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# Analysis of the Accuracy of Diagnosis Codes Based on ICD-10 with the Application of the 4th Character at the Puskesmas of Semarang City

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**Abstract.**The accuracy of the diagnosis code on the medical record document is used as a basis for making reports. If the diagnosis code is not properly coded then the resulting information will have low validation. The results of the initial survey at Puskesmas Genuk in the Top 10 of Disease in 2022, there are still many diagnosis codes that have not been coded until the 4th character. Objective is determine the accuracy analysis of disease diagnosis codes based on ICD-10 with the application of the 4th character of the fourth quarter at Puskesmas Genuk in 2022.This type of research is descriptive quantitative with a retrospective study approach. The primary data sources used are observation and interviews while the secondary data is from medical record data obtained from SIMPUS. The total population was 4,861 medical record data while the samples used were 98 with systematic random sampling techniques.Based on the results of research on 98 medical record data, the exact code is 21 (27.23%) while the incorrect code is 77 (72.77%). The inaccuracy of the diagnosis code is because the coding officer is not PMIK, the code is given only up to the 3rd character, there is no SOP for giving Disease Diagnosis Codes, not using ICD-10 but a list of SIMPUS codes. Conclusion are accuracy of the diagnosis code of 27.23% is much lower than the inaccuracy, coding officers from PMIK should be conducted, Training on Giving Disease / Action Coding, Diagnosis Codes at SIMPUS are given keys so that coders can choose a specific code, SIMPUS plus facilities for PMIK officers to validate coding after service

**Keywords:** accuracy, diagnosis code, ICD-10, 4th character

## I.BACKGROUND

To realize an effective, efficient, and accountable community health center in organizing quality and sustainable first-level health services by paying attention to patient and community safety, it is necessary to regulate the organization and work relationship of the community health center.[1] The accuracy of the diagnosis code in the medical record document is used as the basis for making reports. If the patient's diagnosis code is not accurately, the information produced will have a low level of data validation, this will certainly result in inaccuracy in making reports, for example outpatient morbidity reports, and reports of the top ten diseases.[2]Puskesmas is a health service facility that organizes first-level community health efforts (UKM) and individual health efforts (UKP), by prioritizing promotive and preventive efforts in its work area. In carrying out the UKP function, the community health center is authorized to carry out the organization of medical records.[1]

Medical Records are documents containing patient identity data, examinations, treatments, actions, and other services that have been provided to patients. Electronic Medical Records are Medical Records created using an electronic system intended for organizing Medical Records.[3]Generally, the three-character category is divided into subcategories with the fourth number behind the dot, sometimes up to ten subcategories. These four-character subcategories are used as needed, to identify different anatomical locations or varieties if the three-character category is a single disease, and to indicate individual diseases if the category is for a group of diseases.

When a four-character subdivision applies equally to a series of three-character categories in a range, it is usually only made in one list at the beginning of the range, and applies equally to each three-character category in the range.[4] Factors that affect the accuracy of diagnosis codes and actions include: Man (work experience of less than three years can affect the accuracy of disease diagnosis codes, education is not from the medical record profession but from other health professions, training where never attended training related to coding competency and use of ICD-10). Money (funding at the health center is to finance the salaries of workers and equipment to be purchased). Material (diagnosis, there are no problems related to coding disease diagnoses, knowledge of officers about diagnosis codes, lack of knowledge of coders about the procedures for using ICD-10, writing disease diagnoses does not write the patient's disease diagnosis in the medical record file). Machine (Included in the machine medical record file and SIMPUS). Method (Determining the disease diagnosis code only uses a tabulation list as a reference in determining the disease diagnosis code, SOP has not been created for coding).[5]

Based on previous research from Irmawati, Nadelia Nazillahtunnisa (2019) the results of the study showed that out of 98 DRMs from 3 clinics at the Puskesmas Kagok, the accuracy of the diagnosis code was 32% accurate and 68% inaccurate. The causes of inaccuracy in the disease diagnosis code were lack of specification/wrong writing of the 4th digit and errors in providing the diagnosis code or not in accordance with ICD-10. The characteristics of the officers providing the diagnosis code did not have a medical records background, and did not have special training on ICD 10.[6]Based on an initial survey at the Puskesmas Genuk, Semarang City on the Top 10 Diseases in Quarter III of 2022, 96.86% of disease diagnosis codes did not use the 4th character in accordance with ICD-10. Based on the problems that have been explained, the researcher is interested in conducting this study.

## II.METHOD

The type of research used is Quantitative Descriptive Research with a Retrospective Study approach. The research was conducted at the UPTD Genuk Health Center, Semarang City in April - May 2023. The population of this study was 4,861 medical record data with a sample of 98 medical record data calculated using the Slovin formula totaling 98 medical records.[7] Sample selection used systematic random sampling.[8] Data collection used Observation and Interview techniques using research instruments in the form of observation guidelines, interview guidelines, and checklists. The data processing techniques used were collecting, data examination, classification, comparison, percentage and data presentation with data analysis, namely descriptive statistics.[9]

## III.RESULTS AND DISCUSSION

**General Description of UPTD Genuk Health Center, Semarang City**

Puskesmas Genuk Semarang is geographically located in an urban area with easy access using public transportation, located in the eastern part of Semarang City, including in the Genuksari Village Area, Genuk District, Semarang City. The Working Area of Puskesmas Genuk is 16,021 km2, and the population is 45,861 people consisting of 7 Villages in Genuk District, including: Genuksari Village, Gebangsari Village, Muktiharjo Lor Village, Banjardowo Village, Terboyo Wetan Village, Terboyo Kulon Village, Trimulyo Village. In order to realize a Puskesmas working area, Puskesmas Genuk is supported by a network of Puskesmas services and Puskesmas networks. The Puskesmas Service Network consists of two Assistant Health Centers, namely Puskesmas Pembantu Gebangsari and Puskesmas Pembantu Muktiharjo Lor.[10]The medical record unit Puskesmas Genuk, Semarang City consists of patient registration, filling, and reporting sections which are carried out flexibly.

**Number of Cases of the 10 Biggest Diseases in Quarter IV at the Genuk Health Center UPTD, Semarang City in 2022**

Based on the Results of the Case Report Index of the 10 Biggest Diseases in Quarter IV at the Puskesmas Genuk, Semarang City in 2022, the following are:

**Table 1**.Table of 10 Biggest Diseases in Quarter IV 2022

| No | The type of disease | Quantity |
|---|---|---|
| 1 | *ISPA* | 2.723 |
| 2 | *Hipertensi Esensial* | 1.189 |
| 3 | *Acute Pharyngitis* | 873 |
| 4 | *Acute Nasopharyngitis [common cold]* | 476 |
| 5 | *Non Insulin Independent Diabetes Mellitus* | 467 |
| 6 | *Myalgia* | 360 |

| No | The type of disease | Quantity |
|---|---|---|
| 7 | *Gastritis* | 298 |
| 8 | *Gout* | 261 |
| 9 | *Tension Type Headache* | 256 |
| 10 | *Diarrhoea and Gastroenteritis* | 244 |
| | Total | 7.147 |

After conducting an examination of 10 types of diseases in the top 10 diseases of Tribulan IV, it was found that there were only 6 types of diseases that used the application of the 4th character which can be seen in table 2.

**Table 2.** Table of 10 Biggest Diseases with the Application of the 4th Character of Tribulan IV

| No | The Type of Disease | Quantity |
|---|---|---|
| 1 | *ISPA* | 2723 |
| 2 | *Acute Pharyngitis* | 873 |
| 3 | *Non Insulin Independent Diabetes Mellitus* | 467 |
| 4 | *Gastritis* | 298 |
| | *Tension Type Headache* | 256 |
| 6 | *Diarrhoea and Gastroenteritis* | 244 |
| | Total | 4.861 |

The Number of Cases of the 10 Biggest Diseases in Quarter IV at Puskesmas Genuk, Semarang City in 2022 is 7,147 medical record data, while for the 10 biggest cases of diseases using the 4th character, 6 types of diseases were obtained with 4,861 medical record data.

**Percentage of Accuracy of Diagnosis Codes Based on ICD-10 with the Application of the 4th Character on the Top 10 Diseases of Tribulan IV at Puskesmas Genuk, Semarang City in 2022**

Based on the recapitulation results of the checklist that has been carried out by the researcher, the percentage of accuracy of the diagnosis code based on ICD-10 with the application of the 4th character on the top 10 diseases of Tribulan IV at Puskesmas Genuk, Semarang City in 2022 can be produced in table 3 below:

**Table 3**. Table of Percentage of Accuracy of Diagnosis Codes

| No | Type of Disease | Accurate | | Inaccurate | |
|---|---|---|---|---|---|
| | | Jml | % | Jml | % |
| 1 | *ISPA* | 8 | 14,5 | 47 | 85,5 |
| 2 | *Acute Pharyngitis* | 5 | 27,8 | 13 | 72,2 |
| 3 | *NIDDM* | 4 | 44,4 | 5 | 55,6 |
| 4 | *Gastritis* | 1 | 16,6 | 5 | 83,33 |

| No | Type of Disease | Accurate | | Inaccurate | |
|---|---|---|---|---|---|
| | | Jml | % | Jml | % |
| 5 | *TTH* | 1 | 20 | 4 | 80 |
| 6 | *Diarrhoea and Gastroenteritis* | 2 | 40 | 3 | 60 |
| Average | | | 27,23 | 72,77 | |

The Percentage of Accuracy of Diagnosis Codes based on ICD-10 with the Application of the 4th Character in the 10 Biggest Diseases of Quarter IV at Puskesmas Genuk, Semarang City in 2022 is 27.23% lower than the inaccuracy of the diagnosis code, which is 72.77%. The results of this study are in line with previous research, namely the Laili Rahmatul Ilmi Research (2017) at Puskesmas Pengasih I with a diagnosis code inaccuracy rate of 74% greater than the exact figure, which is 26% and at Puskesmas Pengasih II, the inaccuracy rate reached 70% while the exact figure was 30%.[11]Research by Irmawati, Nadelia Nazillahtunnisa (2019) with a diagnosis code inaccuracy rate of 68% higher than the accuracy rate of 32%.[6] and Research by Ayu Sofiana, M. Afif Rijal Husni (2020) the inaccuracy rate was 64.7% higher than the accuracy rate of 35.5%.[12]Meanwhile, research by Nur Kamilatuz Zahrah Iskandar, Edy Susanto (2018) the inaccuracy rate was lower at 43% compared to the exact rate of 57%.[13]

**Procedure for Providing Diagnosis Codes at Puskesmas Genuk, Semarang City**

Based on the results of observations and interviews conducted by researchers, the procedure for providing diagnosis codes at Puskesmas Genuk, Semarang City is as follows:

1.The officer providing the diagnosis code enters the SIMPUS application then selects the poliklinik menu, selects the visit, selects the date, selects the intended poliklinik, then clicks on medical records

2.After the list of names of patients who are being treated appears, select the patient's name and click fill in medical record.

3.After the poliklinik medical record page appears, the anamnesis, consciousness, temperature, BB/TB, blood pressure, respiratory rate, heart rate, abdominal circumference and physical examination sections that have been filled in by the nurse previously will be visible. Then the doctor will fill in the action, diagnosis, medication, referred/not, and education to the patient

4.The officer will immediately provide a diagnosis code when the doctor already understands the diagnosis code for the type of disease that is often found in the health center, but if the doctor does not know the diagnosis code, the doctor will click on the diagnosis which is then connected to the list of diagnosis codes and their diagnoses, then the doctor will search using the keyword of the diagnosis name and select the correct/specific diagnosis code. Then fill in the diagnosis status old/new

5.The officer fills in the medication, action and name of the examining officer

6.After all is filled in, click save. All medical record data has been saved.

7.The step of providing the diagnosis code in the polyclinic has been completed, but there has been no validation of the diagnosis code carried out by PMIK personnel.

Procedure for Providing Diagnosis Codes at Puskesmas Genuk, Semarang City does not yet have an SOP regarding the provision of diagnosis codes. The provision of diagnosis codes is carried out by doctors, dentists, or midwives when serving patients, the diagnosis column in SIMPUS is directly connected to the existing diagnosis code, so officers who provide diagnoses also provide diagnosis codes, either write them directly when they have memorized/often used, or seek help through the ICD-10 diagnosis code list in SIMPUS. In the list of diagnosis codes in SIMPUS, the code with the 3rd character can be clicked (selected) even though below it there is a code with a more specific 4th character. And in the SIMPUS application, if the diagnosis code is not filled in, the polyclinic medical record page cannot be saved. The results of this study are in line with previous studies, namely Nur Kamilatuz Zahrah Iskandar, Edy Susanto (2018), there is no SOP regarding coding and the coding process using tabulation.[13] Riska Adilah's research (2020) There has been no SOP regarding coding and how to determine the disease diagnosis code, only using the tabulation list as a reference in determining the disease diagnosis code.[5] Meanwhile, research from Ayu Soviana M. Afif Rijal Husni (2020) already has a Coding SOP but does not use manual or

electronic ICD, but uses a smart book that has been included in the SOP.[12] Factors Related to Inaccuracy of Diagnosis Codes at the Puskesmas Genuk, Semarang City

Based on the results of interviews regarding the factors that influence the inaccuracy of diagnosis codes can be seen in table 4.

**Table 4** Table of Factors Influencing Inaccuracy of Diagnosis Codes at Puskesmas Genuk Semarang City

| No | Factor | Result |
|---|---|---|
| 1 | *Man* | a. Officers who provide diagnosis codes are general practitioners, dentists, and midwives<br>b. The education of officers who provide diagnosis codes is doctor profession, dentist profession, and D-3/D-4 midwifery.<br>c. The skills/abilities possessed by officers who provide diagnosis codes (General Practitioners) are: Doctor AR has never attended disease coding training, but was taught the basics of ICD-10 when he was in college for the Doctor Profession<br>d. Doctor R has attended ICD-10 training organized by BPJS in 2014 |
| 2 | *Money* | Financing of network and server or computer services |
| 3 | *Material* | Materials or materials used to assist in providing diagnosis codes before 2014 using the ICD-10 book, but now using the ICD-10 diagnosis code list in SIMPUS.<br>Doctors have difficulty distinguishing specific diagnosis codes<br>Incompleteness of the 4th character diagnosis code in the diagnosis code list in SIMPUS |
| 4 | *Machine* | The SIMPUS application is used for all services to patients who seek treatment at health centers, both general, free, and BPJS<br>The polyclinic medical record page cannot be saved if the diagnosis code is not filled in.<br>The P-Care application is used for all services to BPJS patients |
| 5 | *Method* | Puskesmas Genuk, Semarang City does not have an SOP on providing Diagnosis Codes Based on ICD-10.<br>The method of providing diagnosis codes at Puskesmas Genuk, Semarang City is that the diagnostic code givers directly provide the diagnosis code if they have memorized |

| No | Factor | Result |
|---|---|---|
| | | the code, but if they have not, they search for the diagnosis code through the list of diagnosis codes in SIMPUS, using the keyword of the diagnosis name. |

Man is the human resource that provides diagnosis codes at Puskesmas Genuk, Semarang City, not from PMIK but from doctors, dentists and midwives. With a Doctor's Professional education, dentist profession and D3/D4 Midwifery. Meanwhile, for the expertise/skills regarding disease coding based on ICD-10, Doctor AR was only obtained in college, and Doctor R had attended ICD-10 diagnosis code training around 2014 during the early days of BPJS. The results of this study are in line with previous studies, namely Research by Irmawati, Nadelia Nazillahtunnisa (2019) the characteristics of officers providing diagnosis codes do not have a medical records background, and do not have special training on ICD-10.[6] Research by Ayu Soviana, M. Afif Rijal Husni (2020) the coding process carried out by nurses is not in accordance with the ICD-10 guidelines.[12] Research by Nur Kamilatuz Zahrah Iskandar, Edy Susanto (2018), the diagnostic code is given by doctors and nurses.[13] Research by Riska Adilah (2020), education is not from the medical record profession but from other health professions, work experience of less than three years, have attended training related to coding competency and use of ICD-10.[5] One of the PMIK Professional Standards is disease codification, so the job description of coding officers should be carried out by PMIK.[14]

Money is the cost incurred for organizing medical records that affects the accuracy of the use of diagnostic codes. Costs used for network financing and server or computer services. The results of this study are different from previous research, namely Riska Adilah (2020) Financing at health centers is to finance salaries for workers and equipment to be purchased.[5] Material is that affects the process of providing diagnostic codes, such as the ICD-10 book. At Puskesmas Genuk, Semarang City does not use the ICD-10 book but uses the list of diagnostic codes in the SIMPUS application. However, doctors have difficulty distinguishing specific diagnostic codes, and there are diagnostic codes that do not have the 4th character in the list of diagnostic codes in SIMPUS. The results of this study are different from previous research, namely the research of Ayu Soviana, M. Afif Rijal Husni (2020) in the coding process did not use manual or electronic ICD but rather using smart books.[11] Research by Nur Kamilatuz Zahrah Iskandar, Edy Susanto (2018) used tabulation and unclear and specific doctor's writing.[12]Machine is a technology/information system that affects the accuracy of the use of diagnosis codes.[15,16] Applications related to diagnosis codes at Puskesmas Genuk, Semarang City are SIMPUS and P-Care. In the SIMPUS application on the poly medical record page, it cannot be saved if the diagnosis code is not filled in. and there is no feature for PMIK to validate after service so that the diagnosis code is correct according to ICD-10. The results of this study have the same name as the system used in previous research, namely Riska Adilah's research (2020) SIMPUS.[5]

Method is a way of working or SOP that affects the provision of diagnosis codes. At the Puskesmas Genuk, Semarang City, there is no SOP regarding the provision of disease diagnosis codes. There has been no validation of the diagnosis code by PMIK personnel, there should be validation by PMIK which is reinforced by the Policy of the Head of the Health Center or the Health Office so that the diagnosis code is in accordance with ICD-10 for more accurate reporting. The results of this study are in line with previous studies, namely research from Ayu Soviana, M. Afif Rijal Husni (2020) in the coding process did not use manual or electronic ICD, but used a smart book that had been included in the SOP which regulates diagnosis coding.[11] Research by Nur Kamilatuz Zahrah Iskandar, Edy Susanto (2018) there is no SOP regarding coding and the coding process using tabulation.[12] Research by Riska Adilah (2020) there is no SOP, Determining the disease diagnosis code only uses a tabulation list as a reference in determining the disease diagnosis code.[5]

**Accuracy of Disease Diagnosis Codes Based on ICD-10 with the Application of the 4th Character on the Top 10 Diseases of Tribulan IV at Puskesmas Genuk, Semarang City in 2022**

Based on the recapitulation results of the checklist, the accuracy of the diagnosis code figures based on ICD-10 with the application of the 4th character on the top 10 diseases of Tribulan IV at Puskesmas Genuk, Semarang City in 2022 can be seen in the following table 5.

**Table 5**.Analysis Table of Accuracy of Disease Diagnosis Code Figures

| No | Jenis | Kode SIMPUS | Kode ICD-10 | Tepat | Tidak Tepat |
|---|---|---|---|---|---|
| 1 | *ISPA* | J06 | J06.9 | 0 | 47 |
| | | J06.9 | J06.9 | 8 | 0 |
| 2 | *Acute Pharyngitis* | J02 | J02.9 | 0 | 13 |
| | | J02.9 | J02.9 | 5 | 0 |
| 3 | *NIDDM* | E11 | E11.3 | 0 | 1 |
| | | E11 | E11.8 | 0 | 2 |
| | | E11 | E11.9 | 0 | 2 |
| | | E11.9 | E11.9 | 4 | 0 |
| 4 | *Gastritis* | K29 | K29.7 | 0 | 4 |
| | | K29 | K30 | 0 | 1 |
| | | K29.7 | K29.7 | 1 | 0 |
| 5 | *Tension Type Headache* | G44 | G44.2 | 0 | 4 |
| | | G44.2 | G44.2 | 1 | 0 |
| 6 | *Diarrhoea and Gastroenteritis* | A09 | A09.9 | 0 | 3 |
| | | A09.9 | A09.9 | 2 | 0 |
| Jumlah | | | | 21 | 77 |

Accuracy of Disease Diagnosis Codes Based on ICD-10 with the Application of the 4th Character on the Top 10 Diseases of Tribulan IV at Puskesmas Genuk, Semarang City in 2022 is 21 medical record data (27.23%). The low accuracy rate of the diagnosis code is due to the fact that the 4th character has not been applied to the diagnosis code. If traced in the ICD-10 book in volume 3, then the correct diagnosis code can be found with the following steps:[17]

1.Acute Upper Respiratory Infections (ISPA)
Leadterm: Infection
Infection
-Respiratory (tract) NEC J98.0
--Upper (acute) NEC J06.9
2.Acute Pharyngitis
Leadterm: Pharyngitis
Pharyngitis (acute) (catarrhal) (gangrenous) (invective) (subacute) (suppurative) (ulcerative) J02.9
3.Non-insulin Dependent Diabetes Mellitus (NIDDM)
Leadterm: Diabetes
Diabetes, diabetic (mellitus) (controlled) (familial) (severe) E14.-
- Non-insulin-dependent (of the young) E11.-
Because the point dash symbol ( .- ) appears, the character must be searched for 4th in ICD-10 Volume 1.
In volume 1, the correct diagnosis code can be found as follows:
a.Non-insulin Dependent Diabetes Mellitus with Retinopathy, then the appropriate diagnosis code is H36.0* E11.3†
b.Non-insulin Dependent Diabetes Mellitus with Hypertension, then the appropriate diagnosis code is E11.8

c.Non-insulin Dependent Diabetes Mellitus unspecified, then the appropriate diagnosis code is E11.9
4.Gastritis
Leadterm: Gastritis
Gastritis (simple) K29.7
5.Tension-Type Headache
Leadterm: Tension
Tension
- Headache G44.2
6.Diarrhoea and Gastroenteritis
Leadterm: Diarrhea
Diarrhea, diarrheal (disease) (infantile) A09.9
7.Gastroenteritis Diagnosis
Leadterm: Gastroenteritis
Gastroenteritis (acute) (see also Enteritis ) A09.9

In addition to providing diagnosis codes only up to the 3rd character, the inaccuracy of the diagnosis code is also influenced by the officer giving the diagnosis code not being a PMIK officer but from a doctor, dentist and midwife, the person giving the diagnosis code also does not have training on providing diagnosis codes, this health center also does not have an SOP on providing diagnosis codes, in providing diagnosis codes also does not use a book ICD-10 or E-ICD-10 but a list of diagnosis codes in the SIMPUS Application.The results of this study are in line with previous research, namely research from Ayu Soviana, M. Afif Rijal Husni (2020) The use of diagnosis codes only uses up to the third character.[11] While the results of research from Irmawati, Nadelia Nazillahtunnisa (2019) The cause of inaccuracy in disease diagnosis codes is lack of specification/incorrect writing of the 4th digit and errors in providing diagnosis codes or not in accordance with ICD-10.[6]

## IV. CONCLUSIONS AND SUGGESTIONS

The Percentage of Accuracy of Diagnosis Codes Based on ICD-10 with the Application of the 4th Character in the 10 Biggest Diseases of Quarter IV at the Genuk Health Center UPTD, Semarang City in 2022 is 27.23%, much lower than the inaccuracy rate of the diagnosis code, which is 72.77%. Factors Related to Inaccuracy of Diagnosis Codes are the Human Resources/HR who provide the diagnosis code are not from the Medical Recorder and Health Information and do not have training on disease codification based on ICD-10, money factor is the cost used for network financing and server or computer services, material factor is not use the ICD1-0 book but uses the list of diagnosis codes in the SIMPUS application, machine factors are SIMPUS and P-Care that cannot be saved if the diagnosis code is not filled in, method factor is not having an SOP regarding the provision of disease diagnosis codes.It is better if the provision of disease diagnosis codes and actions is carried out by D-3/D-4 Medical Records and Health Information personnel, Training/Workshops/Seminars related to the Provision of Diagnosis Codes using ICD-10, create an SOP regarding the provision of disease diagnosis codes based on ICD-10. It is better if in the ICD-10 list in SIMPUS in the Diagnosis Code that uses the 4th character in the 3rd Character Diagnosis Code cannot be selected, so that you can choose a more specific Diagnosis Code so that reporting will be more accurate. There should be a policy from the Health Office for validation of the diagnosis code by PMIK after the completion of the service supported by the validation feature in SIMPUS

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