

Conversion of Electronic Medical Records in the Emergency Room for the Outcomes Partnership Common Data Model in South Korea

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Abstract (250 WORDS)

Medical records generated in Emergency Room(ER) are split into two parts. Some records are stored into the emergency electronic medical records (E-EMRs) and the others are stored into the general electronic medical records (G-EMRs) exclusively. E-EMRs include data on assessments, physical examinations, and treatments performed in the ER. Conversion of G-EMR into CDM alone can lead to incomplete data conversion for emergency patients because much critical information is in E-EMR. The inclusion of E-EMR data into the common data model (CDM) through conversion will allow easy and clear identification of details, such as clinically significant emergency department information, patient status, history, physical examination findings, diagnosis, procedures, and drug use in the ER. In this study, the data of all EMR in the ER examinations and procedure, measurement, and observation data were converted added to the existing CDM data. Thus, it is possible to continuously convert EMR data in the ER to CDM data, which can contribute to the precise, in-depth multi-institutional analysis of emergency patients and to the conduction of global studies.

Introduction

Currently, the common data model (CDM) includes data that are based on general electronic medical records (EMRs) generated on visits to the outpatient department, ward, and emergency room (ER). An advanced emergency electronic medical record (E-EMR) is generated on visiting the ER. This E-EMR includes a common emergency patient record and an EMR for specific patients, such as those with cardiac arrest, trauma, severe trauma, and suicide injuries. In addition, E-EMRs include data on emergency symptoms, prescriptions, ER duty work, treatments, and emergency prescription expenses. However, E-EMR data are not usually included in CDM data. Therefore, there are many restrictions on the use of CDM data for studies in emergency medicine. To overcome these restrictions, we attempted to expand CDM data through E-EMR data conversion for addition to the CDM.

Data Description

Using the CDM database, data mining was performed to extract all CDM tables according to the "person id" and "visit occurrence id" of the emergency visit data (visit concept ID = "9203"). Additionally, E-EMR information was added to the CDM. The extracted data were classified into cardiac arrest, trauma, and severe trauma, according to the ICD-10 classification system. Subsequently, the procedure, measurement, and observation data from each patient were converted into CDM data. In the procedure table, the records of activities and treatments prescribed for cardiac arrest and severe trauma patients were added. In the measurement table, the laboratory results and vital signs of cardiac arrest and severe trauma patients were added. In the observation table, the history, physical examination results, and prehospital assessment and treatment records of all emergency patients, as well as cardiac arrest and severe trauma patients were further converted (Figure 1).

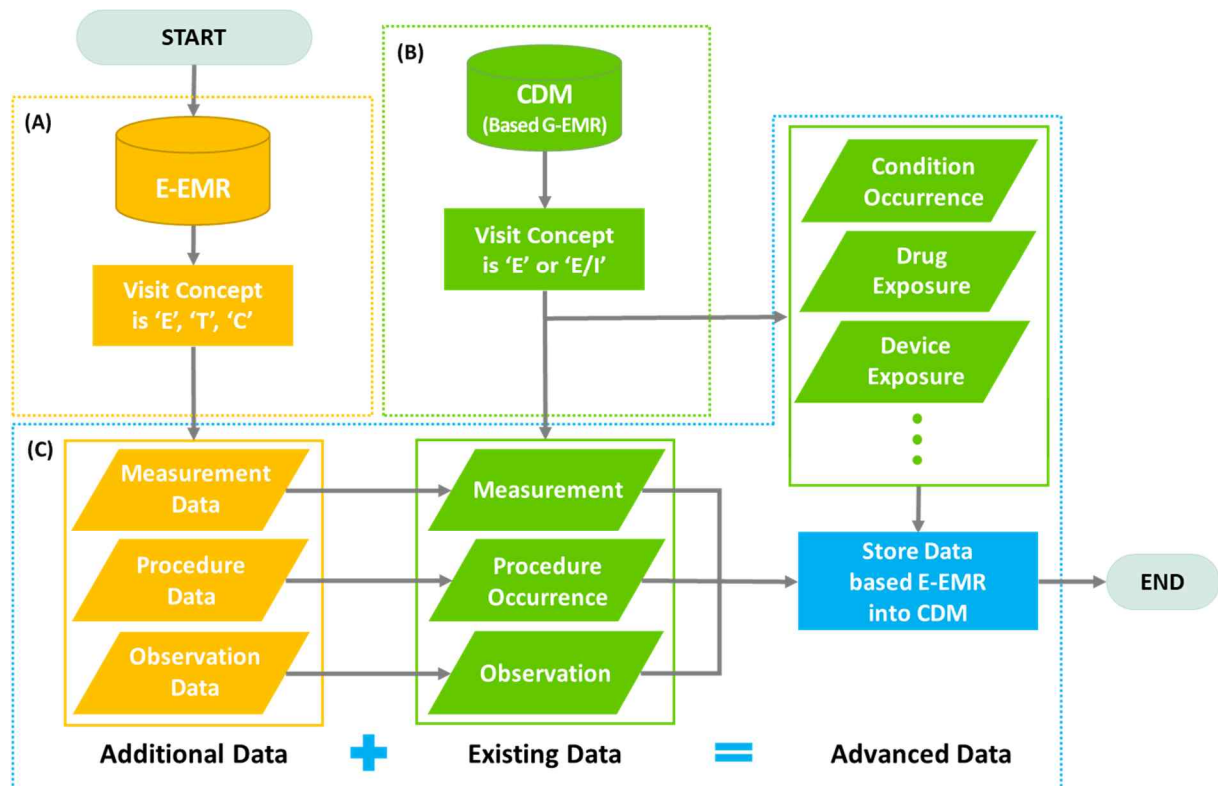


Figure 1. Data processing pipeline; (A) The observation, procedure and measurement data of all patients ('E'), trauma and severe trauma patients ('T'), and cardiac arrest patients ('C') who visited the emergency room based on emergency electronic medical record (E-EMR) were extracted. (B) The observation, procedure and measurement data of emergency patients from the CDM data based on general electronic medical record (G-EMR) (C) The CDM data based on E-EMR was added to existing CDM data of emergency patients

Data Mapping Process

The data used had been recorded between April 1, 1994 and December 31, 2017, and the EMRs in the ER to be converted included the details of all emergency patients, as well as those with trauma, severe trauma, and cardiac arrest in Ajou University. Conversion of EMR data was performed according to the OMOP-CDM, and the results are presented in Figure 2. A total of 1,387,011 visits to the ER were reported, according to the visit concept ID. Of these, 3,040 involved cardiac arrest and 390,632 involved trauma and severe trauma. The ER-EMRs had 1,506,127 emergency details, 267,609 trauma and severe trauma details, 36,434 traffic accident details, 1,781 cardiac arrest details, and 901 suicide injury details. The data converted for the existing CDM could be classified into procedure, measurement, and observation tables according to the ER-EMRs. The emergency department data included information on physical examination findings, history, outcomes, and pre-hospital findings, and the data were added to the observation table through the concept-mapping process. As a result, a total of 1,025,473 records were converted and added to the existing CDM data. Additionally, the cardiac arrest, trauma, and severe trauma data included information on physical examination findings, history, outcomes, laboratory test results, treatment results, and pre-hospital findings. With regard to trauma and severe trauma, the data were added to the CDM table through the concept-mapping process, and the procedure table had 95,084 records, measurement table had 475,420 records, and observation table had 47,542 records. Similarly, with regard to cardiac arrest, the data were added to the CDM table, and the procedure table had 2,107 records and observation table had 8,605 records (Figure 2).

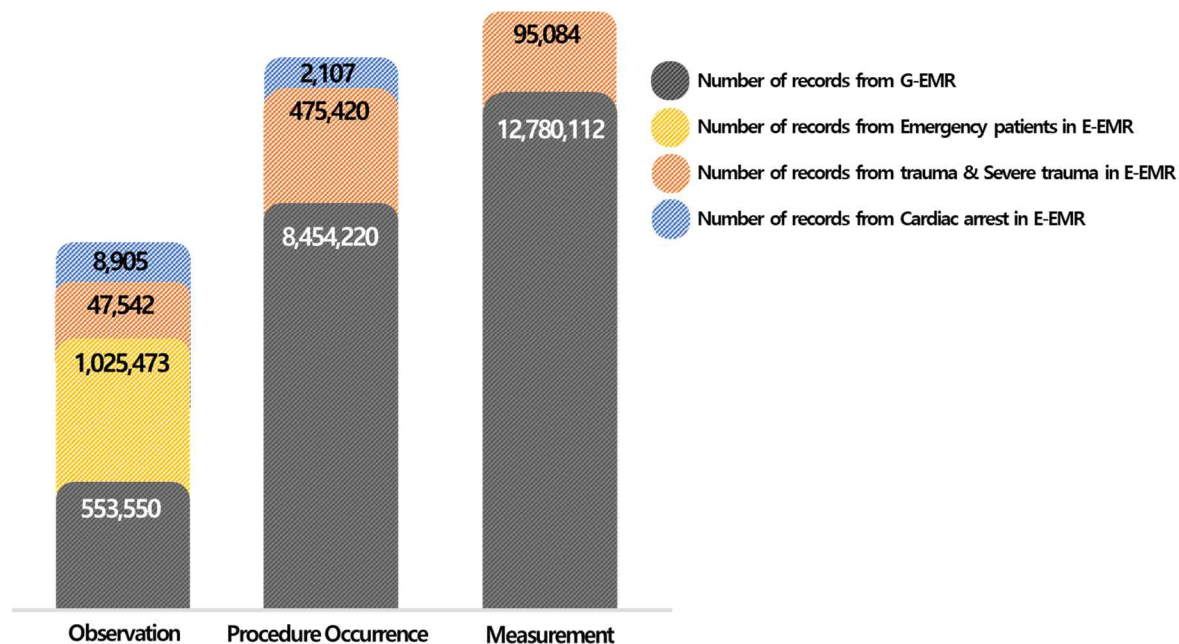


Figure 2. The proportion of mapped data with regard to CDM ; The gray is the number of records showing G-EMR based CDM data. The yellow is common information of emergency patients, the red is trauma and severe trauma patient information, and the blue is cardiac patient information included in E-EMR. After converting the data contained in E-EMR into CDM, records were added for each table as shown in the figure 2.

Conclusion

We successfully developed an extract–transform–load procedure to convert Korean EMR data in the ER for the OMOP-CDM. In the future, we will be able to add detailed emergency patient data to the CDM, and this will help support precise and accurate multicenter studies in emergency medicine.

Acknowledgments

This work was supported by a grant of the Korea Health Technology R&D Project through the Korea Health Industry Development Institute (KHIDI), funded by the Ministry of Health & Welfare, Republic of Korea (grant number : HI16C0992) and the Bio Industrial Strategic Technology Development Program (20003883) funded By the Ministry of Trade, Industry & Energy (MOTIE, Korea).

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