



# SNOMED CT Case Studies



**SNOMED CT**  
The global  
language of  
healthcare

## Case for Investment Case Studies



### OHDSI

OHDSI is an international network of researchers and observational health databases. OHDSI develops health care evidence through methodological research, open-source analytics development, and clinical evidence generation. OHDSI provides access to over 100 different databases, with half a billion patient records from 19 different countries.

### OMOP CDM

OHDSI has developed the SNOMED CT-embedded OMOP Common Data Model (CDM) for its data platform as a global standard for patient and population observational research. It is positioned at level 4/5 on the SNOMED CT maturity model.

### OHDSI Research

Examples of OHDSI search using the SNOMED CT-embedded OMOP CDM include:

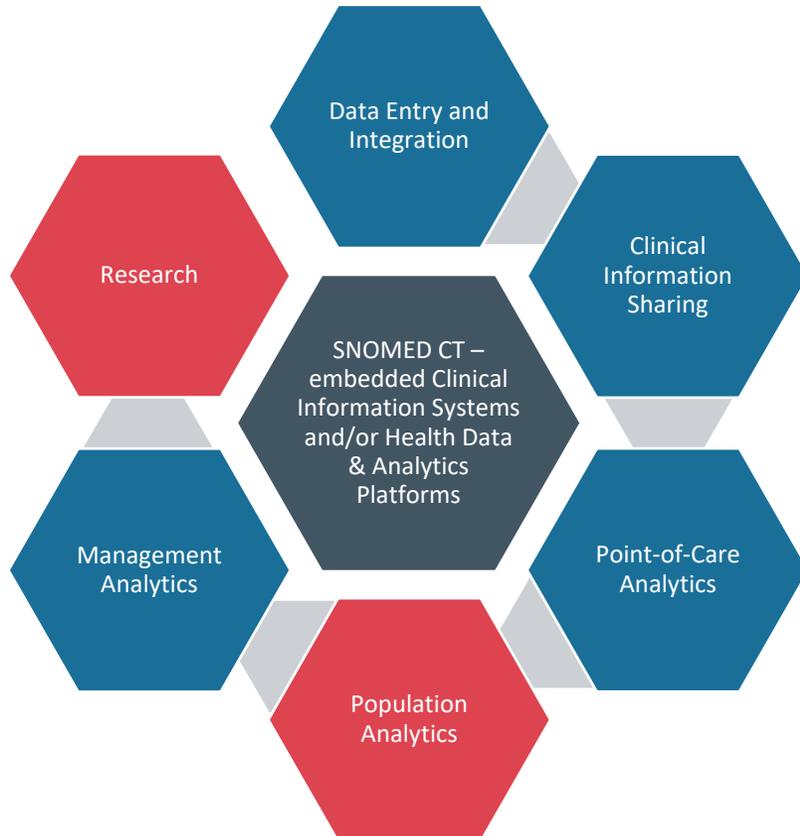
- **OHDSI Hydroxychloroquine Safety Study Completed in Four Days** – In March 2020 a team of researchers from around the world analyzed the safety profile of hydroxychloroquine to treat COVID-19. The team used data from 14 datasets to analyze the medical history of over 950,000 patients from 6 countries who had previously taken hydroxychloroquine. They found the medication to be **safe for short-term use** in doses used for other diseases. But, **when prescribed in combination with azithromycin, it may induce heart failure and cardiovascular mortality** and they urged caution in using the two together.
- **OHDSI Hypertension Study** - A 2019 OHDSI study compared chlorthalidone and hydrochlorothiazide for treating hypertension using 3 large observational databases of patients from the United States. The findings contrast with current treatment guidelines recommending chlorthalidone over hydrochlorothiazide. The researchers found that **patients taking chlorthalidone had nearly three times the risk of developing dangerously low levels of potassium and a greater risk of other electrolyte imbalances and kidney problems compared with those taking hydrochlorothiazide.**

OHDSI research studies using SNOMED CT on knee replacements and cervical cancer risks further described in Appendix 5 [here](#)



# Case Study #8

## Observational Data Research



**OHDSI**  
OBSERVATIONAL HEALTH DATA SCIENCES AND INFORMATICS

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# Case Study #8

## Observational Data Research

### Observational Health Data Sciences and Informatics (OHDSI), Columbia University, New York, USA.

- OHDSI<sup>1</sup> is an international network of researchers and observational health databases with a central coordinating centre housed at Columbia University in New York. Currently, OHDSI strives to develop reliable real world, health care evidence through methodological research, open-source analytics development, and clinical evidence generation.
- OHDSI provides access to over 100 different databases, with half a billion patient records from 19 different countries, with more than 200 million patient records from outside the U.S. All its solutions are open source. Observational research using OHDSI solutions starts with observational data, gathered through various populations, care settings, data capture processes, and health systems. By converting that data through the OMOP Common Data Model (CDM), the research can create three types of evidence: clinical characterization; population-level effect estimation, and patient-level prediction.
- OHDSI developed the OMOP CDM, as a global standard for observational research. As part of the CDM, the OMOP Standardized Vocabularies are available for two main purposes: common repository of all vocabularies used in the health care community; as well as standardization and mapping for use in research.
- Similar to **SNOMED CT** all clinical events in the OMOP CDM are expressed as concepts, which represent the semantic notion of each event. **SNOMED CT** is used as a standard concept in five of the seven data domains – condition, procedure, measurement, device and observation. Like **SNOMED CT**, the OMOP CDM represents relationships in a hierarchy through ‘is a’ statements, as well as attribute relationships among concept hierarchies, so the OHDSI OMOP CDM is at level 4/5 on the **SNOMED CT** maturity model.

1. Observational Health Data Sciences and Informatics (OHDSI). See <https://www.ohdsi.org/>

# Case Study #8

## Observational Data Research

### OHDSI Hydroxychloroquine Safety Study<sup>2</sup> Completed in Four Days

- In the face of rapid spread and escalation of the coronavirus, many decisions are being made quickly and a number of therapies are being trialed for its treatment. One of these is the use of hydroxychloroquine, a drug approved in 1950s. The drug has been used for malaria, lupus and rheumatoid arthritis. However, physicians have been using it off label for COVID-19 and in the past weeks the FDA has approved the use of the drug for compassionate use in the treatment of COVID-19. Despite the lack of evidence of its clinical effectiveness, U.S. President Donald Trump says the drug has shown “very encouraging results” in treating COVID-19. More research needed to be done based on these claims.
- Over 4 days in March 2020, Professor Dani Prieto-Alhambra, Professor of Pharmaco- and Device Epidemiology at the Centre for Statistics in Medicine at Oxford University in England and a team of researchers from around the world set out to analyze the safety profile of hydroxychloroquine. The team used data from fourteen datasets to analyze the medical history of over 950,000 patients who have previously taken hydroxychloroquine. Patient data came from six countries: Germany, Japan, the Netherlands, Spain, the UK and the USA.
- First, they found it to be a safe medication for short-term use. When administered at the doses used for current indications like rheumatoid arthritis, they did not detect any worrying side effects. However, when prescribed in combination with azithromycin, it may induce heart failure and cardiovascular mortality and they urged caution in using the two together. It was noted that there is a lack of sufficient data at higher doses, and hence it is too early to understand the clinical effectiveness in treating COVID-19. Formal clinical trials in this regard are ongoing.

2. Lane et al., “Safety of hydroxychloroquine, alone and in combination with azithromycin, in light of rapid wide-spread use for COVID-19: a multinational, network cohort and self-controlled case series study”. Medrxiv, May 31, 2020. See preprint at <https://www.medrxiv.org/content/10.1101/2020.04.08.20054551v2.full.pdf>

# Case Study #8

## Observational Data Research

### OHDSI Hypertension Study - Recommended Diuretic Causes More Side Effects than a Similar Hypertension Drug

- The 2017 American College of Cardiology/American Heart Association hypertension guideline recommends thiazide and thiazidelike diuretics as one of the first-line treatment classes for hypertension. Hydrochlorothiazide is the most commonly prescribed member of the class, but the guideline states that chlorthalidone is preferred on the basis of longer half-life and proven trial reduction of cardiovascular disease. However, there are no large, completed randomized clinical trials comparing these medications, although one is in progress.
- A recent OHDSI study<sup>3</sup> compared chlorthalidone and hydrochlorothiazide on 55 outcomes in 3 large observational databases of patients from the United States. The findings contrast with current treatment guidelines recommending chlorthalidone over hydrochlorothiazide. Chlorthalidone, the guideline-recommended diuretic for lowering blood pressure, causes more serious side effects than hydrochlorothiazide, a similarly effective diuretic, according to the OHDSI study.
- The researchers found that **patients taking chlorthalidone had nearly three times the risk of developing dangerously low levels of potassium and a greater risk of other electrolyte imbalances and kidney problems compared with those taking hydrochlorothiazide.** Information from the largest individual database studied by the team revealed that 6.3% of patients treated with chlorthalidone experienced hypokalemia (low blood potassium), compared with 1.9% of patients who were treated with hydrochlorothiazide.

3. Hripcsak et al., "Comparison of Cardiovascular and Safety Outcomes of Chlorthalidone vs Hydrochlorothiazide to Treat Hypertension". JAMA Internal Medicine, August 10, 2020. See <https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2760777?resultClick=1>

# Case Study #8

## Observational Data Research

### EHDEN-OHDSI Knee Replacement Study

- The IMI European Health Data & Evidence Network (EHDEN) project and OHDSI recently published the results of its first ‘study-a-thon’ in Lancet Rheumatology on the effectiveness and safety associated with uni-compartmental versus total knee replacement<sup>4</sup>. This was the largest study to date with data on more than 250,000 individuals who underwent either procedure in five databases from the US and the UK.
- The choice of which type of knee replacement to recommend remains difficult for surgeons, and there remains insufficient information to inform them and patients of the best approach, dependent on the patient’s personal context.
- The study emulated to the extent possible, the design of the five year Total or Partial Knee Arthroplasty Trial (TOPKAT). The study-a-thon assessed whether the efficacy results seen in the trial translated into effectiveness in real-world settings and provided further consideration of safety outcomes that were too uncommon to assess in TOPKAT.
- **Uni-compartmental knee replacement was associated with a reduced risk of complications, in particular venous thromboembolism, and persistent opioid use, possibly indicating a reduced risk of persistent pain after surgery. Total knee replacement was, however, associated with a lower risk of revision procedures, and the need to repair or replace the original replacement.**

4. Burn E, et al; “Complications and adverse events of uni-compartmental versus total knee replacement” Lancet Rheumatology, published online November, 2019 . See [https://www.thelancet.com/journals/lanrhe/article/PIIS2665-9913\(19\)30075-X/fulltext](https://www.thelancet.com/journals/lanrhe/article/PIIS2665-9913(19)30075-X/fulltext)

# Case Study #8

## Observational Data Research

### OHDSI Cervical Cancer Risk Study - Cervical Cancer Risk Decreases In Users Of Copper IUDs vs. Hormonal IUDs -

- Studies from the 1980s suggested a reduced risk of cervical cancer among women who used an intrauterine contraceptive, though those studies did not differentiate between the varying types of IUDs. Furthermore, much of the data from those studies was collected prior to the availability of most hormonal IUDs.
- By standardizing four decades' worth of data from the Columbia University Irving Medical Center database through the OMOP Common Data Model and using high-level analytics developed within the OHDSI collaboration, the research team ran a retrospective cohort analysis of more than 10,000 patients who received IUDs.
- Overall, IUD use has become more popular over the past 20 years. Copper IUD use has remained constant whereas hormonal IUD use has increased. The rising popularity of hormonal IUDs may be related to the fact that they decrease the pain and bleeding of menses.
- The study<sup>5</sup> found that the diagnosis of high-grade cervical neoplasia was 0.7% in the copper IUD (Cu IUD) cohort and 1.8% in the hormonal IUD (LNG-IUS) cohort.
- In conclusion, patients who used copper intrauterine devices (Cu IUD) were found to have a lower risk of high-grade cervical neoplasms (cervical cancer) compared to users of the levonorgestrel-releasing intrauterine system (LNG-IUS).

5. Spotnitz al., "Relative Risk of Cervical Neoplasms Among Copper and Levonorgestrel-Releasing Intrauterine System Users". Obstetrics and Gynecology, February, 2020. See [https://journals.lww.com/greenjournal/Fulltext/2020/02000/Relative\\_Risk\\_of\\_Cervical\\_Neoplasms\\_Among\\_Copper.11.aspx](https://journals.lww.com/greenjournal/Fulltext/2020/02000/Relative_Risk_of_Cervical_Neoplasms_Among_Copper.11.aspx)



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