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Relationship between specificity of diagnosis writing and accuracy of chronic kidney disease codes

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Abstract: Inaccurate diagnostic coding in health services often results from incomplete or unclear diagnostic documentation, particularly in chronic conditions like kidney disease. This study aimed to examine the relationship between the specificity of diagnostic writing and the accuracy of chronic kidney disease (CKD) codes in medical records. An analytical retrospective study was conducted at a tertiary hospital, analyzing 110 medical record documents with CKD diagnoses, selected through total sampling from January to December 2024. Data were analyzed using the chi-square test to evaluate the association between diagnostic writing specificity (independent variable) and CKD code accuracy (dependent variable). Results revealed that 78 documents (70.9%) had specific diagnostic writing, while 32 (29.1%) were non-specific. Accurate codes appeared in 98 documents (89%), with 12 (11%) inaccurate. The chi-square test yielded a p-value <0.05, confirming a significant relationship: more specific diagnostic writing enhances code accuracy. These findings highlight the critical role of precise documentation in healthcare coding. To reduce errors, physicians and coding officers should improve ICD-10 comprehension through regular training, strengthen interdisciplinary communication, and adopt standardized documentation protocols, ultimately enhancing diagnostic coding quality and patient care outcomes.

Keywords: *Chronic kidney disease, Code accuracy, Diagnosis, ICD-10, Specificity.*

1. Introduction

The accuracy of diagnostic coding is pivotal in the healthcare system, influencing various aspects of clinical data management, decision-making, and health insurance claims. Inaccurate coding can lead to significant financial repercussions, demonstrating disparities in resource allocation and impacting reimbursement policies. For example, the Indonesian healthcare system, particularly with its BPJS (Badan Penyelenggara Jaminan Sosial), has been critiqued for its reliance on accurate coding for reimbursement of healthcare services, highlighting that coding inaccuracies can result in wrongful payment denials and financial strain on health institutions [1]. Similarly, the complexity of global insurance systems, which often rely on International Classification of Diseases (ICD) codes, necessitates high accuracy to mitigate risks associated with incorrect reimbursement processes [2].

The global prevalence of chronic kidney disease (CKD) underscores challenges in coding diagnoses according to ICD-10 standards. CKD has reached concerning levels worldwide, affecting millions and posing significant public health challenges [3]. However, variability in coding practices often leads to underreporting or misclassification of CKD. One study pointed out that the presence of diagnostic uncertainty complicates accurate coding and distorts epidemiological data regarding CKD prevalence [4]. Under these circumstances, establishing new codes or refining existing ones to capture such uncertainties in CKD diagnosis could vastly improve the quality of health data reported.

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Common issues in medical documentation, such as the lack of specificity in written diagnoses by healthcare professionals, contribute directly to coding errors. Documentation that fails to provide sufficient detail can lead to misclassification by coding personnel, particularly when converting physician notes into standardized codes like ICD-10 [5]. This lack of specificity complicates the coding process and hampers patient care by masking the true nature of health conditions, thus affecting treatment decisions [6]. The implications of such documentation errors are profound, often leading to conflicts in clinical management and hindering quality improvement initiatives focused on patient safety [7].

The ramifications of inaccurate diagnostic codes are manifold in terms of healthcare quality, cost implications, and patient safety. Erroneous coding can dramatically inflate healthcare costs due to unnecessary procedures or interventions triggered by misdiagnosed patient conditions [2]. Additionally, it poses a threat to patient safety by potentially leading to inappropriate treatment or failure to deliver the correct interventions warranted by the true nature of the patient's condition[7]. This undermines trust in healthcare systems and brings forth ethical implications surrounding patient care standards [8]. To enhance the accuracy of coding, healthcare systems globally must prioritize education and training for medical professionals on the importance of precise documentation. Furthermore, integrating technology with structured protocols can serve as an effective strategy to minimize diagnostic errors [9]. By emphasizing these elements within clinical practice, healthcare providers can improve the quality of care delivered to patients and ensure a more equitable distribution of healthcare resources across systems and nations [10].

This study focuses on the importance of accurate diagnosis coding in the health system, which not only affects the quality of medical services but also plays a role in cost management and resource allocation. Clear and specific medical documentation, especially in writing CKD diagnoses, is essential to ensure that the diagnosis codes used are in accordance with the ICD-10 guidelines. Inaccuracy in coding can lead to errors in patient management and inappropriate clinical decision making. Therefore, this study aims to analyze the relationship between the specificity of physicians' diagnosis writing and the accuracy of CKD diagnosis codes based on ICD-10, with the hope of improving the quality of medical documentation and more accurate coding in clinical practice.

2. Literature Review

2.1. Coding of Diagnosis in Healthcare

Diagnosis coding based on the International Classification of Diseases, Tenth Revision (ICD-10), is crucial for health information management, as it provides a standardized framework for classifying and managing health conditions accurately. This coding system is essential for communication across various healthcare settings, supporting accurate billing, public health monitoring, and research [11]. Accurate diagnostic coding plays a vital role in clinical and administrative decision-making by influencing patient care, resource allocation, and health policy development [12]. It also impacts epidemiological studies and public health initiatives, such as those aimed at CKD prevention and management [13]. Furthermore, healthcare managers rely on coded data for evaluating clinical performance and resource utilization, enhancing operational efficiency, and ensuring that clinical guidelines and treatment pathways lead to better patient outcomes [14].

However, despite its critical function, diagnosis coding is fraught with challenges that can compromise its effectiveness. Common issues include coder errors, incomplete documentation, and a lack of adequate training among coding professionals [12]. For instance, a study of obstetric cases revealed that while 68% of diagnoses were coded accurately, a significant percentage showed inaccuracies stemming from poor documentation practices [15]. Moreover, insufficient training can lead to misunderstandings of coding guidelines and nuances in documentation, resulting in misclassification of health conditions [11]. This is particularly pronounced in complex cases where specificity in diagnosis writing is crucial for accurate coding, such coding inaccuracies not only

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undermine the quality of healthcare data but also adversely impact secondary applications like resource allocation and clinical decision-making [12].

Addressing these challenges requires comprehensive training programs tailored to enhance coding practices and improve documentation quality. In tandem, healthcare organizations must invest in systems and technologies that automate coding processes, thereby reducing manual errors and increasing overall efficiency [12]. Moreover, cultivating a culture of accuracy and accountability in documentation is crucial for driving effective health information management. With these strategies in place, the healthcare system can ensure that accurate diagnosis coding serves its intended purpose of enhancing clinical and administrative operations, ultimately leading to better health outcomes.

2.2. Specificity of Writing a Diagnosis

Diagnostic writing specificity refers to the precision and clarity with which clinicians articulate diagnoses in medical records, which is crucial for accurate coding under the ICD-10 standards. Specificity involves providing detailed descriptions of a patient's condition, which is essential for accurate coding by clinical coders [16]. Detailed ICD-10 codes correspond to specific diseases, injuries, and health issues, ensuring healthcare data accurately reflects patient health and treatment needs. Poor specificity can result in misclassifications, affecting clinical decisions, healthcare policy, and epidemiological research [17]. Therefore, enhancing diagnostic writing specificity is vital for reducing ICD-10 coding inaccuracies. Key factors influencing specificity include the clarity of medical terminology used by clinicians. Using precise and widely understood terms increases the likelihood of accurate coding [17]. Additionally, clinicians must receive adequate training in coding practices to understand how their documentation impacts coding outcomes. Discrepancies often arise from varied terminologies and communication barriers between physicians and coders [18, 19] highlighting the importance of effective communication to align understanding and reduce miscommunication regarding a patient's condition. Addressing these factors can significantly improve diagnostic writing clarity and ICD-10 coding accuracy.

Evidence from previous studies underscores the critical impact of diagnostic specificity on coding accuracy. For instance, Jalal et al. demonstrated that improved specificity in diagnosing chronic kidney disease (CKD) correlated with enhanced coding accuracy, highlighting the need for precise documentation in clinical settings [20]. Furthermore, studies indicate that more explicit documentation practices result in coding sensitivities and specificities that better reflect accurate disease prevalence [11]. Clinical audits have repeatedly shown that incomplete or vague documentation significantly contributes to coding errors, emphasizing the direct relationship between writing specificity and diagnostic coding [18]. These findings reinforce the notion that cultivating specific diagnostic writing habits can minimize common coding challenges faced in healthcare settings. In conclusion, the specificity of diagnostic writing is integral to achieving accurate ICD-10 coding. Strong relationships exist between the clarity of medical terminology, the quality of communication between clinicians and coders, and training practices that enhance diagnostic writing.

2.3. CKD Diagnosis Code Accuracy

Chronic Kidney Disease (CKD) is a progressive condition marked by the gradual decline in kidney function, classified into five stages based on glomerular filtration rate (GFR) and albuminuria levels. Stage 1 involves mild kidney damage with a normal or elevated GFR (>90 mL/min), while stage 5, or end-stage renal disease (ESRD), represents severe kidney impairment (eGFR <15 mL/min), often requiring dialysis or a kidney transplant [21]. The ICD-10 system provides specific codes (N18.1 to N18.9) for these stages, facilitating precise clinical reporting and statistical analysis [22, 23]. However, challenges remain in the accurate coding of CKD, particularly due to nonspecific diagnoses where healthcare providers document only "CKD" without indicating its stage. This lack of detail leads to significant inaccuracies in coding, which underrepresents CKD prevalence in administrative datasets. Research shows that nonspecific documentation contributes to coding errors, affecting both clinical

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decision-making and research data [16]. For example, the CaReME study revealed that only 34% of laboratory-confirmed CKD cases were accurately coded, underscoring systemic issues in the diagnostic documentation process [23].

A review of existing literature identifies several factors contributing to inaccuracies in CKD coding. First, considerable research has shown that incomplete documentation by healthcare providers leads to discrepancies in coding practices. For instance, one study observed that less than half of the patients with lab-confirmed CKD were accurately represented in their medical records, affecting the overall clinical awareness of CKD within the patient population [23]. Furthermore, physician training in coding practices and effective communication between clinicians and coders significantly influence the precision of diagnostic writing [3, 24]. The interactions between healthcare professionals and coders play a vital role, as ambiguous notes can lead to misinterpretation during the coding process.

Previous research on CKD coding accuracy highlights several factors contributing to inaccuracies. Jalal et al. found that the transition from ICD-9 to ICD-10 did not sufficiently improve the identification of patients with rapidly progressing CKD stages. A population-based study revealed low sensitivity but higher positive predictive values for CKD coding under ICD-10, with significant variation across different patient groups [25]. These findings underscore the need for continuous improvements in documentation practices and coding education to enhance the accuracy of CKD diagnosis coding. Such efforts are crucial for improving clinical practices, healthcare funding, and policy-making, ultimately impacting patient care outcomes. In conclusion, while ICD-10 offers a structured approach to CKD coding, the issues of nonspecific diagnoses and incomplete documentation highlight the need for focused efforts to improve diagnostic writing specificity in healthcare settings.

3. Method

This study uses an analytical research design with a retrospective approach to analyze medical record documents of patients diagnosed with chronic kidney disease (CKD) at Waras Wiris Hospital, Boyolali [26]. The retrospective approach was chosen because this study aims to analyze existing data, namely medical record documents containing a diagnosis of CKD [27]. By using this approach, researchers can see the relationship between the specificity of writing a diagnosis and the accuracy of the CKD diagnosis code without the need for direct intervention on patients, because the data analyzed has been recorded in the previous period, namely 2023.

The population of this study consisted of all medical record documents of patients diagnosed with CKD at Waras Wiris Hospital, Boyolali during 2023. Documents recording the diagnosis of CKD were the main focus of this study because of their relevance to the aim of assessing the specificity of diagnosis writing and the accuracy of diagnosis codes based on ICD-10. This study used the total sampling method, which means that all documents that met the inclusion criteria were included in the study sample. Thus, the total sample used in this study was 110 medical record documents recording the diagnosis of CKD.

Table 1.
Inclusion and exclusion criteria.

Criteria	Description
Inclusion	- Patient medical record documents that record a CKD diagnosis according to ICD-10.
	- Complete medical documents that can be used for analysis.
Exclusion	- Incomplete documents or documents that do not comply with ICD-10 standards.
	- Medical records that do not include a CKD diagnosis.

Data collection in this study was carried out through three main methods: interviews with medical record officers or doctors to understand the obstacles to writing a specific CKD diagnosis, document observation to analyze whether the CKD diagnosis includes the stage according to ICD-10, and ICD-10 code checking to verify the accuracy of the diagnosis code in medical documents. The instruments used included a diagnosis specificity analysis form to categorize the CKD diagnosis as specific or non-specific,

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and an interview guide to explore obstacles in writing a non-specific diagnosis. This study measured two main variables: the independent variable, namely the specificity of the writing of the CKD diagnosis by doctors (specific vs. non-specific), and the dependent variable, namely the accuracy of the CKD diagnosis code as measured based on the conformity of the code in the medical document with the applicable ICD-10 standards, such as N18.1 for CKD Stage 1 or N18.9 for unspecified CKD [26, 27].

Data collection was carried out through several stages. Starting with collecting medical record documents of CKD patients from Waras Wiris Hospital, Boyolali, then an analysis of the specificity of writing a CKD diagnosis was carried out which was categorized into specific and non-specific diagnoses. Furthermore, verification of the conformity of the diagnosis code with the relevant ICD-10 code was carried out to ensure compliance with applicable standards. The diagnostic code accuracy verification procedure includes coding the CKD diagnosis by a team of analysts based on ICD-10 guidelines, with references from doctors or medical record experts. Finally, a re-check was carried out on the codes attached to the medical record documents to ensure coding accuracy.

Data analysis was carried out through two approaches. Univariate analysis presents the frequency distribution of the specificity of writing a CKD diagnosis and the accuracy of the diagnosis code which is divided into two categories: specific vs. non-specific and accurate vs. inaccurate based on the ICD-10 code. Bivariate analysis uses the chi-square test to test for a significant relationship between the specificity of writing a diagnosis and the accuracy of the CKD diagnosis code, with a p-value <0.05 indicating a significant relationship. The odds ratio of 0.667 indicates that specificity of diagnosis increases the chances of CKD code accuracy by 0.667 times [28]. The validity of the data was maintained by testing the validity of the instrument through trials and testing by a team of experts, who ensured that the instrument measured the specificity of the diagnosis and code accuracy correctly. Verification of the CKD diagnosis code by the analyst team using the ICD-10 guidelines resulted in 89% accurate codes. Limitations of the study include bias in incomplete medical record data and coding discrepancies that were not fully controlled, resulting in 11% of documents having coding errors.

Table 2.
Results of validity test analysis.

Analysis	Description	Results
Chi-Square Test	To test the significant relationship between specificity of diagnosis writing and accuracy of CKD diagnosis codes.	p-value < 0.05 (significant)
Odd Ratio	To measure the strength of the relationship between specificity of diagnosis writing and accuracy of CKD diagnosis codes.	Odd ratio = 0.667
ICD-10 Code Accuracy	To verify the consistency and accuracy of diagnosis codes based on ICD-10 coding performed by the analysis team, reducing coding errors.	89% accurate, 11% inaccurate
Limitations in Data	The possibility of bias or data inconsistency in incomplete medical records, as well as coding that is not always consistent.	Not fully controlled, high potential for bias in incomplete documents

4. Results

4.1. The Specificity of Writing the Diagnosis of Chronic Kidney Disease

The specificity of writing the diagnosis of chronic kidney disease (CKD) was obtained directly by the researchers through the analysis of 110 patient medical record documents. The analysis categorized the specificity of CKD diagnosis writing into two groups: specific and non-specific. Based on the results of the observations, the number and percentage of each category are as follows:

Table 3.
Specificity of writing CKD diagnosis.

Specificity of Diagnosis	Amount	Percentage %
Specific	78	71
Not Specific	32	29
Total	110	100

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The specificity of diagnosis writing is categorized into two types: specific and non-specific. A diagnosis is considered specific if it aligns with the classification of chronic kidney disease (CKD) severity, ranging from Stage 1 to Stage 5. Conversely, a diagnosis is considered non-specific if it does not correspond to the CKD severity classification (Stages 1 to 5). The detailed description is as follows:

Table 4.
Specificity of writing CKD diagnosis.

No.	Diagnosis	Amount	Percentage %
1.	CKD *Stage* 1	1	1
2.	CKD *Stage* 2	8	10
3.	CKD *Stage* 3	13	17
4.	CKD *Stage* 4	20	25
5.	CKD *Stage* 5	36	47
Total		78	100

Based on the table above, it shows that the specificity of writing a CKD diagnosis with the largest number of cases is in the diagnosis of CKD Stage 5 with a total of 36 documents with a percentage of 47% and the lowest is CKD Stage 1 with a percentage of 1%. Based on the results of observations of 110 medical record files in CKD, 32 files were obtained that were not specific. The results of the non-specificity of writing the diagnosis are as follows:

Table 5.
Nonspecificity of CKD diagnosis writing.

No.	Diagnosis	Specific	Non-Specific	Caused
1	CKD	-	32	Because the writing of the CKD type is not specific according to the ICD
Total			32	

Based on the table above, it shows that there are 32 documents that are not as specific as the diagnosis written because they do not write the details of the type of CKD according to the ICD.

4.2. Accuracy of Chronic Kidney Disease Diagnosis Code

The accuracy of the chronic kidney disease diagnosis code is data obtained by researchers by observing 110 medical record documents. The analysis of the accuracy of the chronic kidney disease diagnosis code is divided into two, namely accurate and inaccurate. Based on observations, the number and percentage of code accuracy are as follows:

Table 6.
Accuracy of chronic kidney disease diagnosis codes.

Accuracy of Code	Amount	Percentage %
Accurate	98	89
Not Accurate	12	11
Total	110	100

Inaccuracy of chronic kidney disease diagnosis codes due to coders making mistakes in determining diagnosis codes was found in 2 documents out of 110 documents. The results of the inaccuracy are as follows:

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Table 7.
Inaccuracy of CKD diagnosis codes wrong code.

No.	Diagnosis	Code	Information
1	CKD dan *Cholic Abdomen*	N18.2 J18.0	It is not accurate because on all the medical record resume, CPPT and supporting documents, the patient's diagnosis is written as CKD. The diagnosis of CKD should be N18.9, not N18.2.
2	Febris viral dan CKD *Stage* 4	B34.9 N18.5	It is not accurate because the supporting examination shows CKD Stage 4, for CKD stage 4 the code is N18.4 not N18.5

Inaccuracy of the code due to errors in coding occurred in 2 diagnoses, namely in the diagnosis of CKD the hospital gave the code N18.2 chronic kidney disease, stage 2 while the researcher applied the code N18.9, namely chronic kidney disease unspecified based on the medical record resume document sheet, CPPT and supporting documents showing the patient was diagnosed with chronic kidney disease unspecified. For the diagnosis of CKD Stage 4 the hospital gave the code N18.5, namely chronic kidney disease, Stage 5 while the researcher applied the code N18.4 chronic kidney disease, Stage 4 based on the results of supporting examinations showing the diagnosis of chronic kidney disease, Stage 4 the inaccuracy of the code was caused by the lack of coder accuracy when carrying out the coding process.

Inaccuracy of Chronic Kidney Disease diagnosis codes due to coders not providing diagnosis codes on medical record documents was found in 10 documents out of 110 documents. The results of the inaccuracy are as follows:

Table 8.
Table of Inaccuracy of chronic kidney disease diagnosis codes due to not coding.

No.	Diagnosis	Code	Amount	information
1.	CKD with *Anemia*	-	1	Inaccurate because it is not coded on the manual medical resume for the diagnosis of CKD it should be coded N18.9 and for the diagnosis of Anemia D63.8
2	HHD with CKD *Stage* 4	-	1	Inaccurate because it is not coded on the manual medical resume for the diagnosis of CKD Stage 4 it should be coded N18.4 and for the diagnosis of HHD I13.0
3.	CKD *Stage* 5 dengan HT	-	1	Inaccurate because it is not coded on the manual medical resume for the diagnosis of CKD Stage 5 with HT it should be coded I12.0
4.	CKD with Ulkus DM	-	1	Inaccurate because it is not coded on the manual medical resume for the diagnosis of CKD it should be coded N18.9 and for the diagnosis of DM Ulcer the code is E11.5
5.	*Covid 19* with CKD *Stage* 5	-	1	Inaccurate because it is not coded on the manual medical resume, for CKD Stage 5 it should be coded N18.5 and for the diagnosis of Covid 19 the code is B34.2
6.	CKD *Stage* 5 with Anemia	-	1	Inaccurate because it is not coded on the manual medical resume for CKD Stage 5 it should be coded N18.5 and for the diagnosis of Anemia the code is D63.8
7.	CKD	-	2	Inaccurate because it is not coded on the manual medical resume for the diagnosis of CKD it should be coded N18.9
8.	CHF with CKD *Stage* 4	-	2	Inaccurate because it is not coded on the manual medical resume for the diagnosis of CKD Stage 4 it is coded N18.4 and for the diagnosis of CHF the code is I50.0

The table above shows that the inconsistency of the chronic kidney disease (CKD) diagnosis code due to the absence of coding was found in 10 documents, with a percentage of 10%. This code inaccuracy is caused by the lack of coding in the manual medical resume, low coder accuracy, and incomplete documents so that the ICD code is not recorded in the manual medical record. The results of the chi-square test show a p-value of 0.00 with an error rate of 0.05, which means $p < 0.05$. Based on these results, the null hypothesis (Ho) is rejected and the alternative hypothesis (Ha) is accepted, which indicates a significant relationship between the specificity of writing the diagnosis and the accuracy of

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the CKD diagnosis code. The odds ratio value of 0.667 indicates that each specification of writing the diagnosis increases the chance of accuracy of the CKD diagnosis code by 0.667 times higher than writing a non-specific diagnosis.

5. Discussion

5.1. Specificity of Writing the Diagnosis of Chronic Kidney Disease (CKD)

The analysis of the specificity in documenting the diagnosis of chronic kidney disease (CKD) revealed that out of 110 examined medical records, 78 documents (71%) specified a diagnosis of CKD, whereas 32 documents (29%) failed to detail the stage of the disease. Specific diagnoses provide information regarding the severity of the disease as per the ICD-10 classification, whereas non-specific diagnoses merely denote "CKD" without specifying the disease stage. This discovery underscores the necessity of composing a more comprehensive diagnosis to enhance coding precision and facilitate improved clinical decision-making. A comprehensive diagnosis enables the applied code to align more closely with ICD-10 guidelines, hence facilitating more effective treatment management.

Underspecification in CKD diagnosis writing is often due to a lack of detailed documentation of the stage of the disease. Research shows that incomplete or ambiguous diagnoses can affect the accuracy of clinical coding, as coders rely on details in the medical record to assign the correct ICD code [29, 30]. In addition, misunderstanding of coding guidelines or lack of training for clinicians responsible for coding can add to errors [31]. This often occurs when the diagnosis is inadequate, forcing coders to make assumptions that can lead to errors in coding [32, 33].

Formulating a more precise diagnosis in accordance with ICD-10 rules is crucial for mitigating coding errors that may affect health management. Numerous studies indicate that erroneous coding frequently arises from ambiguous or insufficient diagnoses, thus impacting the reporting and reimbursement processes [34]. Accurate coding is crucial to guarantee that hospitals and clinics obtain suitable payment rates and to avert the manipulation of epidemiological data. Consequently, articulating a precise and comprehensive diagnosis can enhance the overall quality of healthcare services [30, 35, 36].

5.2. Accuracy of Chronic Kidney Disease (CKD) Diagnosis Codes

The accuracy of diagnosis codes is a critical component in healthcare administration, directly influencing patient care, institutional reimbursements, and the quality of health statistics. Accurate coding aligns medical records with the appropriate codes, ensuring that diagnoses are precisely represented in the classification system, thus improving data reliability in reporting [13, 37]. In the case of chronic kidney disease (CKD), the accuracy of diagnosis codes is particularly significant, as it directly affects treatment decisions, resource allocation, and cost management. However, inaccuracies often arise from incomplete documentation, vague diagnoses, or inconsistent coding practices [38]. Research highlights a direct relationship between comprehensive documentation and coding accuracy, indicating that insufficient or ambiguous documentation leads to errors in coding and negative clinical and financial outcomes [39, 40].

Inaccuracies in CKD diagnosis codes typically stem from several factors, including incomplete or inconsistent documentation by physicians. Common issues include vague or nonspecific diagnoses that do not meet the level of detail required by ICD-10, misunderstandings of coding guidelines, and inadequate training for coding personnel [41]. These issues often result in incorrect code assignments, as coders must make assumptions when diagnoses lack sufficient detail [3, 42]. Studies further emphasize that clear and specific diagnosis documentation significantly improves coding accuracy [43]. For instance, research has shown that precise and detailed diagnosis writing enhances clarity and aids coders in accurately reflecting clinical realities in the coding system [44].

Supporting the importance of clear documentation, studies demonstrate that improved documentation practices lead to higher coding accuracy rates. Munawaroh, et al. [13] found that specific and clear diagnosis writing directly influences coding accuracy, with ambiguous entries

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impairing the process and ultimately affecting hospital revenue and care quality. Additionally, implementing comprehensive training programs for healthcare providers and regularly evaluating documentation and coding practices have proven to improve coding outcomes. Maryati, et al. [45] stated how the quality of medical information significantly determines the quality of diagnosis codes, suggesting that enhancing clinician training and documentation can bridge gaps in coding accuracy. In this study, the results indicate that 89% of CKD diagnosis codes adhered to ICD-10 guidelines, while 11% were inaccurate. These inaccuracies were largely due to incomplete or inaccurate diagnosis documentation, which was especially apparent in manual coding systems, highlighting the benefits of using electronic medical records for improving coding accuracy.

5.3. Relationship Between Specificity of Diagnosis Writing and Accuracy of CKD Diagnosis Codes

The statistical tests performed in this study revealed a substantial correlation between the specificity of diagnosis documentation and the correctness of the chronic kidney disease (CKD) diagnosis code, with a p-value <0.05. This signifies that the correlation between the two variables is genuine and dependable. The odds ratio of 0.667 reinforces this conclusion, signifying that a more specific CKD diagnosis enhances the likelihood of accurate CKD diagnosis coding by 0.667 times compared to a non-specific diagnosis. A more complete and precise CKD diagnosis enhances the likelihood that the applied diagnosis code aligns with ICD-10 rules, hence facilitating more accurate coding and improved disease management. This finding aligns with previous literature, which verifies that the precision of diagnosis coding is significantly linked to patient care outcomes. Prior research indicates that precise coding for chronic kidney disease (CKD) can diminish hospitalization rates and cardiovascular incidents, while also enhancing the appropriateness of therapies [46, 47]. Adherence to criteria for precise documenting of diagnoses by healthcare professionals enhances the surveillance and management of chronic kidney disease (CKD), potentially decelerating disease progression [48, 49]. Moreover, precise coding not only represents the clinical reality of CKD but also guarantees the optimal distribution of healthcare resources [21, 22].

Research indicates that the utilization of precise medical terminology and uniformity in documenting diagnoses is crucial to avert coding inaccuracies. Numerous investigations have established a robust correlation between diagnostic specificity and coding accuracy. Research examining administrative claims data revealed that ambiguity in CKD coding resulted in substantial underreporting, therefore undermining estimates of illness burden and management outcomes [50]. The utilization of precise medical terminology significantly influences the efficacy of the clinical coding process, maintaining a consistent correlation between documented diagnoses and suitable treatment procedures. Consequently, educating medical professionals in the use of precise terminology and effective documentation techniques is crucial for enhancing coding quality and, ultimately, patient outcomes in multidisciplinary environments [51, 52].

This study possesses multiple limitations that warrant consideration. The potential for bias in medical record data, including incompleteness or disagreement with ICD-10 standards, may compromise the accuracy of the analytical results. Moreover, human coding inaccuracies that are not entirely manageable constitute a constraint, particularly when coders lack comprehensive or explicit access to the information inside the medical record. This is substantiated by research indicating that coding errors frequently arise from insufficient or inconsistent diagnoses documented in medical records [24]. To address these constraints, additional study is advised to implement more rigorous medical coding training for physicians and medical record personnel, aimed at enhancing the precision and accuracy of diagnosis documentation. Employing automated coding technology is advised to reduce human error in the coding process, which has been demonstrated to enhance accuracy greatly [22]. Furthermore, it is essential to prioritize effective communication between physicians and medical record personnel to ensure that the information documented in medical records is comprehensive and precise, hence enhancing the quality of coding and patient care results.

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6. Conclusions and Recommendations

This study examined the specificity of diagnosis writing for chronic kidney disease (CKD) and the accuracy of the associated diagnosis codes. The results showed that out of 110 medical record documents analyzed, 78 documents (70.9%) had a specific CKD diagnosis, while 32 documents (29.1%) lacked specificity. Regarding the accuracy of the diagnosis codes for CKD, 98 documents (89%) were correctly coded, while 12 documents (11%) had inaccurate codes. The chi-square test performed using SPSS version 25 yielded a p-value of 0.00, indicating a statistically significant relationship ($p < 0.05$) between the specificity of diagnosis writing and the accuracy of diagnosis coding. Additionally, the calculated odds ratio of 0.667 suggests that a more specific diagnosis increases the chance of accurate coding by 0.667 times compared to a non-specific diagnosis.

Based on these findings, it is recommended that medical coders review detailed medical information before performing coding and communicate with doctors if a non-specific CKD diagnosis is recorded. Further, there should be targeted socialization efforts directed at doctors, emphasizing the importance of writing detailed and specific CKD diagnoses. This will help improve the accuracy of diagnosis coding, ensure proper resource allocation, and enhance the overall quality of patient care.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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