

FeederNet (Federated E-Health Big Data for Evidence Renovation Network) platform in Korea

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Background

In Korea, A nation-wide distributed research network (DRN), namely ‘*The Federated E-Health Big Data for Evidence Renovation Network (FeederNet)*’ platform was launched in 2019. The initial project to develop the FeederNet was started in 2018 to 2020 with the support of the Ministry of Trade, Industry & Energy of Korea. And the follow-up project to expand the data network of the FeederNet has been going on with the EUR 3 million budget of Korean government from 2019 to 2022.

Due to these grants, the FeederNet platform was successfully developed, and research using OMOP-CDM and FeederNet platform has been being actively conducted in Korea. In this study, we share the status of the FeederNet platform and the future R&D plans on it in Korea.

FeederNet Platform

OMOP-CDM Data Network

The size of data network is essential for the success of a DRN. As the number of available database increases, research opportunities increase, and as the research outcomes increase, the overall profit increases and the probability of entrance of new database increase, that is a network externality.

In Korea, 53 hospitals across the country converted EMR to OMOP-CDM, and the FeederNet has them as data partners. More than 72% of tertiary hospitals in Korea participated in this OMOP-CDM data network, and more than 71 million of patient (including duplicates) data have been converted (see Table 1). 46 hospitals are interfaced with the FeederNet coordinating system and they use it as an analytic portal for their OMOP-CDM, and other hospitals are also in the process of connecting or collaborating with the FeederNet system.

Table 1. Summary of OMOP-CDM Data Network in Korea (as of March 2022)

Number of hospitals	Number of patients
53 hospitals	71,987,327 patients (including duplicates)

FeederNet Coordinating System

The FeederNet coordinating system (hereafter FeederNet system) aims to support collaborative research using OMOP-CDM data network. To distribute analytic codes to each hospital and collect the result of them, the communication between the central coordinating center and hospital’s CDM analytic server is necessary, and so FeederNet system is composed of central- and node-side modules.

The FeederNet central is a portal to harmonize distributed joint research and manage the resources of the FeederNet platform. It implemented the features such as membership, member/authority management, research project creation/manage, CDM analytic tools (ATLAS) support, analytic results report/visualization, CDM DB resource monitoring, dashboard for the status of analysis, etc. And the FeederNet node is a client module to support the execution engine of analysis codes for each hospital’s CDM data and the networking with FeederNet central. Figure 1 is the main page of FeederNet portal.

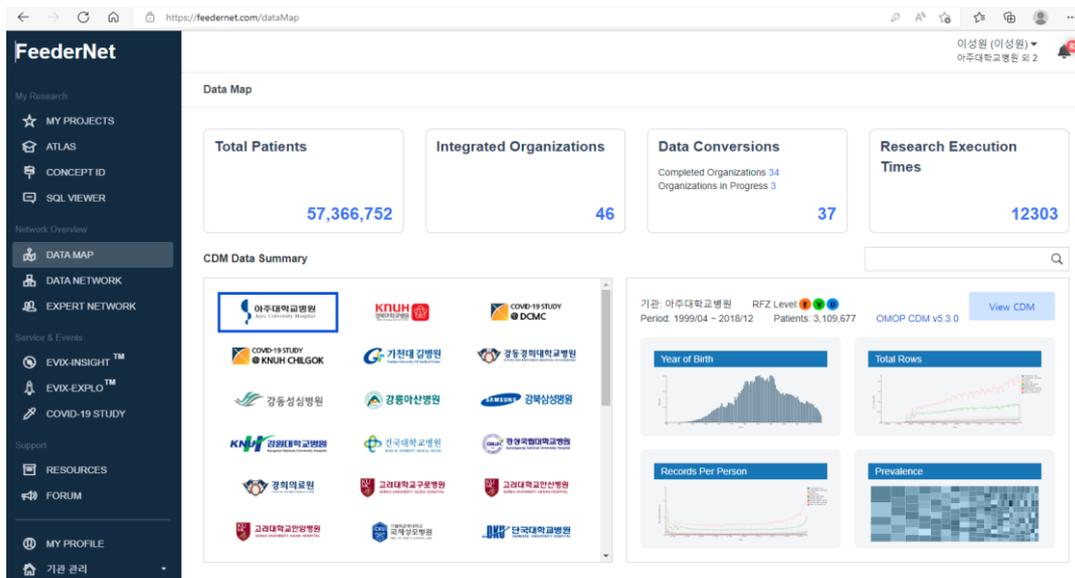


Figure 1. Main Page of the FeederNet System

Research Free Zone

In 2019, the Research Free Zone (RFZ) to promote collaborative research was launched. Initially, 6 hospitals signed an MOU with the following clauses.

1. The same authority granted to in-hospital researchers in FeederNet system are equally granted to researchers from other institutions participating in the RFZ.
2. A single IRB is operated among the RFZ institutions.

Currently, 18 hospitals have joined the RFZ and about 90% of the analyses which were conducted in 2021 utilized CDM data of RFZ institutions.

OMOP-CDM Research in Korea

The Increase of Analytics using FeederNet

Since May 2019, when FeederNet system was launched, to April 2022, a total of 11,806 CDM analyzes have been performed using FeederNet. In particular, since June 2020, about 400 analyzes have been being conducted every month, and more than 4,700 analyzes were performed in 2021. (see Figure 2)

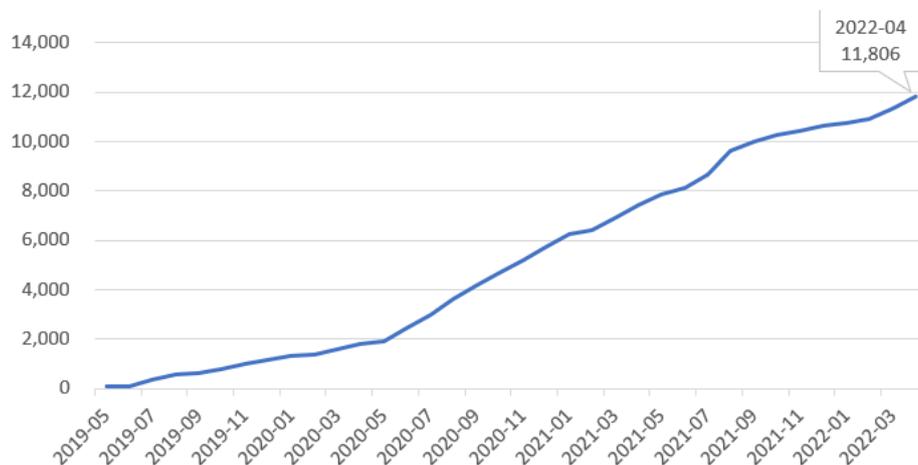


Figure 2. Cumulative number of analyses using FeederNet

The Increase of Publications using OMOP-CDM

Publications using OMOP-CDM by Korean researchers are increased year by year. We searched a list of studies from Google Scholar with the keyword, 'OMOP-CDM', and selected studies that were published in journals and of which first author is a Korean researcher (see Figure 3). As a result of examining the publication trend by year of the final 97 papers, it was confirmed that the number is increasing every year to 4 in 2019, 21 in 2020, and 55 in 2021 (see Figure 4).

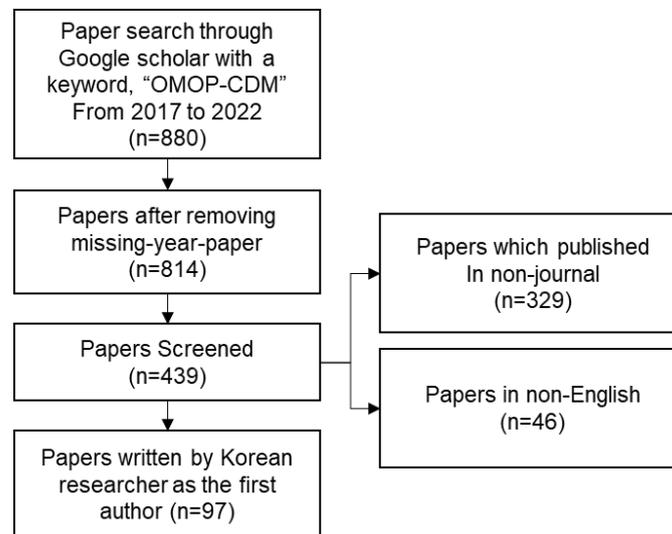


Figure 3. The process of screening papers for review

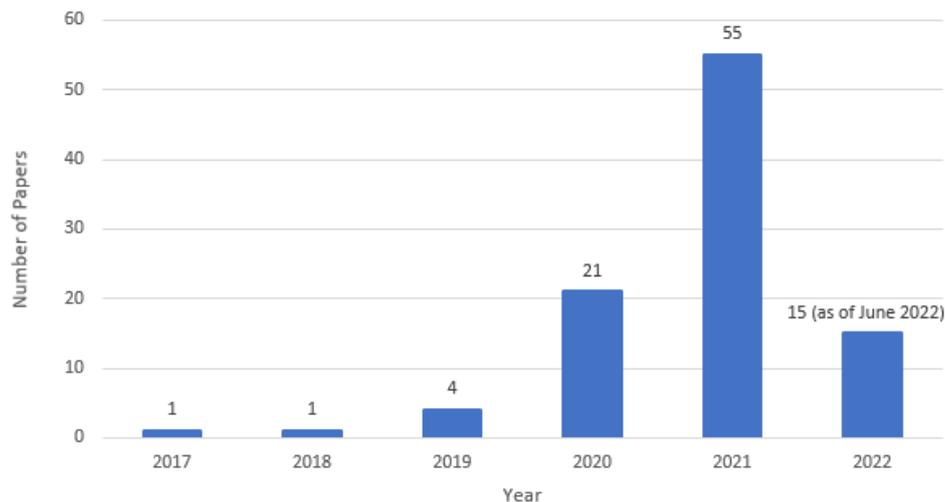


Figure 4. OMOP-CDM research status by year by Korean researcher

Future R&D Plan

We plan to elaborate on three R&D tasks to broaden the scope and heighten the level of research which are performed using OMOP-CDM and the FeederNet.

1. (Near) Real-time CDM ETL

If CDM conversion cycle is in sync with real-time medical data, the analytic scope could be expanded to research area that require recent data, such as COVID-19 studies and pragmatic clinical trials. We have developed a (near) real-time incremental OMOP-CDM ETL software (see Figure 5). It has been successfully applied to 20 hospitals to perform CDM-ETL in daily or weekly or monthly execution cycle.

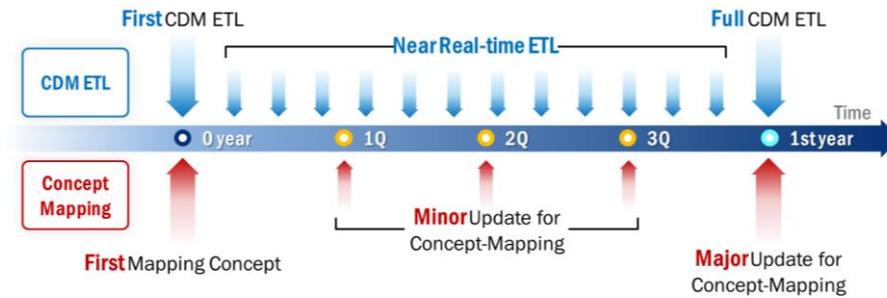


Figure 3. (Near) Real-time CDM ETL Process

2. Building Specialized Small CDM

As the level of research using CDM is heightened and the need to use data owned by a medical department or physician for joint research increases, the importance for a small but specific CDM for disease or in-depth medical data is increasing. In Korea, research on the building small CDM DBs such as oncology CDM, bio-signal CDM for ICU patients, and bone mineral density CDM have been conducted, so we will elaborate on specialized small CDM as another R&D strategy.

3. Conversion of Unstructured Medical Data into CDM

Unstructured medical data such as radiology images, bio-signals, and medical notes (free text) are essential for in-depth CDM analysis research, so Korean researchers have been converting them to OMOP-CDM with global OHDSI workgroups. During the FeederNet project, we developed the 7 CDM extension data models for unstructured or semi-structured medical data; genomics, radiology, lifelog data, vital signs, national emergency registry, geographic data, and medical notes. We will continue to drive it as an important R&D strategy.

Conclusion

The FeederNet is leading the medical big data analysis research in Korea. We expect that the FeederNet will contribute to collaborate research with Europe OHDSI beyond Korea.

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