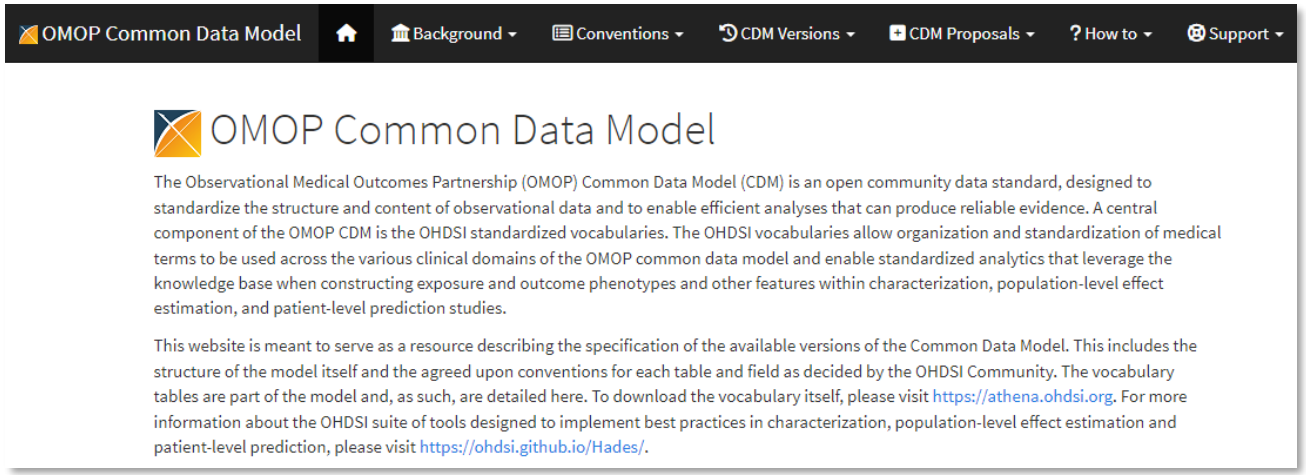
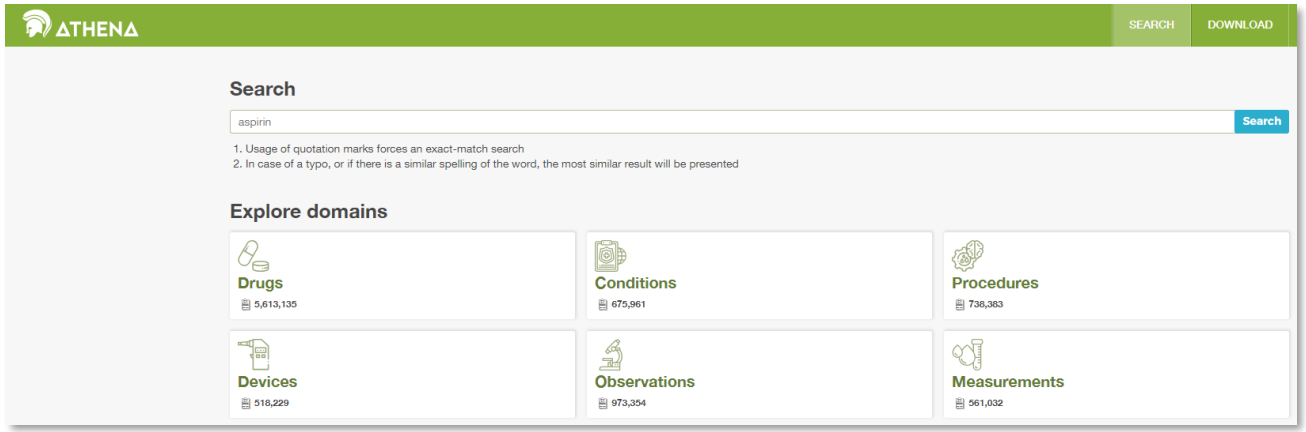
OMOP CDM and Vocabulary

Helpful Bookmarks

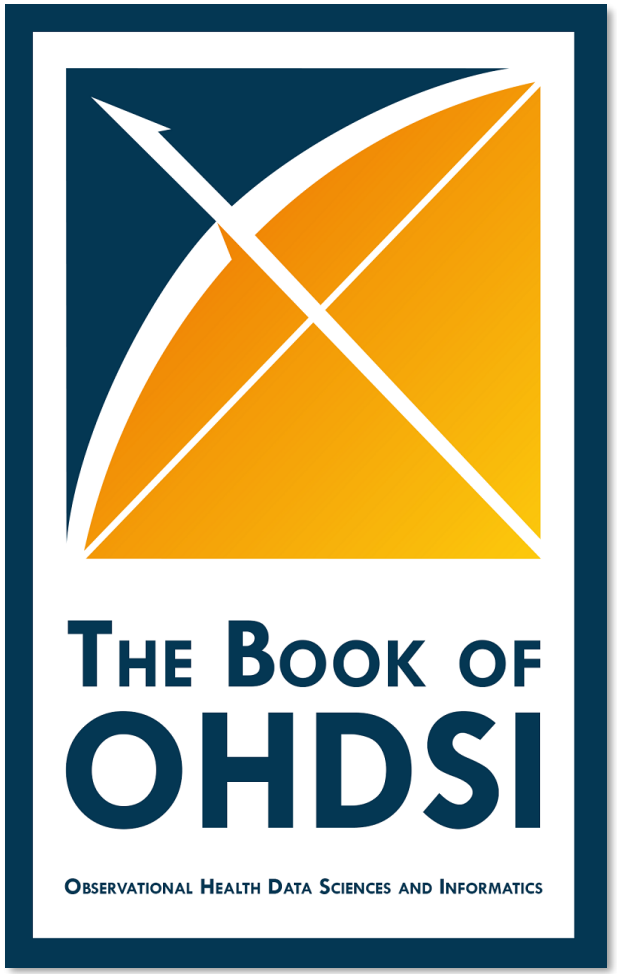
https://ohdsi.github.io/CommonDataModel/



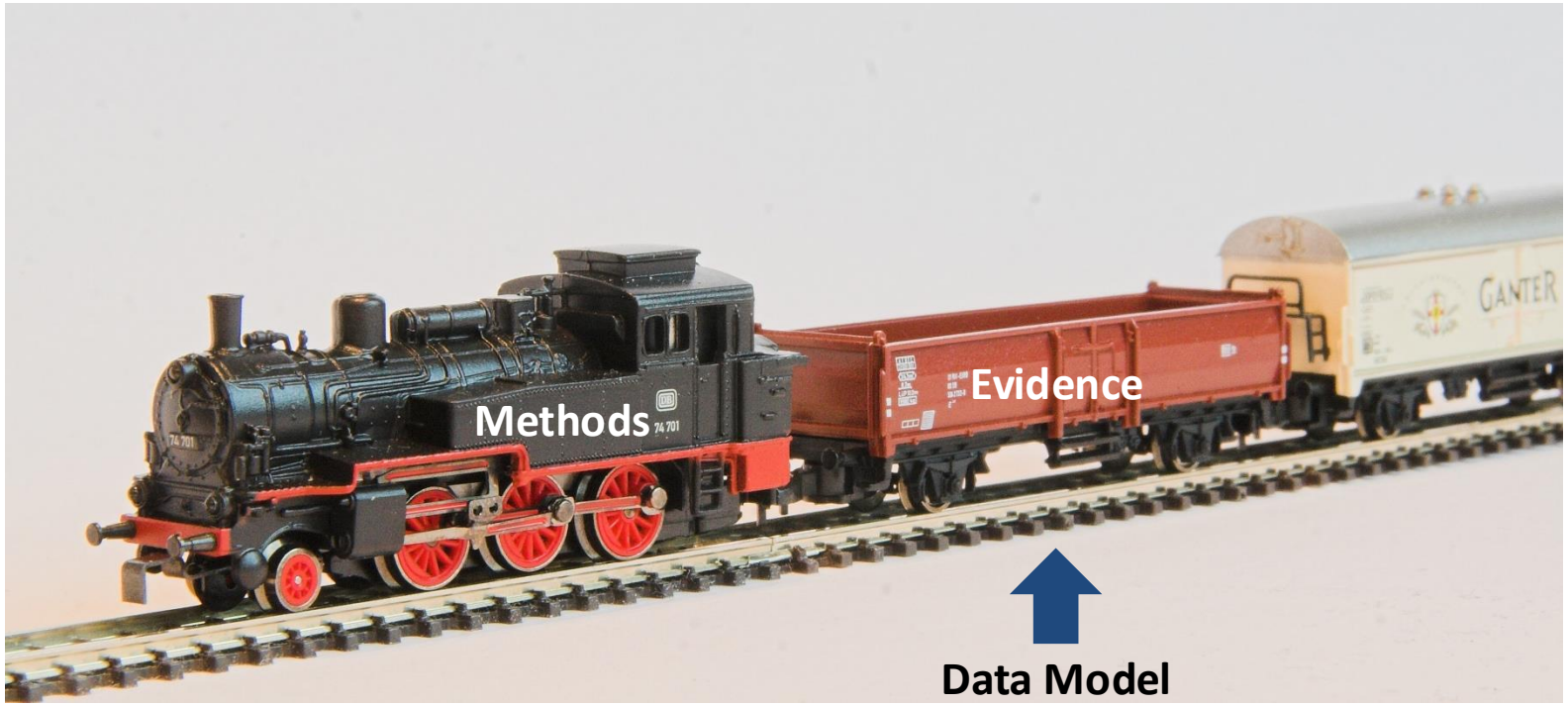
https://athena.ohdsi.org/



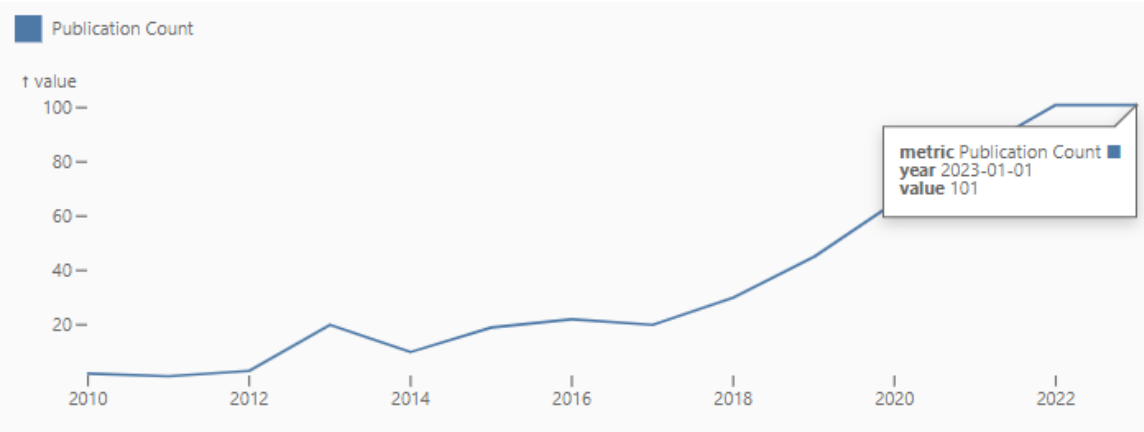
https://ohdsi.github.io/TheBookOfOhdsi/



Why a Common Data Model



Why a Common Data Model



	Journal	Creation Date ↓	Authors
Predictive Models for Assessing Patients' Response to Treatment in Metastatic Prostate Cancer: A Systematic Review.	European urology open science	2024/04/10 04:15	Lawlor, Ailbhe | Lin, Carol | Gomez Rivas, Juan | Ibanez, Laura | Abad Lopez, Pablo | Willemse, Peter-Paul | Imran Omar, Muhammad | Remmers, Sebastiaan | Cornford, Philip | Rajwa, Pawel | Nicoletti, Rossella | Gandaglia, Giorgio | Yuen-Chun Teoh, Jeremy | Moreno Sierra, Jesus | Golozar, Asieh | Bjartell, Anders | Evans-Axelsson, Susan | N'Dow, James | Zong, Jihong | Ribal, Maria J | Roobol, Monique J | Van Hemelrijck, Mieke | Beyer, Katharina
Converge or Collide? Making Sense of a Plethora of Open Data Standards in Health Care.	Journal of medical Internet research	2024/04/09 16:53	Tsafnat, Guy | Dunscombe, Rachel | Gabriel, Davera | Grieve, Grahame | Reich, Christian
Research Protocol for an Observational Health Data Analysis on the Adverse Events of Systemic Treatment in Patients with Metastatic Hormone-sensitive Prostate Cancer: Big Data Analytics Using the PIONEER Platform.	European urology open science	2024/04/04 04:11	Rajwa, Pawel | Borkowetz, Angelika | Abbott, Thomas | Alberti, Andrea | Bjartell, Anders | Brash, James T | Campi, Riccardo | Chilelli, Andrew | Conover, Mitchell | Constantinovici, Niculae | Davies, Eleanor | De Meulder, Bertrand | Eid, Sherrine | Gacci, Mauro | Golozar, Asieh | Hafeez, Haroon | Haque, Samiul | Hijazy, Ayman | Hulsen, Tim | Josefsson, Andreas | Khalid, Sara | Kolde, Raivo | Kotik, Daniel | Kurki, Samu | Lambrecht, Mark | Leung, Chi-Ho | Moreno, Julia | Nicoletti, Rossella | Nieboer, Daan | Oja, Marek | Palanisamy, Soundarya | Prinsen, Peter | Reich, Christian | Raffaele Resta, Giulio | Ribal, Maria J | Gomez Rivas, Juan | Smith, Emma | Snijder, Robert | Steinbeisser, Carl | Vandenberghe, Frederik | Cornford, Philip | Evans-Axelsson, Susan | N'Dow, James | Willemse, Peter-Paul M
Use of Recommended Neurodiagnostic Evaluation Among Patients With Drug-Resistant Epilepsy.	JAMA neurology	2024/04/01 16:08	Spotnitz, Matthew | Ekanayake, Cameron D | Ostropolets, Anna | McKhann, Guy M | Choi, Hyunmi | Ottman, Ruth | Neugut, Alfred I | Hripcsak, George | Natarajan, Karthik | Youngerman, Brett E
Increase transparency and reproducibility of real-world evidence in rare diseases through disease-specific Federated Data Networks.	Pharmacoepidemiology and drug safety	2024/04/01 02:03	van Baalen, Valerie | Didden, Eva-Maria | Rosenberg, Daniel | Bardenheuer, Kristina | van Speybroeck, Michel | Brand, Monika
Correlation of Socioeconomic and Environmental Factors With Incidence of Crohn Disease in Children and Adolescents: Systematic Review and Meta-Regression.	JMIR public health and surveillance	2024/03/25 11:53	Weidner, Jens | Glauche, Ingmar | Manuwald, Ulf | Kern, Ivana | Reinecke, Ines | Bathelt, Franziska | Amin, Makan | Dong, Fan | Rothe, Ulrike | Kugler, Joachim
Patterns of Comorbidities and Prescribing and Dispensing of Non-steroidal Anti-inflammatory Drugs (NSAIDs) Among Patients with Osteoarthritis in the USA: Real-World Study.	Drugs & aging	2024/03/23 12:21	Ide, Joshua | Shoaibi, Azza | Wagner, Kerstin | Weinstein, Rachel | Boyle, Kathleen E | Myers, Andrew

https://dash.ohdsi.org/research

OMOP CDM

The OMOP CDM is a system of tables, vocabularies, and conventions that allow observational health data to be standardized.

It is this standard approach that facilitates rapid innovation in the areas of open-source development, methods research, and evidence generation.

https://ohdsi.github.io/CommonDataModel/index.html

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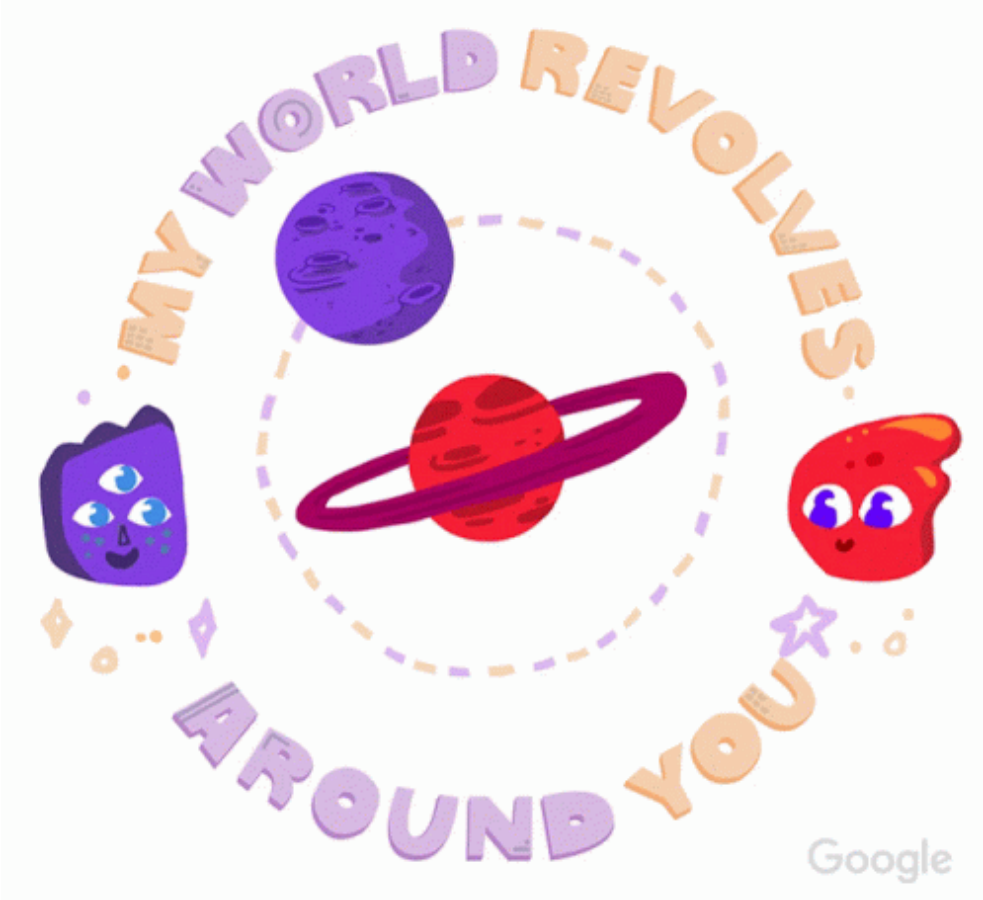
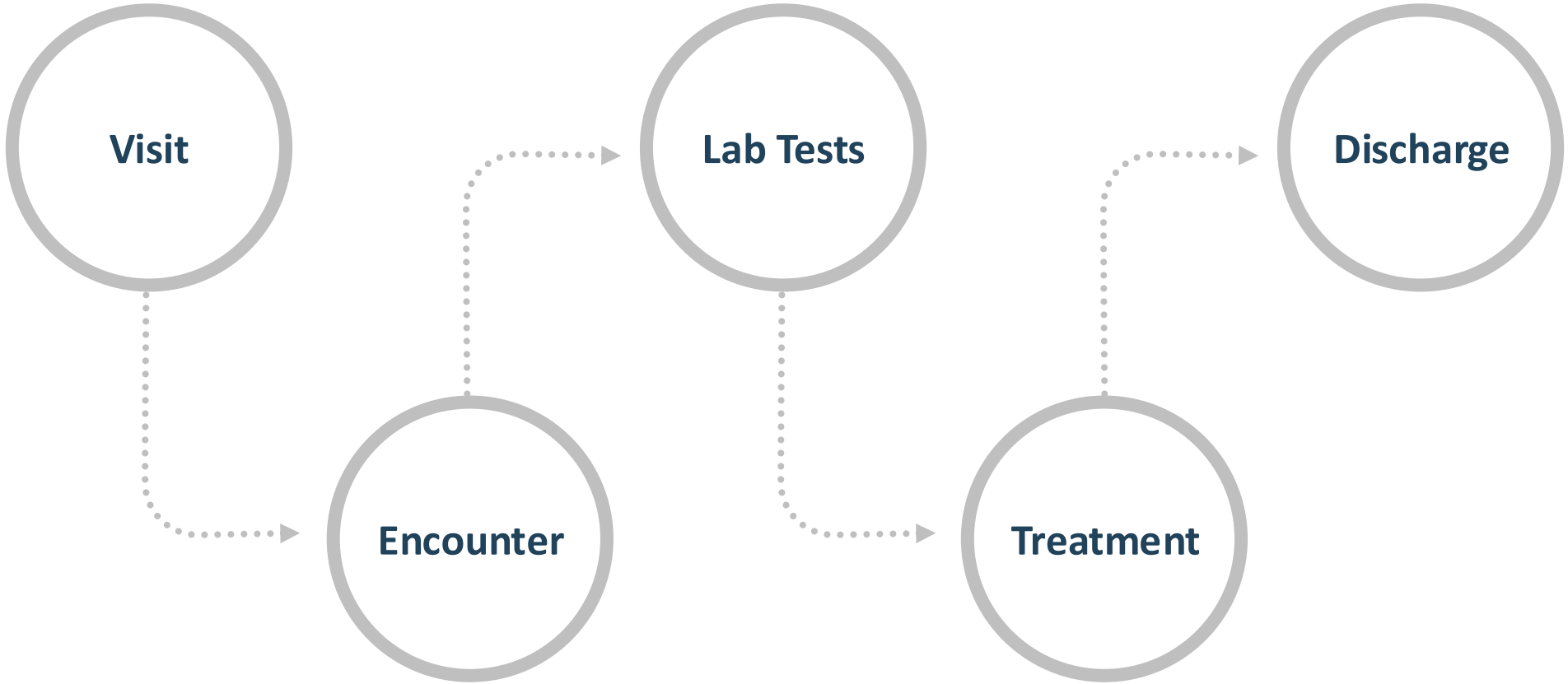
Tables

The OMOP CDM is a person-centric model



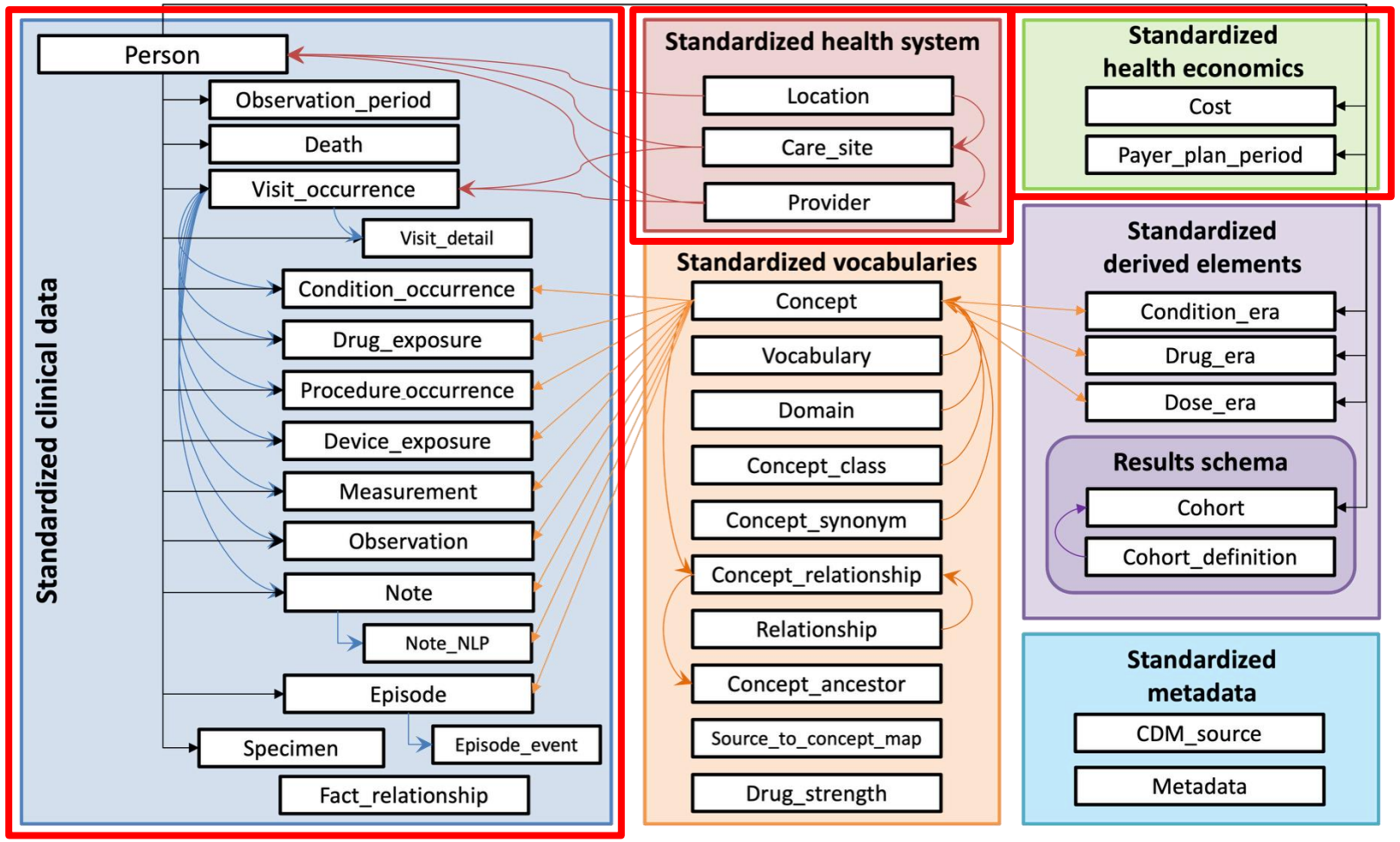
Tables

A typical patient journey within a healthcare system



Tables

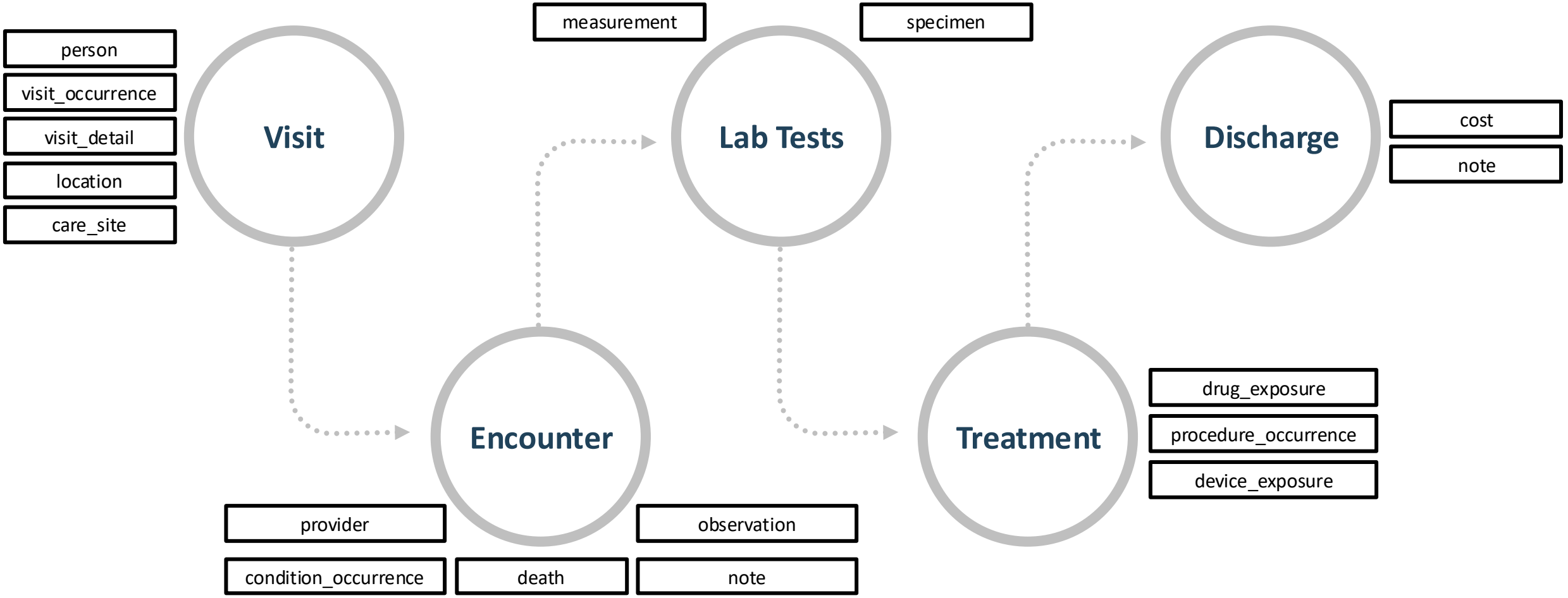
A typical patient journey within a healthcare system into data



https://ohdsi.github.io/CommonDataModel/index.html

Tables

A typical patient journey within a healthcare system into data



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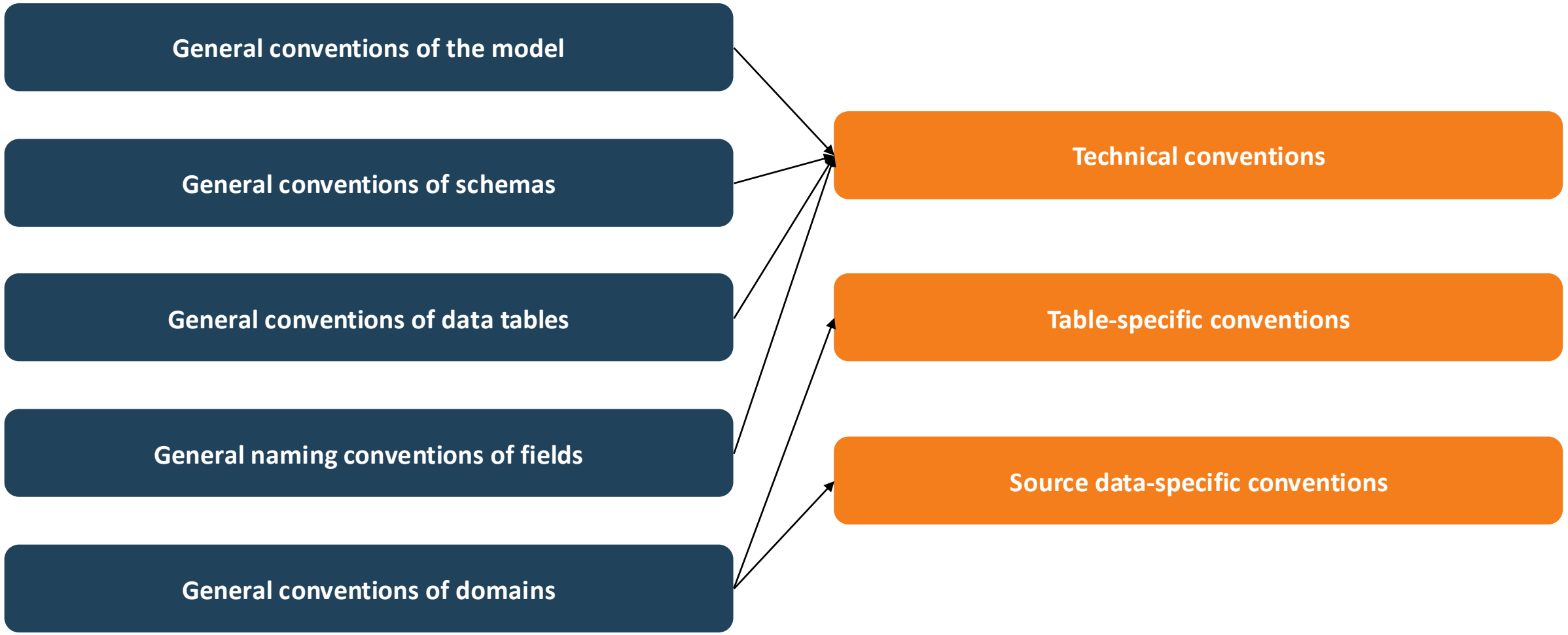
Conventions



https://ohdsi.github.io/TheBookOfOhdsi/CommonDataModel.html#data-model-conventions

Technical Conventions

Fields

Variable names across all tables follow one convention:

Notation	Description
_SOURCE_VALUE	Verbatim information from the source data, typically used in ETL to map to CONCEPT_ID, and not to be used by any standard analytics. For example, CONDITION_SOURCE_VALUE = '787.02' was the ICD-9 code captured as a diagnosis from the administrative claim.
_ID	Unique identifiers for key entities, which can serve as foreign keys to establish relationships across entities. For example, PERSON_ID uniquely identifies each individual. VISIT_OCCURRENCE_ID uniquely identifies a PERSON encounter at a point of care.
_CONCEPT_ID	Foreign key into the Standardized Vocabularies (i.e. the standard_concept attribute for the corresponding term is true), which serves as the primary basis for all standardized analytics. For example, CONDITION_CONCEPT_ID = 31967 contains the reference value for the SNOMED concept of 'Nausea'
_SOURCE_CONCEPT_ID	Foreign key into the Standardized Vocabularies representing the concept and terminology used in the source data, when applicable. For example, CONDITION_SOURCE_CONCEPT_ID = 45431665 denotes the concept of 'Nausea' in the Read terminology; the analogous CONDITION_CONCEPT_ID might be 31967, since SNOMED-CT is the Standardized Vocabulary for most clinical diagnoses and findings.
_TYPE_CONCEPT_ID	Delineates the origin of the source information, standardized within the Standardized Vocabularies. For example, DRUG_TYPE_CONCEPT_ID can allow analysts to discriminate between 'Pharmacy dispensing' and 'Prescription written'

Table-specific Conventions

PERSON

Table Description

This table serves as the central identity management for all Persons in the database. It contains records that uniquely identify each person or patient, and some demographic information.

User Guide

All records in this table are independent Persons.

ETL Conventions

All Persons in a database needs one record in this table, unless they fail data quality requirements specified in the ETL. Persons with no Events should have a record nonetheless. If more than one data source contributes Events to the database, Persons must be reconciled, if possible, across the sources to create one single record per Person. The content of the BIRTH_DATETIME must be equivalent to the content of BIRTH_DAY, BIRTH_MONTH and BIRTH_YEAR.

CDM Field	User Guide	ETL Conventions	Datatype	Required	Primary Key	Foreign Key	FK Table	FK Domain
person_id	It is assumed that every person with a different unique identifier is in fact a different person and should be treated independently.	Any person linkage that needs to occur to uniquely identify Persons ought to be done prior to writing this table. This identifier can be the original id from the source data provided if it is an integer, otherwise it can be an autogenerated number.	integer	Yes	Yes	No		

https://ohdsi.github.io/CommonDataModel/cdm54.html#PERSON

Source data-specific Conventions

Observation Period Considerations for EHR Data

By Melanie Philofsky and the EHR Working Group

The EHR WG convened on July 24, August 7, and August 21, 2020 to discuss the creation of an Observation Period from EHR data. The current and future conventions are not prescriptive enough and leave room for various ways of interpretation. The goals of our discussions were to increase the standardization for the implementation of the OBSERVATION_PERIOD table by providing some general guidelines for determining the start, end, and gaps in Observation Periods. The suggestions we came up with are only "suggestions" at this point. More research should be done to understand how these choices might impact evidence generated using these data. All of these decisions should be tempered by local understanding of patients in the EHR you are ETLing.

- *Note - These suggestions are not intended for HMO EHR sites since HMO EHR Observation Periods more closely resemble claims data Observation Periods.*

Observation Period Start Date

- Generally an Observation Period does NOT begin before birth, however, it might begin before birth IF the pregnant mother receives care recorded in your EHR. The child's record is then split from the mother's record at birth but may retain care given during pregnancy. For these children in your dataset, the field **observation_period_start_date should be the birth date minus 9 months**
- An **Observation Period does NOT begin before the implementation of the EHR at your site.** Any records prior to implementation are probably "history of" record types and not a complete EHR record of clinical events.
- Special consideration should be given to migration from previous EHR, implementation at different sites within your healthcare system, implementation of different modules, etc.

Observation Period end date

Set the **observation_period_end_date** as the first date from the following:

- **Date of death + 60 days**
  - This is a CDM convention to allow events after death (autopsy, final notes, etc).
- **Last clinical event + 60 days**
  - The assumption is that person will return to the same health provider if an adverse reaction/complication/unresolved condition occurs.
- **Date of the data pull from the system**

https://ohdsi.github.io/CommonDataModel/ehrObsPeriods.html

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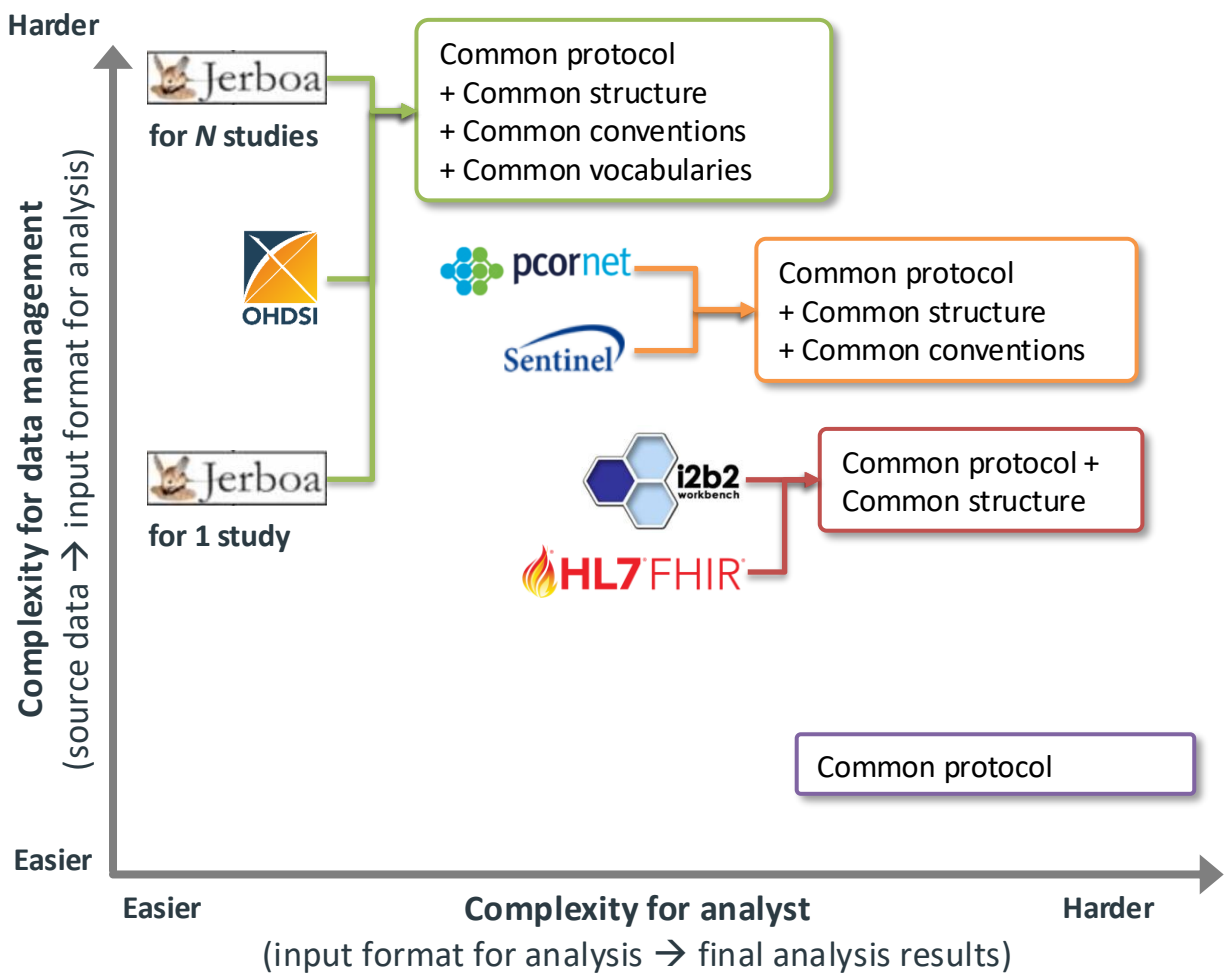
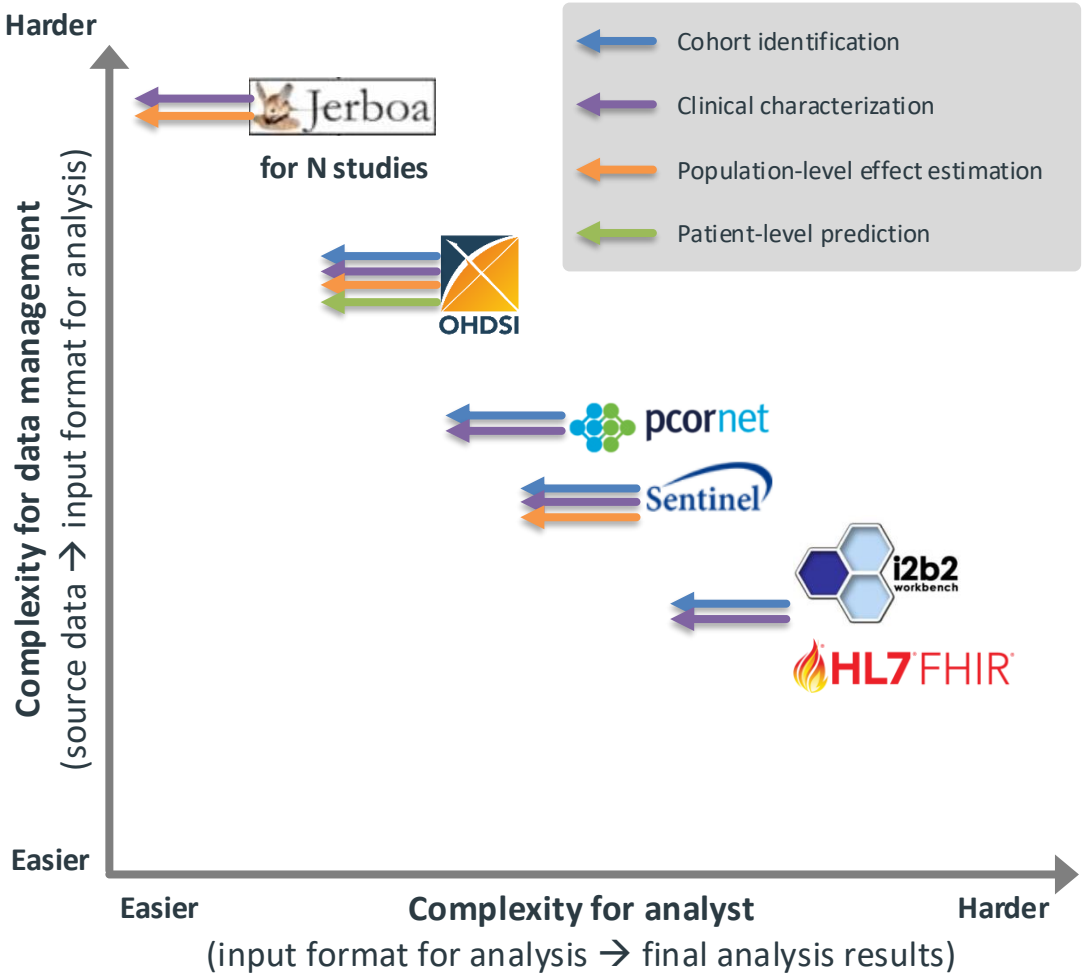
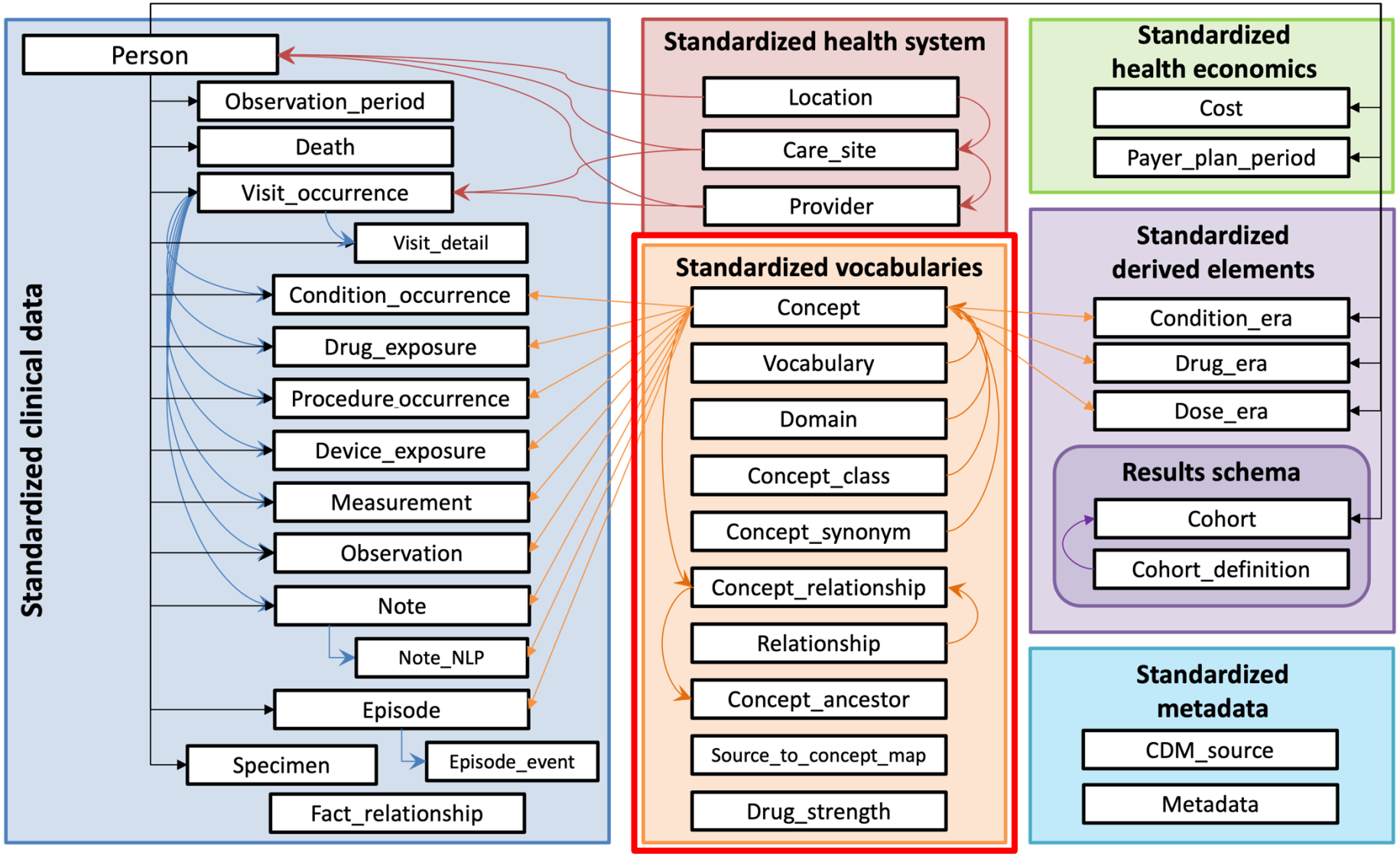
Comparison of common data models

Balancing trade-offs in data management vs. analysis complexity





Vocabularies



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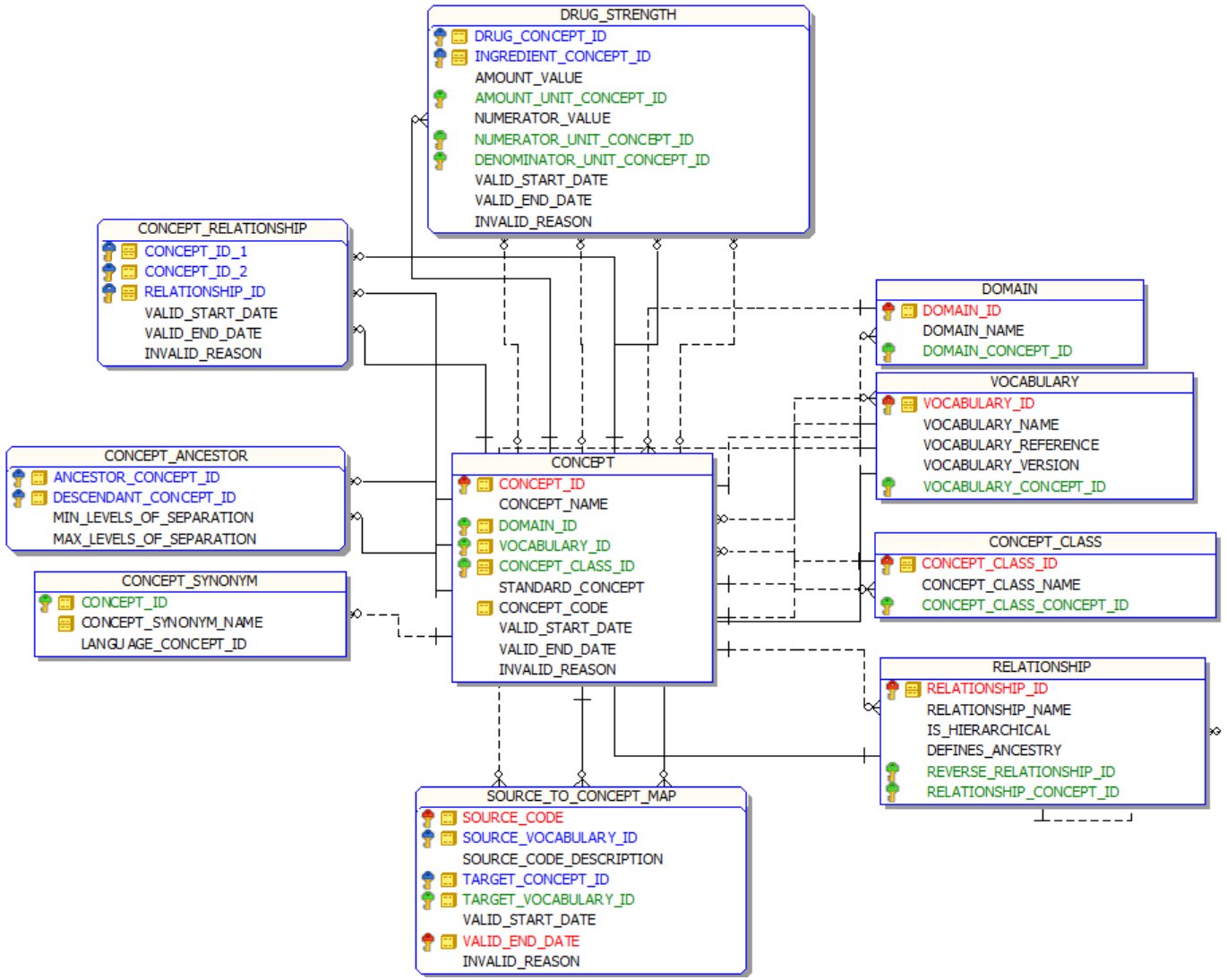
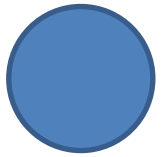
OMOP Standardized Vocabularies

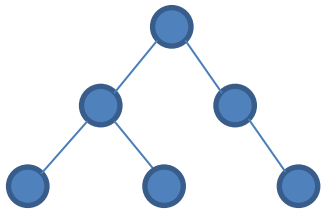


OMOP Standardized Vocabularies



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

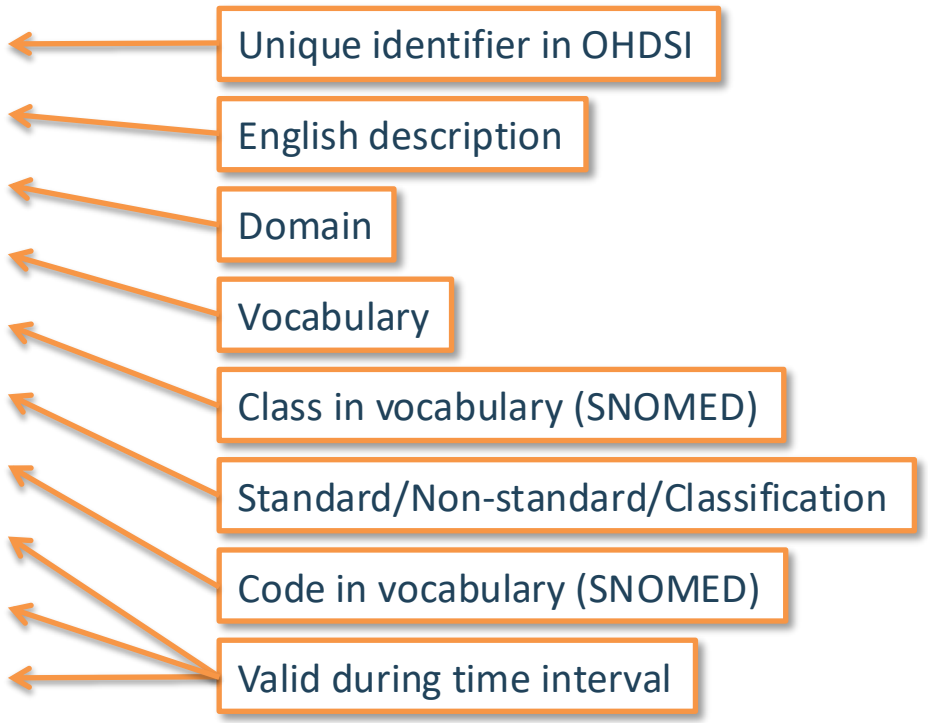
Direct relationships between concepts in **`concept_relationship`**



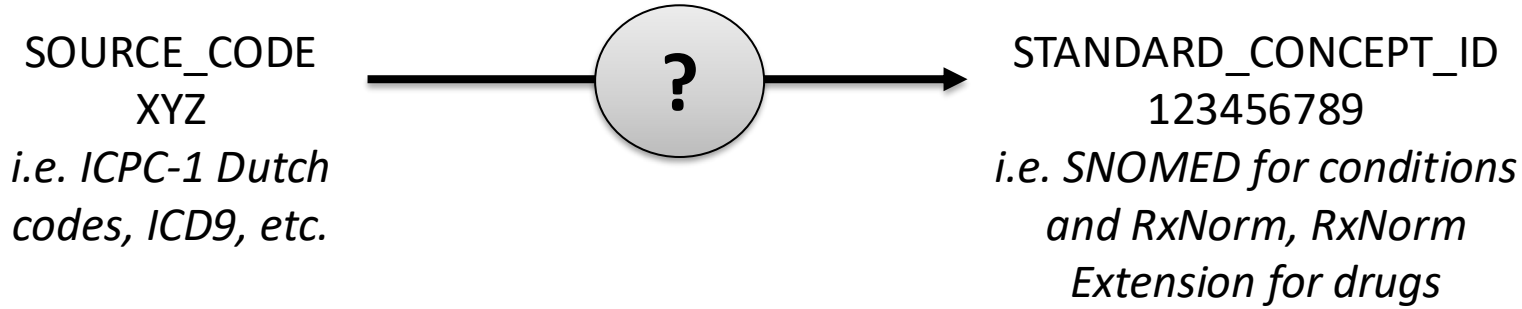
Multi-step hierarchical relationships pre-processed into **`concept_ancestor`**

Concept

CONCEPT_ID	313217
CONCEPT_NAME	Atrial fibrillation
DOMAIN_ID	Condition
VOCABULARY_ID	SNOMED
CONCEPT_CLASS_ID	Disorder
STANDARD_CONCEPT	S
CONCEPT_CODE	49436004
VALID_START_DATE	01-Jan-2002
VALID_END_DATE	31-Dec-2099
INVALID_REASON	



Mapping to OMOP Standardized Vocabularies

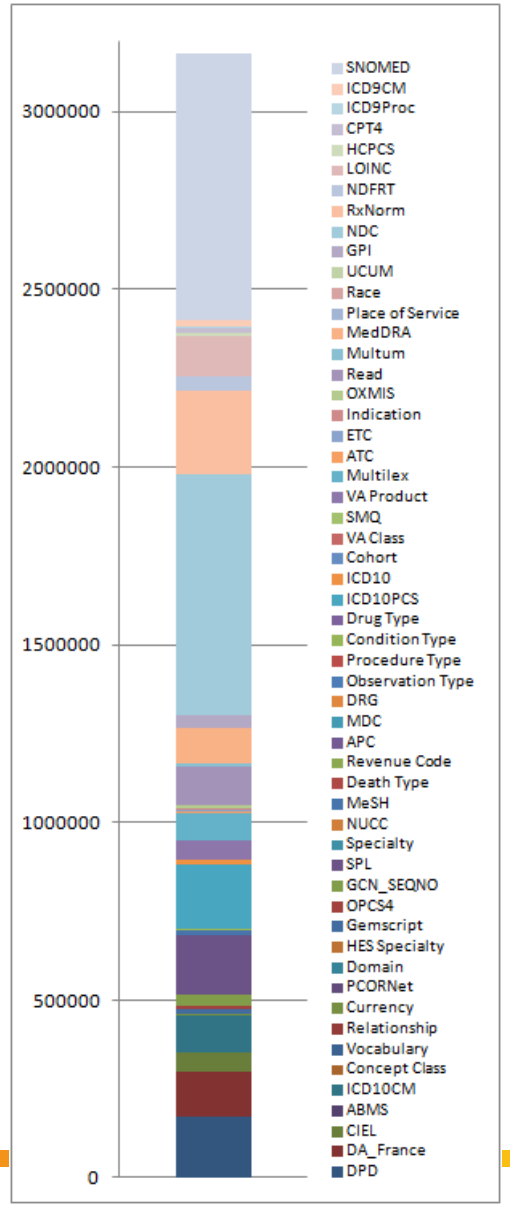


- What is standardized:
  - TABLE_CONCEPT_ID: standard concept the source code maps to, **used for analysis**
  - TABLE_SOURCE_CONCEPT_ID: concept representation of the source code, **helps maintain tie to raw data**
  - TABLE_SOURCE_VALUE: original source code as given in the source table, **helps to review data quality**

- Ways to get a source code to standard code:
  - OMOP Vocabulary (concept_relationship)
  - USAGI

Mapping to OMOP Standardized Vocabularies

- If your source data's codes are in the OMOP vocabularies, you can use it to translate to an OMOP standard
  - For example: ICD9 → SNOMED or NDC → RxNorm



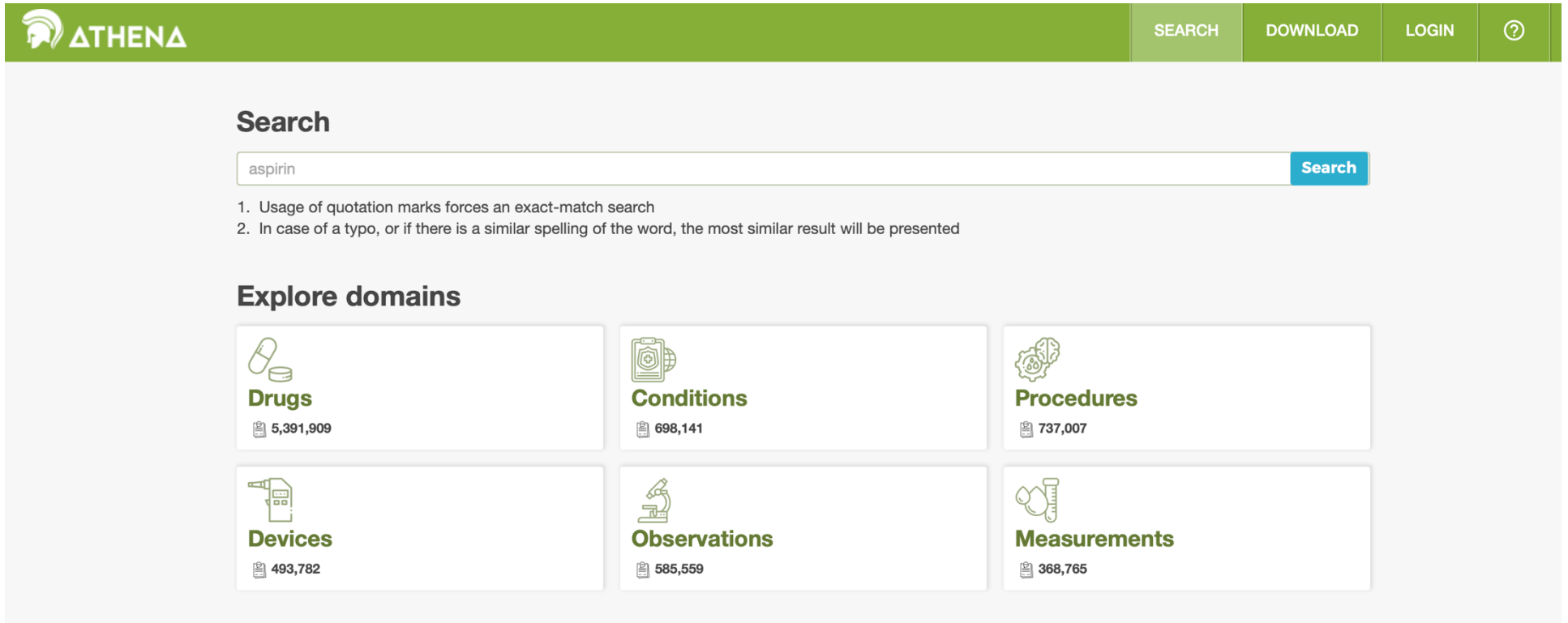
OMOP Standardized Vocabularies In a Nutshell

- **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

Demo: ATHENA

- https://athena.ohdsi.org/



Exercises

Find standard concept IDs for the following conditions:

- Asthma
- Plague
- Ingrown toenail

Find standard concept IDs for the following drug ingredients:

- Metformin
- Tolazamide
- Telmisartan
- Telmisartan oral tablet
- Telmisartan 40 mg oral tablet

Exercises

Find standard concept IDs for the following conditions:

- Asthma — 317009
- Plague — 434271
- Ingrown toenail — 4065236, 4290993

Find standard concept IDs for the following drugs:

- Metformin — 1503297
- Tolazamide — 1502809 — ingredients
- Telmisartan — 1317640
- Telmisartan oral tablet — 40102453 — clinical drug form
- Telmisartan 40 mg oral tablet — 19028935 — clinical drug

Exercises

- What is the standard concept ID for the ICD10 code E11.9?
  - What domain does E11.9 belong to?
- What is the standard concept ID for the ICD10 code C78.0?
  - What domain does C78.0 belong to?
- What ICD10 codes are mapped to the concept ID 443767?
- What is the standard concept ID for the ICD10 code X67.0?

Exercises

- What is the standard concept ID for the ICD10 code E11.9?
  - What domain does E11.9 belong to?

1:1 mapping
45561952 → 201826

OMOP domain = Condition

- What is the standard concept ID for the ICD10 code C78.0?
  - What domain does C78.0 belong to?

1:1 mapping
45537839 → 36770283

OMOP domain = Condition

- What ICD10 codes are mapped to the concept ID 443767?

n:1 mapping
45591032 → 443767
45591036 → 443767

- What is the standard concept ID for the ICD10 code X67.0?

1:n mapping
710678 → 4320826
710678 → 4152376
710678 → 4303690
710678 → 439235

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