

# **MAPPING ICD-11 (THE 11TH INTERNATIONAL CLASSIFICATION OF DISEASE) TO ICD-10-KM-7TH (THE KOREAN MODIFICATION 7TH OF THE ICD-10) FOR FLEXIBLE TRANSITION TO ICD-11**

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## **Abstract**

In the World Health Congress in May 2019, ICD-11 was approved. This study aims to analyze the classification system of the 11th revision of the International Classification of Disease mapping with the ICD-10-KM-7th (ICD-10 Korean Modification 7th) to identify the characteristics of ICD-11 so that it can be flexibly linked to KCD-7 when introduced in Korea.

The mapping was conducted based on the ICD-11 frozen version (April 2019). Most of the ICD-11 codes were mapped to a single ICD-10 or KCD-7 code. However, for the diabetes code, more than 80 percent of KCD-7 codes needed to be mapped to one or two post-coordination codes, along with one stem code in ICD-11.

ICD-11 is a great classification that has an excellent taxonomy system to express detailed information. For the codes that have been changed or removed, a proper guideline might also be useful for users to understand the changes made in KCD-7 or ICD-10 code.

**Keywords:** ICD-10, ICD-11, Mapping, Post-Coordination, Granularity

## **Introduction**

Patient information collected for care delivery can be used for research and billing purposes as well as accreditation of health facilities.<sup>1</sup> ICD-10 (International Classification of Diseases 10th revision) has been used for more than 25 years in 115 countries for disease classification. The International Classification of Diseases (ICD), used to classify and report health conditions and factors, provides a basis for health statistics.<sup>2</sup>

The World Health Organization (WHO) has been developing the International Classification of Diseases 11th Revision since 2007 with the aim of comparing the statistics compilation for diseases and causes of death between countries.<sup>3,4</sup> ICD-11 addresses the needs of medical innovation and changes in the digitized healthcare system.<sup>5</sup>

One of the important features of ICD-11 is that it has a post-coordination system. ICD-11 has two types of codes: stem codes and extension codes. Similar to ICD-10 PCS, stem codes provide basic information, and by adding extension codes, which specify other things such as laterality, severity, etc., a code can have detailed information as a modifier. In some cases, more than two stem codes can be combined to express one diagnosis. Cluster refers to combined codes, which includes stem codes and extension codes, and it is a post-coordination system in ICD-11. Another feature of ICD-11 is that the ICD-11 codes have short or long descriptions, which helps the users to understand the diagnosis and the way of use.<sup>6</sup> Descriptions are provided in the ICD-11 tabular list.

After the World Health Congress approved ICD-11 in May 2019, the members of the WHO will switch from ICD-10 to ICD-11, and health statistics reports based on the new system will begin on January 1, 2022.<sup>7</sup>

In this regard, Statistics Korea, which manages disease classification and statistics in Korea, conducted the first research project in 2018, a structural analysis and field test for chapters 1, 2, 3, and 4 of ICD-KM-7 (the Korean modification 7th of the ICD-10 (KCD-7)). It contains unique codes that are used in Korea and that are not included in ICD-10; therefore, separate study about KCD-7 was needed. (See [Table 1](#).)

Statistics Korea has been performing an ICD-11 study with a plan to finish before the implementation of the ICD-11. As a consecutive research project of 2018, a structural analysis and code mapping, which maps ICD-11 codes to KCD-7 codes for Chapter 5 (endocrine, nutritional or metabolic diseases), Chapter 9 (diseases of visual system), and Chapter 10 (diseases of the ear or mastoid process) were performed in 2019. The chapters that are going to be covered by the study were decided by Statistics Korea, reflecting on the budget and amount of study. This study will report the result of chapters studied in 2019; other chapters were studied by other researchers.

This study aims to analyze the classification system of the ICD-11 along with those of KCD-7 to identify structural and content differences of ICD-11 compared with KCD-7 so that it can be flexibly linked to KCD-7 when introduced in Korea and help to achieve more stable transition.

## **Method**

A total of 1,485 codes (625 in Chapter 5, 710 in Chapter 9, and 150 in Chapter 10) were analyzed. Six health information managers with disease classification experience of more than 10 years who are working in secondary and tertiary hospitals in Korea participated in the mapping research.

Before the researchers started the mapping, sample ICD-11 to KCD-7 mapping on about 30 codes from each chapter was conducted by the principal researcher and the manager of the analysis team, and the needed analysis items and method were set.

First, for the structural analysis, the ICD-11 web browser contents for ICD-11 Mortality and Morbidity Statistics (ICD-11 MMS) frozen version of 2019 were studied. Second, the ICD-11 codes and the KCD-7 (with ICD-10) codes were mapped to compare the detailed level of the two systems and analyze their differences.

For all the codes, the participants were asked a question about comparison of granularity between ICD-11 and KCD-7.

After the end of the mapping, the mapped ICD-10 code was compared with the ICD-11 to KCD-7 mapping in the WHO's one category ICD-11 to ICD-10 map table. Using this comparison data, the missing codes or different mapped codes each other were studied.

### 1. Data Source

- ICD-11 codes (Downloaded from WHO ICD-11 website MMS 2019. APR)
- KCD-7 code master table (Provided by Statistic Korea)
- One category ICD-11 to ICD-10 Map -each ICD-11 code maps to only 1 ICD-10 code (Downloaded from WHO ICD-11 website) MMS 2019. APR
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### 2. Structural Analysis of ICD-11 and KCD-7

In the ICD-11 MMS frozen version, some items, such as "description," "inclusion," "exclusion," "note," and "post-coordination," are presented for each code depending on characteristics of a code, and it is called "foundation" structure. Foundations include all the contents included in the alphabet index and a tabular list of the code to provide a knowledge base.<sup>5</sup> It is designed to flexibly respond to science and medicine, which are changing constantly. The researchers reviewed which items are on each code for structural analysis. The items reviewed for each code as structure analysis include inclusion, exclusion, note, post-coordination, etc. (See [Figure 1](#).)

### 3. Mapping Method

Based on the title of the ICD-11 codes in the MMS frozen version of April 2019, most of the ICD-11 codes, except for the diabetes codes, were reclassified in both KCD-7 and ICD-10. The total number of ICD-11 codes is 1,485, and about 250 codes were assigned to each researcher.

Segments were not overlapped in the performance, and after the first mapping, two members re-examined the mapped codes with each other. A doctor consultation was performed to resolve any difficulties the researchers faced in the mapping or differences in opinions regarding codes. More than two ICD-10 codes (KCD-7 codes) could be mapped in case it is needed to express one ICD-11 code.

#### Mapping example (ICD-11 to KCD-7 and ICD-10)

The ICD-11 code 9C83.5 has a title of "Internuclear ophthalmoplegia." Researchers classified H51.2 as both KCD-7 and ICD-10.

In cases where the codes that are only used in Korea are found in the ICD-11 code, both the ICD-10 and KCD-7 codes were mapped. For example, the ICD-11 code "9A78.51 Corneal Staphyloma" could be mapped to KCD-7 code "H18.79 Corneal Staphyloma"; however, ICD-10 did not have any specific code that could be mapped. Hence, "H18.7 Other Corneal Deformities" was mapped.

To map ICD-11 code "5B80 Overweight or localized adiposity," two ICD-10 (KCD-7 codes) codes, "E65 Localized Adiposity" and "E66.9 Overweight Unspecified," were required.

## Mapping Example (KCD-7 to ICD-11) – Diabetes Mellitus

For diabetes codes, based on the KCD-7 code title, KCD-7 codes, including diabetic complication, were reclassified with the ICD-11 codes. There were 250 diabetes mellitus codes on KCD-7, including the fifth code. In ICD-11, all complications have to be described by using post-coordinations. For example, for ICD-10 code "E10.0 Type 1 diabetes with coma," two ICD-11 codes ("5A10 Type 1 diabetes" and "5A23 Diabetic coma") were required to fully explain the ICD-10 code. The KCD-7 codes, which are only used in Korea, was also mapped with ICD-11. (See [Figure 2](#).)

## **Results**

### *1. Analysis of ICD-11 Structure Performed by Chapters*

The percentage of the cases where "description" was presented is as follows: 45.9 percent in Chapter 5; 24.8 percent in Chapter 9; and 33.3 percent in Chapter 10. Other items, such as "inclusion" and "exclusion" are presented at around 10 percent in each chapter. (See [Table 2](#).)

### *2. Analysis of Post-Coordinations by Chapters*

In chapters 9 and 10, most of the post-coordinations seen were "laterality." In Chapter 9, the most appeared post-coordination was "has manifestation." "Specified anatomy" was also frequently seen. (See [Table 3](#).)

### *3. ICD-11 to KCD-7 Mapping*

#### Mapping ICD-11 to KCD-7 Using the ICD-10's Digit Codes

Most of the ICD-11 codes were mapped to four-digit code in ICD-10 (81.3 percent). Because KCD-7 has unique codes in five or six digits, 64.5 percent of the ICD-11 codes were mapped to four-digit KCD-7 codes; 16.8 percent were mapped to five-digit codes; and 0.2 percent were mapped to six-digit KCD-7 codes.

3.2 percent of ICD-11 codes were mapped to a range of codes and not mapped to one code in specific (e.g., ICD-11 code AA4Z).

The ICD-11 code AA4Z Noninflammatory disorders of the external ear, unspecified could not be mapped to one code; therefore, it was mapped to a range of codes from ICD-10 (KCD-7), H61-H62 ("H61 Other disorders of external ear," "H62 Disorder of external ear in disease classified elsewhere").

About 3 percent of the ICD-11 codes needed two ICD-10 or KCD-7 codes. For example, the ICD-11 code "5B55.5 Vitamin A deficiency with xerophthalmic scars of cornea or blindness" was mapped to two ICD-10 (KCD-7) codes, "E50.5 [Vitamin A](#) deficiency with [night blindness](#)" and "E50.6 Vitamin A deficiency with xerophthalmic scars of cornea."

There were some codes that were moved from other chapters. For example, ICD-11 code "9A00.Z Atopic eczema of eyelid" was moved to the chapter on visual system from the chapter of skin

subcutaneous. (In ICD-10, it was labeled "L20.8, Other atopic dermatitis.") (See [Table 4.](#))

Comparison of HIMs' ICD-11 to ICD-10 Code Mapping and the Codes Provided on the WHO's Mapping Table.

On the WHO's ICD-11 to ICD-10 mapping table, each ICD-10 code was mapped to a single ICD-11 code; 2.7 percent of the codes were not mapped to individual codes but were mapped to chapter codes. The concordance rate of the mapped codes of the WHO and the mapped codes suggested by the researchers was 63.1 percent. The concordance rate of Chapter 5 was the highest with 74.7 percent.

Among the nonconcordant codes, the cases where researchers used specific codes that are unique to Korea, while the WHO's mapping table used a range codes showed the highest nonconcordance with 34.6 percent. For example, the ICD-11 code "AA6Z Diseases of external ear, unspecified" was mapped to a range code "H60-H62 disease of external code" on the WHO's mapping table; whereas the researchers mapped the code to one specific code, "H61.9 Disorder of external ear, unspecified."

#### Survey Results on Granularity Comparison

HIMs answered that 52.2 percent of ICD-11 codes were more detailed than KCD-7, and 47.3 percent were similar to KCD-7. Especially for Chapter 10, 69.4 percent of health information professionals answered that "granularity was similar." (See [Table 5.](#))

#### KCD-7 to ICD-11 Mapping Result for Diabetes Mellitus

Around 18.2 percent of the KCD-7 diabetic codes showed a one-to-one match. Only stem codes were required to describe the KCD-7 codes. However, for 63.5 percent of the KCD-7 codes, a single post-coordination (extension or associated/manifestation code) was required. (See [Table 6.](#))

For 18.2 percent of the KCD-7 codes, more than two post-coordination codes were required to fully explain the diabetes codes. In ICD-10, 20 percent of the codes only required stem codes to describe the diabetic codes.

#### Comparison of the Mapped KCD-7 Codes and KCD-7 Master Table Code

After finishing ICD-11 to KCD-7 mapping, the mapped KCD-7 codes and the codes in the KCD-7 master table from Statistics Korea were compared. Through this process, the unmapped KCD-7 codes were reviewed to re-examine the reasons why they remain unmapped. It was found that there were many cases where the diseases with specific KCD-7 or ICD-10 codes belonged to "all index terms" or where the codes were deleted or moved to other chapters in ICD-11. "All index terms" are terms that are provided in the ICD-11 code browser, and the terms can be searched on the browser. However, the terms do not have specific codes. (See [Figure 3.](#))

The total number of KCD-7 codes not presented in ICD-11 was 598. Of them, 297 cases (49.7 percent) were unique Korean codes that were not listed in ICD-10. Of the total 598 codes, 39.5 percent of the

codes were not included in ICD-11; 55 percent of the codes were included as "all index terms"; and 5.5 percent of the codes were moved to another chapter.

For example, two ICD-10 codes, "E15 Nondiabetic hypoglycaemic coma" and "E16.0 Drug induced hypoglycaemia without coma," are all included in the ICD-11 code "5A41 Hypoglycaemia without associated diabetes" as an "all index term." (See [Figure 3](#).)

For the ICD-10 codes that are not the codes that are unique to Korea, 21.6 percent of the 301 codes were deleted, 24.4 percent were changed to "all index terms," and 4.2 percent of the codes were moved to another chapter. (See [Table 7](#).)

## Discussion

### 1. Structural Analysis Review

There were many new codes in ICD-11. The code description was helpful for the researchers to understand what the diseases were and how to use the codes. For chapters 5, 9, and 10, about 34.5 percent of ICD-11 codes had descriptions in the tabular list, which were useful for mapping.

In some cases, "exclusions," which were provided in ICD-10 (KCD-7) codes, were not provided in ICD-11. Therefore, it was discussed that a future study should perform the comparison of the structure between ICD-11 and ICD-10 (KCD-7).

Post-coordination was another factor that affected the mapping, as it adds detailed information about the code. However, the researchers had difficulties using them because they were confused about how to arrange the order of the codes and how many stem codes or post-coordination codes could be used.

In some cases, an extension (e.g., laterality or manifestation) that should have been added to a stem code was not provided in the stem code. Some researchers put extension codes by researching the codes in the main web browser; however, others did not put any extension codes. A unified rule for post-coordination may be required to receive a coherent data.

### 2. Mapping Result Review

#### Changed Codes

There were many KCD-7 codes that were removed or changed to "inclusion" or "all index terms" in ICD-11. Codes could have been deleted for logical and clinical reasons; therefore, a guideline must be provided to fully explain the change, including the rationale behind the change to guide users and prevent confusion.

In addition, a detailed review of the subdiagnostic terms of ICD-10 or KCD-7 is required. In some cases, it was found that only a term among multiple subdiagnostic terms of an ICD-10 code was presented in a code that has been changed to different chapters in ICD-11.

For example, in the case of ICD-10 code "H02.8 Other specified disorders of the eyelid," subterm 1, "hypertrichosis of eyelid," is listed in the chapter on visual system in ICD-11. Subterm 2, "Retained foreign body in eyelid," was moved to the chapter on injury in ICD-11, indicating the necessity of a prior review and analysis of subtitle for smooth calculations in the future. (See [Table 8](#).)

### Comparison Results of Mapped KCD-7 Codes and KCD-7 Master Codes

There were many KCD-7 codes that were mapped to multiple ICD-11 codes. Thirteen KCD-7 codes were mapped from two ICD-11 codes to 30 ICD-11 codes. For example, KCD-7 code "E88.8 Metabolic disorders" was mapped to 39 ICD-11 codes, including "5C50.G Trimethylaminuria," "5C53.1 Disorder of citric acid cycle," and "5C63.2 Disorder of Vitamin D transport or metabolism." To help coding professionals after ICD-11 implementation, KCD-7 codes that are mapped to multiple ICD-11 codes should be informed.

In a comparative analysis of ICD-11, ICD-10, and ICD-10-CM, a round-trip method was used to identify the equivalent codes between ICD-10 and ICD-11, which were validated by limited manual review. In conclusion, with post-coordination, it is possible to fully represent the meaning of a high proportion of ICD-10-CM codes.<sup>8</sup>

Therefore, to make the transition of going from using the KCD-7 classification to the ICD-11 classification smooth, there is a need to present mapping tables (KCD-7 to ICD-11 mapping table and ICD-11 to KCD-7 mapping table), especially with post-coordination information, to present KCD-7 as clearly as possible so that hands-on workers can use the codes by directly comparing them in the two classification systems.

The American Health Information Management Association (AHIMA) introduced a mapping schema for mapping of SNOMED to ICD-9-CM. In this schema, four tables (Concept Table, Cross Maps Sets Table, Cross Maps (Maps Table), and Cross Maps Target Table) were used for systematic mapping. By using terminology concepts and tables, mapping process can be conducted clearly systematically, even in the case of an ambiguous guidance in ICD.<sup>6</sup>

Moreover, in the paper about ICD-11 framework for classifying patient safety events, field trials were conducted on the application of the ICD-11 classification system. The results were analyzed by dividing the cases into the case where the code could be applied and the case where the code could not be applied.<sup>9</sup>

In this research, the most suitable KCD-7 codes for all ICD-11 codes were selected using ICD-11 title and were mapped by manual coding. Only one ICD-11 code, "9D42.1 Normal visual field," remained not mapped, as there was no suitable code for it in ICD-10 (KCD-7). After the research, there was an opinion that the code that could not select a suitable code should remain unmapped because some new ICD-11 codes could not be perfectly matched with an ICD-10 (KCD-7) code. In subsequent

research, the mapping rule, including mapping range, should be restudied.

### Importance of Detailed Mapping Guidance

The mapping results appeared quite differently depending on the researcher's experience and the ways the researchers used to apply coding rules. Malaysia and Sweden used SNOMED CT to map the acute coronary syndrome registry and performed comparative study. The conclusion of the study showed that in order to ensure reproducible and reusable maps, special actions were required. Especially, the importance of the detailed mapping guidance was reaffirmed to reduce the deviation by coding professionals' opinions.<sup>10</sup>

The symbols \* and + are no longer used in the section on complications of diabetes. Instead, users have to select related complications from the post-coordination, which has an extensive list of diseases. This caused confusion for the researchers, as deep clinical knowledge was required to select proper a manifestation. With this, it can be suggested that an intensive training of clinical knowledge may also be essential to carry out an accurate classification.

### Limitations

This study was performed based on the 2019 WHO mapping table and 2019 ICD-11 MMS.

It was found that the mapping table provided on the ICD-11 web browser in 2021 showed different data from the mapping table provided on the same web browser that was studied in 2019.

Specifically, in 2019, some of the ICD-11 codes were mapped to chapters; whereas, in 2021, there were no ICD-11 codes that were mapped to chapter. Due to such circumstances, minimum level of WHO mapping table comparison study was reported in this article.

### **Conclusion**

ICD-11 is a great classification that has an open structure to meet the modern and innovative era with post-coordination system. The description provided in the tabular list also helps coding professionals to easily understand the new diseases and adapt to the new classification system. Using this excellent taxonomy system, various codes that have detailed information can be used in many areas, including research and healthcare planning.

ICD-11 is still changing, and a dual mapping table (the ICD-11 to KCD-7 and KCD-7 to ICD-11) with post-coordination information might be useful for users to understand the changes that are made in KCD-7 or ICD-10.

Also, a guideline for the mapping process should be developed by multidisciplinary experts to keep the consistency of the work.

For the changed codes, such as the ones that were removed or moved to another chapter, it is necessary to make an easy-to-use code book to avoid any confusion.

Further study and mapping, including code-specific research by chapter, will be needed to make the transition from KCD-7 to ICD-11 smooth.

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## Author Biography

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