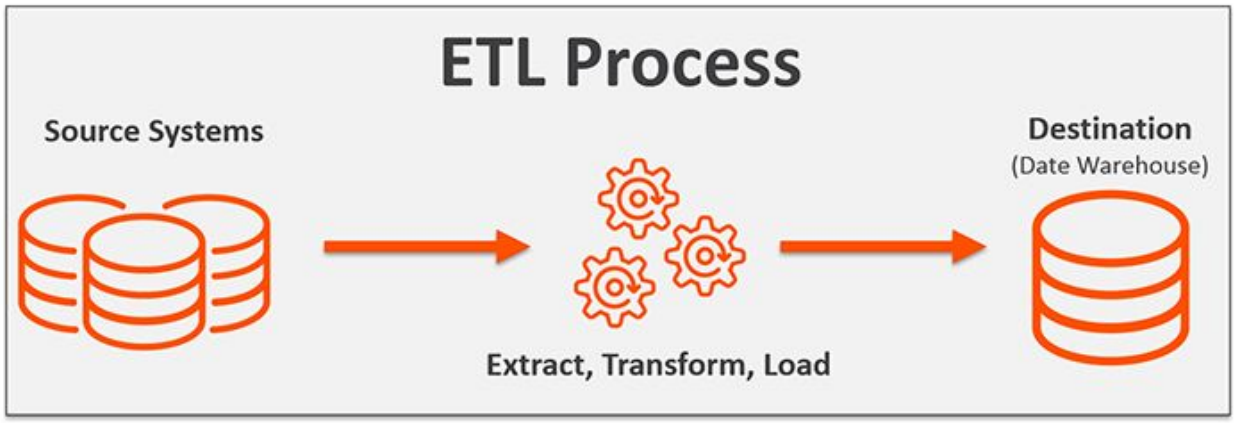

ETL Guide

Saphire Model (KTPH) to Common Data Model V5

07.08.2018

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Overview

The purpose of this document is to describe the Extract, Transform, and Load (ETL) mapping of the HSA data of Khoo Teck Puat Hospital into the Observational Medical Outcomes Partnership (OMOP) Common Data Model (CDM) V5. This document will also be useful to repeat the ETL process in case more data is added to the KTPH Database, or to replicate it with a different database model. Prior to reading this document, the reader should be familiar with the purpose and structure of the CDM.

Abbreviations

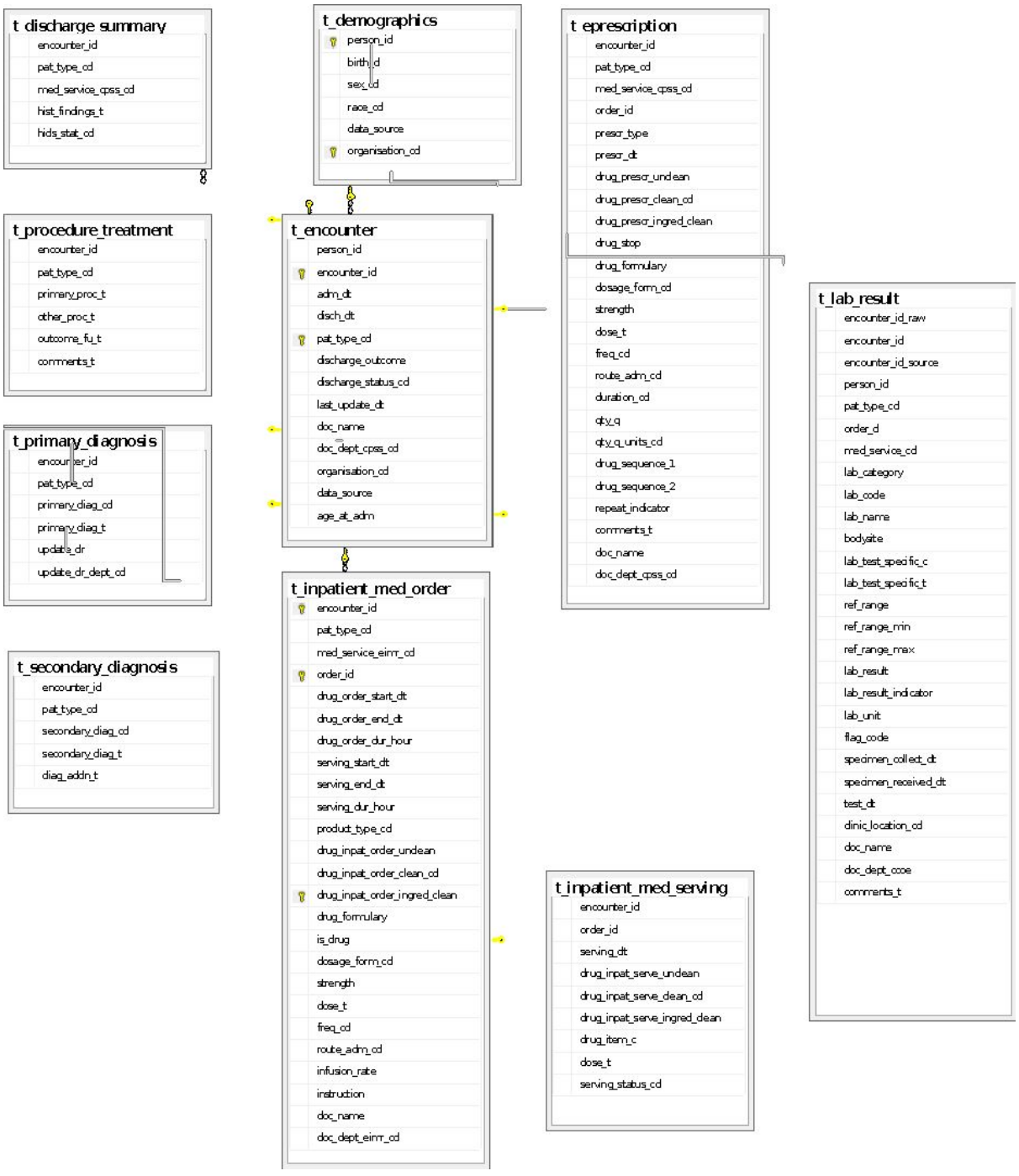
Abbreviation	**Description**
ETL	Extract, Transform, Load
OMOP	Observational Medical Outcomes Partnership
CDM	Common Data Model
KTPH	Khoo Teck Puat Hospital
OHDSI	Observational Health Data Sciences and Informatics
ICD	International Classification of Diseases
RxNorm	a normalized naming system for generic and branded drugs
SNOMED	a systematically organized computer processable collection of medical terms

Introduction to the Saphire KTPH Database

Tables

No	Table name	Description
1	demographics	This table contains the patients' profile; contains one record per person ID with the most recent information on weight and height.
2	encounter	This table contains information about the patients' hospital admission and outpatient visits.
3	discharge_summary	This table contains the free text information on medical conditions, adverse drug reaction, treatment and procedure etc.
4	primary_diagnosis	This table describes the primary medical condition why the patient was admitted to the hospital.
5	secondary_diagnosis	This table describes the other medical condition(s) why the patient was admitted to the hospital.
6	procedure_treatment	This table describes the procedure and treatment given to patients.
7	eprescription	This table describes the medications prescribed to patients at the point of discharge or at outpatient clinics, emergency and day surgery clinic.
8	inpatient_med_order	This table describes the drugs ordered for patients at inpatient stay.
9	inpatient_med_serving	This table describes the drugs served to patients at inpatient stay.
10	lab_result	This table describes the laboratory test results i.e. 1 laboratory test result per entry

Schema


t_discharge_summary
encounter_id
pat_type_cd
med_service_cpss_cd
hist_findings_t
hids_stat_cd
t_demographics
person_id
birth_d
sex_cd
race_cd
data_source
organisation_cd
t_epresciption
encounter_id
pat_type_cd
med_service_cpss_cd
order_id
presc_type
presc_dt
drug_presc_undean
drug_presc_clean_cd
drug_presc_ingred_clean
drug_stop
drug_formulary
dosage_form_cd
strength
dose_t
freq_cd
route_adm_cd
duration_cd
qty_q
qty_q_units_cd
drug_sequence_1
drug_sequence_2
repeat_indicator
comments_t
doc_name
doc_dept_cpss_cd
t_procedure_treatment
encounter_id
pat_type_cd
primary_proc_t
other_proc_t
outcome_fu_t
comments_t
t_encounter
person_id
encounter_id
adm_dt
disch_dt
pat_type_cd
discharge_outcome
discharge_status_cd
last_update_dt
doc_name
doc_dept_cpss_cd
organisation_cd
data_source
age_at_adm
t_lab_result
encounter_id_raw
encounter_id
encounter_id_source
person_id
pat_type_cd
order_d
med_service_cd
lab_category
lab_code
lab_name
bodysite
lab_test_specific_c
lab_test_specific_t
ref_range
ref_range_min
ref_range_max
lab_result
lab_result_indicator
lab_unit
flag_code
specimen_collect_dt
specimen_received_dt
test_dt
clinic_location_cd
doc_name
doc_dept_code
comments_t
t_primary_diagnosis
encounter_id
pat_type_cd
primary_diag_cd
primary_diag_t
update_dr
update_dr_dept_cd
t_inpatient_med_order
encounter_id
pat_type_cd
med_service_einr_cd
order_id
drug_order_start_dt
drug_order_end_dt
drug_order_dur_hour
serving_start_dt
serving_end_dt
serving_dur_hour
product_type_cd
drug_inpat_order_undean
drug_inpat_order_clean_cd
drug_inpat_order_ingred_clean
drug_formulary
is_drug
dosage_form_cd
strength
dose_t
freq_cd
route_adm_cd
infusion_rate
instruction
doc_name
doc_dept_einr_cd
t_secondary_diagnosis
encounter_id
pat_type_cd
secondary_diag_cd
secondary_diag_t
diag_addn_t
t_inpatient_med_serving
encounter_id
order_id
serving_dt
drug_inpat_serve_undean
drug_inpat_serve_dean_cd
drug_inpat_serve_ingred_dean
drug_item_c
dose_t
serving_status_cd

Description

Description	Period	Count (April 2017)	Count (18 June 2018)
Discharge report– inpatient stay & day surgery– inpatient stay & day surgery			t_discharge_summary
No. of unique patients	June 2010 – Dec 2015	101,805	120,536
No. of encounters(case ids)		177,838	219,399
outpatient medications - discharge & outpatient medications			t_eprescription_dispensing
No. of unique patients	Jan 2015 – Dec 2015	127,141	191,153
No. of ordered medications		1,022,200	2,147,870
Inpatient medication order – inpatient stay & day surgery			t_inpatient_med_order
No. of unique patients	Jan 2013 – Mar 2017	60,586	60,586
No. of medications (order level)		2,022,428	2,022,428
Laboratory results			t_lab_results
No. of unique patients	Nov 2011 – June 2016	135,535	146,785
No. of rows of records of lab tests		18,352,997	19,357,717

Introduction to the CDM V5

No single observational data source provides a comprehensive view of the clinical data a patient accumulates while receiving healthcare, and therefore none can be sufficient to meet all expected outcome analysis needs. This explains the need for assessing and analyzing multiple data sources concurrently using a common data standard. This standard is provided by the OMOP Common Data Model (CDM).

The CDM is designed to support the conduct of research to identify and evaluate associations between interventions (drug exposure, procedures, healthcare policy changes etc.) and outcomes caused by these interventions (condition occurrences, procedures, drug exposure etc.). Outcomes can be efficacious (benefit) or adverse (safety risk). Often times, specific patient cohorts (e.g., those taking a certain drug or suffering from a certain disease) may be defined for treatments or outcomes, using clinical events (diagnoses, observations, procedures, etc.) that occur in predefined temporal relationships to each other. The CDM,

combined with its standardized content (via the Standardized Vocabularies), will ensure that research methods can be systematically applied to produce meaningfully comparable and reproducible results.

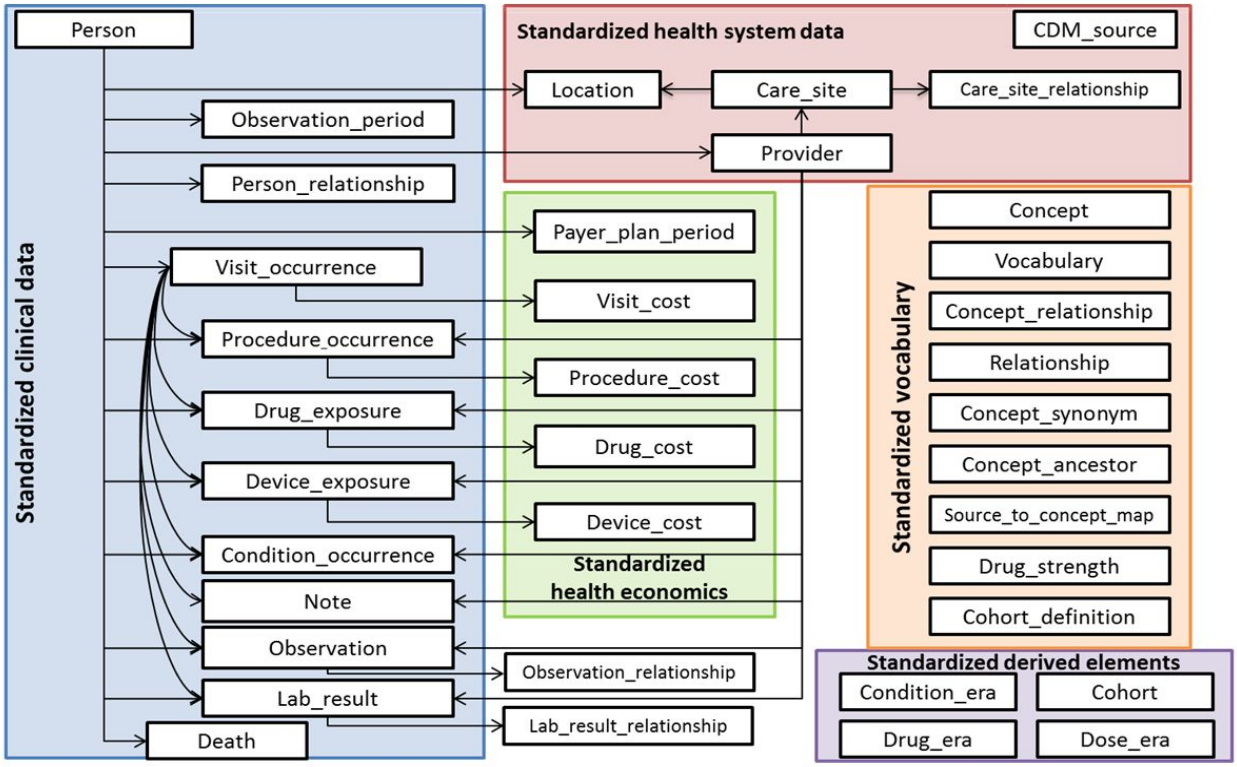
General Conventions of fields

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 reference value for 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 = 35708202 denotes the concept of 'Nausea' in the MedDRA terminology; the analogous condition_concept_id might be 31967, since SNOMED-CT is the Standardized Vocabularies 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'

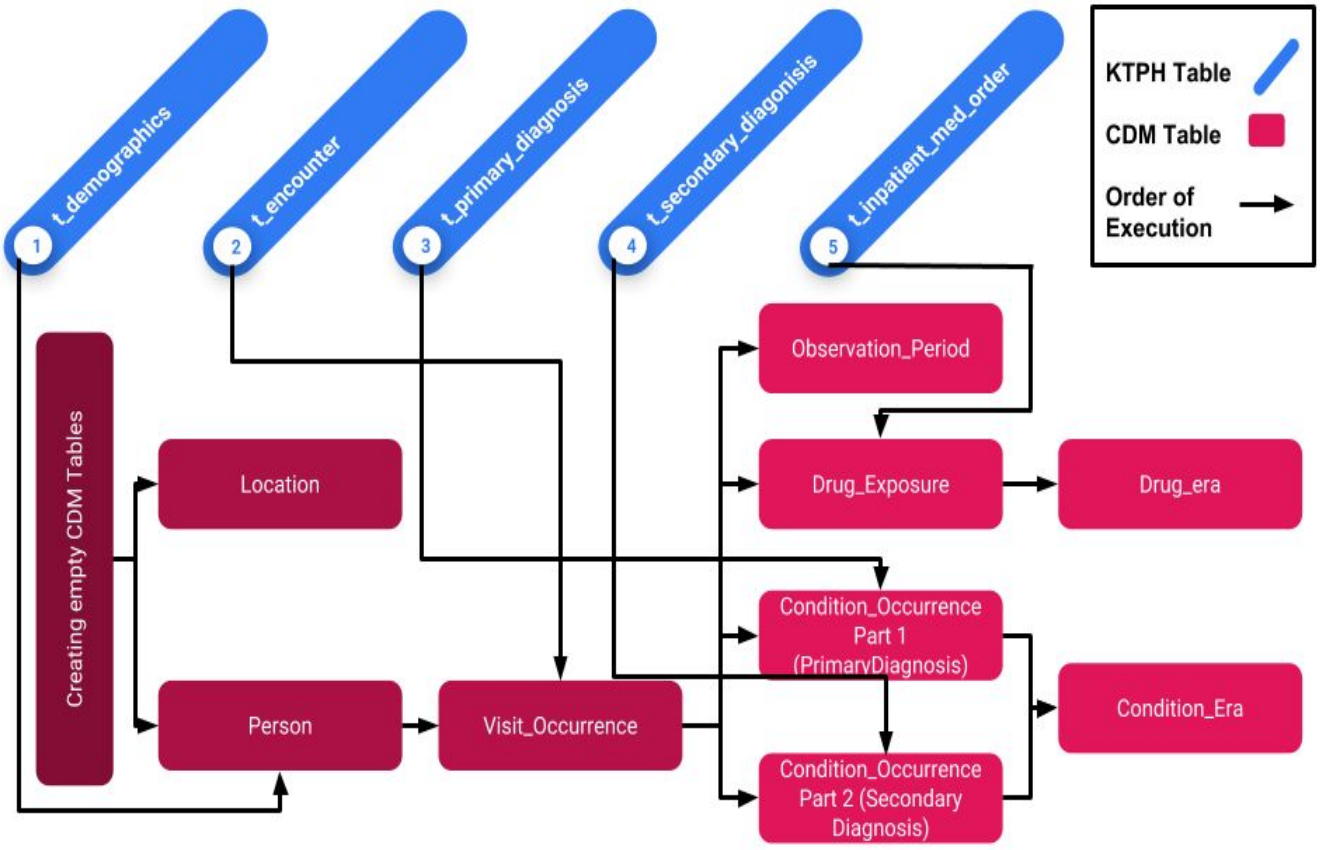
Representation of content through Concepts

In CDM data tables the meaning of the content of each record is represented using Concepts. Concepts are stored with their concept_id as foreign keys to the CONCEPT table in the Standardized Vocabularies, which contains Concepts necessary to describe the healthcare experience of a patient. If a Standard Concept does not exist or cannot be identified, the Concept with the concept_id 0 is used, representing a non-existing or unmappable concept. Records in the CONCEPT table contain all the detailed information about it (name, relationships, types etc.). Concepts, Concept Relationships and other information relating to Concepts contained in the tables of the Standardized Vocabularies..

Schema



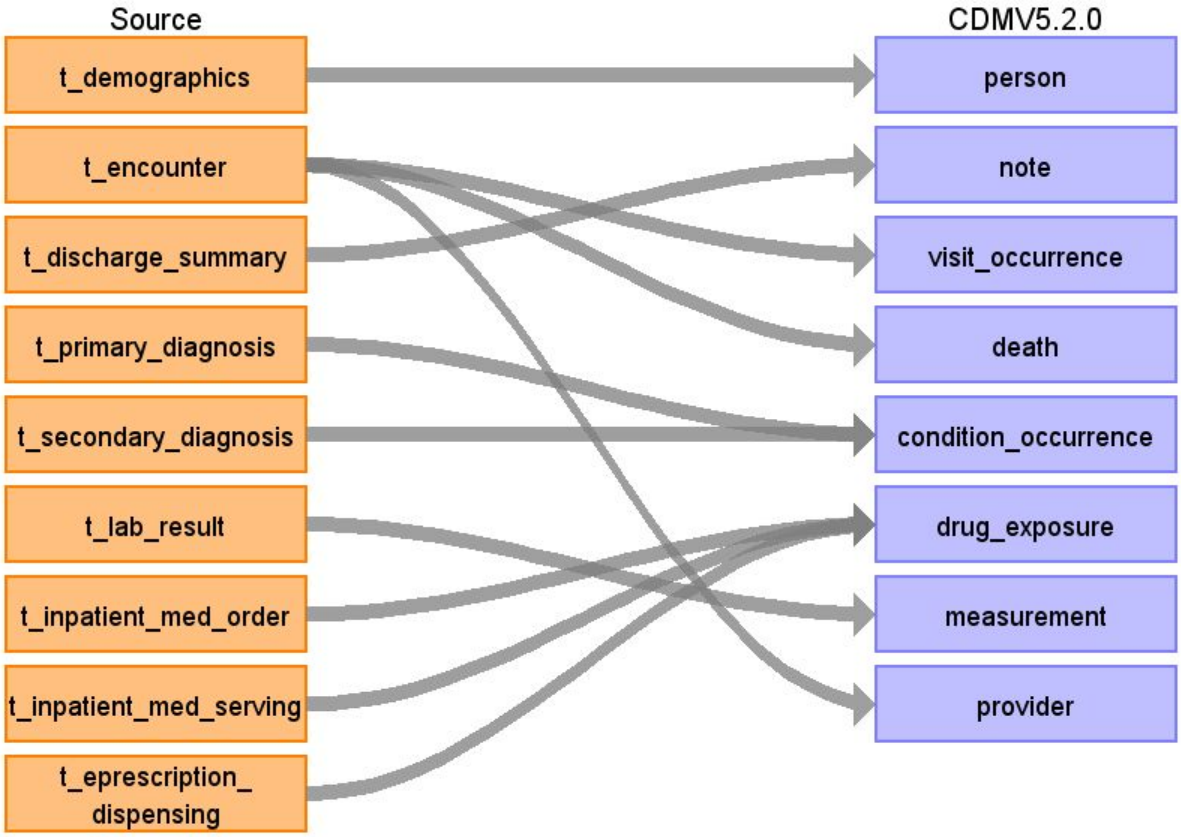
Mapping Steps



The order of the execution of the ETL steps is crucial for a valid mapping. This is because the filling of CDM tables uses data from other tables from the KTPH database AND/OR tables from the CDM. For instance, filling the table **Visit_Occurrence (CDM)** requires data from **t_encounter (KTPH)** that contains all the information about the date, time and other details of the visit, but also requires data from **Person (CDM)** that contains data about the patient.

In the graph above, we map some, but not all, tables of the CDM. Some of the tables on the CDM are supposed to contain data that does not exist in the KTPH database. Naturally, these tables will stay empty. However, there is one exception of one table whose data exists in the KTPH database but that we do not map to the CDM, and this table is lab_results. The reason we do not map this table is that KTPH uses internal codes for their lab tests that cannot be mapped to a known dictionary, that can later be mapped to the CDM standardized dictionary for the lab test. KTPH will provide HSA in the future with a mapping from their internal codes to LOINC vocabulary. Once this mapping is available, applying ETL on the lab_results table will be possible.

This is the mapping from the source database (KTPH tables) to the the target database (CDMV5.2.0) generated by OHDSI's Rabbit-In-a-Hat tool.



Mapping Specifications

This section explains each step of the ETL process. This ETL is to be performed on an empty CMD model (i.e., when more data is added to the KTPH, the tables of the the CDM should be deleted and the ETL process should be started from scratch). This ETL takes account for creation of the CDM, but for update.

Step 1: Execute RELEVANT SECTIONS of "0.create_cdm_tables.sql"

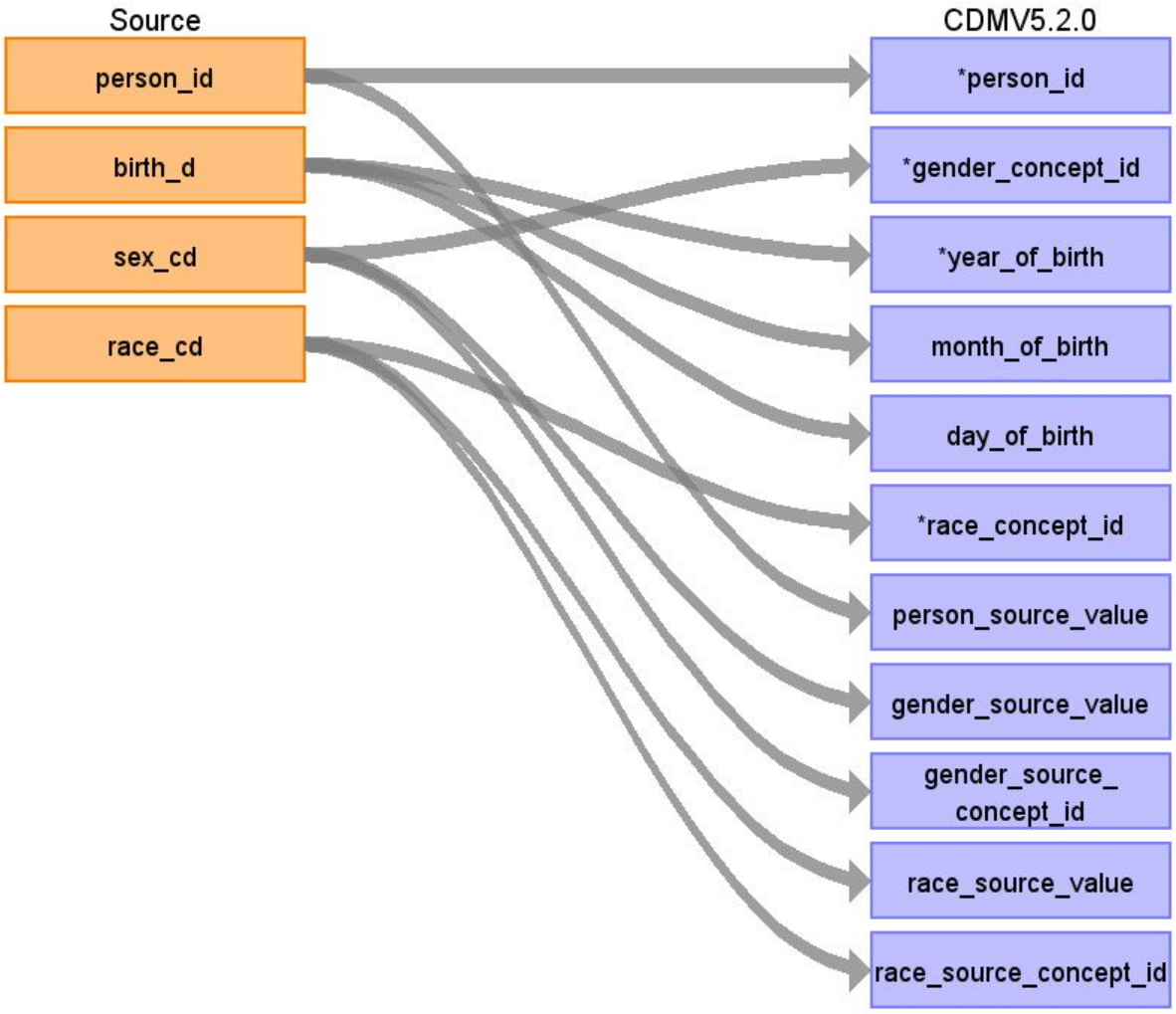
This codes drops all tables of CDM and creates new empty ones. While will need to delete some tables and recreate them, we do not want to apply this to all tables. The tables of the standardized vocabulary (refer to schema above) will not need to be updated (of course, unless OHDSI updates them). This is to say that it will not be necessary to recreate them. If we end up deleting these tables, then we will need to download them from Athena (Link) and import them to the server using the import wizard. Ideally, we should recreate only the tables that we need to map from the KTPH database.

Step 2: Execute "1.Mapping LOCATION table.sql"

This code fills the location table with the hospitals KTPH and NUH. The LOCATION table represents a generic way to capture physical location or address information of Persons and Care Sites.

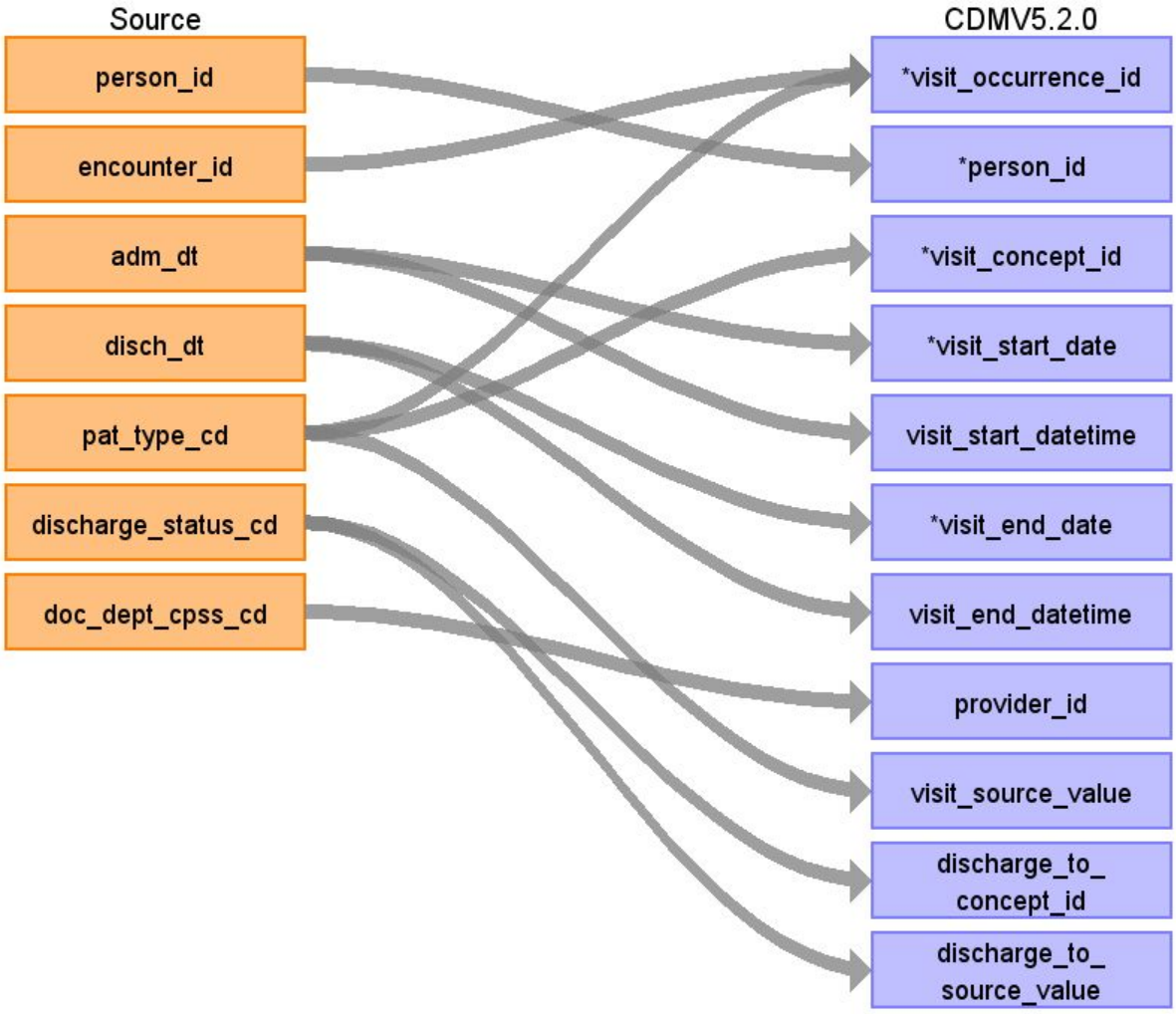
Step 3: Execute "1.Mapping PERSON table.sql"

This table fills the Person table from data in t_demographics. The Person Domain contains records that uniquely identify each patient in the source data who is time at-risk to have clinical observations recorded within the source systems. The mapping is as follows:



Step 4: Execute "2.Mapping VISIT_OCCURENCE table.sql"

This code fills the Visit_Occurrence table with data from t_encounter. The VISIT_OCCURRENCE table contains the spans of time a Person continuously receives medical services from one or more providers at a Care Site in a given setting within the health care system. Visits are classified into 4 settings: outpatient care, inpatient confinement, emergency room, and long-term care. Persons may transition between these settings over the course of an episode of care (for example, treatment of a disease onset). The mapping is as follows:



Step 5: Execute "3.create_visit_id_source_mapping_table.sql"

This code creates an empty table with three columns: encounter_id, pat_type_cd, and visit_occurrence_id. The first two are the primary key of t_encounter, and the third is the

primary key of visit occurrence. These two tables, theoretically, contain the same data. Hence, we need to be able to link their primary keys. Usually, (at least in the CDM), the primary key of a table in one column and it is an numeric ID column. The CDM has one column for source value, that is supposed to contain this source ID. As such, we could link the two tables. However, in this case t_encoutner has two columns that make up its primary key (encounter_id and pat_type_cd). Hence, the one column that visit_occurrence has for the Id source value is not enough to contain both columns. Therefore, we create this extra table that will allow us to connect the primary key of t_encounter with the primary key of visit_occurrence.

Step 6: Execute "4.filling_visit_id_source_mapping_table.sql"

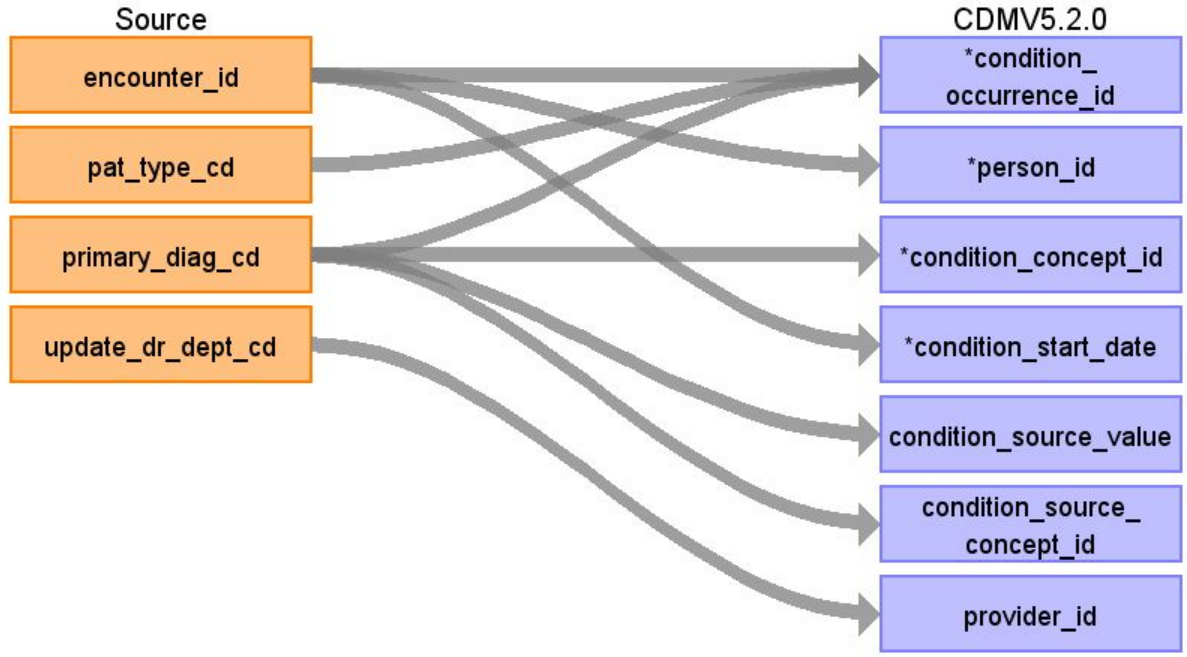
This table file the table vist_id_source_mapping_table explained in Step 5.

Step 7: Execute "5.Mapping CONDITION_OCCURENCE table Part 1.sql"

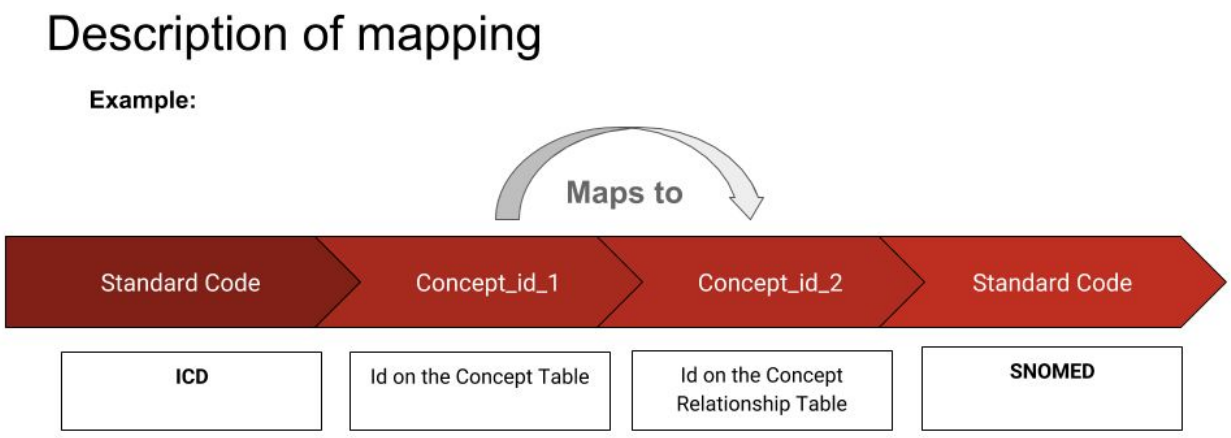
This code fills the table condition_occurrence with data from primary_diagnosis. Conditions are records of a Person suggesting the presence of a disease or medical condition stated as a diagnosis, a sign or a symptom, which is either observed by a Provider or reported by the patient. Conditions are recorded in different sources and levels of standardization, for example:

- Medical claims data include diagnoses coded in ICD-9-CM that are submitted as part of a reimbursement claim for health services and
- EHRs may capture Person Conditions in the form of diagnosis codes or symptoms.

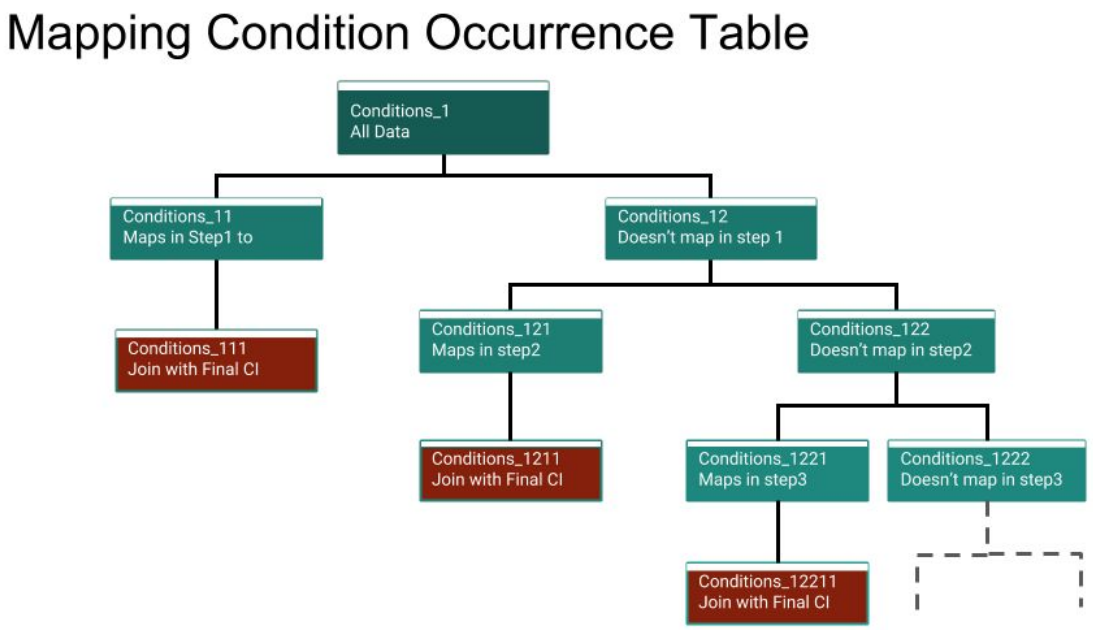
The mapping is as follows:



To map the diagnosis codes in t_primary_diagnosis to the standardized concept_ids in condition_occurrence we will have to go through the steps in the chart below. First, we use the Concept table of the standardized vocabulary to match each ICD code with a concept ID. We can find the exact specific ID of each ICD code because we know its concept_code and vocabulary_id, which are a primary key of the Concept table. Then we use the Concept_Relationship table to map the concept_id of the ICD code to a standardized concept_id (which happens to identify a SNOMED code).



Unfortunately, the ICD codes are not all in standard formats. Therefore, we must make a few alterations to them before mapping them by joining them with the concept_code of the ICD codes on the Concept table of the standardized vocabulary. We apply these modification sequentially as indicated in the graph below. In other words, we first map all the KTPH ICD codes to the Concept ICD codes. Then we take those that have not been mapped, we make modification 1 to them and map them to the Concept ICD codes. Then we take those that are still not mapped, we make modification 2 to them and map them to the Concept ICD codes. So on and so forth, until all the KTPH diagnosis codes are mapped.



Conditions_1 contains all the data. Conditions_11 contains the data that has been mapped in the first step. Condition_12 contains the data that has not been mapped in the first step. Conditions_121 contains the data has has not been mapped in the first step, but that has been mapped in the second. Conditions_122 contains the data that has not been mapped neither in the first nor in the second step. By checking which ICD code belongs to what table, we can know at what step exactly this ICD code was mapped. The Condition_Occurrence table should finally contains all the data in the table colored in red (Conditions_111, Conditions_1211, Conditions_12211, Conditions_122211…)

Step 8: Execute "5.Mapping CONDITION_OCCURENCE table Part 2.sql"

This code performs the same operations describes in step 7, but on the KTPH table t_secondary_diagnosis, not t_primary_diagnosis.

Step 9: Execute "5.Mapping DRUG_EXPOSURE table.sql"

This code fills the table Drug_Exposure with data from t_impatient_med_order This code performs the same operations describes in step 7, but on the KTPH table t_secondary_diagnosis, not t_primary_diagnosis.

The drug exposure domain captures records about the utilization of a Drug when ingested or otherwise introduced into the body. A Drug is a biochemical substance formulated in such a way that when administered to a Person it will exert a certain physiological effect. Drugs include prescription and over-the-counter

medicines, vaccines, and large-molecule biologic therapies. Radiological devices ingested or applied locally do not count as Drugs. Drug Exposure is inferred from clinical events associated with orders, prescriptions written, pharmacy dispensings, procedural administrations, and other patient-reported information, for example:

- The "Prescription" section of an EHR captures prescriptions written by physicians or from electronic ordering systems
- The "Medication list" section of an EHR for both non-prescription products and medications prescribed by other providers
- Prescriptions filled at dispensing providers such as pharmacies, and then captured in reimbursement claim systems
- Drugs administered as part of a Procedure, such as chemotherapy or vaccines.

To map the drugs in t_inpatient_med_order to standardized concept_id (that happen to be RxNorm codes) we will have to use the drug names and match them with the Concept_name column of the Concept table of the standardized vocabulary. The reason we cannot use the concept_code like we did when mapping diagnosis, is that the codes the KTPH uses for drugs are specific to KTPH and do not belong to any known dictionary that is recorded on the Concept table on OHDSI's standardized vocabulary.

Since many of the drugs given in KTPH are combinations, and these combinations do not exist on the Concept_table, we manually created a table on OHDSI_KTPH called manually_mapped_drugs that contains all the combinations of drugs that KTPH typically give out and contains the standardized concept_id they map to. We use this table to map the drug combinations.

Step 10: Execute "5.Mapping OBSERVATION_PERIOD.sql"

This tabe fills Observaiton_period with data from visit_occurrence. The OBSERVATION_PERIOD table contains records which uniquely define the spans of time for which a Person is at-risk to have clinical events recorded within the source systems, even if no events in fact are recorded (healthy patient with no healthcare interactions).

Step 11: Execute "6.Mapping CONDITION_ERA.sql"

This tabe fills Condition_Era with data from Condition_Occurrence. A Condition Era is defined as a span of time when the Person is assumed to have a given condition. Similar to Drug Eras, Condition Eras are chronological periods of Condition Occurrence. Combining individual Condition Occurrences into a single Condition Era serves two purposes:

- It allows aggregation of chronic conditions that require frequent ongoing care, instead of treating each Condition Occurrence as an independent event.

- It allows aggregation of multiple, closely timed doctor visits for the same Condition to avoid double-counting the Condition Occurrences.

Step 12: Execute "6.Mapping DRUG_ERA.sql"

This tabe fills Drug_Era with data from Drug_Exposure. A Drug Era is defined as a span of time when the Person is assumed to be exposed to a particular active ingredient. A Drug Era is not the same as a Drug Exposure: Exposures are individual records corresponding to the source when Drug was delivered to the Person, while successive periods of Drug Exposures are combined under certain rules to produce continuous Drug Eras.

Step 12: Test the Mapping

We check whether all data was mapped using the test codes on the folder "ETL_SQL_CODE". It should also be easy at this point to write fresh code to test the mapping.

Code Examples

1.Mapping PERSON table.sql

```
/* map patient who have at least a year of birth */
INSERT INTO OHDSI_KTPH.dbo.person (gender_concept_id,
                                   year_of_birth,
                                   month_of_birth,
                                   day_of_birth,
                                   race_concept_id,
                                   location_id,
                                   ethnicity_concept_id,
                                   person_source_value,
                                   gender_source_value,
                                   race_source_value,
                                   ethnicity_source_value)
SELECT
-- person_id is auto-incremented
CASE
      WHEN sex_cd = 'M' THEN 8507
      WHEN sex_cd = 'F' THEN 8532
      ELSE 8551
      END AS gender_concept_id,
-- 'M' and 'F' are already the OMOP standardized values for sec so we just
```

```
map them to their concept_ids
-- since there are few values (3), there is no need to use the
Concept_Relationship table
-- we just include the values manually in the code
DATEPART(YEAR, birth_d) AS year_of_birth,
DATEPART(MONTH, birth_d) AS month_of_birth,
DATEPART(DAY, birth_d) AS day_of_birth,
CASE
      WHEN race_cd ='C' THEN 38003579 -- Chinese
      WHEN race_cd = 'E' THEN 100 -- Eurasian
      WHEN race_cd = 'I' OR race_cd = 'S' THEN 100 --Indian or Sikh
      WHEN race_cd ='J' THEN 38003584 -- Japanese
      WHEN race_cd = 'M' THEN 38003587 -- Malay
      WHEN race_cd = 'N' THEN 8527 -- White
      ELSE 0 -- Other
      END AS race_concept_id,
1, -- location_id for KTPH - check OHDSI_KTPH.dbo.location for other
loaction_ids
CASE
      WHEN race_cd ='C' THEN 38003579 -- Chinese
      WHEN race_cd = 'E' THEN 100 -- Eurasian
      WHEN race_cd = 'I' OR race_cd = 'S' THEN 100 --Indian or Sikh
      WHEN race_cd ='J' THEN 38003584 -- Japanese
      WHEN race_cd = 'M' THEN 38003587 -- Malay
      WHEN race_cd = 'N' THEN 8527 -- White
      ELSE 0 -- Other
      END AS ethnicity_concept_id,
person_id, -- source value
sex_cd, -- source value
race_cd, -- source value
race_cd-- source value

FROM Saphire_KTPH.dbo.t_demographics
WHERE  DATEPART(YEAR, birth_d) IS NOT NULL
-- each patient on the CMD must have a valid date of birth;
```

2.create_visit_id_source_mapping_table.sql

```
INSERT INTO OHDSI_KTPH.dbo.visit_occurrence (person_id,

visit_concept_id,

visit_start_date,

visit_start_datetime,

visit_end_date,

visit_end_datetime,
                                                                    /*
provide_id - does not apply to KTPH*/

visit_source_value,

visit_type_concept_id)

SELECT
      p.person_id,
      CASE
      WHEN te.pat_type_cd = 'I' or te.pat_type_cd = 'EL' THEN 9201 /*
Impatient or Elective Impatient */
      WHEN te.pat_type_cd  = 'O' THEN 9202 /* outpatient */
      WHEN te.pat_type_cd  = 'E' or te.pat_type_cd ='EM' THEN 9203 /*
Emergency */
      ELSE 0 /* unknown */
      END AS visit_concept_id,

      CONVERT(date, te.adm_dt),
      CONVERT(time, te.adm_dt),
      CONVERT(date, te.disch_dt),
      CONVERT(time, te.disch_dt),
      te.pat_type_cd,
      44818518

FROM Saphire_KTPH.dbo.t_encounter te INNER JOIN OHDSI_KTPH.dbo.person p
                                                        ON
p.person_source_value = te.person_id
-- JOIN serves to retrieve the person_id on OHDSI.dbo.person table, and not
```

```
the one on Saphire_KTPH.dbo.t_demographics
WHERE te.adm_dt IS NOT NULL
AND te.disch_dt IS NOT NULL
-- each visit record must have valid admission and discharge dates;
```

3.create_visit_id_source_mapping_table.sql

```
CREATE TABLE OHDSI_KTPH.dbo.visit_id_source_mapping (
/* This table is not part of the OMOP CDM */
/* This table serves to link visit_occurence_id (the primary key of visit
occurence) */
/* to encounter_id and pat_type_cd (the primary key of t_encounter) */
      encounter_id VARCHAR(100),
      pat_type_cd VARCHAR (100),
      visit_occurrence_id INTEGER IDENTITY(0,1) PRIMARY KEY) ;
```

4.filling_visit_id_source_mapping_table.sql

```
INSERT INTO OHDSI_KTPH.dbo.visit_id_source_mapping(encounter_id,

      pat_type_cd)

SELECT
      te.encounter_id,
      te.pat_type_cd
      -- primary key of t_encounter
      -- primary key of visit_occurrence is auto_incremented
FROM Saphire_KTPH.dbo.t_encounter te INNER JOIN OHDSI_KTPH.dbo.person p
                                                      ON
p.person_source_value = te.person_id
WHERE te.adm_dt IS NOT NULL
      AND te.disch_dt IS NOT NULL;
```

5.Mapping CONDITION_OCCURENCE table Part 1.sql

```
WITH [Condition_Selection_1] AS
      (SELECT VO.person_id as person_id,
                VO.visit_start_date as condition_start_date,
                VO.visit_start_datetime as condition_start_datetime,
                VO.visit_end_date as condition_end_date,
                VO.visit_end_datetime as condition_end_datetime,
```

```
            44786627 as condition_type_concept_id, -- standardized
concept_id for primary condition
            VO.visit_occurrence_id as visit_occurrence_id,
            PD1.icd_clean as condition_source_value,
            MAX(C.concept_id) as condition_source_concept_id -- we
select max because we group by all other columns
                                                              -- this is
to take account for the ICD codes that are in multiple dictionaries

                -- for instance, ICD9 and ICD9CM

      FROM Saphire_KTPH.dbo.t_primary_diagnosis PD1
            INNER JOIN OHDSI_KTPH.dbo.visit_id_source_mapping VISD -- join
with VISD to link the PK of PD2 with the PK of VO
            ON PD1.encounter_id = VISD.encounter_id
                  COLLATE SQL_Latin1_General_CP1_CI_AS
                  AND PD1.pat_type_cd = VISD.pat_type_cd
                  COLLATE SQL_Latin1_General_CP1_CI_AS
            INNER JOIN OHDSI_KTPH.dbo.visit_occurrence VO -- join with VO
to select the vist_id from OHDSI_KTPH.dbo.visit_id and not from
Saphire_KTPH.dbo.t_encoutner
            ON VISD.visit_occurrence_id = VO.visit_occurrence_id
            LEFT OUTER JOIN OHDSI_KTPH.dbo.concept C
            ON PD1.icd_clean = C.concept_code
            COLLATE SQL_Latin1_General_CP1_CI_AS
            AND (C.vocabulary_id LIKE '%ICD%') -- any ICD dictionary (ICD9,
ICD10, ICD9CM, ICD0CM)
            AND C.domain_id = 'Condition' -- condition on domain
            --AND C.invalid_reason NOT IN ('D','U') -- ICD code has no been
Deleted ('D') or Updated ('U')
      GROUP BY PD1.icd_clean,
                VO.person_id,
            VO.visit_start_date,
            VO.visit_start_datetime,
            VO.visit_end_date,
            VO.visit_end_datetime,
            VO.visit_occurrence_id,
            PD1.icd_clean
      ),

[Condition_Selection_11] AS
      (SELECT *
```

```
       FROM Condition_Selection_1 CS1
       WHERE CS1.condition_source_concept_id IS NOT NULL),



[Condition_Selection_111] AS
      (SELECT CS11.person_id,
                  CR.concept_id_2 as condition_concept_id, -- first cohort
of mapped ICD codes
                  CS11.condition_start_date,
                  CS11.condition_start_datetime,
                  CS11.condition_end_date,
                  CS11.condition_end_datetime,
                  CS11.condition_type_concept_id,
                  CS11.visit_occurrence_id,
                  CS11.condition_source_value,
                  CS11.condition_source_concept_id
      FROM [Condition_Selection_11] CS11
            LEFT OUTER JOIN OHDSI_KTPH.dbo.CONCEPT_RELATIONSHIP CR
            ON  CS11.condition_source_concept_id  = CR.concept_id_1
            AND CR.relationship_id ='Maps to'),

[Condition_Selection_12] AS
      (SELECT person_id,
                  condition_start_date,
                  condition_start_datetime,
                  condition_end_date,
                  condition_end_datetime,
                  condition_type_concept_id,
                  visit_occurrence_id,
                  condition_source_value
                  -- condition_source_concept_id
       FROM Condition_Selection_1 CS1
       WHERE CS1.condition_source_concept_id IS NULL
       UNION
       SELECT person_id,
                  condition_start_date,
                  condition_start_datetime,
                  condition_end_date,
                  condition_end_datetime,
                  condition_type_concept_id,
                  visit_occurrence_id,
```

```
                  condition_source_value
       FROM Condition_Selection_111 CS111
       WHERE CS111.condition_concept_id IS NULL),

[Condition_Selection_121] AS
      (SELECT CS12.person_id,
                  -- CR.concept_id_2 as condition_concept_id,
                  CS12.condition_start_date,
                  CS12.condition_start_datetime,
                  CS12.condition_end_date,
                  CS12.condition_end_datetime,
                  CS12.condition_type_concept_id,
                  CS12.visit_occurrence_id,
                  CS12.condition_source_value,
                  MAX(C.concept_id) as condition_source_concept_id
      FROM [Condition_Selection_12] CS12
            LEFT OUTER JOIN OHDSI_KTPH.dbo.concept C
            ON
            -- ICD code is of the format 'T.D.34' then it becomes of the
format 'D34'
            -- else if it is of the format 'T.D.3412' then it becomes of
the format 'D34.12'
            -- else it stays the same
                  (CASE
                        WHEN CS12.condition_source_value LIKE 'T._.__'
                        THEN SUBSTRING (CS12.condition_source_value, 3, 1)
                        + SUBSTRING (CS12.condition_source_value, 5, LEN
(CS12.condition_source_value) - 4)
                        WHEN CS12.condition_source_value LIKE 'T._._%_%_'
-- has at least 3 characters after the second decimal point
                        THEN  SUBSTRING (CS12.condition_source_value, 3,
1)
                        + SUBSTRING (CS12.condition_source_value, 5, 2)
                        +'.'
                        + SUBSTRING (CS12.condition_source_value, 7, LEN
(CS12.condition_source_value) - 6)
                        ELSE  LEFT(CS12.condition_source_value,
LEN(CS12.condition_source_value) - 1)
                   END = C.concept_code
                   COLLATE SQL_Latin1_General_CP1_CI_AS)
                   AND (C.vocabulary_id LIKE 'ICD%')
                   AND C.domain_id = 'Condition'
```

```
                    --AND C.invalid_reason NOT IN ('D','U')
      GROUP BY CS12.person_id,
            CS12.condition_start_date,
            CS12.condition_start_datetime,
            CS12.condition_end_date,
            CS12.condition_end_datetime,
            CS12.condition_type_concept_id,
            CS12.visit_occurrence_id,
            CS12.condition_source_value
      ),

[Condition_Selection_1211] AS
      (SELECT CS121.person_id,
                  CR.concept_id_2 as condition_concept_id,
                  CS121.condition_start_date,
                  CS121.condition_start_datetime,
                  CS121.condition_end_date,
                  CS121.condition_end_datetime,
                  CS121.condition_type_concept_id,
                  CS121.visit_occurrence_id,
                  CS121.condition_source_value,
                  CS121.condition_source_concept_id
      FROM [Condition_Selection_121] CS121
            LEFT OUTER JOIN OHDSI_KTPH.dbo.CONCEPT_RELATIONSHIP CR
            ON  CS121.condition_source_concept_id  = CR.concept_id_1
            AND CR.relationship_id ='Maps to'
      WHERE CS121.condition_source_concept_id IS NOT NULL),

[Condition_Selection_122] AS
      (SELECT person_id,
                  condition_start_date,
                  condition_start_datetime,
                  condition_end_date,
                  condition_end_datetime,
                  condition_type_concept_id,
                  visit_occurrence_id,
                  condition_source_value
                  -- condition_source_concept_id
       FROM Condition_Selection_121 CS121
       WHERE CS121.condition_source_concept_id IS NULL
       UNION
       SELECT person_id,
```

```
                  condition_start_date,
                  condition_start_datetime,
                  condition_end_date,
                  condition_end_datetime,
                  condition_type_concept_id,
                  visit_occurrence_id,
                  condition_source_value
       FROM Condition_Selection_1211 CS1211
       WHERE CS1211.condition_concept_id IS NULL),

[Condition_Selection_1221] AS
            (SELECT CS122.person_id,
                  CS122.condition_start_date,
                  CS122.condition_start_datetime,
                  CS122.condition_end_date,
                  CS122.condition_end_datetime,
                  CS122.condition_type_concept_id,
                  CS122.visit_occurrence_id,
                  CS122.condition_source_value,
                  MAX(C.concept_id) as condition_source_concept_id
       FROM Condition_Selection_122 CS122
       LEFT OUTER JOIN OHDSI_KTPH.dbo.concept C
       ON
            -- ICD code is of the format 'T.D.34' then it becomes of the
format 'D34'
            -- else if it is of the format 'T.D.3412' then it becomes of
the format 'D34.1'
            -- else if it is of any other format, say 'E.1234', it becomes
'E12.3'
            (CASE
                        WHEN CS122.condition_source_value LIKE 'T._.__'
                        THEN SUBSTRING (CS122.condition_source_value, 3,
1)
                        + SUBSTRING (CS122.condition_source_value, 5, LEN
(CS122.condition_source_value) - 5) -- 5 not 4!
                        WHEN CS122.condition_source_value LIKE 'T._._%_%_'
                        THEN  SUBSTRING (CS122.condition_source_value, 3,
1)
                        + SUBSTRING (CS122.condition_source_value, 5, 2)
                        +'.'
                        + SUBSTRING (CS122.condition_source_value, 7, LEN
(CS122.condition_source_value) - 7) -- 7 not 6!
```

```
                        ELSE  LEFT(CS122.condition_source_value,
LEN(CS122.condition_source_value) - 2)
            END = C.concept_code
          COLLATE SQL_Latin1_General_CP1_CI_AS)
       GROUP BY CS122.person_id,
                  CS122.condition_start_date,
                  CS122.condition_start_datetime,
                  CS122.condition_end_date,
                  CS122.condition_end_datetime,
                  CS122.condition_type_concept_id,
                  CS122.visit_occurrence_id,
                  CS122.condition_source_value
      ),

[Condition_Selection_12211] AS
      (SELECT CS1221.person_id,
                  CR.concept_id_2 as condition_concept_id,
                  CS1221.condition_start_date,
                  CS1221.condition_start_datetime,
                  CS1221.condition_end_date,
                  CS1221.condition_end_datetime,
                  CS1221.condition_type_concept_id,
                  CS1221.visit_occurrence_id,
                  CS1221.condition_source_value,
                  CS1221.condition_source_concept_id
      FROM [Condition_Selection_1221] CS1221
            LEFT OUTER JOIN OHDSI_KTPH.dbo.CONCEPT_RELATIONSHIP CR
            ON  CS1221.condition_source_concept_id  = CR.concept_id_1
            AND CR.relationship_id ='Maps to'
      WHERE CS1221.condition_source_concept_id IS NOT NULL),

[Condition_Selection_1222] AS
      (SELECT person_id,
                  condition_start_date,
                  condition_start_datetime,
                  condition_end_date,
                  condition_end_datetime,
                  condition_type_concept_id,
                  visit_occurrence_id,
                  condition_source_value
                  -- condition_source_concept_id
       FROM Condition_Selection_1221 CS1221
```

```
	WHERE CS1221.condition_source_concept_id IS NULL
	UNION
	SELECT person_id,
			condition_start_date,
			condition_start_datetime,
			condition_end_date,
			condition_end_datetime,
			condition_type_concept_id,
			visit_occurrence_id,
			condition_source_value
	FROM Condition_Selection_111 CS12211
	WHERE CS12211.condition_concept_id IS NULL),

[Condition_Selection_12221] AS
		(SELECT CS1222.person_id,
			CS1222.condition_start_date,
			CS1222.condition_start_datetime,
			CS1222.condition_end_date,
			CS1222.condition_end_datetime,
			CS1222.condition_type_concept_id,
			CS1222.visit_occurrence_id,
			CS1222.condition_source_value,
			MAX(C.concept_id) as condition_source_concept_id
	FROM Condition_Selection_1222 CS1222
	LEFT OUTER JOIN OHDSI_KTPH.dbo.concept C
	ON
		-- ICD code is of the format 'T.D.34' then it becomes of the
format 'D34'
		-- else if it is of the format 'T.D.3412' then it becomes of
the format 'D34'
		-- else if it is of any other format, say 'E12.34' or
'F45.656', it becomes 'E12' or 'F45.'
		(CASE
				WHEN CS1222.condition_source_value LIKE 'T._.__'
				THEN SUBSTRING (CS1222.condition_source_value, 3,
1)
				+ SUBSTRING (CS1222.condition_source_value, 5, LEN
(CS1222.condition_source_value) - 5) -- 6 not 4!
				WHEN CS1222.condition_source_value LIKE
'T._._%_%_'
				THEN  SUBSTRING (CS1222.condition_source_value, 3,
1)
```

```
                        + SUBSTRING (CS1222.condition_source_value, 5, 2)
--- map to highest level
                        ELSE (CASE
                                    WHEN
LEN(CS1222.condition_source_value) > 3
                                    THEN
LEFT(CS1222.condition_source_value, LEN(CS1222.condition_source_value) - 3)
                                    ELSE
LEFT(CS1222.condition_source_value, LEN(CS1222.condition_source_value) - 2)
                                END)
            END = C.concept_code
          COLLATE SQL_Latin1_General_CP1_CI_AS)
       GROUP BY CS1222.person_id,
                  CS1222.condition_start_date,
                  CS1222.condition_start_datetime,
                  CS1222.condition_end_date,
                  CS1222.condition_end_datetime,
                  CS1222.condition_type_concept_id,
                  CS1222.visit_occurrence_id,
                  CS1222.condition_source_value
      ),

[Condition_Selection_122211] AS
      (SELECT CS12221.person_id,
                  CR.concept_id_2 as condition_concept_id,
                  CS12221.condition_start_date,
                  CS12221.condition_start_datetime,
                  CS12221.condition_end_date,
                  CS12221.condition_end_datetime,
                  CS12221.condition_type_concept_id,
                  CS12221.visit_occurrence_id,
                  CS12221.condition_source_value,
                  CS12221.condition_source_concept_id
      FROM [Condition_Selection_12221] CS12221
            LEFT OUTER JOIN OHDSI_KTPH.dbo.CONCEPT_RELATIONSHIP CR
            ON  CS12221.condition_source_concept_id  = CR.concept_id_1
            AND CR.relationship_id ='Maps to'),


[Condition_Selection_12222] AS
      (SELECT person_id,
                  condition_start_date,
```

```
                  condition_start_datetime,
                  condition_end_date,
                  condition_end_datetime,
                  condition_type_concept_id,
                  visit_occurrence_id,
                  condition_source_value
                  -- condition_source_concept_id
       FROM Condition_Selection_12221 CS12221
       WHERE CS12221.condition_source_concept_id IS NULL
       UNION
       SELECT person_id,
                  condition_start_date,
                  condition_start_datetime,
                  condition_end_date,
                  condition_end_datetime,
                  condition_type_concept_id,
                  visit_occurrence_id,
                  condition_source_value
       FROM Condition_Selection_111 CS122211
       WHERE CS122211.condition_concept_id IS NULL),

[Condition_Selection_122221] AS
            (SELECT CS12222.person_id,
                  CS12222.condition_start_date,
                  CS12222.condition_start_datetime,
                  CS12222.condition_end_date,
                  CS12222.condition_end_datetime,
                  CS12222.condition_type_concept_id,
                  CS12222.visit_occurrence_id,
                  CS12222.condition_source_value,
                  MAX(C.concept_id) as condition_source_concept_id
       FROM Condition_Selection_12222 CS12222
       LEFT OUTER JOIN OHDSI_KTPH.dbo.concept C
       ON
            -- if the ICD code is of the format 'E.12345' then it becomes
'E12.345'
            -- else is stays the same
            (CASE
            WHEN  LEN (condition_source_value) > 6
            THEN LEFT(condition_source_value, 1)
                 + SUBSTRING (condition_source_value,3,2)
                 +'.'
```

```
                + SUBSTRING (condition_source_value, 5, LEN
(condition_source_value) - 6)
            ELSE condition_source_value
            END
            )= C.concept_code
          COLLATE SQL_Latin1_General_CP1_CI_AS
       GROUP BY CS12222.person_id,
                  CS12222.condition_start_date,
                  CS12222.condition_start_datetime,
                  CS12222.condition_end_date,
                  CS12222.condition_end_datetime,
                  CS12222.condition_type_concept_id,
                  CS12222.visit_occurrence_id,
                  CS12222.condition_source_value
      ),

[Condition_Selection_1222211] AS
      (SELECT CS122221.person_id,
                  CR.concept_id_2 as condition_concept_id,
                  CS122221.condition_start_date,
                  CS122221.condition_start_datetime,
                  CS122221.condition_end_date,
                  CS122221.condition_end_datetime,
                  CS122221.condition_type_concept_id,
                  CS122221.visit_occurrence_id,
                  CS122221.condition_source_value,
                  CS122221.condition_source_concept_id
      FROM [Condition_Selection_122221] CS122221
            LEFT OUTER JOIN OHDSI_KTPH.dbo.CONCEPT_RELATIONSHIP CR
            ON  CS122221.condition_source_concept_id  = CR.concept_id_1
            AND CR.relationship_id ='Maps to')


INSERT INTO OHDSI_KTPH.dbo.condition_occurrence(person_id,

condition_concept_id,

condition_start_date,

condition_start_datetime,

condition_end_date,
```

```
condition_end_datetime,

condition_type_concept_id,

visit_occurrence_id,

condition_source_value,

condition_source_concept_id)


SELECT * FROM Condition_Selection_111
WHERE condition_concept_id IS NOT NULL -- because sometimes a concept_id
does not have a mapping on the CONCEPT RELATIONSHIP TABLE
UNION ALL
SELECT * FROM Condition_Selection_1211
WHERE condition_concept_id IS NOT NULL -- because sometimes a concept_id
does not have a mapping on the CONCEPT RELATIONSHIP TABLE
UNION ALL
SELECT * FROM Condition_Selection_12211
WHERE condition_concept_id IS NOT NULL -- because sometimes a concept_id
does not have a mapping on the CONCEPT RELATIONSHIP TABLE
UNION ALL
SELECT * FROM Condition_Selection_122211
WHERE condition_concept_id IS NOT NULL -- because sometimes a concept_id
does not have a mapping on the CONCEPT RELATIONSHIP TABLE
UNION ALL
SELECT * FROM Condition_Selection_1222211
WHERE condition_concept_id IS NOT NULL -- because sometimes a concept_id
does not have a mapping on the CONCEPT RELATIONSHIP TABLE
```

Mapping DRUG_EXPOSURE table.sql

```
WITH Drug_Selection_11 AS
      (SELECT VO.person_id as person_id,
                  CONVERT (date, IMO.drug_order_start_dt) as
drug_exposure_start_date,
                  CONVERT (time, IMO.drug_order_start_dt) as
drug_exposure_start_time,
                  CONVERT (date, IMO.drug_order_end_dt) as
```

```
drug_exposure_end_date,
                  CONVERT (time, IMO.drug_order_end_dt) as
drug_exposure_end_time,
                  581373 as drug_type_concept_id, -- Physician administered
drug
                  VO.visit_occurrence_id as visit_occurrence_id,
                  IMO.drug_inpat_order_ingred_clean as drug_source_value,
-- source value
                  MIN(C.concept_id) as drug_source_concept_id, -- we search
min because we group by all other columns

             -- this is because some drugs have the same name ore are
registered more than once
                  route_adm_cd as route_source_value,
                  strength as dose_unit_source_value

      FROM Saphire_KTPH.dbo.t_inpatient_med_order IMO
            LEFT OUTER JOIN OHDSI_KTPH.dbo.visit_id_source_mapping VISD --
join with VISD to link the PK of IMO with the PK of VO
            ON IMO.encounter_id = VISD.encounter_id
                  COLLATE SQL_Latin1_General_CP1_CI_AS
                  AND IMO.pat_type_cd = VISD.pat_type_cd
                  COLLATE SQL_Latin1_General_CP1_CI_AS
            LEFT OUTER JOIN OHDSI_KTPH.dbo.visit_occurrence VO -- join with
VO to select the vist_id from OHDSI_KTPH.dbo.visit_id and not from
Saphire_KTPH.dbo.t_encoutner
            ON VISD.visit_occurrence_id = VO.visit_occurrence_id
            LEFT OUTER JOIN OHDSI_KTPH.dbo.concept C
            ON IMO.drug_inpat_order_ingred_clean = C.concept_name
            COLLATE SQL_Latin1_General_CP1_CI_AS
            /* ON CAST (IMO.drug_inpat_order_clean_cd as VARCHAR(100)) =
C.concept_code */
            AND C.domain_id = 'Drug' -- condition on domain
            -- AND C.invalid_reason NOT IN ('U', 'D') --AND
C.invalid_reason NOT IN ('D','U') -- ICD code has no been Deleted ('D') or
Updated ('U')
            WHERE C.concept_id IS NOT NULL
            GROUP BY VO.person_id,
                  CONVERT (date, IMO.drug_order_start_dt),
                  CONVERT (time, IMO.drug_order_start_dt),
                  CONVERT (date, IMO.drug_order_end_dt),
                  CONVERT (time, IMO.drug_order_end_dt),
```

```
                  VO.visit_occurrence_id,
                  IMO.drug_inpat_order_ingred_clean,
                  route_adm_cd,
                  strength),

Drug_Selection_12 AS
      (SELECT person_id,
                  CR.concept_id_2 as drug_concept_id,
                  drug_exposure_start_date,
                  drug_exposure_start_time,
                  drug_exposure_end_date,
                  drug_exposure_end_time,
                  581373 as drug_type_concept_id, -- Physician administered
drug
                  visit_occurrence_id,
                  drug_source_value,
                  drug_source_concept_id,
                  route_source_value,
                  dose_unit_source_value

      FROM Drug_Selection_11 DS11
            LEFT OUTER JOIN OHDSI_KTPH.dbo.CONCEPT_RELATIONSHIP CR
            ON DS11.drug_source_concept_id = CR.concept_id_1
            AND CR.relationship_id ='Maps to'
      WHERE DS11.drug_source_concept_id IS NOT NULL),

-- Drug_Selection_12 contains 90% of the mapped data
-- the other 10% is all the compositions of different durgs
-- Dr.Sung mapped all these drugs manually on the table
OHDSI_KTPH.dbo.manually_mapped_drugs MMD
-- in Drug_Selection_2 we match the compositions to their manually mapped
standardized codes


Drug_Selection_2 AS
      (SELECT VO.person_id as person_id,
                  CR.concept_id_2 as drug_concept_id,
                  CONVERT (date, IMO.drug_order_start_dt) as
drug_exposure_start_date,
                  CONVERT (time, IMO.drug_order_start_dt) as
drug_exposure_start_time,
                  CONVERT (date, IMO.drug_order_end_dt) as
```

```
drug_exposure_end_date,
                  CONVERT (time, IMO.drug_order_end_dt) as
drug_exposure_end_time,
                  581373 as drug_type_concept_id, -- Physician administered
drug
                  VO.visit_occurrence_id as visit_occurrence_id,
                  IMO.drug_inpat_order_ingred_clean as drug_source_value,
                  CR.concept_id_2 as drug_source_concept_id,
                  route_adm_cd as route_source_value,
                  strength as dose_unit_source_value

      FROM Saphire_KTPH.dbo.t_inpatient_med_order IMO
            LEFT OUTER JOIN OHDSI_KTPH.dbo.visit_id_source_mapping VISD
            ON IMO.encounter_id = VISD.encounter_id
                  COLLATE SQL_Latin1_General_CP1_CI_AS
                  AND IMO.pat_type_cd = VISD.pat_type_cd
                  COLLATE SQL_Latin1_General_CP1_CI_AS
            LEFT OUTER JOIN OHDSI_KTPH.dbo.visit_occurrence VO
            ON VISD.visit_occurrence_id = VO.visit_occurrence_id
            LEFT OUTER JOIN OHDSI_KTPH.dbo.manually_mapped_drugs MMD
            ON IMO.drug_inpat_order_ingred_clean = MMD.clean_drug_name
            COLLATE SQL_Latin1_General_CP1_CI_AS
            AND IMO.drug_inpat_order_unclean = MMD.[unclean_drug_name ]
            COLLATE SQL_Latin1_General_CP1_CI_AS
            LEFT OUTER JOIN OHDSI_KTPH.dbo.CONCEPT_RELATIONSHIP CR
            ON MMD.[OMOP Standard Code] = CR.concept_id_1
            AND CR.relationship_id ='Maps to'

      WHERE IMO.drug_inpat_order_ingred_clean NOT IN (SELECT
DS12.drug_source_value

      FROM  Drug_Selection_12 DS12)
      AND MMD.[OMOP Standard Code] IS NOT NULL)

INSERT INTO OHDSI_KTPH.dbo.drug_exposure (person_id,

drug_concept_id,

drug_exposure_start_date,

drug_exposure_start_datetime,
```

```
drug_exposure_end_date,

drug_exposure_end_datetime,

drug_type_concept_id,

visit_occurrence_id,

drug_source_value,

drug_source_concept_id,

route_source_value,

dose_unit_source_value)

SELECT * FROM Drug_Selection_12 DS12
      WHERE DS12.person_id IS NOT NULL
      AND DS12.visit_occurrence_id IS NOT NULL
      AND DS12.drug_concept_id IS NOT NULL
      AND DS12.drug_exposure_start_date IS NOT NULL
      AND DS12.drug_exposure_end_date IS NOT NULL
      AND DS12.drug_exposure_start_time IS NOT NULL
      AND DS12.drug_exposure_end_time IS NOT NULL

UNION ALL

SELECT *
FROM Drug_Selection_2 DS2
      WHERE DS2.person_id IS NOT NULL
      AND DS2.visit_occurrence_id IS NOT NULL
      AND DS2.drug_concept_id IS NOT NULL
      AND DS2.drug_exposure_start_date IS NOT NULL
      AND DS2.drug_exposure_end_date IS NOT NULL
      AND DS2.drug_exposure_start_time IS NOT NULL
      AND DS2.drug_exposure_end_time IS NOT NULL
```

Mapping OBSERVATION_PERIOD.sql

```
-- the observation period is the difference in time
```

```
-- between the first visit_occurrence of a certain patient
-- and his/her last visit_occurrence.
INSERT INTO OHDSI_KTPH.dbo.observation_period
SELECT VO.person_id AS person_id,
         MIN(VO.visit_start_date) as observation_period_start_date,
         MAX(VO.visit_end_date) as observation_period_end_date,
         38000280 as period_type_concept_id --Observation recorded from EHR
FROM OHDSI_KTPH.dbo.visit_occurrence VO
GROUP BY VO.person_id
```

6.Mapping CONDITION_ERA.sql

```
WITH cteConditionTarget
      (CONDITION_OCCURRENCE_ID,
      PERSON_ID,
      CONDITION_CONCEPT_ID,
      CONDITION_TYPE_CONCEPT_ID,
      CONDITION_START_DATE,
      CONDITION_END_DATE) AS

      (SELECT co.CONDITION_OCCURRENCE_ID,
                  co.PERSON_ID,
                  co.CONDITION_CONCEPT_ID,
                  co.CONDITION_TYPE_CONCEPT_ID,
                  co.CONDITION_START_DATE,
      COALESCE(co.CONDITION_END_DATE, DATEADD(day,1,CONDITION_START_DATE))
AS CONDITION_END_DATE
      FROM OHDSI_KTPH.dbo.CONDITION_OCCURRENCE co),


cteEndDates (PERSON_ID,
                   CONDITION_CONCEPT_ID,
                   END_DATE) AS -- the magic
      (SELECT PERSON_ID,
                  CONDITION_CONCEPT_ID,
                  DATEADD (day,-30,EVENT_DATE) AS END_DATE -- unpad the end
date
      FROM
      (
            SELECT PERSON_ID,
                     CONDITION_CONCEPT_ID,
```

```
                    EVENT_DATE,
                    EVENT_TYPE,
                    MAX(START_ORDINAL) OVER
                            (PARTITION BY PERSON_ID, CONDITION_CONCEPT_ID
                            ORDER BY EVENT_DATE, EVENT_TYPE
                            ROWS UNBOUNDED PRECEDING) as START_ORDINAL,
-- this pulls the current START down from the prior rows so that the NULLs
from the END DATES will contain a value we can compare with
                    ROW_NUMBER() OVER (PARTITION BY PERSON_ID,

CONDITION_CONCEPT_ID
                                                    ORDER BY EVENT_DATE,
EVENT_TYPE) AS OVERALL_ORD -- this re-numbers the inner UNION so all rows
are numbered ordered by the event date
            FROM
                  (
                  -- select the start dates, assigning a row number to each
                  SELECT PERSON_ID,
                           CONDITION_CONCEPT_ID,
                           CONDITION_START_DATE AS EVENT_DATE,
                           -1 as EVENT_TYPE,
                           ROW_NUMBER() OVER (PARTITION BY PERSON_ID,

CONDITION_CONCEPT_ID
                                                           ORDER BY
CONDITION_START_DATE) as START_ORDINAL
                  FROM cteConditionTarget

                  UNION ALL

                  -- pad the end dates by 30 to allow a grace period for
overlapping ranges.
                  SELECT PERSON_ID,
                           CONDITION_CONCEPT_ID,
                           DATEADD(day,30,CONDITION_END_DATE),
                           1 as EVENT_TYPE,
                           NULL
                  FROM cteConditionTarget
                  ) RAWDATA
      ) E

      WHERE (2 * E.START_ORDINAL) - E.OVERALL_ORD = 0
```

```
      ),

cteConditionEnds (PERSON_ID,
                        CONDITION_CONCEPT_ID,
                        CONDITION_TYPE_CONCEPT_ID,
                        CONDITION_START_DATE, ERA_END_DATE) as
      (select c.PERSON_ID,
               c.CONDITION_CONCEPT_ID,
               c.CONDITION_TYPE_CONCEPT_ID,
               c.CONDITION_START_DATE,
               MIN(e.END_DATE) as ERA_END_DATE
      FROM cteConditionTarget c
      JOIN cteEndDates e
      ON c.PERSON_ID = e.PERSON_ID
         and c.CONDITION_CONCEPT_ID = e.CONDITION_CONCEPT_ID
         and e.END_DATE >= c.CONDITION_START_DATE
      GROUP BY
      c.PERSON_ID,
      c.CONDITION_CONCEPT_ID,
      c.CONDITION_TYPE_CONCEPT_ID,
      c.CONDITION_START_DATE )

INSERT INTO OHDSI_KTPH.dbo.condition_era (person_id,

condition_concept_id,

condition_era_start_date,

condition_era_end_date,

condition_occurrence_count)
SELECT person_id,
         CONDITION_CONCEPT_ID,
         min(CONDITION_START_DATE) as CONDITION_ERA_START_DATE,
         ERA_END_DATE as CONDITION_ERA_END_DATE,
         COUNT(*) as CONDITION_OCCURRENCE_COUNT
FROM cteConditionEnds
GROUP BY person_id, CONDITION_CONCEPT_ID, CONDITION_TYPE_CONCEPT_ID,
ERA_END_DATE
ORDER BY person_id, CONDITION_CONCEPT_ID
```

References

- Christian Reich, Patrick Ryan, Rimma Belenkaya, Karthik Natarajan and Clair Blacketer. (November 2017). OMOP Common Data Model Specifications
- Saphire Schema - Data Model v5
- Qianli Ma, Erica Voss, Chris Knoll, Ajit Londhe. (March 2017). Common Data Model (CDM v5.0) ETL Mapping Specification for Optum Extended SES & Extended DOD (Optum Clinformatics DataMart v7.0)
- Saphire Data Schema Description (as of 13 Feb 2015)