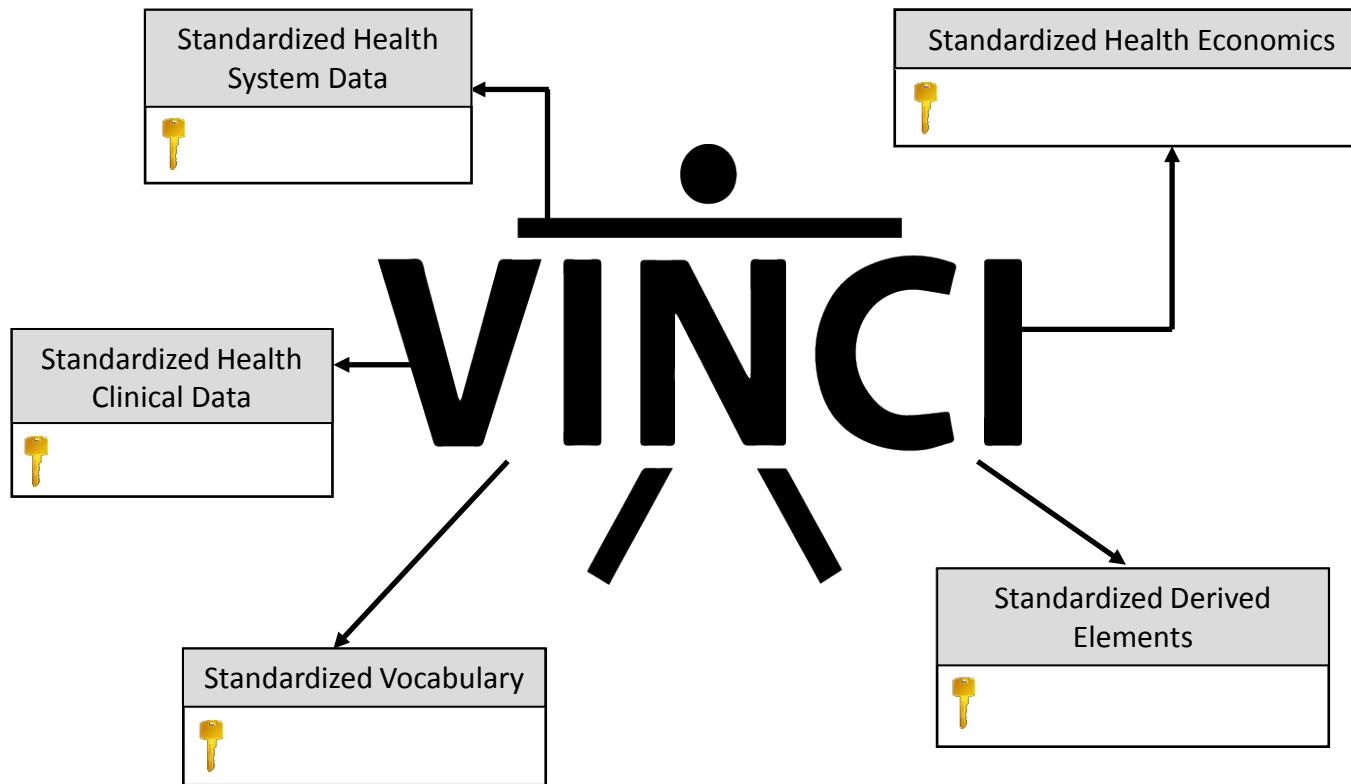


VA User Workshop



Conducting research using VA OMOP data

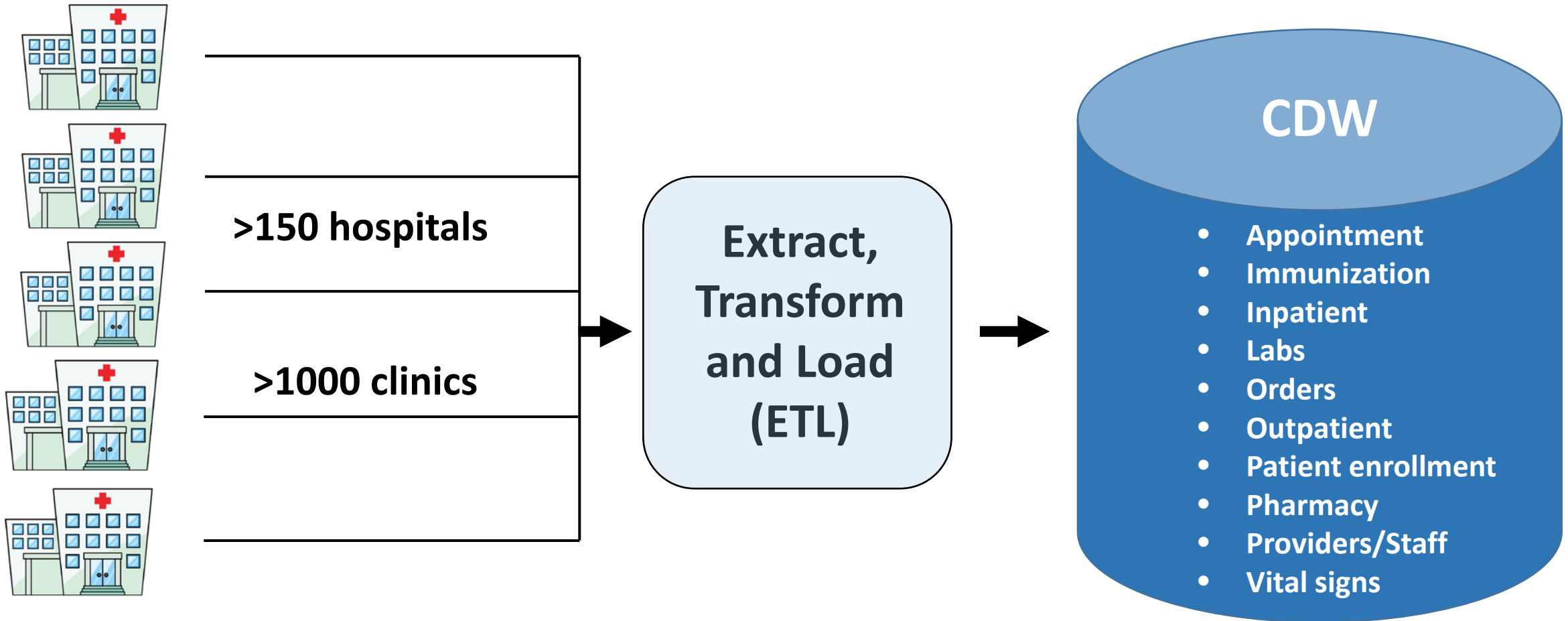
Cyberseminar June 14, 2018

Conducting a research study using OMOP data

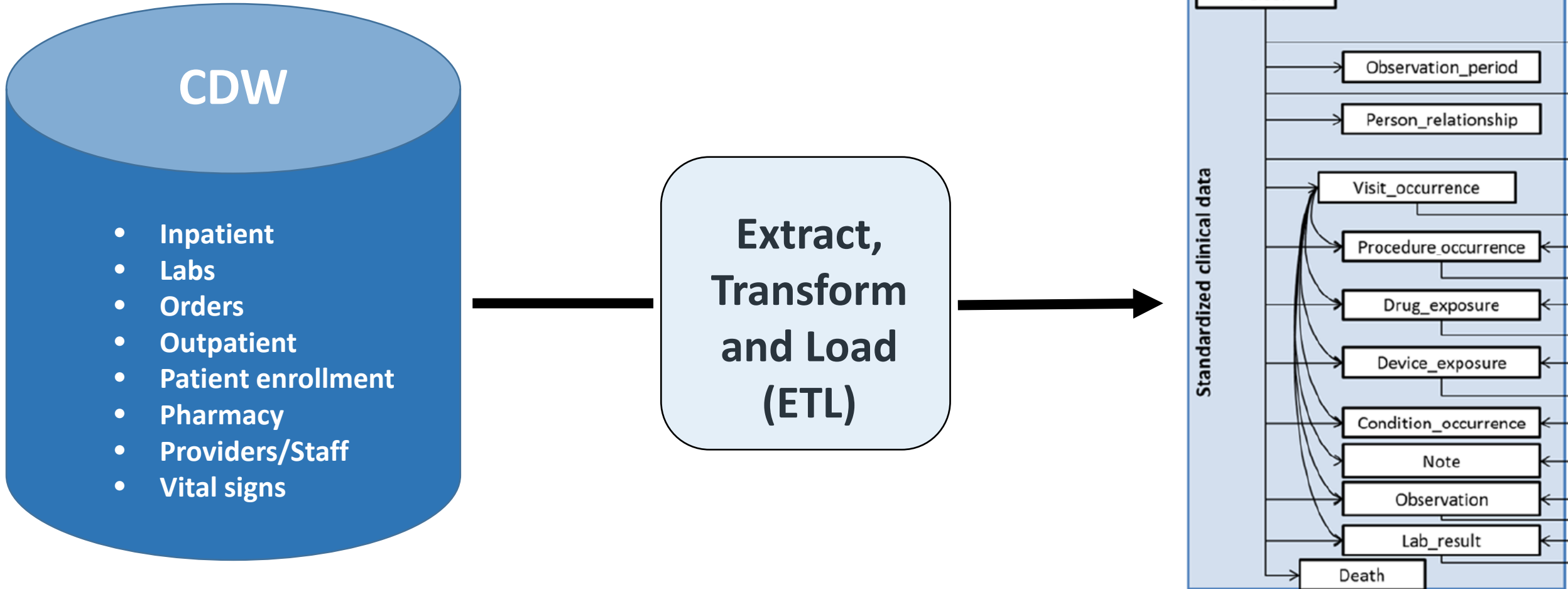


- Brief background
- Implementing traditional research approach using OMOP and the role of the CONCEPT and the CONCEPT table
- Q & A

VA Corporate Data Warehouse (CDW)



CDW to OMOP Common Data Model





CDW Domains Transformed

- Physical Care Site (Location, Institution)
- Patient
- Staff/Provider
- Inpatient Domain (Encounters, Admin Codes)
- Outpatient Domain (Encounters, Admin Codes)
- Inpatient BCMA
- Outpatient Pharmacy Fill
- Patient Chemistry Laboratory
- Vital Signs
- Tobacco Use (Dental)
- Inpatient Fee Basis Records

Who are we?



ETL



Fern
FitzHenry



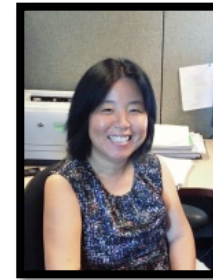
Michael
Matheny



Scott
DuVall



Kristine
Lynch



Aize
Cao



Steve
Deppen



Bobbie
Schofield

QA



Kushan
Hewa



Jason
Denton



Daniel
Park



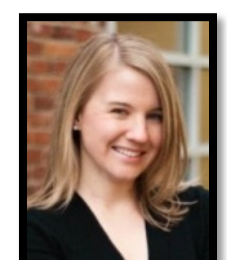
Karuna
Gujar



Ben
Viernes



Liz
Hanchrow



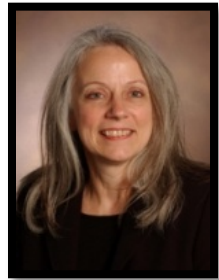
Abby
Hillard

Help Desk/ Documentation

Who are we?



ETL



Fern
FitzHenry



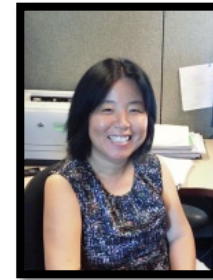
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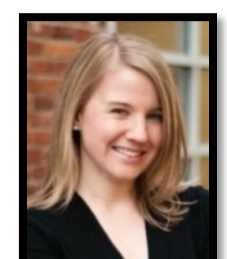
Karuna
Gujar



Ben
Viernes



Liz
Hanchrow



Abby
Hillard

Poll questions:



1.) What is your position title?

- a) Physician PI
- b) Non-physician PI
- c) Data analyst/manager
- d) Project manager
- e) Other

Poll questions:



2.) What is your CDW experience level?

- a) High
- b) Moderate
- c) Low
- d) None

Poll questions:



3.) What is your OMOP experience level?

- a) High
- b) Moderate
- c) Low
- d) None

Conducting a research study using OMOP data



- Brief background
- Implementing traditional research approach using OMOP and the role of the CONCEPT and the CONCEPT table
- Q & A

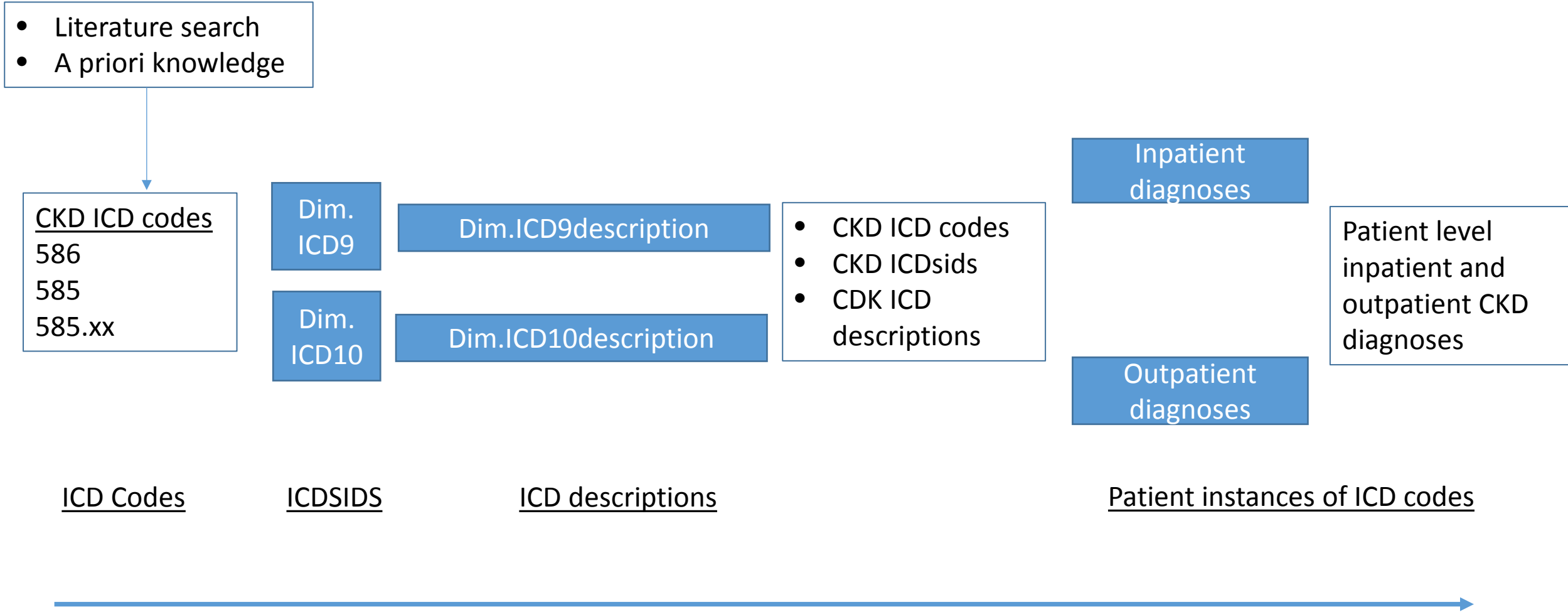
Research study: general approach

1. Define study question and approach
2. Define study variables/study cohort
3. Construct analytic file
4. Complete analysis
5. Assess results
6. Dissemination of results

Research study: general approach

1. Define study question and approach
- 2. Define study variables/study cohort**
3. Construct analytic file
4. Complete analysis
5. Assess results
6. Dissemination of results

General approach in CDW



General approach in OMOP

- Literature search
- A priori knowledge

CKD ICD codes

586
585
585.xx

CONCEPT

- CKD ICD codes
- CKD CONCEPT_IDs
- CONCEPT descriptions

CONDITION_OCCURRENCE

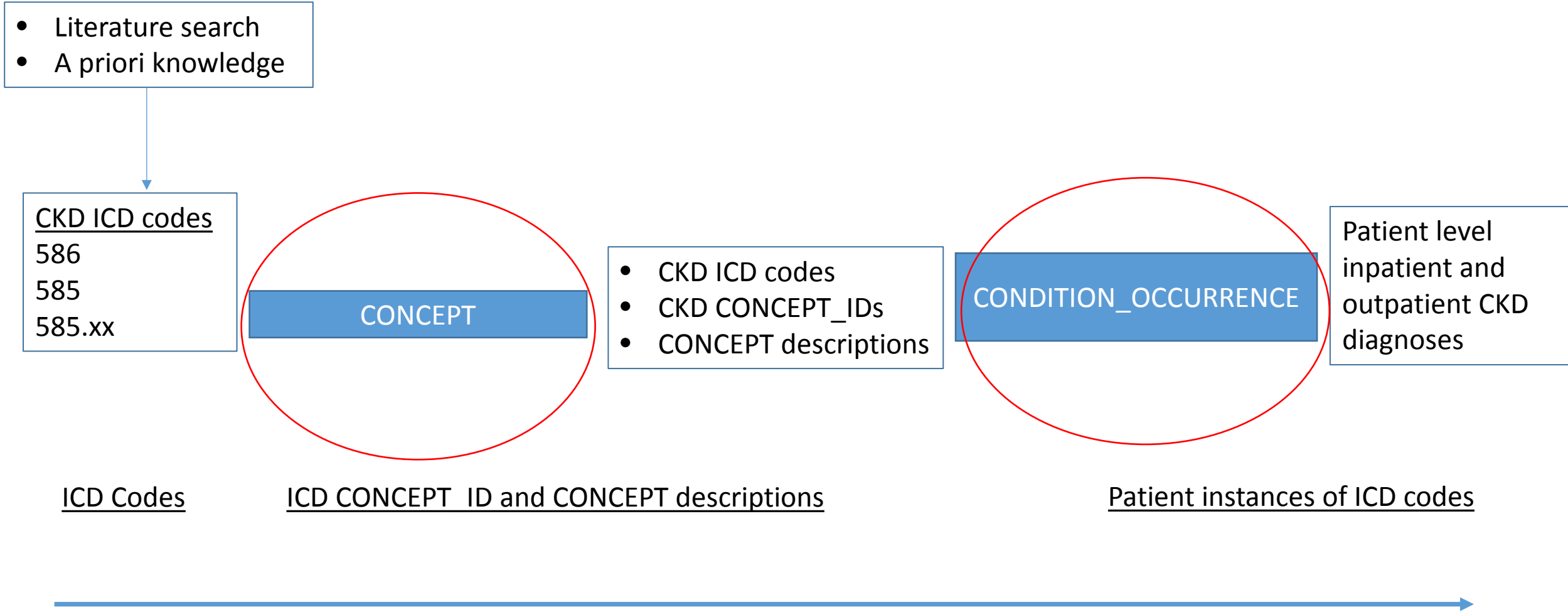
Patient level
inpatient and
outpatient CKD
diagnoses

ICD Codes


































ICD CONCEPT ID and CONCEPT descriptions




















Patient instances of ICD codes

General approach in OMOP



The CONCEPT and the CONCEPT Table

- +  Src.OMOPV5_CARE_SITE
- +  Src.OMOPV5_CDM_SOURCE
- +  Src.OMOPV5_CONCEPT
- +  Src.OMOPV5_CONCEPT_ANCESTOR
- +  Src.OMOPV5_CONCEPT_CLASS
- +  Src.OMOPV5_CONCEPT_RELATIONSHIP
- +  Src.OMOPV5_CONCEPT_SYNONYM
- +  Src.OMOPV5_CONDITION_ERA
- +  Src.OMOPV5_CONDITION_OCCURRENCE
- +  Src.OMOPV5_DEATH
- +  Src.OMOPV5_DEVICE_COST
- +  Src.OMOPV5_DEVICE_EXPOSURE
- +  Src.OMOPV5_DOMAIN
- +  Src.OMOPV5_DOSE_ERA
- +  Src.OMOPV5_DRUG_COST
- +  Src.OMOPV5_DRUG_ERA
- +  Src.OMOPV5_DRUG_EXPOSURE
- +  Src.OMOPV5_DRUG_STRENGTH
- +  Src.OMOPV5_FACT_RELATIONSHIP
- +  Src.OMOPV5_LOCATION
- +  Src.OMOPV5_MEASUREMENT
- +  Src.OMOPV5_NOTE
- +  Src.OMOPV5_OBSERVATION
- +  Src.OMOPV5_OBSERVATION_PERIOD
- +  Src.OMOPV5_PAYER_PLAN_PERIOD
- +  Src.OMOPV5_PERSON
- +  Src.OMOPV5_PROCEDURE_COST
- +  Src.OMOPV5_PROCEDURE_OCCURRENCE
- +  Src.OMOPV5_PROVIDER
- +  Src.OMOPV5_RELATIONSHIP
- +  Src.OMOPV5_SPECIMEN
- +  Src.OMOPV5_VISIT_COST
- +  Src.OMOPV5_VISIT_OCCURRENCE
- + Src.OMOPV5 VOCABULARY

- +  Dim.ICD10Procedure
- +  Dim.ICD10ProcedureDescriptionVersion
- +  Dim.ICD10ProcedureDRGIDCode
- +  Dim.ICD10ProcedureMDC
- +  Dim.ICD10ProcedureOperationVersion
- +  Dim.ICD10ProcedureSexVersion
- +  Dim.ICD10ProcedureStatusVersion
- +  Dim.ICD10SexVersion
- +  Dim.ICD10StatusVersion
- +  Dim.ICD9
- +  Dim.ICD9AgeHighVersion
- +  Dim.ICD9AgeLowVersion
- +  Dim.ICD9DescriptionVersion
- +  Dim.ICD9DiagnosisVersion
- +  Dim.ICD9MDCMap
- +  Dim.ICD9Procedure
- +  Dim.ICD9ProcedureDescriptionVersion
- +  Dim.ICD9ProcedureDRGIDCode
- +  Dim.ICD9ProcedureMDC



The CONCEPT and the CONCEPT Table

- Everything in the OMOP CDM revolves around the idea of a **CONCEPT**
- The **CONCEPT_ID** is a unique identifier that is generated for each **CONCEPT** across all domains
- The content of each clinical record is represented by one or more **CONCEPT_IDS** in the fact tables
- The description of those **CONCEPT_IDS** are stored in the CONCEPT Table

The CONCEPT Table



```
select count(*), count(distinct concept_id)
from OMOP_V5.OMOPV5.CONCEPT
```

rows_in_concept_table	concepts_in_concept_table
4623677	4623677

CONCEPT_ID	44830172
CONCEPT_NAME	Chronic kidney disease
DOMAIN_ID	Condition
VOCABULARY_ID	ICD9CM
CONCEPT_CLASS_ID	3-dig nonbill code
STANDARD_CONCEPT	
CONCEPT_CODE	585

The CONCEPT Table



CONCEPT_ID	1112840
CONCEPT_NAME	Aspirin 324 MG Oral tablet
DOMAIN_ID	Drug
VOCABULARY_ID	RxNorm
CONCEPT_CLASS_ID	Clinical Drug
STANDARD_CONCEPT	S
CONCEPT_CODE	198465

CONCEPT_ID	8748
CONCEPT_NAME	Microgram per liter
DOMAIN_ID	Unit
VOCABULARY_ID	UCUM
CONCEPT_CLASS_ID	Unit
STANDARD_CONCEPT	S
CONCEPT_CODE	Ug/L

Example:



1. Define study question and approach
- 2. Define study variables/study cohort**
3. Construct analytic file
4. Complete analysis
5. Assess results
6. Dissemination of results

Cohort definition:

- Cohort of patients with a CKD diagnosis according to ICD9 code 585.

Getting your CONCEPT_IDs



-- Option 1: you know the ICD code

```
SELECT *  
FROM OMOP_V5.OMOPV5.CONCEPT  
WHERE CONCEPT_CODE like '585'
```

CONCEPT_ID	CONCEPT_NAME	DOMAIN_ID	VOCABULARY_ID	CONCEPT_CLASS_ID	STANDARD_CONCEPT	CONCEPT_CODE
45906108	MASS TENDER	Condition	CIEL	Finding		585
38001353	Breast biopsy, local excision & other breast proce...	Observation	DRG	MS-DRG	S	585
44830172	Chronic kidney disease (CKD)	Condition	ICD9CM	3-dig nonbill code		585
45410776	Atropine Sulfate, Ophthalmic, 1% ophthalmic oint...	Drug	Multum	Multum		585



Getting your CONCEPT_IDs

-- Option 1: you know the ICD code

```
SELECT *  
FROM OMOP_V5.OMOPV5.CONCEPT  
WHERE CONCEPT_CODE like '585'  
and VOCABULARY_ID='icd9cm'
```

CONCEPT_ID	CONCEPT_NAME	DOMAIN_ID	VOCABULARY_ID	CONCEPT_CLASS_ID	STANDARD_CONCEPT	CONCEPT_CODE
44830172	Chronic kidney disease (CKD)	Condition	ICD9CM	3-dig nonbill code		585

Getting your CONCEPT_IDs



-- Option 2: you know the description

```
SELECT *  
FROM OMOP_V5.OMOPV5.CONCEPT  
WHERE CONCEPT_NAME like '%KIDNEY%DISEASE%'  
and VOCABULARY_ID='ICD9CM'
```

CONCEPT_ID	CONCEPT_NAME	DOMAIN_ID	VOCABULARY_ID	CONCEPT_CLASS_ID	STAND...	CONCEPT_CODE
44827780	Hypertensive heart and chronic kidney disease	Condition	ICD9CM	3-dig nonbill code		404
44827888	Chronic kidney disease, Stage III (moderate)	Condition	ICD9CM	4-dig billing code		585.3
44828971	Hypertensive chronic kidney disease, unspecified,...	Condition	ICD9CM	5-dig billing code		403.91
44830172	Chronic kidney disease (CKD)	Condition	ICD9CM	3-dig nonbill code		585

Concepts in the CONDITION_OCCURRENCE Table



OMOPV5.CONDITION_OCCURRENCE

Columns

CONDITION_OCCURRENCE_ID (bigint, not null)

PERSON_ID (bigint, null)

CONDITION_CONCEPT_ID (int, not null)

CONDITION_START_DATE (date, null)

CONDITION_START_DATETIME (datetime2(0), null)

CONDITION_END_DATE (date, null)

CONDITION_END_DATETIME (datetime2(0), null)

CONDITION_TYPE_CONCEPT_ID (int, null)

STOP_REASON (varchar(20), null)

PROVIDER_ID (bigint, null)

VISIT_OCCURRENCE_ID (bigint, null)

CONDITION_SOURCE_VALUE (varchar(50), null)

CONDITION_SOURCE_CONCEPT_ID (int, null)

Standard OMOP concept

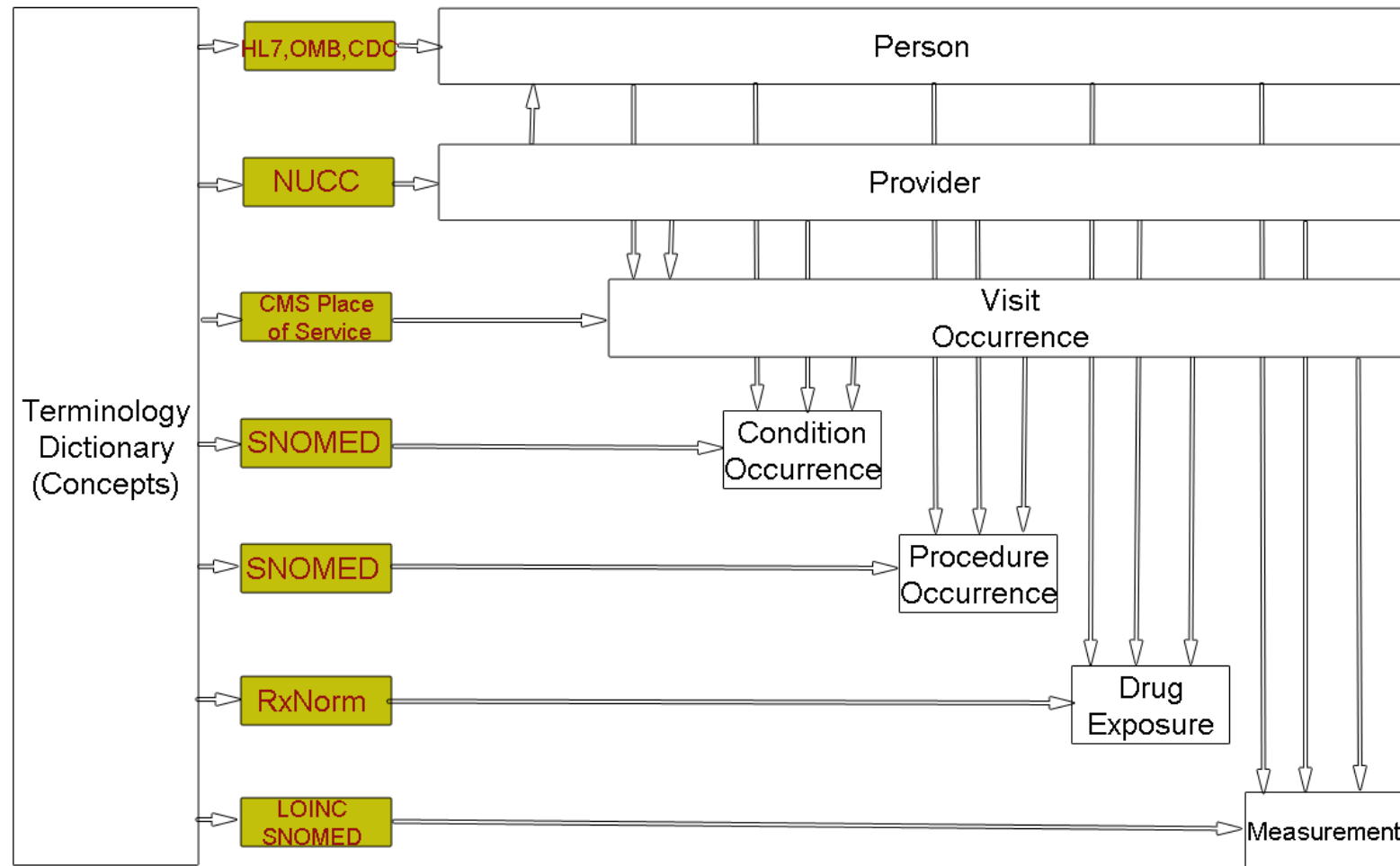
The type of fact presented (different across domains). Here it's the admin code position.

Concept of the source clinical data.

You have the CONCEPT_ID for CKD ICD9 code. Now what??

?

OMOP Concept relationships



Concepts in the CONDITION_OCCURRENCE Table



OMOPV5.CONDITION_OCCURRENCE

Columns

CONDITION_OCCURRENCE_ID (bigint, not null)

PERSON_ID (bigint, null)

CONDITION_CONCEPT_ID (int, not null)

CONDITION_START_DATE (date, null)

CONDITION_START_DATETIME (datetime2(0), null)

CONDITION_END_DATE (date, null)

CONDITION_END_DATETIME (datetime2(0), null)

CONDITION_TYPE_CONCEPT_ID (int, null)

STOP_REASON (varchar(20), null)

PROVIDER_ID (bigint, null)

VISIT_OCCURRENCE_ID (bigint, null)

CONDITION_SOURCE_VALUE (varchar(50), null)

CONDITION_SOURCE_CONCEPT_ID (int, null)

Standard OMOP concept (SNOMED)

The type of fact presented (different across domains). Here it's the admin code position.

Concept of the source clinical data. Source=CDW ICD codes

You have the CONCEPT_ID for CKD ICD9 code. Now what??



Find instances of CONCEPT_ID(s)

```
SELECT TOP 1 CONDITION_CONCEPT_ID, CONDITION_TYPE_CONCEPT_ID, CONDITION_SOURCE_CONCEPT_ID
FROM
    OMOP_V5.OMOPV5.CONDITION_OCCURRENCE
WHERE
    CONDITION_SOURCE_CONCEPT_ID=44830172
```

CONDITION_CONCEPT_ID	CONDITION_TYPE_CONCEPT_ID	CONDITION_SOURCE_CONCEPT_ID
46271022	38000230	44830172

```
SELECT *
FROM OMOP_V5.OMOPV5.CONCEPT
where CONCEPT_ID IN
( 46271022
,38000230
,44830172
)
```

CONCEPT_ID	CONCEPT_NAME	DOMAIN_ID	VOCABULARY_...	CONCEPT_CLASS_...	STANDARD_CONCE...	CONCEPT_CODE
38000230	Outpatient header - 1st position	Type Concept	Condition Type	Condition Type	S	OMOP generated
44830172	Chronic kidney disease (CKD)	Condition	ICD9CM	3-dig nonbill code		585
46271022	Chronic kidney disease	Condition	SNOMED	Clinical Finding	S	709044004



Find instances of a SNOMED

```
SELECT
    CONDITION_CONCEPT_ID, CONDITION_TYPE_CONCEPT_ID, CONDITION_SOURCE_CONCEPT_ID
FROM
    OMOP_V5.OMOPV5.CONDITION_OCCURRENCE
WHERE
    CONDITION_CONCEPT_ID = 46271022
```

CONDITION_CONCEPT_ID	CONDITION_TYPE_CONCEPT_ID	CONDITION_SOURCE_CONCEPT_ID
46271022	38000231	44830172

```
SELECT *
FROM
    OMOP_V5.OMOPV5.CONCEPT
WHERE
    CONCEPT_ID IN (46271022, 38000231, 44830172)
```

CONCEPT_ID	CONCEPT_NAME	DOMAIN_ID	VOCABULARY_ID	CONCEPT_CLASS_ID	STANDARD_CONCEPT
38000231	Outpatient header - 2nd position	Type Concept	Condition Type	Condition Type	S
44830172	Chronic kidney disease (CKD)	Condition	ICD9CM	3-dig nonbill code	
46271022	Chronic kidney disease	Condition	SNOMED	Clinical Finding	S

Find instances of a SNOMED

```
SELECT *
FROM
    OMOP_V5.OMOPV5.CONCEPT
WHERE
    CONCEPT_NAME LIKE 'Chronic Kidney disease%'
AND
    VOCABULARY_ID = 'SNOMED'
AND
    DOMAIN_ID = 'Condition'
```

CONCEPT_ID	CONCEPT_NAME	DOMAIN_ID	VOCABULARY_ID	CONCEPT_CLASS_ID
46271022	Chronic kidney disease	Condition	SNOMED	Clinical Finding
46270353	Chronic kidney disease due to benign hypertension	Condition	SNOMED	Clinical Finding
44782429	Chronic kidney disease due to hypertension	Condition	SNOMED	Clinical Finding
36717349	Chronic kidney disease due to systemic infection	Condition	SNOMED	Clinical Finding
36716455	Chronic kidney disease due to traumatic loss of kid...	Condition	SNOMED	Clinical Finding
45773688	Chronic kidney disease due to type 1 diabetes mell...	Condition	SNOMED	Clinical Finding
43531578	Chronic kidney disease due to type 2 diabetes mell...	Condition	SNOMED	Clinical Finding
36716184	Chronic kidney disease following donor nephrectomy	Condition	SNOMED	Clinical Finding
36717534	Chronic kidney disease following excision of renal ...	Condition	SNOMED	Clinical Finding
37017104	Chronic kidney disease mineral and bone disorder	Condition	SNOMED	Clinical Finding
46284080	Chronic kidney disease resolved	Condition	SNOMED	Clinical Finding
443614	Chronic kidney disease stage 1	Condition	SNOMED	Clinical Finding

OMOP Support



- VINCI Help Desk– include OMOP in your ticket descriptor or subject line in email to VINCI@VA.gov
- VAPulse.net VINCI OMOP Users Group- Training resources, Documentation, FAQ, Example code
- OHDSI OMOP-CDM Community - Open Source www.ohdsi.org