | Primary Condition |

# OMOP CDM = Standardized content: common vocabularies across disparate sources

**PharMetrics Plus: CONDITION_OCCURRENCE**

| PERSON_ID | CONDITION_START_DATE | CONDITION_SOURCE_VALUE | CONDITION _TYPE_CONCEPT_ID | CONDITION_SOURCE_CONCEPT_ID | CONDITION_CONCEPT_ID |
|---|---|---|---|---|---|
| 05917921689 | 1/5/2006 | 41071 | Inpatient claims - primary position | 4482542 | 444406 |

**LRx/Dx: CONDITION_OCCURRENCE**

| PERSON_ID | CONDITION_START_DATE | CONDITION_SOURCE_VALUE | CONDITION _TYPE_CONCEPT_ID | CONDITION_SOURCE_CONCEPT_ID | CONDITION_CONCEPT_ID |
|---|---|---|---|---|---|
| 80445908 | 8/1/2012 | 41071 | Primary Condition | 4482542 | 444406 |

**German DA : CONDITION_OCCURRENCE**

| PERSON_ID | CONDITION_START_DATE | CONDITION_SOURCE_VALUE | CONDITION _TYPE_CONCEPT_ID | CONDITION_SOURCE_CONCEPT_ID | CONDITION_CONCEPT_ID |
|---|---|---|---|---|---|
| 6478747 | 11/19/2014 | I21.4 | EHR problem list entry | 4557208 | 444406 |

**Ambulatory EMR : CONDITION_OCCURRENCE**

| PERSON_ID | CONDITION_START_DATE | CONDITION_SOURCE_VALUE | CONDITION _TYPE_CONCEPT_ID | CONDITION_SOURCE_CONCEPT_ID | CONDITION_CONCEPT_ID |
|---|---|---|---|---|---|
| 271138 | 4/11/2013 | I214 | Primary Condition | 4557208 | 444406 |

- Standardize across vocabularies to a common referent standard (ICD9/10→SNOMED)
- Source codes mapped into each domain standard so that now you can talk across different languages

- Standardize source codes to be uniquely defined across all vocabularies
- No more worries about formatting or code overlap

# Data Used for Demonstration

- Medicare Claims Synthetic Public Use Files (SynPUFs)
  - synthetic US Medicare insurance claims database
  - Medicare is a government based insurance program for primarily 65 and older but also individuals with disabilities
  - SynPUF not for research but rather demonstration/development purposes
  - Has been converted to the Common Data Model

CMS.gov
Centers for Medicare & Medicaid Services

https://www.cms.gov/research-statistics-data-and-systems/downloadable-public-use-files/synpufs/

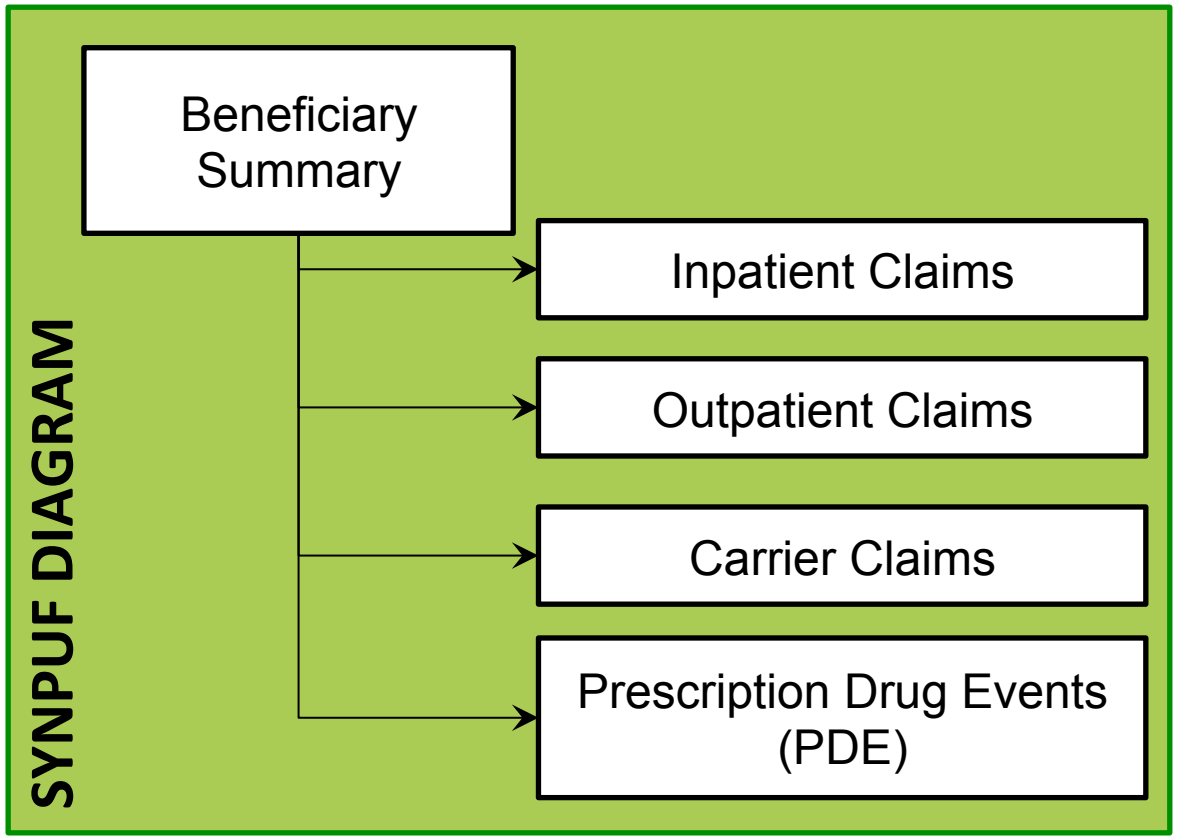
# Data Used for Demonstration

- Five types of data:

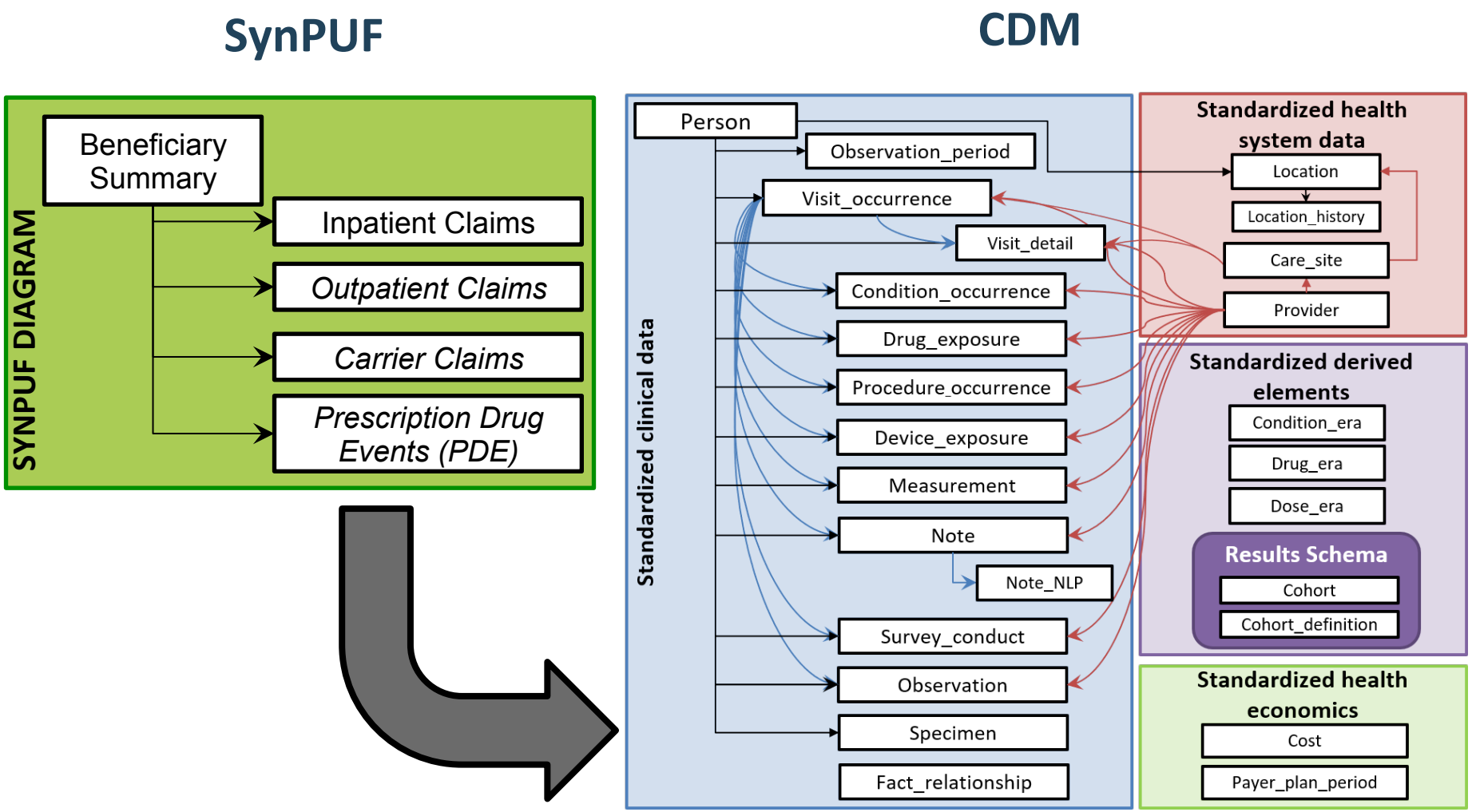
| | DE-SynPUF | Unit of record | Number of Records 2008 | Number of Records 2009 | Number of Records 2010 |
|---|---|---|---|---|---|
| 1 | *Beneficiary Summary* | Benefi-ciary | 2,326,856 | 2,291,320 | 2,255,098 |
| 2 | *Inpatient Claims* | claim | 547,800 | 504,941 | 280,081 |
| 3 | *Outpatient Claims* | claim | 5,673,808 | 6,519,340 | 3,633,839 |
| 4 | *Carrier Claims* | claim | 34,276,324 | 37,304,993 | 23,282,135 |
| 5 | *Prescription Drug Events (PDE)* | event | 39,927,827 | 43,379,293 | 27,778,849 |

https://www.cms.gov/Research-Statistics-Data-and-Systems/Downloadable-Public-Use-Files/SynPUFs/DE_Syn_PUF.html

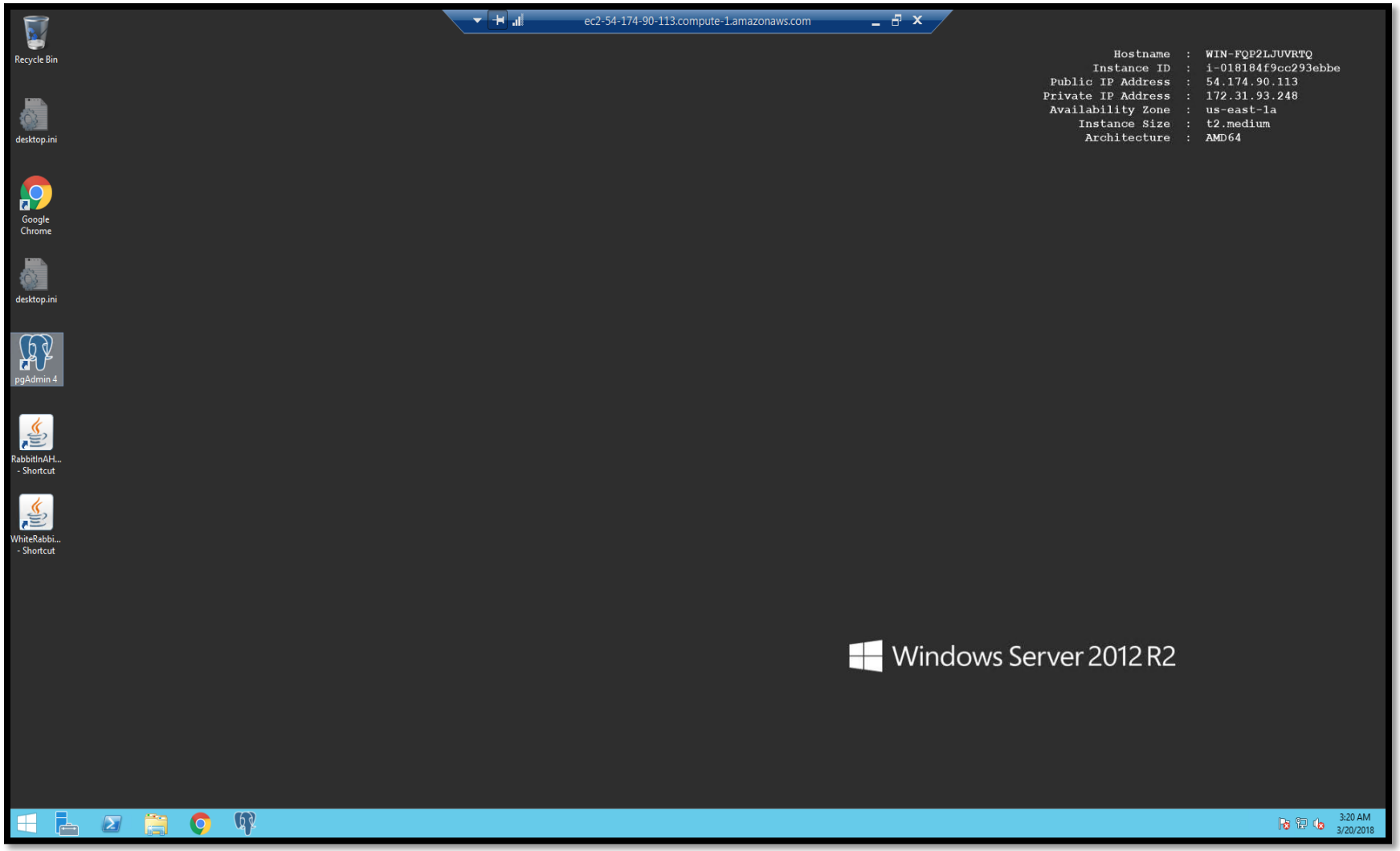
# SynPUF High Level Diagram



# Mapping SynPUF to CDM

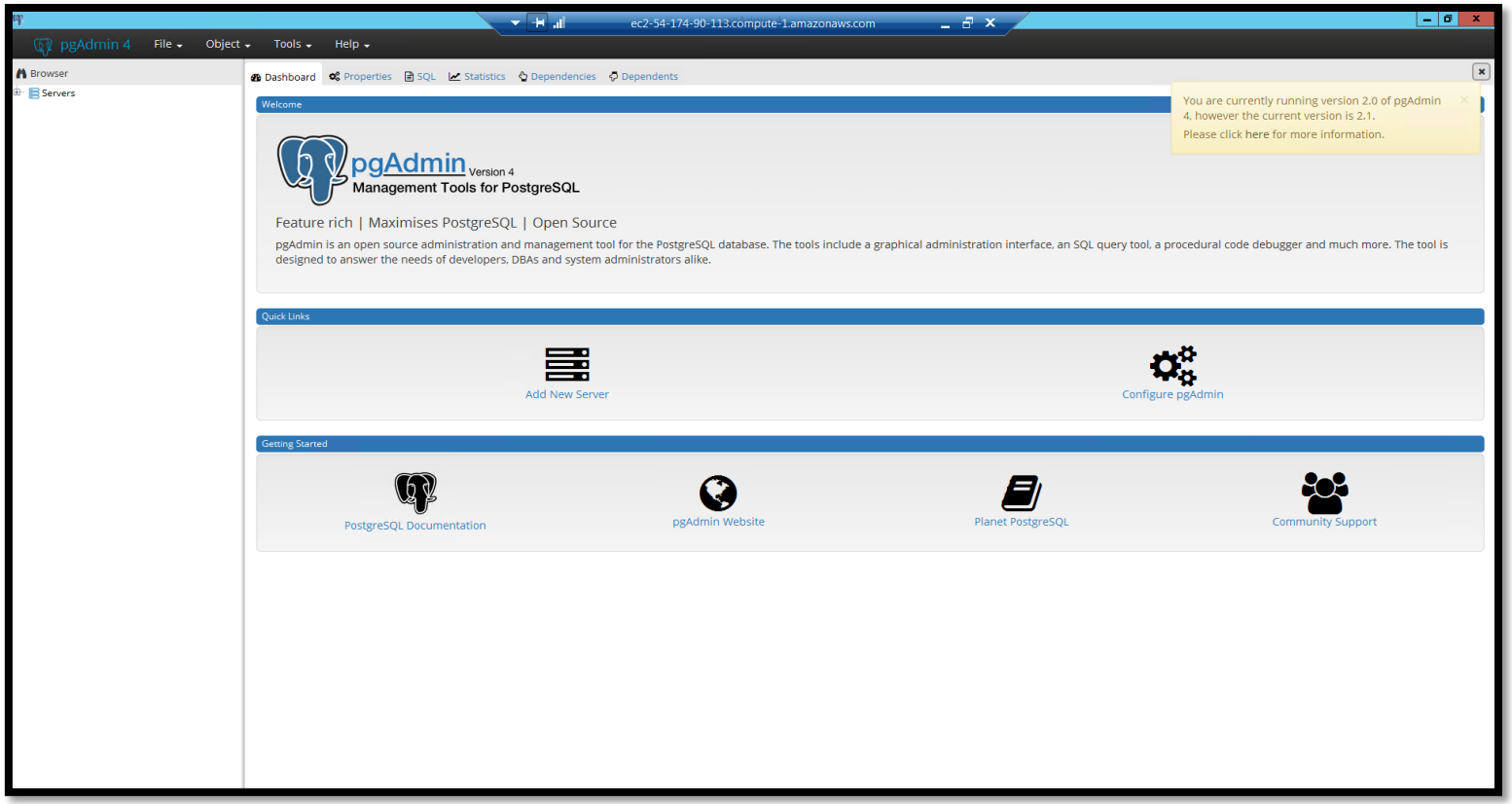


# OHDSI in a Box

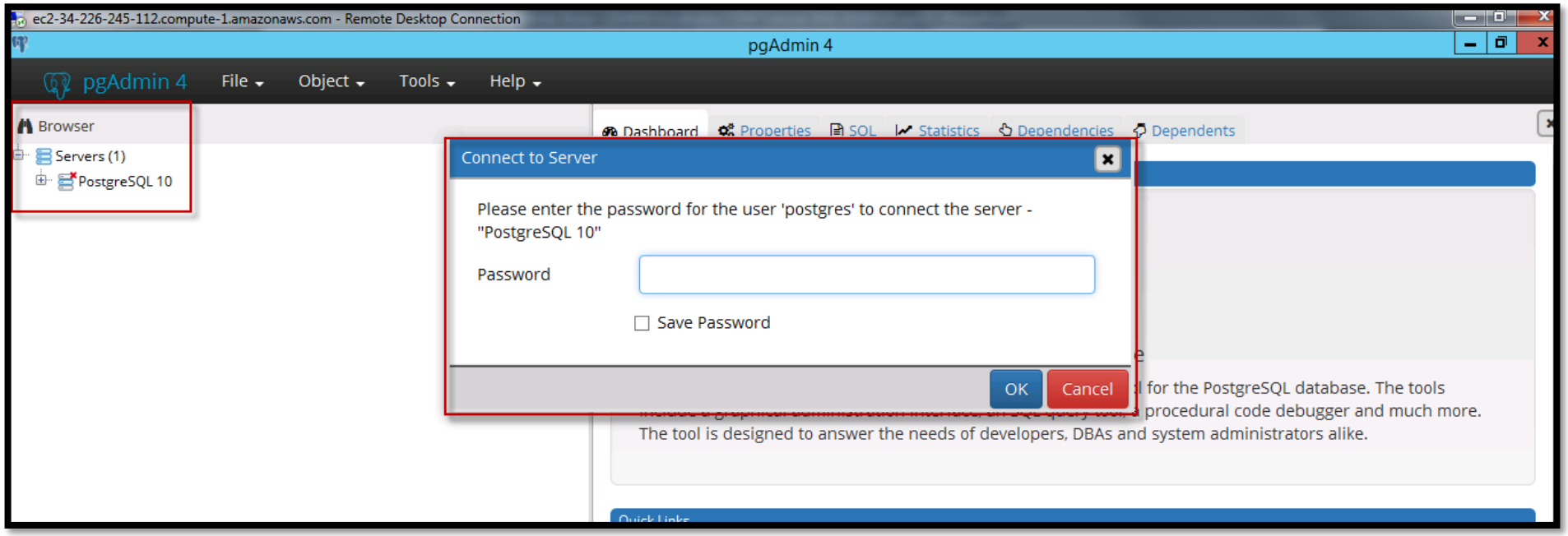


# CDM Database: pgAdmin III New Server

- Click on pgAdmin

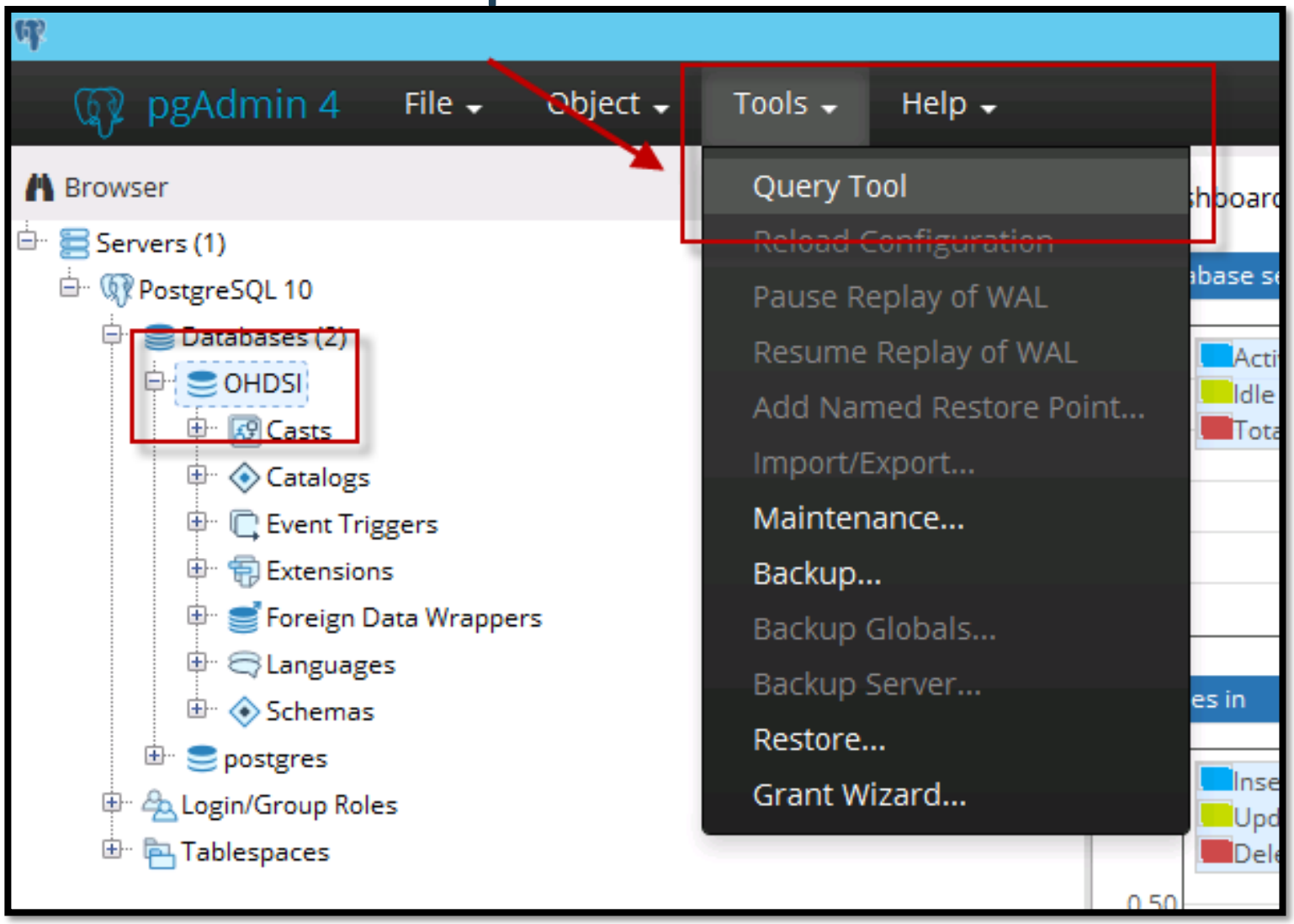


# CDM Database: Connect



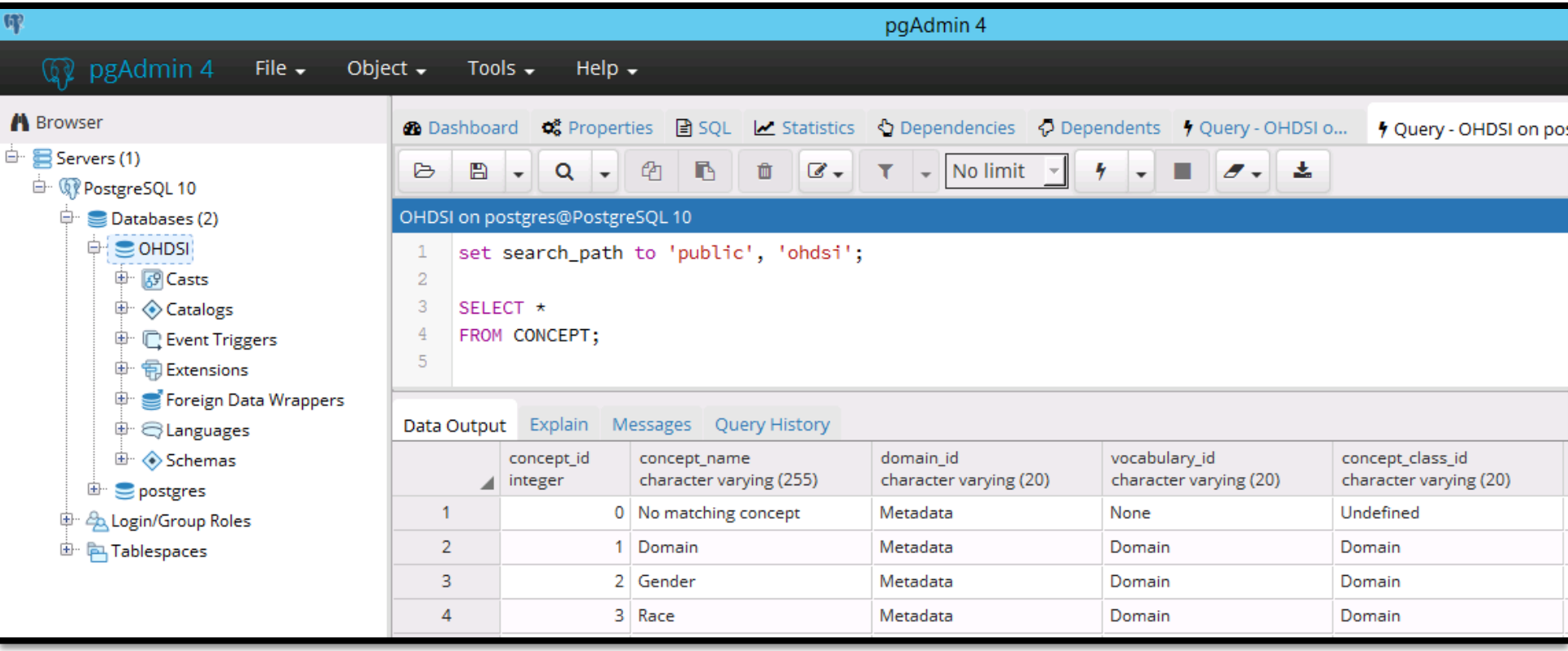

- Password: `ohdsi`

# CDM Database: Open SQL Sheet



# CDM Database: Ready

```
set search_path to 'public', 'ohdsi';
```



# Some Example Questions

Ex 1

Finding Warfarin

Ex 2

New Users of Warfarin

Ex 3

New Users of Warfarin who are >=65?

Ex 4

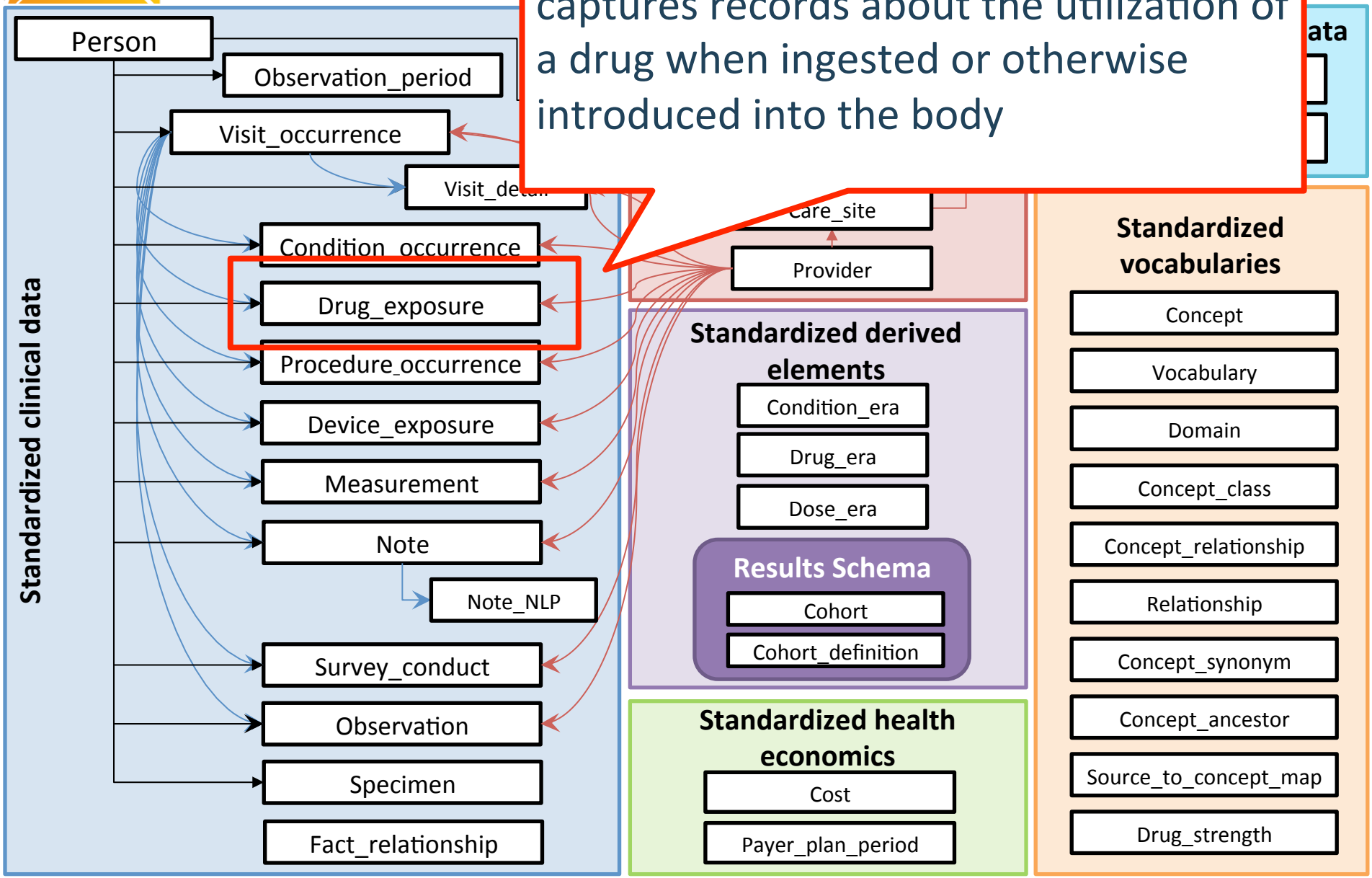
New Users of Warfarin with prior Atrial Fibrillation?

# Warfarin Exposure

- Warfarin is a blood thinner that is used to treat/prevent blood clots.
  - Where do you find drug data in the CDM?
  - What codes do I use to define drugs?

# Where are D

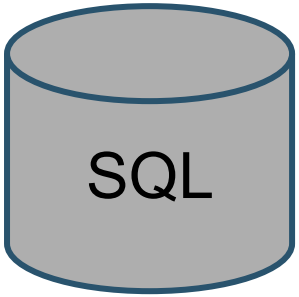
captures records about the utilization of a drug when ingested or otherwise introduced into the body



# How do I define Warfarin?

- When raw data is transformed into the CDM raw source codes are transformed into standard OMOP Vocabulary concepts
- In the CDM, we no longer care what source codes existed in the raw data, we just need to use concept identifiers
- We can use the OMOP Vocabulary to identify all concepts that contain the ingredient warfarin

# How do I define Warfarin?




- Writing SQL Statement


- OHDSI Tool ATLAS

# Some Example Questions

Ex 1 Finding Warfarin

**Ex 2** New Users of Warfarin

Ex 3 New Users of Warfarin who are >=65?

Ex 4 New Users of Warfarin with prior Atrial Fibrillation?

# Finding Warfarin

Ex 0

```
/*********************************************************************************
*       (Exercise 0) Finding Warfarin
*********************************************************************************/

/*Just looking for the ingredient concept*/
SELECT COUNT(DISTINCT de.PERSON_ID)
FROM DRUG_EXPOSURE de
WHERE DRUG_CONCEPT_ID = 1310149 /*warfarin*/;
```

**0 individuals**

```
/*Looking for drugs associated with the ingredient*/
SELECT COUNT(DISTINCT de.PERSON_ID)
FROM DRUG_EXPOSURE de
WHERE de.DRUG_CONCEPT_ID IN (
        SELECT DESCENDANT_CONCEPT_ID
        FROM CONCEPT_ANCESTOR
        WHERE ANCESTOR_CONCEPT_ID = 1310149 /*warfarin*/
);

/*looking for anticoagulants, a class of drugs warfarin belongs*/
SELECT COUNT(DISTINCT de.PERSON_ID)
FROM DRUG_EXPOSURE de
WHERE de.DRUG_CONCEPT_ID IN (
        SELECT DESCENDANT_CONCEPT_ID
        FROM CONCEPT_ANCESTOR
        WHERE ANCESTOR_CONCEPT_ID = 4283987 /*ANTICOAGULANTS (VA Class)*/
);
```

# Finding Warfarin

Ex 0

```
/*********************************************************************************
*       (Exercise 0) Finding Warfarin
*********************************************************************************/

/*Just looking for the ingredient concept*/
SELECT COUNT(DISTINCT de.PERSON_ID)
FROM DRUG_EXPOSURE de
WHERE DRUG_CONCEPT_ID = 1310149 /*warfarin*/;

/*Looking for drugs associated with the ingredient*/
SELECT COUNT(DISTINCT de.PERSON_ID)
FROM DRUG_EXPOSURE de
WHERE de.DRUG_CONCEPT_ID IN (
        SELECT DESCENDANT_CONCEPT_ID
        FROM CONCEPT_ANCESTOR
        WHERE ANCESTOR_CONCEPT_ID = 1310149 /*warfarin*/
);

/*looking for anticoagulants, a class of drugs warfarin belongs*/
SELECT COUNT(DISTINCT de.PERSON_ID)
FROM DRUG_EXPOSURE de
WHERE de.DRUG_CONCEPT_ID IN (
        SELECT DESCENDANT_CONCEPT_ID
        FROM CONCEPT_ANCESTOR
        WHERE ANCESTOR_CONCEPT_ID = 4283987 /*ANTICOAGULANTS (VA Class)*/
);
```

**0 individuals**

**22,247 individuals**

# Finding Warfarin

Ex 0

```
/*********************************************************************************
*       (Exercise 0) Finding Warfarin
*********************************************************************************/

/*Just looking for the ingredient concept*/
SELECT COUNT(DISTINCT de.PERSON_ID)
FROM DRUG_EXPOSURE de
WHERE DRUG_CONCEPT_ID = 1310149 /*warfarin*/;

/*Looking for drugs associated with the ingredient*/
SELECT COUNT(DISTINCT de.PERSON_ID)
FROM DRUG_EXPOSURE de
WHERE de.DRUG_CONCEPT_ID IN (
        SELECT DESCENDANT_CONCEPT_ID
        FROM CONCEPT_ANCESTOR
        WHERE ANCESTOR_CONCEPT_ID = 1310149 /*warfarin*/
);

/*looking for anticoagulants, a class of drugs warfarin belongs*/
SELECT COUNT(DISTINCT de.PERSON_ID)
FROM DRUG_EXPOSURE de
WHERE de.DRUG_CONCEPT_ID IN (
        SELECT DESCENDANT_CONCEPT_ID
        FROM CONCEPT_ANCESTOR
        WHERE ANCESTOR_CONCEPT_ID = 4283987 /*ANTICOAGULANTS (VA Class)*/
);
```

**0 individuals**

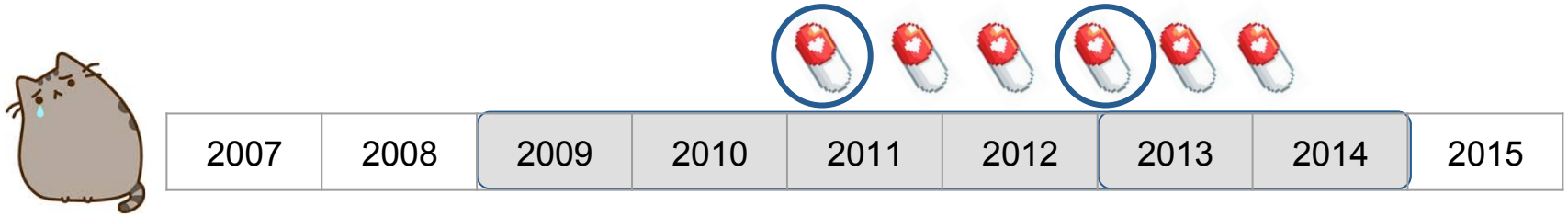
**22,247 individuals**

**32,955 individuals**

# How do I define new users of a drug?

Ex 2

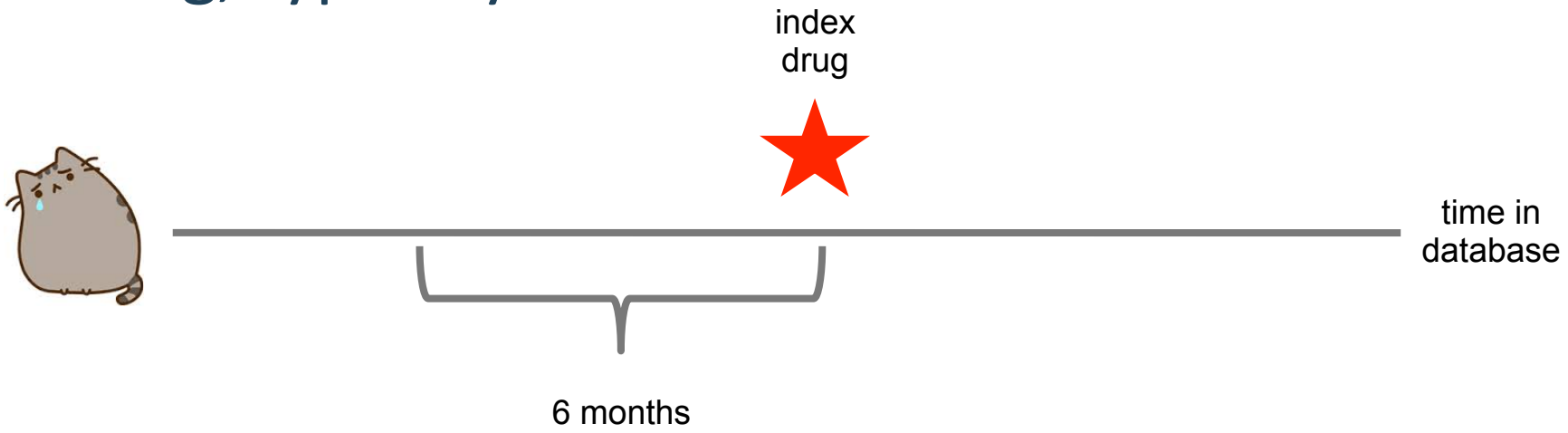
Someone who has recently started taking the drug, typically with a 6 or 12 month wash out



# How do I define new users of a drug?

Ex 2

Someone who has recently started taking the drug, typically with a 6 or 12 month wash out



# What is Needed in the CDM?

Ex 2

- **OMOP Vocabulary**
  to find the concepts
- **CDM Table DRUG_EXPOSURE**
  to find individuals with exposure
- **CDM Table OBSERVATION_PERIOD**
  to know people's time within the database

# New Users of Warfarin

Ex 2

```
/**************************************************************************************
*    (Exercise 1) Warfarin New Users
**************************************************************************************/

WITH CTE_DRUG_INDEX AS (
    SELECT de.PERSON_ID, MIN(de.DRUG_EXPOSURE_START_DATE) AS INDEX_DATE
    FROM DRUG_EXPOSURE de
    WHERE de.DRUG_CONCEPT_ID IN (
        SELECT DESCENDANT_CONCEPT_ID
        FROM CONCEPT_ANCESTOR WHERE ANCESTOR_CONCEPT_ID = 1310149 /*warfarin*/
    )
    GROUP BY de.PERSON_ID
)
SELECT i.PERSON_ID, i.INDEX_DATE, op.OBSERVATION_PERIOD_START_DATE, op.OBSERVATION_PERIOD_END_DATE,
    (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) AS DAYS_BEFORE_INDEX
FROM CTE_DRUG_INDEX i
    JOIN OBSERVATION_PERIOD op
        ON op.PERSON_ID = i.PERSON_ID
        AND i.INDEX_DATE BETWEEN op.OBSERVATION_PERIOD_START_DATE AND op.OBSERVATION_PERIOD_END_DATE
WHERE (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) >= 180
ORDER BY i.PERSON_ID
```

# Step 1: Get the codes you need

Ex 2

```
/**********************************************************************************
*    (Exercise 1) Warfarin New Users
**********************************************************************************/

WITH CTE_DRUG_INDEX AS (
    SELECT de.PERSON_ID, MIN(de.DRUG_EXPOSURE_START_DATE) AS INDEX_DATE
    FROM DRUG_EXPOSURE de
    WHERE de.DRUG_CONCEPT_ID IN (
        SELECT DESCENDANT_CONCEPT_ID
        FROM CONCEPT_ANCESTOR WHERE ANCESTOR_CONCEPT_ID = 1310149 /*warfarin*/
    )
    GROUP BY de.PERSON_ID
)
SELECT i.PERSON_ID, i.INDEX_DATE, op.OBSERVATION_PERIOD_START_DATE, op.OBSERVATION_PERIOD_END_DATE,
    (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) AS DAYS_BEFORE_INDEX
FROM CTE_DRUG_INDEX i
    JOIN OBSERVATION_PERIOD op
        ON op.PERSON_ID = i.PERSON_ID
        AND i.INDEX_DATE BETWEEN op.OBSERVATION_PERIOD_START_DATE AND op.OBSERVATION_PERIOD_END_DATE
WHERE (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) >= 180
ORDER BY i.PERSON_ID
```

# Step 2: Find Drug Exposures

Ex 2

```
/**************************************************************************************
*    (Exercise 1) Warfarin New Users
**************************************************************************************/

WITH CTE_DRUG_INDEX AS (
    SELECT de.PERSON_ID, MIN(de.DRUG_EXPOSURE_START_DATE) AS INDEX_DATE
    FROM DRUG_EXPOSURE de
    WHERE de.DRUG_CONCEPT_ID IN (
        SELECT DESCENDANT_CONCEPT_ID
        FROM CONCEPT_ANCESTOR WHERE ANCESTOR_CONCEPT_ID = 1310149 /*warfarin*/
    )
    GROUP BY de.PERSON_ID
)
SELECT i.PERSON_ID, i.INDEX_DATE, op.OBSERVATION_PERIOD_START_DATE, op.OBSERVATION_PERIOD_END_DATE,
    (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) AS DAYS_BEFORE_INDEX
FROM CTE_DRUG_INDEX i
    JOIN OBSERVATION_PERIOD op
        ON op.PERSON_ID = i.PERSON_ID
        AND i.INDEX_DATE BETWEEN op.OBSERVATION_PERIOD_START_DATE AND op.OBSERVATION_PERIOD_END_DATE
WHERE (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) >= 180
ORDER BY i.PERSON_ID
```

# Step 3: Find New Users

Ex 2

```
/**********************************************************************************
*    (Exercise 1) Warfarin New Users
**********************************************************************************/

WITH CTE_DRUG_INDEX AS (
    SELECT de.PERSON_ID, MIN(de.DRUG_EXPOSURE_START_DATE) AS INDEX_DATE
    FROM DRUG_EXPOSURE de
    WHERE de.DRUG_CONCEPT_ID IN (
        SELECT DESCENDANT_CONCEPT_ID
        FROM CONCEPT_ANCESTOR WHERE ANCESTOR_CONCEPT_ID = 1310149 /*warfarin*/
    )
    GROUP BY de.PERSON_ID
)
SELECT i.PERSON_ID, i.INDEX_DATE, op.OBSERVATION_PERIOD_START_DATE, op.OBSERVATION_PERIOD_END_DATE,
    (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) AS DAYS_BEFORE_INDEX
FROM CTE_DRUG_INDEX i
    JOIN OBSERVATION_PERIOD op
        ON op.PERSON_ID = i.PERSON_ID
        AND i.INDEX_DATE BETWEEN op.OBSERVATION_PERIOD_START_DATE AND op.OBSERVATION_PERIOD_END_DATE
WHERE (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) >= 180
ORDER BY i.PERSON_ID
```

# New Users of Warfarin

Ex 2

```
/**************************************************************************************
*    (Exercise 1) Warfarin New Users
**************************************************************************************/

WITH CTE_DRUG_INDEX AS (
    SELECT de.PERSON_ID, MIN(de.DRUG_EXPOSURE_START_DATE) AS INDEX_DATE
    FROM DRUG_EXPOSURE de
    WHERE de.DRUG_CONCEPT_ID IN (
        SELECT DESCENDANT_CONCEPT_ID
        FROM CONCEPT_ANCESTOR WHERE ANCESTOR_CONCEPT_ID = 1310149 /*warfarin*/
    )
    GROUP BY de.PERSON_ID
)
SELECT i.PERSON_ID, i.INDEX_DATE, op.OBSERVATION_PERIOD_START_DATE, op.OBSERVATION_PERIOD_END_DATE,
    (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) AS DAYS_BEFORE_INDEX
FROM CTE_DRUG_INDEX i
    JOIN OBSERVATION_PERIOD op
        ON op.PERSON_ID = i.PERSON_ID
        AND i.INDEX_DATE BETWEEN op.OBSERVATION_PERIOD_START_DATE AND op.OBSERVATION_PERIOD_END_DATE
WHERE (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) >= 180
ORDER BY i.PERSON_ID
```

# New Users of Warfarin

Ex 2

Try running this on your own!

How many people do you get?

**15,685 individuals**

Results | Messages

| | PERSON_ID | INDEX_DATE | OBSERVATION_PERIOD_START_DATE | OBSERVATION_PERIOD_END_DATE | DAYS_BEFORE_INDEX |
|---|---|---|---|---|---|
| 1 | 11 | 2009-01-23 | 2008-02-04 | 2010-12-19 | 354 |
| 2 | 12 | 2009-02-17 | 2008-01-20 | 2010-11-23 | 394 |
| 3 | 17 | 2009-11-04 | 2008-03-04 | 2010-11-11 | 610 |
| 4 | 31 | 2009-01-16 | 2008-01-26 | 2010-12-14 | 356 |
| 5 | 51 | 2008-10-22 | 2008-01-03 | 2010-03-31 | 293 |
| 6 | 58 | 2008-10-20 | 2008-01-31 | 2010-09-17 | 263 |
| 7 | 61 | 2009-12-29 | 2008-01-05 | 2010-11-15 | 724 |
| 8 | 66 | 2009-08-01 | 2008-02-28 | 2010-10-29 | 520 |
| 9 | 68 | 2010-06-26 | 2008-01-21 | 2010-12-28 | 887 |
| 10 | 88 | 2008-08-31 | 2007-12-19 | 2010-12-14 | 256 |
| 11 | 91 | 2008-11-17 | 2008-04-14 | 2010-12-19 | 217 |

Query executed successfully. | WIN-FQP2LJUVRTQ\IQVIA_OHDSI... | WIN-FQP2LJUVRTQ\iqvia-... | Synpuf-2.3m | 00:04:54 | 361007 rows

# Some Example Questions

Ex 1 Finding Warfarin

Ex 2 New Users of Warfarin

**Ex 3**

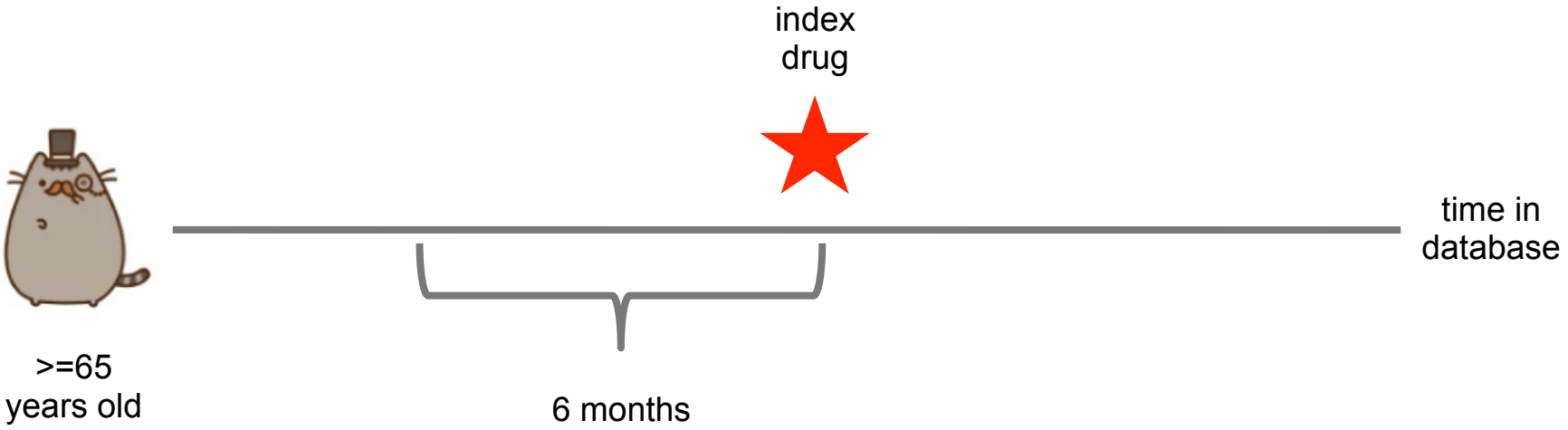
## New Users of Warfarin who are >=65?

Ex 4 New Users of Warfarin with prior Atrial Fibrillation?

# How do I define new users of warfarin who are >=65?

Ex 3

Someone who has recently started taking the drug, typically with a 6 or 12 month wash out



# What is Needed in the CDM?

Ex 3

- **OMOP Vocabulary**
  to find the concepts
- **DRUG_EXPOSURE**
  to find individuals with exposure
- **OBSERVATION_PERIOD**
  to know people's time within the database
- **PERSON**
  to know year of birth

# Step 1: Start with the previous query

Ex 3

```
/*********************************************************************************
*       (Exercise 2) Warfarin New Users 65 or Older at Index
*********************************************************************************/

WITH CTE_DRUG_INDEX AS (
        SELECT de.PERSON_ID, MIN(de.DRUG_EXPOSURE_START_DATE) AS INDEX_DATE
        FROM DRUG_EXPOSURE de
        WHERE de.DRUG_CONCEPT_ID IN (
                SELECT DESCENDANT_CONCEPT_ID FROM CONCEPT_ANCESTOR WHERE ANCESTOR_CONCEPT_ID = 1310149 /*warfarin*/
        )
        GROUP BY de.PERSON_ID
)
SELECT i.PERSON_ID, i.INDEX_DATE, op.OBSERVATION_PERIOD_START_DATE, op.OBSERVATION_PERIOD_END_DATE,
        (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) AS DAYS_BEFORE_INDEX,
        EXTRACT(YEAR FROM i.INDEX_DATE)-p.YEAR_OF_BIRTH AS AGE_AT_INDEX
FROM CTE_DRUG_INDEX i
        JOIN OBSERVATION_PERIOD op
                ON op.PERSON_ID = i.PERSON_ID
                AND i.INDEX_DATE BETWEEN op.OBSERVATION_PERIOD_START_DATE AND op.OBSERVATION_PERIOD_END_DATE
        JOIN PERSON p
                ON p.PERSON_ID = i.PERSON_ID
WHERE (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) >= 180
AND EXTRACT(YEAR FROM i.INDEX_DATE)-p.YEAR_OF_BIRTH >= 65
ORDER BY i.PERSON_ID
```

# Step 2: Add the Person Table to calculate age

Ex 3

```
/**********************************************************************************
*       (Exercise 2) Warfarin New Users 65 or Older at Index
**********************************************************************************/

WITH CTE_DRUG_INDEX AS (
        SELECT de.PERSON_ID, MIN(de.DRUG_EXPOSURE_START_DATE) AS INDEX_DATE
        FROM DRUG_EXPOSURE de
        WHERE de.DRUG_CONCEPT_ID IN (
                SELECT DESCENDANT_CONCEPT_ID FROM CONCEPT_ANCESTOR WHERE ANCESTOR_CONCEPT_ID = 1310149 /*warfarin*/
        )
        GROUP BY de.PERSON_ID
)
SELECT i.PERSON_ID, i.INDEX_DATE, op.OBSERVATION_PERIOD_START_DATE, op.OBSERVATION_PERIOD_END_DATE,
        (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) AS DAYS_BEFORE_INDEX,
        EXTRACT(YEAR FROM i.INDEX_DATE)-p.YEAR_OF_BIRTH AS AGE_AT_INDEX
FROM CTE_DRUG_INDEX i
        JOIN OBSERVATION_PERIOD op
                ON op.PERSON_ID = i.PERSON_ID
                AND i.INDEX_DATE BETWEEN op.OBSERVATION_PERIOD_START_DATE AND op.OBSERVATION_PERIOD_END_DATE
        JOIN PERSON p
                ON p.PERSON_ID = i.PERSON_ID
WHERE (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) >= 180
AND EXTRACT(YEAR FROM i.INDEX_DATE)-p.YEAR_OF_BIRTH >= 65
ORDER BY i.PERSON_ID
```

# New Users of Warfarin >= 65 years of age

Ex 3

## Try running this on your own!

```
/**********************************************************************************
*       (Exercise 2) Warfarin New Users 65 or Older at Index
**********************************************************************************/

WITH CTE_DRUG_INDEX AS (
        SELECT de.PERSON_ID, MIN(de.DRUG_EXPOSURE_START_DATE) AS INDEX_DATE
        FROM DRUG_EXPOSURE de
        WHERE de.DRUG_CONCEPT_ID IN (
                SELECT DESCENDANT_CONCEPT_ID FROM CONCEPT_ANCESTOR WHERE ANCESTOR_CONCEPT_ID = 1310149 /*warfarin*/
        )
        GROUP BY de.PERSON_ID
)
SELECT i.PERSON_ID, i.INDEX_DATE, op.OBSERVATION_PERIOD_START_DATE, op.OBSERVATION_PERIOD_END_DATE,
        (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) AS DAYS_BEFORE_INDEX,
        EXTRACT(YEAR FROM i.INDEX_DATE)-p.YEAR_OF_BIRTH AS AGE_AT_INDEX
FROM CTE_DRUG_INDEX i
        JOIN OBSERVATION_PERIOD op
                ON op.PERSON_ID = i.PERSON_ID
                AND i.INDEX_DATE BETWEEN op.OBSERVATION_PERIOD_START_DATE AND op.OBSERVATION_PERIOD_END_DATE
        JOIN PERSON p
                ON p.PERSON_ID = i.PERSON_ID
WHERE (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) >= 180
AND EXTRACT(YEAR FROM i.INDEX_DATE)-p.YEAR_OF_BIRTH >= 65
ORDER BY i.PERSON_ID
```

## How many people do you get?

# Some Example Questions

Ex 1 Finding Warfarin

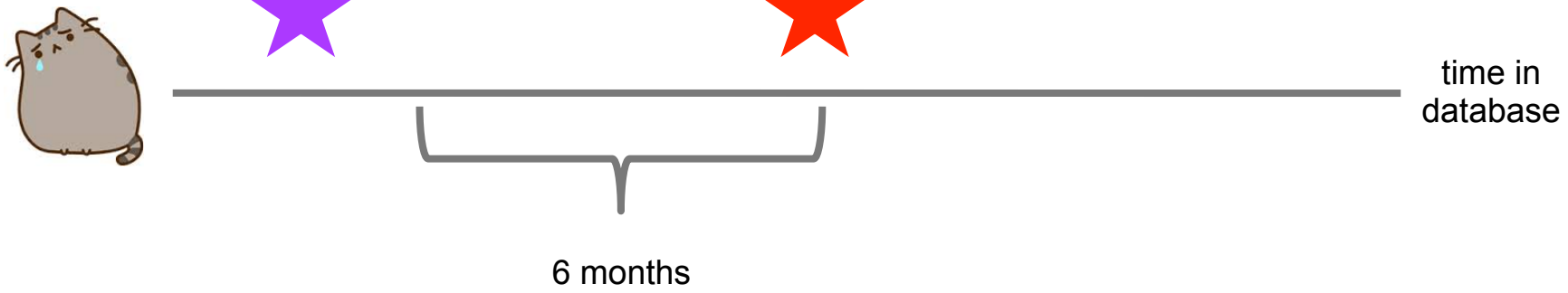
Ex 2 New Users of Warfarin

Ex 3 New Users of Warfarin who are >=65?

**Ex 4** New Users of Warfarin with prior Atrial Fibrillation?

# How do I define new users of Warfarin with prior Atrial Fibrillation?

Ex 4



# What is Needed in the CDM?

Ex 4

- **OMOP Vocabulary**
  to find the concepts
- **DRUG_EXPOSURE**
  to find individuals with exposure
- **OBSERVATION_PERIOD**
  to know people's time within the database
- **PERSON**
  to know year of birth
- **CONDITION_OCCURRENCE**
  to find presence of a disease

# Step 1: Start with the Ex 1 query

Ex 4

```
/*********************************************************************************
*       (Exercise 3) Warfarin New Users With Prior AFIB
*********************************************************************************/

WITH CTE_DRUG_INDEX AS (
        SELECT de.PERSON_ID, MIN(de.DRUG_EXPOSURE_START_DATE) AS INDEX_DATE
        FROM DRUG_EXPOSURE de
        WHERE de.DRUG_CONCEPT_ID IN (
                SELECT DESCENDANT_CONCEPT_ID FROM CONCEPT_ANCESTOR WHERE ANCESTOR_CONCEPT_ID = 1310149 /*warfarin*/
        )
        GROUP BY de.PERSON_ID
),
CTE_DRUG_NEW_USERS AS (
        SELECT i.PERSON_ID, i.INDEX_DATE, op.OBSERVATION_PERIOD_START_DATE, op.OBSERVATION_PERIOD_END_DATE,
                (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) AS DAYS_BEFORE_INDEX
        FROM CTE_DRUG_INDEX i
                JOIN OBSERVATION_PERIOD op
                        ON op.PERSON_ID = i.PERSON_ID
                        AND i.INDEX_DATE BETWEEN op.OBSERVATION_PERIOD_START_DATE AND op.OBSERVATION_PERIOD_END_DATE
        WHERE (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) >= 180
)
SELECT nu.*, MIN(nu.INDEX_DATE-co.CONDITION_START_DATE) AS DAYS_OF_CLOSEST_AFIB_PRIOR_TO_INDEX
FROM CTE_DRUG_NEW_USERS nu
        JOIN CONDITION_OCCURRENCE co
                ON co.PERSON_ID = nu.PERSON_ID
                AND co.CONDITION_START_DATE BETWEEN nu.OBSERVATION_PERIOD_START_DATE AND nu.OBSERVATION_PERIOD_END_DATE
WHERE co.CONDITION_CONCEPT_ID IN (
                SELECT DESCENDANT_CONCEPT_ID FROM CONCEPT_ANCESTOR WHERE ANCESTOR_CONCEPT_ID =  313217 /*Atrial fibrillation*/
)
AND co.CONDITION_START_DATE < nu.INDEX_DATE
GROUP BY nu.PERSON_ID, nu.INDEX_DATE, nu.OBSERVATION_PERIOD_START_DATE, nu.OBSERVATION_PERIOD_END_DATE, nu.DAYS_BEFORE_INDEX
ORDER BY nu.PERSON_ID
```

# Step 2: Define Atrial Fibrillation

Ex 4

```
/**************************************************************************
*       (Exercise 3) Warfarin New Users With Prior AFIB
**************************************************************************/

WITH CTE_DRUG_INDEX AS (
        SELECT de.PERSON_ID, MIN(de.DRUG_EXPOSURE_START_DATE) AS INDEX_DATE
        FROM DRUG_EXPOSURE de
        WHERE de.DRUG_CONCEPT_ID IN (
                SELECT DESCENDANT_CONCEPT_ID FROM CONCEPT_ANCESTOR WHERE ANCESTOR_CONCEPT_ID = 1310149 /*warfarin*/
        )
        GROUP BY de.PERSON_ID
),
CTE_DRUG_NEW_USERS AS (
        SELECT i.PERSON_ID, i.INDEX_DATE, op.OBSERVATION_PERIOD_START_DATE, op.OBSERVATION_PERIOD_END_DATE,
                (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) AS DAYS_BEFORE_INDEX
        FROM CTE_DRUG_INDEX i
                JOIN OBSERVATION_PERIOD op
                        ON op.PERSON_ID = i.PERSON_ID
                        AND i.INDEX_DATE BETWEEN op.OBSERVATION_PERIOD_START_DATE AND op.OBSERVATION_PERIOD_END_DATE
        WHERE (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) >= 180
)
SELECT nu.*, MIN(nu.INDEX_DATE-co.CONDITION_START_DATE) AS DAYS_OF_CLOSEST_AFIB_PRIOR_TO_INDEX
FROM CTE_DRUG_NEW_USERS nu
        JOIN CONDITION_OCCURRENCE co
                ON co.PERSON_ID = nu.PERSON_ID
                AND co.CONDITION_START_DATE BETWEEN nu.OBSERVATION_PERIOD_START_DATE AND nu.OBSERVATION_PERIOD_END_DATE
WHERE co.CONDITION_CONCEPT_ID IN (
                SELECT DESCENDANT_CONCEPT_ID FROM CONCEPT_ANCESTOR WHERE ANCESTOR_CONCEPT_ID =  313217 /*Atrial fibrillation*/
)
AND co.CONDITION_START_DATE < nu.INDEX_DATE
GROUP BY nu.PERSON_ID, nu.INDEX_DATE, nu.OBSERVATION_PERIOD_START_DATE, nu.OBSERVATION_PERIOD_END_DATE, nu.DAYS_BEFORE_INDEX
ORDER BY nu.PERSON_ID
```

# Step 3: Prior Atrial Fibrillation

Ex 4

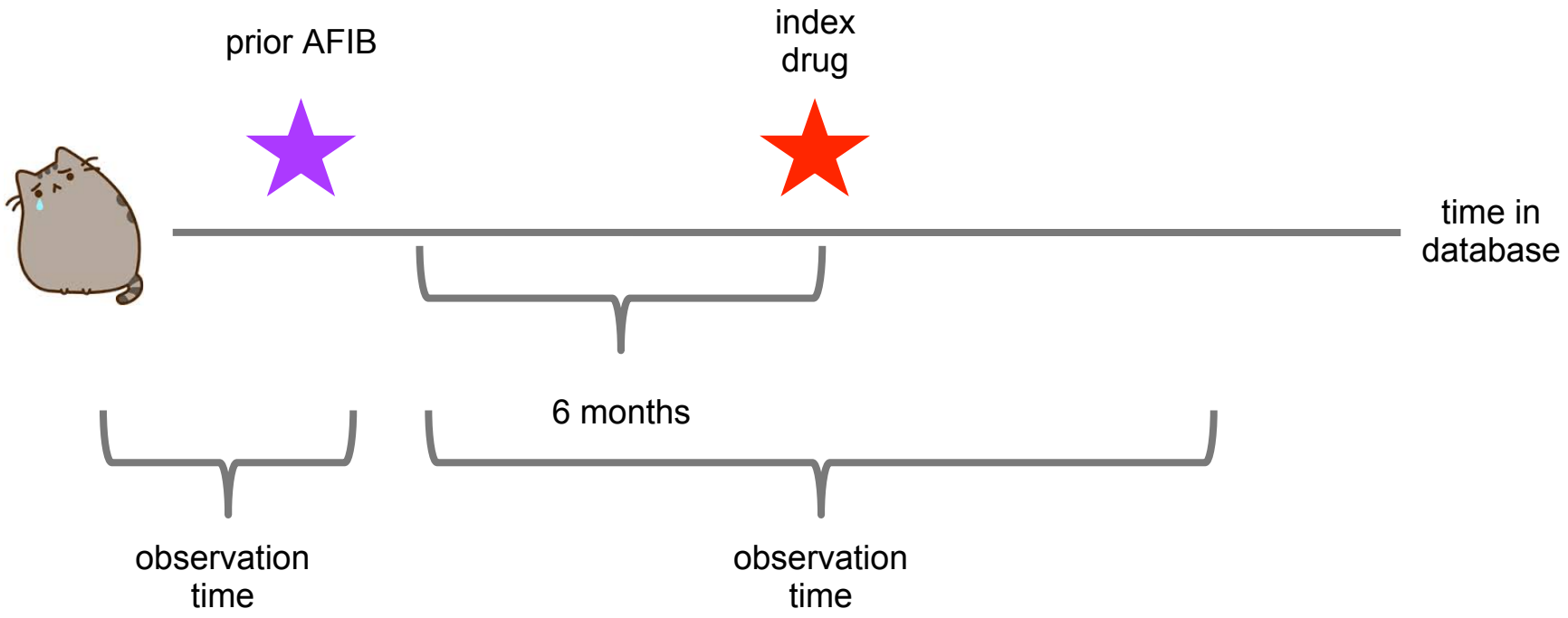
```
/**********************************************************************************
*       (Exercise 3) Warfarin New Users With Prior AFIB
**********************************************************************************/

WITH CTE_DRUG_INDEX AS (
        SELECT de.PERSON_ID, MIN(de.DRUG_EXPOSURE_START_DATE) AS INDEX_DATE
        FROM DRUG_EXPOSURE de
        WHERE de.DRUG_CONCEPT_ID IN (
                SELECT DESCENDANT_CONCEPT_ID FROM CONCEPT_ANCESTOR WHERE ANCESTOR_CONCEPT_ID = 1310149 /*warfarin*/
        )
        GROUP BY de.PERSON_ID
),
CTE_DRUG_NEW_USERS AS (
        SELECT i.PERSON_ID, i.INDEX_DATE, op.OBSERVATION_PERIOD_START_DATE, op.OBSERVATION_PERIOD_END_DATE,
                (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) AS DAYS_BEFORE_INDEX
        FROM CTE_DRUG_INDEX i
                JOIN OBSERVATION_PERIOD op
                        ON op.PERSON_ID = i.PERSON_ID
                        AND i.INDEX_DATE BETWEEN op.OBSERVATION_PERIOD_START_DATE AND
        WHERE (i.INDEX_DATE-op.OBSERVATION_PERIOD_START_DATE) >= 180
)
SELECT nu.*, MIN(nu.INDEX_DATE-co.CONDITION_START_DATE) AS DAYS_OF_CLOSEST_AFIB_PRIOR_
FROM CTE_DRUG_NEW_USERS nu
        JOIN CONDITION_OCCURRENCE co
                ON co.PERSON_ID = nu.PERSON_ID
                AND co.CONDITION_START_DATE BETWEEN nu.OBSERVATION_PERIOD_START_DATE AND nu.OBSERVATION_PERIOD_END_DATE
WHERE co.CONDITION_CONCEPT_ID IN (
                SELECT DESCENDANT_CONCEPT_ID FROM CONCEPT_ANCESTOR WHERE ANCESTOR_CONCEPT_ID =  313217 /*Atrial fibrillation*/
)
AND co.CONDITION_START_DATE < nu.INDEX_DATE
GROUP BY nu.PERSON_ID, nu.INDEX_DATE, nu.OBSERVATION_PERIOD_START_DATE, nu.OBSERVATION_PERIOD_END_DATE, nu.DAYS_BEFORE_INDEX
ORDER BY nu.PERSON_ID
```

Keeps condition within the same observable time, exclude if you want all time prior

# How do I define new users of Warfarin with prior Atrial Fibrillation?

Ex 4



# New Users of Warfarin with prior Atrial Fibrillation

Ex 4

## Try running this on your own!

```
/*************************************************************************
*             (Exercise 4) Warfarin New Users With Prior AFIB
*************************************************************************/

;WITH CTE_DRUG_INDEX AS (
                SELECT de.PERSON_ID, MIN(de.DRUG_EXPOSURE_START_DATE) AS INDEX_DATE
                FROM DRUG_EXPOSURE de
                WHERE de.DRUG_CONCEPT_ID IN (
                                SELECT DESCENDANT_CONCEPT_ID FROM CONCEPT_ANCESTOR WHERE ANCESTOR_CONCEPT_ID = 1310149 /*warfarin*/
                )
                GROUP BY de.PERSON_ID
),
CTE_DRUG_NEW_USERS AS (
                SELECT i.PERSON_ID, i.INDEX_DATE, op.OBSERVATION_PERIOD_START_DATE, op.OBSERVATION_PERIOD_END_DATE,
                                DATEDIFF(DAY,op.OBSERVATION_PERIOD_START_DATE,i.INDEX_DATE) AS DAYS_BEFORE_INDEX
                FROM CTE_DRUG_INDEX i
                                JOIN OBSERVATION_PERIOD op
                                                ON op.PERSON_ID = i.PERSON_ID
                                                AND i.INDEX_DATE BETWEEN op.OBSERVATION_PERIOD_START_DATE AND op.OBSERVATION_PERIOD_END_DATE
                WHERE DATEDIFF(DAY,op.OBSERVATION_PERIOD_START_DATE,i.INDEX_DATE) >= 180
)
SELECT nu.*, MAX(DATEDIFF(DAY,co.CONDITION_START_DATE,nu.INDEX_DATE)) AS DAYS_OF_CLOSEST_AFIB_PRIOR_TO_INDEX
FROM CTE_DRUG_NEW_USERS nu
                JOIN CONDITION_OCCURRENCE co
                                ON co.PERSON_ID = nu.PERSON_ID
                                AND co.CONDITION_START_DATE BETWEEN nu.OBSERVATION_PERIOD_START_DATE AND nu.OBSERVATION_PERIOD_END_DATE
WHERE co.CONDITION_CONCEPT_ID IN (
                                SELECT DESCENDANT_CONCEPT_ID FROM CONCEPT_ANCESTOR WHERE ANCESTOR_CONCEPT_ID =          313217 /*Atrial fibrillation*/
)
AND co.CONDITION_START_DATE < nu.INDEX_DATE
GROUP BY nu.PERSON_ID, nu.INDEX_DATE, nu.OBSERVATION_PERIOD_START_DATE, nu.OBSERVATION_PERIOD_END_DATE, nu.DAYS_BEFORE_INDEX
ORDER BY nu.PERSON_ID
```

# Try on your own!

- Warfarin New Users 65 or Older at Index with Prior Atrial Fibrillation

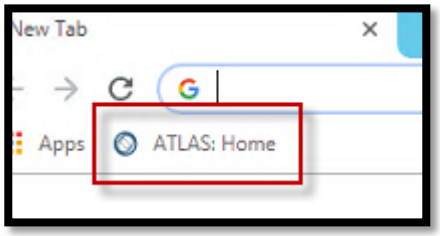
**7,067 individuals**

- Bonus:  Clopidogrel New Users 65 or Older at Index with Prior Atrial Fibrillation

**2,683 individuals**

# Queries Can Be Automated

- Open up Google Chrome 


- Open up ATLAS 


- Example cohort under “Cohort Definitions”: “Warfarin New Users 65 or Older at Index with Prior Atrial Fibrillation”

Cohort

Warfarin New Users 65 or Older at Index with Prior Atrial Fibrillation

Save | Close | Copy | Delete

Definition | Concept Sets | Generation | Reporting | Explore | Export

**Cohort definition:** A cohort is defined as the set of persons satisfying one or more inclusion criteria for a duration of time. criteria and cohort exit criteria. Cohort entry criteria involve selecting one or more initial events, which determine the start d entry record to determine the end date when the person's episode no longer qualifies for the cohort.

Cohort #2

Warfarin New Users 65 or Older at Index with Prior Atrial Fibrillation

Definition | Concept Sets | Generation | Reporting | Export

Available CDM Sources

| | Source Name | Generation Status | People | Records | Generated | Generation Duration | |
|---|---|---|---|---|---|---|---|
| Generate | Synpuf-100k | COMPLETE | 7,067 | 7,067 | 4/25/2018 2:37:23 PM | 45.727s | View Reports |
| Generate | Synpuf-2.3m | COMPLETE | 163,271 | 163,271 | 4/25/2018 2:38:17 PM | 1218.763s | View Reports |

having all of the following criteria: Add New Criteria...

with the following event criteria:

with age Greater or Equal To 65

and with at least 1 using all occurrences of:

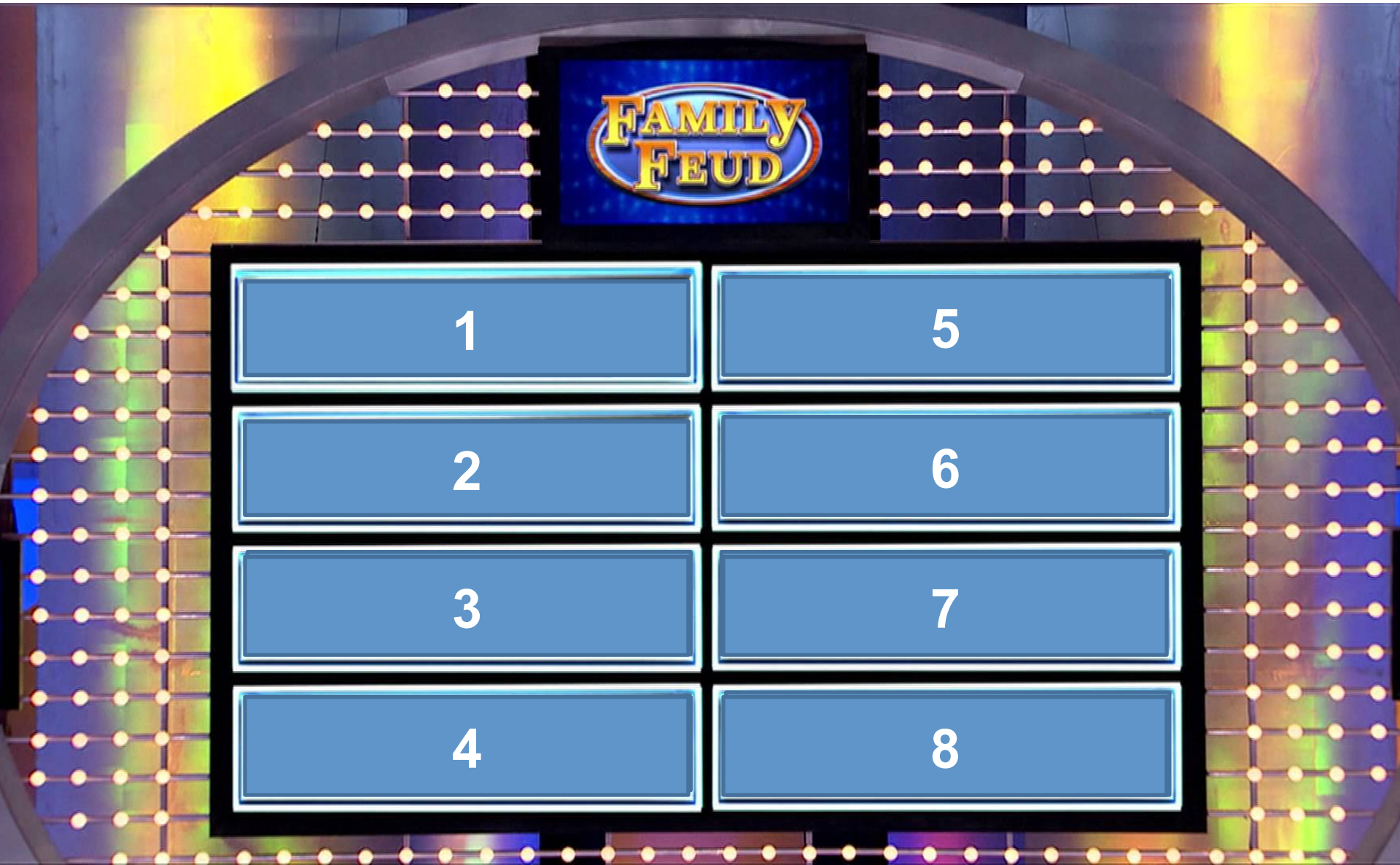
a condition occurrence of Atrial Fibrillation Add

starting between All days Before and 1 days Before event index date and ending any time.

Limit cohort of initial events to: earliest event per person.


# Conclusions

# Conclusion Game



# OMOP Vocabulary

- Is used to **standardize terminology**
- **Compiles standards** from disparate public and private sources and some OMOP-grown concepts
- Has **one uniform structure** to house multiple vocabularies used in the public domain
- Is designed to **facilitate efficient queries**
- Is **regularly updated, maintained,** and **improved**

# OMOP CDM

- Is used to **standardize structure** and **queries**
- **Integrated with Controlled Vocabulary**
- **Consolidates data from heterogeneous data sources**: EMR, claims, registries
- **Patient centric**
- **Domain** (subject area) **based**: concepts decide what table each piece of data lands on
- **Preserves data provenance**
- **Database platform independent**

# What Makes OMOP CDM Unique

- **Supports collaborative research** across data sources both within and outside of US
- Developed **based on analytic use cases** by community of collaborators
- **Specialized:** reflective of clinical domain, granular, well structured
- **Integrated with Vocabulary** that is uniformly structured and well curated
- **Extendable**: new concepts and attributes can be added
- **Supported by Community** of interdisciplinary developers and researches