ORIGINAL ARTICLE

Analysis of the Profile of Primary Diagnosis Codes for Diabetes Mellitus Inpatients at Dr. Soekardjo Regional General Hospital Tasikmalaya Based on ICD-10, ICD-11, and SNOMED CT

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Abstract

Background: The accuracy of a diagnosis code is essential in financing health services and diseases and procedure indexing and hospital management information. Based on the results of the preliminary study, diabetes mellitus is among the top 10 diseases. While coding 10 medical record documents, three consisted of 30% which were accurate, and the seven recorded 70% were found to be accurate. The four-character of the code was predominantly the character with many inaccuracies. Therefore, the researchers conducted a study on the accuracy of a diagnosis code at Dr. Soekardjo Regional General Hospital specifically on inpatient cases of diabetes mellitus in 2022.

Methods: A quantitative type of study with a descriptive research design was implied in the study. The study object is data coding of diabetes mellitus cases. Data are collected by observation and interviews.

Results: According to the research results, diabetes mellitus is one of the top 10 diseases, while 40 medical record documents were coded, 20 (50%) were inaccurate and 20 (50%) were accurate, while the highest percentage of unaccuracy occurs in the fourth character of the code. The alignment of codes based on ICD-11 revealed that 10 documents (25%) were not aligned due to lack of specificity regarding ulcer complications and gastropathy.The alignment of codes based on SNOMED CT showed that 40 documents were aligned with the SNOMED CT clinical phrase standards.

Conclusion: The inaccuracies in diabetes mellitus diagnosis coding at Dr. Soekardjo Regional General Hospital are attributed to less specific diagnoses, unclear handwriting by doctors in patient medical records, and coding personnel still facing difficulties in determining complication coding. The researchers suggest solutions such as involving coders and medical personnel in training and socialization activities related to diagnosis codes, particularly for Diabetes Mellitus.

Key Words: *Accuracy; ICD-10; ICD-11; SNOMED CT; Diabetes mellitus.*

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Introduction

Diagnosis coding, or encoding, involves assigning disease diagnoses into codes consisting of a combination of numbers and letters [1]. According to the Decree of the Minister of Health of the Republic of Indonesia Number 312 of 2020 concerning the Profession of Medical Records and Health Information (PMIK), one of the competencies that must be achieved by medical records personnel is proficiency in clinical classification, disease coding, and health problem coding, as well as clinical procedures. According to the Directorate General of Health Services (2022), disease coding activities involve determining Indonesian diagnosis codes using the International Statistical Classification of Diseases and Related Health Problems Tenth Revision (ICD-10) established by the Indonesian Ministry of Health since February 19, 1996. The accuracy of diagnosis codes plays a crucial role in healthcare financing, disease and procedure indexing, and hospital management information [2]. The accuracy rate of disease diagnosis codes based on ICD-10 was found to be 79% accurate and 21% inaccurate [2]. Meanwhile, the diagnosis code accuracy rate for Diabetes Mellitus cases was 53 (67.9%) accurate and 25 (32.1%) inaccurate, primarily due to insufficiently specific diagnosis writing [3].

The development of ICD-10 into the International Classification of Diseases and Related Health Problems 11th Revision (ICD-11) occurred on June 18, 2018, when the World Health Organization (WHO) officially released the new international disease classification (ICD-11). In May 2019, WHO member states agreed to adopt ICD-11. Starting in January 2022, ICD-11 has been enforced by WHO for national and international recording and reporting purposes, and since 2019, the International Federation of Health Information Management Associations (IFHIMA) has facilitated global community preparation for the implementation of ICD-11. ICD-11 is linked to the Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT), with SNOMED CT being connected or mapped to ICD-11, resulting in a SNOMED CT that is understandable and useful [4]. Since January 2002, 22 latest versions have been released every six months through the International Health Terminology Standards Development Organization (IHTSDO) to coordinate the maintenance and promotion of SNOMED CT as a clinical reference terminology [5].

The reason for using ICD-11 and SNOMED CT is their focus on electronic resources. For the first time, ICD is fully digital, designed for use in various IT environments and integrated solutions. ICD offers easy integration with Electronic Health Records (EHR) and terminologies such as Systematized Nomenclature of Medicine Clinical Terms (SNOMED). This aligns with the Ministry of Health's decision to change regulations regarding medical records to electronic medical records (EMR). It is mandatory for healthcare facilities to implement this by December 31, 2023, as stated in Minister of Health Regulation Number 24 of 2022 regarding Medical Records.

Based on the findings of preliminary studies conducted at Dr. Soekardjo Regional General Hospital, data on the top 10 inpatient diseases revealed that diabetes mellitus diagnosis ranks among the top 10 diseases. Out of 10 medical record documents, 3 (30%) were found to be inaccurate and 7 (70%) accurate. It was noted from the initial survey that there were no difficulties in coding diabetes mellitus, but there were challenges in coding its secondary diagnoses. There were also difficulties in coding for claims as they do not always reference ICD-10 and must comply with the eligibility criteria

of the National Health Insurance (BPJS). The consequences of incorrect coding and failure to code diabetes mellitus diagnosis in health department reports could lead to it not being listed among the top 10 diseases, resulting in decreased tariff claims. Regarding ICD-11 and SNOMED CT, personnel are already familiar with them. The hope is that the implementation of ICD-11 and SNOMED CT will lead to more up-to-date and specific coding. The purpose of this study is to examine the accuracy level and coding profile of diabetes mellitus among inpatients in the year 2022, presented in percentages, which will be subsequently narrated or described.

Material and Methods

The type of research in this study is quantitative, utilizing a retrospective research design. In a descriptive research design, the existing situation within a society or community is depicted or outlined [6]. The aim of this research is to examine the accuracy level and description of the coding of diabetes mellitus among inpatients in the year 2022, presented as percentages which will be narrated or described later on.

This research was conducted in the medical records room of Dr. Soekardjo Regional General Hospital located at Jl. Rumah Sakit No.33, Empangsari, Tawang District, Tasikmalaya Regency, West Java 46113. The research was conducted from January to March 2023.

The population in this study consisted of the medical records of inpatients diagnosed with diabetes mellitus at Dr. Soekardjo Regional General Hospital. Based on data from September to November 2022, there were 81 patients based on that case. The sample in this study showed the total number of diabetes mellitus cases from September to November 2022 among inpatients. The research variables are to the

accuracy of diabetes mellitus diagnosis cases based on the ICD 10, ICD 11, and SNOMED CT classification systems.

The inclusion criteria are all the diabetes mellitus diagnosis cases based on the ICD 10, ICD 11, and SNOMED CT classification systems, while in the exclusion criteria we do not include the comorbidity or diseases complication.

Results

Dr. Soekardjo Hospital has established Standard Operating Procedures (SOP) for disease coding, with the coding process outlined as follows: Utilize the ICD revision 10 second edition book as a dictionary after completing medical record compilation and verification, or assembling. Next, review the primary disease diagnosis (CM 4) written on the summary sheet as the definitive diagnosis. Subsequently, to find the appropriate diagnosis code corresponding to the one listed in the primary CM 4 diagnosis, refer to the ICD volume 3 book (letter index). Following that, consult the next ICD volume 1 book (tabulation list), write down the disease code with a minimum of four alphanumeric characters (plus one digit behind the dot) on the CM 4 medical record sheet, and then transfer it to CM 1.

Diabetes Mellitus cases were among the top 10 diseases in 2022 at Dr. Soekardjo Regional Hospital in Tasikmalaya City. The attending physician or responsible doctor determines the diagnosis. Analysis of the diabetes mellitus diagnosis code profile was conducted through observation of medical record documents. A comparison was made by comparing the coding results of Dr. Soekardjo Regional Hospital staff with the coding results by the researcher on the observation sheet based on ICD-10, ICD-11, and SNOMED CT. The accuracy of the ICD-10 code for the primary diagnosis of diabetes mellitus can be seen in Table 1.

Source: Primary data (2023)

Based on Table 1, the data indicates that out of a sample of 40 medical record documents, the majority of the codes are inaccurate, with 20 medical records (50%) showing diagnoses of Type 2 Diabetes Mellitus with complications such as Ulcer, Hypoglycemia, Hyperglycemia, Gastropathy, Gastroparesis, and Diabetic Ketoacidosis. Meanwhile, accurate codes were found in 20 medical record documents (50%), solely for cases of Type 2 Diabetes Mellitus.

TABLE 1
The percentage of primary diagnosis codes for diabetes mellitus.

No	Accuracy of Diagnosis Code	Frequency	%
1	Accurate	20	50
2	No Accurate	20	50
	Total	40	100

Source: Primary data (2023)

Based on Table 2, the data indicates that out of a sample of 40 medical record documents, the majority of the codes are appropriate, with 30 medical records (75%) showing correct diagnoses. However, 10 medical records (25%) show discrepancies.

TABLE 2
The concordance of primary diagnosis of diabetes mellitus based on ICD-11.

No	Accuracy of Diagnosis Code	Frequency	%
1	Accurate	30	75
2	No Accurate	10	25
	Total	40	100

The incorrect diagnoses were found in cases of Type 2 Diabetes Mellitus with unspecified ulcer complications in 5 medical records, and unspecified gastropathy complications in 5 medical records. It was observed that the staff were already familiar with ICD-11, as interviews with informants revealed that they were aware of its implementation.

Source: Primary data (2023)

Based on Table 3, the data shows that of the 40 samples of medical record documents, most of the codes were appropriate, with 0 medical records (0%) showing a discrepancy. In contrast, 40 medical records (100%) showed accurate codes. The obtained diagnosis entries were in agreement with those in SNOMED CT. Interviews regarding SNOMED CT revealed that staff members were knowledgeable about its use, according to informant responses.

TABLE 3
The concordance of primary diagnosis of diabetes mellitus based on SNOMED-CT.

No	Accuracy of Diagnosis Code	Frequency	%
1	Accurate	40	100
2	No Accurate	0	0
	Total	40	100

Based on the research findings, the identification of causes of inaccurate primary diagnosis codes in cases of diabetes mellitus is as follows:

1. Inaccurate primary diagnosis based on non-specificity:

Difficulty arises in determining the codification of the primary diagnosis of Diabetes Mellitus because the disease usually presents with several complications. This was revealed by a medical records officer informant at the hospital, stating that doctors only write "diabetes mellitus" in the medical records.

2. Illegible or unclear handwriting by doctors in the medical records:

Difficulty in codification occurs when there is illegible handwriting by doctors in the diagnosis of diseases. This was disclosed by an informant working in the medical records department of Dr. Soekardjo Regional General Hospital, stating that for diagnoses with illegible handwriting, the

staff would usually inquire with the casemix team rather than directly to the doctor, as the casemix team is accustomed to interpreting unclear diagnosis.

Discussion

Percentage of primary diagnosis codes based on ICD-10 in cases of diabetes mellitus

Research results with the primary diagnosis codes of inpatient cases of diabetes mellitus based on ICD-10 revealed that the majority of the codes were inaccurate, accounting for 50%, while accurate codes constituted 50%.

Based on this inaccuracy, the inaccuracies occurred in the primary codes with the following complications: Ulcer complications in 7 documents, Diabetic gastropathy complications in 5 documents, Diabetic gastroparesis complications in 3 documents, Hyperglycemia complications in 2 documents, Hypoglycemia complications in 4 documents, and Diabetic ketoacidosis complications in 1 document. As known, inaccuracies occur in the primary diagnosis of diabetes mellitus when accompanied by complications.

The highest cause of inaccuracy in the primary diagnosis codes is because the codes are only coded as ".9 Without complications." This occurs because coders still face difficulty in determining the existing complications to be combined or separated, and most doctors only mention Type 2 Diabetes Mellitus in the primary diagnosis of the case. Therefore, coders code Diabetes Mellitus in the 4th character using ".9 Without complications." These findings align with a study which identified the cause of code inaccuracy in the 4th character, where coding errors occurred because healthcare workers or coders often assign the 4th character with ".9" for complications [7].

Overview of Primary Diagnosis Codes Based on ICD-11 and SNOMED CT in Cases of Diabetes Mellitus

Overview of diabetes mellitus diagnosis codes based on ICD-11

The addition of over 40,000 new codes has made ICD-11 a more complex system, but it comes with its advantages, namely facilitating usage compared to previous versions. It offers a more contemporary coding system that integrates more easily with electronic health records. Being fully electronic aims to ease user experience [8].

Research findings on the primary diagnosis codes of diabetes mellitus at Dr. Soekardjo Regional General Hospital based on ICD-11 revealed that 25% of the primary diagnoses were not suitable for coding in ICD-11. The use of ICD-11 represents an upgrade aimed at improving term clarity for the general public and facilitating accurate coding of important details. Consequently [8], ICD-11 codes are more detailed or specific, requiring diagnoses to be more specific to obtain the correct code in ICD-11. The mismatched codes found are a result of insufficient specificity in documenting existing complications.

The suitability of the obtained codes in the detailed case examples of diabetes mellitus can be seen as follows Figures 1 and 2 :
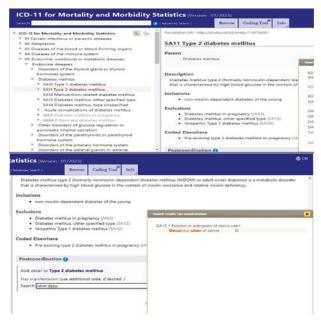

Figure 1) *Display of ICD-11 browser results.*

Anamnesa	: Pasein datang dengan keluhan terdapat luka pada punggung dan pasien berbaring terus
Diagnosis Utama	: *Diabetes Mellitus Type 2*
Komplikasi	: *Ulkus Diabetes Mellitus*
Kode Rumah Sakit (ICD 10)	: E11.9
Kode Peneliti (ICD 11)	:5A11/EB90.0 (*Type 2 diabetes mellitus/Diabetic skin lesions*)

Figure 2) *The difference between ICD 10 Code and ICD 11 code for diabetes mellitus type 2 with ulkus diabetes mellitus.*

Based on the case above, it is known that the primary diagnosis is Type 2 Diabetes Mellitus with complications of ulcers recorded in the medical records. However, the complications documented in the medical records are not appropriate because after codification in ICD-11 by the researcher, it was found that ulcer information alone cannot be coded, while for ulcer complications in ICD-11, specificity is required. This is mentioned by WHO (2020), stating that accurate important details are needed for coding in ICD-11. Some similarities found between ICD-10 and ICD-11 include alphanumeric codes, terminologies expressing causal relationships between conditions, and notable differences such as the positioning of letters and numbers within the codes. In ICD-10, the first position contains a letter, followed by numbers in the second, third, and fourth positions. In ICD-11, to distinguish it from ICD-10, letters are in the second position, numbers in the third position, and the fourth character is followed by a decimal point. The addition of forced numbers in the third character position is prohibited to spell out "unwanted words".

Description of Primary Diagnosis Codes Based on SNOMED CT in Cases of Diabetes Mellitus

The advantages of SNOMED CT include timely access and accurate recording of data without ambiguity, detailed patient care analysis, evidence-based research projects, effective use

for indexing, storing, and retrieving patient information for clinical purposes, and support for computerized medical record systems [9]. SNOMED CT itself will be linked or mapped to ICD-11, resulting in a SNOMED CT that is understandable and useful [4].

According to the research findings on the primary diagnosis codes of Diabetes Mellitus at Dr. Soekardjo Regional General Hospital based on SNOMED CT, it was found that 100% of the recorded primary diagnoses were suitable for coding in SNOMED CT. The primary diagnosis of diabetes mellitus cases written in medical records adheres to the SNOMED CT standard. SNOMED CT supports the development of comprehensive, high-quality clinical content in health records. It provides a standard way to represent clinical phrases captured by physicians [10].

The suitability of the obtained codes in the detailed case examples of diabetes mellitus can be seen as follows Figures 3 and 4 :
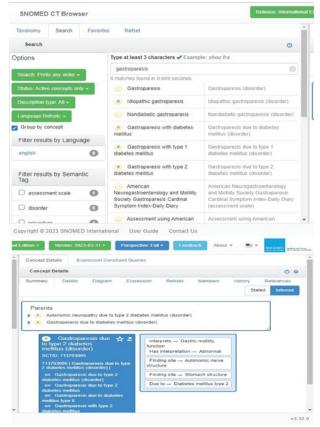

Figure 3) *Display of SNOMED CT results.*

Figure 4) *The difference between ICD 10 Code and ICD 11 code for diabetes mellitus type 2 with gastroparesis diabetes mellitus.*

Figure 5) *Sample of inaccurate primary diagnosis codes for diabetes mellitus type 2 with hypoglycemia.*

Based on the case above, it is known that the medical record indicates the primary diagnosis of Type 2 Diabetes Mellitus with the complication of Gastroparesis. The code obtained from SNOMED CT aligns with the diagnosis recorded by the doctor.

Identification of factors causing inaccurate primary diagnosis codes in cases of diabetes mellitus

The research conducted at Dr. Soekardjo Regional General Hospital in Tasikmalaya City regarding the causes of inaccurate primary diagnosis codes in cases of diabetes mellitus reveals that the inaccuracy lies in the fourth character related to complications. Doctors only recorded "diabetes mellitus" on the medical record summary sheet, and the doctor's handwriting was illegible.

a. **The primary diagnosis is inaccurate due to its lack of specificity.**

Inaccurate primary diagnosis codes are often found in the fourth character, with 20 medical records (50%) exhibiting this issue. Below is a detailed example of a case Figure 5:

Based on the case above, it can be observed that the code used is inaccurate because Type 2 Diabetes Mellitus with hypoglycemia should be coded as E11.6, but E11.9 was used for the diagnosis in this case. Type 2 Diabetes Mellitus without complications is indicated in the fourth character. However, this case has been identified as a patient with Type 2 Diabetes Mellitus with hypoglycemia, indicating that it should be included in the E10-E14 block for Diabetes Mellitus, specifically coded as E11.6 due to the indication of Type 2 Diabetes Mellitus with hypoglycemia.

The code E11.6 was selected because hypoglycemia is one of the complications of Type 2 Diabetes Mellitus as mentioned earlier or specifically stated. Meanwhile, hypoglycemia complications without a comma do not fall into categories 0 - 5, thus falling into the .6 category with other unspecified complications.

b. **The doctor's handwriting is illegible or unclear in the medical record summary**

Inaccurate primary diagnosis codes are identified based on this criterion, where unclear or illegible handwriting from doctors on the medical record summary affects the accuracy of the assigned codes. According to research by Qurbany in 2015

at RS Atmajaya, the codes given become less accurate due to unclear or illegible doctor's summaries. The study indicates that doctor's handwriting correlates with the accuracy of diagnosis coding [7].

c. Coding staff face difficulty determining complication codes

Coding staff in the medical records department most often verify Type 2 Diabetes Mellitus with code E11.9 when complications are recorded in patients. Therefore, they are not coding according to the provisions set in ICD-10, indicating that coding staff still face difficulty determining complication codes. The process of diagnosing coding must be done correctly and in accordance with the applicable provisions (ICD-10), and adjust the fourth digit to match the patient's complications.

d. Hospital management and patient care

Coding inconsistencies could impact the management of healthcare provider. It can influence the healthcare delivery efficacy, healthcare service delays, escalated administrative load, reduced healthcare quality [11]. Coding inaccuracies will give the bad impact for the patient's care. It can cause the pharmaceutical misadventures, allergenic responses, adverse drug reactions (ADRs) [12]. Inaccuracies in coding also is also leading the misinformation to deliver the patient quality healthcare [13].

There are several key strategies to promote the successful use of ICD 11. Fisrt, we must involve all expected end users widely within our organization [14]. Second, Accessibility of Transformation Tools crosswalk mapping files, translation software, and dual-coded datasets which it should be usable publicly [15].

Study Limitation

We were using the paper based Medical Records in this study. The Electronic Medical Record are being developed in the hospital. Registration menu is already built up, while another menu are still being processed. After completing the development of electronic medical records, we would like to conduct the study about the completeness of electronic medical records as the future research.

Conclusion

Accuracy of primary diagnosis codes for cases of diabetes mellitus based on ICD-10 at Dr. Soekardjo Regional General Hospital in Tasikmalaya City in 2022 from November to September showed that the majority of codes were accurate, with a percentage of 50%, while inaccurate codes also constituted 50%. The highest inaccuracy was found in cases with complications of diabetic ulcers, with 7 medical records.

Overview of the alignment of primary diagnoses for cases of diabetes mellitus based on ICD-11 and SNOMED CT at Dr. Soekardjo Regional General Hospital in Tasikmalaya City in 2022 from November to September: Based on ICD-11, most codes were aligned, with a percentage of 75%, while the remaining 25% were not aligned. The research findings revealed the highest discrepancies in cases with complications of diabetic ulcers and diabetic gastropathy. Based on SNOMED CT at Dr. Soekardjo Regional General Hospital in Tasikmalaya City in 2022 from November to September, the majority of codes were aligned, with a percentage of 100%. The diagnosis notes by doctors were in accordance with the standard clinical phrases of SNOMED CT.

The causes of inaccuracies in primary diagnosis codes for cases of diabetes mellitus are attributed to the need for more specific determination of complications, unclear or less specific primary diagnosis notes, and coding staff still encountering difficulties in determining complication codes.

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