

Implementation of Interoperable Healthcare Standards for Community Healthcare

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Abstract. Building an integrated data model that includes not only clinical data but also personal health records has become increasingly important. We aimed to build a big data healthcare platform by developing a common data model that can be utilized in the healthcare field. To this end, we acquired health data from various communities to establish community care digital healthcare service models. Further, to improve personal health data interoperability, we ensured conformance to international standards, namely, the Systemized Nomenclature of Medicine Clinical Terms (SNOMED-CT) and transmission standards, namely, Health Level 7 Fast Healthcare Interoperability Resource (HL7 FHIR). Furthermore, FHIR resource profiling was designed to transmit and receive data, following the HL7 FHIR R4 guidelines.

Keywords. Healthcare standards, patient generated health data, bigdata platform, Systemized Nomenclature of Medicine Clinical terms, HL7, FHIR

1. Introduction

In this study, we aimed to build an open big data platform for personal healthcare. We provided standards for establishing clinical terminologies, structuring data, data security, and quality management to improve data interoperability. This standardized system will facilitate data integration, management, and utilization.

2. Methods and Results

Standardization with SNOMED-CT and FHIR: We defined a common dataset for SNOMED-CT concepts that are frequently used by clinical institutions. A common dataset was created using data obtained from Korea's National Health Screening Program [1] and health Application Programming Interfaces (APIs) from global corporations, such as Samsung [2] and Google [3]. To ensure semantic interoperability via mapping clinical terms, we designed customized SNOMED post-expressions based on the FHIR structure (Figure 1). In addition, we profiled the FHIR, obtaining a transmission standard called HL7 FHIR, to set the data model.

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Evaluating the generality of standardized common data model: In the healthcare field, big data sources are obtained under various situations. Through FHIR resource profiling using the SNOMED-CT expression, clinical indicators in the data model can be expressed consistently without changing the model structure and representative observation code. To ensure consistency and accuracy when mapping post-coordinated code, we used the validation tool provided by SNOMED CT International and HL7 [4]. In addition, three experts in this field assessed validation results via cross-checking or group discussion [5].

Development of bigdata platform: After standardizing the data, we developed a big data platform to integrate data from various sources. Researchers, healthcare professionals, and healthcare companies will be able to utilize the platform. Pseudonymization processing is performed before transmitting data to the platform. Additionally, we follow a data security guideline that complies with Korea's Personal Information Protection Act, and we have developed a cloud-based platform. Furthermore, we plan to deploy a system-theoretical, architecture-centric, ontology-based, policy-driven approach that conforms to the ISO 23903 standard.

3. Discussion and Conclusions

The challenge associated with big data management was limited entity sets that cover the physical data used in clinical institutions. Expansion of the service model and domain in personal areas, such as psychological data, will facilitate the building of an optimized platform that enables individuals to proactively use and share their health information through a big data platform with improved interoperability.

To standardize the clinical terminology, we mapped clinical terminology codes using SNOMED-CT. In addition, to appropriately set the data models, we developed transmission standard guidelines by profiling the HL7 FHIR resource. We designed medical institution datasets to simplify the exchange of clinical information among disparate healthcare providers and health service systems. Furthermore, we expect that using international standards data and linking personal health data will facilitate healthcare research and healthcare service industry.

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