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Analysis of Inpatient Care Utilization Among Type 2 Diabetes Mellitus Patients

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ABSTRACT

Globally and in Indonesia, diabetes mellitus (DM) is mainly type 2. When outpatient care fails to control blood glucose, hospitalization treatment becomes necessary. This is in line with the implementation of the referral system in the era of the National Health Insurance. This study aims to analyze the utilization of hospitalization among patients diagnosed with Type 2 DM (T2DM). A cross-sectional design was applied using sample data from *BPJS Kesehatan* Year 2024, representing 2023 visit records. All patients admitted with T2DM were included. Inpatient utilization measured by admission frequency, intervals, length of stay, referral sources, diagnostic consistency, discharge status, and comorbidities among T2DM patients. Descriptive analysis was performed on patient characteristics and hospitalization utilization patterns. In 2023, there were 480 admissions involving 417 patients, mean interval between hospitalizations was 69 days. The length of hospital stay increased with the presence of complications. Most referrals came from hospitals, 66% of primary diagnoses matched the admission diagnosis, and hypertension was the most common comorbidity. Most discharge status was recovered. Recommendations include enhancing continuity of care and the referral back program through system integration to mitigate T2DM readmission risks.

Keywords: Utilization, diabetes mellitus, T2DM, National Health Insurance, *BPJS Kesehatan*

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by defects in insulin secretion and insulin action, resulting in persistent hyperglycemia and associated dyslipidemia (1). DM is classified into several categories, including type 1 diabetes mellitus (T1DM), type 2 diabetes mellitus (T2DM), maturity-onset diabetes of the young (MODY), gestational diabetes mellitus, neonatal diabetes, and secondary diabetes due to endocrine dysfunction, steroid therapy, and other etiologies (2). DM affects individuals across all age groups and is influenced by a complex interplay of genetic and environmental factors (3). T2DM represents the most common form of diabetes, particularly among the elderly, and is strongly associated with lifestyle modifications (4).

Diabetes has emerged as a major global health challenge due to the continuous increase in its prevalence worldwide. According to the International Diabetes Federation (IDF), in 2021 Indonesia had approximately 19,5 million individuals living with diabetes, and this number is projected to rise to 28,6 million by 2045 (5). The burden of diabetes is further exacerbated by a high proportion of undiagnosed cases. Indonesia ranks third globally, with an estimated 14,3 million individuals (73,7%) unaware of their diabetes status (6). Individuals with type 2 diabetes mellitus commonly experience a range of complications (7). Previous studies have reported that the most frequently observed diabetes-related complications include neuropathy (13–78%), albuminuria (33–77,7%), microvascular complications (27,6–53%), reduced glomerular filtration rate (7.5–43,7%), macrovascular complications (16–20%), and diabetic foot (7,3–24%) (8). A study conducted at Al-Ihsan hospital identified common comorbidities among patients with T2DM, including hypertension (35,68%), cataracts (6,01%), osteoarthritis (3,58%), pulmonary tuberculosis (2,92%), and dyspepsia (2,91%) (9). Similarly, Iglay et al. (2016) reported that the most prevalent comorbid conditions in patients with type 2 diabetes mellitus were hypertension (82,1%), obesity (78,2%), hyperlipidemia (77,2%), chronic kidney disease (24,1%), and cardiovascular disease (21,6%). Delayed diagnosis of diabetes mellitus substantially increases the risk of complications affecting multiple organ systems, which explains why diabetes is often referred to as a silent killer disease (10).

The need for early detection of diabetes and the initiation of preventive measures to reduce complications has been integrated into Indonesia's healthcare system through the national referral system under the era of the National Health Insurance (NHI)/ *Jaminan Kesehatan Nasional (JKN)* provided by *BPJS Kesehatan*. Healthcare

services are delivered through a tiered system, in which primary healthcare facilities function as gatekeepers responsible for early detection and prevention of diabetes-related complications. Patients with complications are subsequently referred to advanced referral healthcare facilities for further management(11). Type 2 diabetes mellitus is classified as non–insulin-dependent diabetes, in which insulin action is impaired. The occurrence of diabetes mellitus is influenced by multiple risk factors, such as behavioral patterns, sociodemographic characteristics, lifestyle factors, and underlying clinical or mental health conditions (12). Compared with other diabetes subtypes, individuals with type 2 diabetes mellitus demonstrate a higher prevalence of hospitalization (13).

The referral system plays a pivotal role in the healthcare delivery system, as optimizing the function of primary healthcare facilities is essential to controlling healthcare expenditures that substantially increase when patients are referred to advanced referral healthcare facilities. Utilization data from the National Health Insurance program in 2023 indicate that outpatient visits at the primary and advanced levels accounted for the majority of service utilization (97%), compared with advanced-level inpatient care (3%). However, in terms of healthcare expenditure, advanced-level inpatient care contributed the largest share of costs (58%), exceeding that of primary and advanced outpatient services combined (42%) (14). Other studies have reported that inpatient care represents the largest component of healthcare costs among patients with type 2 diabetes mellitus, as diabetes-related complications often require intensive interventions and significantly increase treatment expenses (15).

An assessment of inpatient service utilization at advanced referral healthcare facilities is therefore needed, particularly for cases that are considered potentially avoidable hospitalizations. Based on this background, the present study aims to to analyze the inpatient utilization T2DM patients, specifically examining admission frequency, admission intervals, and length of stay (LOS) in relation to complications, referral sources, diagnostic consistency, discharge status, and comorbidities.

METHODS

This quantitative study employed a cross-sectional design using contextual diabetes mellitus sample NHI data obtained from *BPJS Kesehatan* in 2024, representing healthcare utilization records from 2023. The study population comprised NHI participants hospitalized at advanced referral healthcare facilities with a admission diagnosis of T2DM. All eligible cases were included (total sampling).

As illustrated in Figure 1, advanced-level healthcare utilization records were merged with secondary diagnosis and participant membership data (n = 160.082 visits). Records were then filtered by admission diagnosis (FKL15) to retain type 2 diabetes mellitus cases (ICD-10 code E11; n = 5.608 visits), and further restricted to inpatient services based on service level (FKL10, code 2), yielding a final sample of 480 inpatient visits involving 417 participants.

Descriptive analyses were performed to summarize patient characteristics (sex, marital status, participant segmentation, inpatient class, and age) and inpatient service utilization, including hospitalization frequency, inter-admission intervals, length of stay, and referring healthcare facility. Concordance between admission and discharge diagnoses was also assessed, with consistent cases further examined according to discharge status and secondary diagnoses.

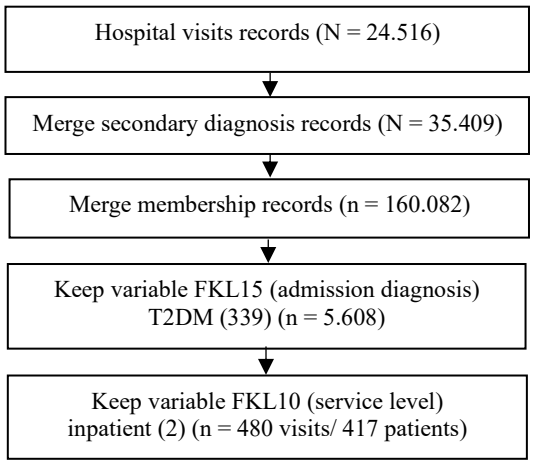

Figure 1. Sampling Technique

RESULTS

Patients Characteristics

Table 1. presents the demographic and clinical characteristics of NHI patients with type 2 diabetes mellitus who required hospitalization in 2023. Female patients accounted for a higher proportion of admissions (259; 62%), and most patients were married (353; 85%). The largest membership category was the Local government-subsidized (PBI APBD) scheme, comprising 193 patients (46%), while the vast majority of admissions occurred in class 3 wards (382; 92%). Patients are predominantly aged >65 years.

Table 1. Characteristics of Hospitalized NHI Patients with T2DM in 2023 (N = 417)

Variable	Frequency (Patient)	Percentage (%)
Gender		
Male	158	38
Female	259	62
Marital status		
Single	30	7
Married	353	85
Divorced	53	13
Participant Segmentation		
Non-worker	2	0
Local government-subsidized (PBI APBD)	193	46
National government-subsidized (PBI APBN)	39	9
Non-wage recipient (PBPU)	179	43
Wage recipient (PPU)	4	1
Ward class		
1	11	3
2	24	6
3	382	92
Age (years)		
>65	154	37
56-65	169	4
46-55	74	18
36-45	19	5
26-35	1	0

Inpatient Utilization of Patients with Type 2 Diabetes Mellitus

As presented in Table 2., overall patients experienced between one and three hospital admissions in 2023. Hospitalizations were most frequent in the >65 age group, with a total of three admissions recorded. Across all age groups, the mean number of hospitalizations was one per patient.

Table 2. Frequency of inpatient admissions by Age Group among NHI Patients with T2DM in 2023 (N = 480)

Age group (years)	Min-Max	Mean	Median
26-35	1	1	1
36-45	1-2	1	1
46-55	1-2	1,2	1
56-65	1-2	1.2	1
>65	1-3	1.4	1

The time interval between successive inpatient admissions ranged from 1 to 287 days, with a mean of 69 days, a median of 53 days, and a standard deviation of 65.6 days (Table 3.).

Table 3. Interval of Inpatient Admissions among NHI Patients with T2DM in 2023 (N = 480)

Variable	Min - Max	Mean	Median
Interval between inpatient visits (days)	1 - 287	69	53

Type 2 diabetes mellitus was classified according to the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10) as follows: E11 (type 2 diabetes mellitus, unspecified),

E11.0 (with coma), E11.1 (with ketoacidosis), E11.2 (with renal complications), E11.3 (with ophthalmic complications), E11.4 (with neurological complications), E11.5 (with peripheral circulatory complications), E11.6 (with other specified complications), E11.7 (with multiple complications), E11.8 (with unspecified complications), and E11.9 (without complications) (16). As shown in Table 4., the mean length of stay varied across ICD-10 categories. The longest average length of stay was observed for the E11 category; however, this code provides limited clinical detail and does not specify the presence or absence of complications. Among patients with documented complications, those with peripheral circulatory complications (E11.5) had the longest average length of stay compared with other complication categories.

Table 4. Average Length of Hospital Stay by ICD-10 Codes among NHI Patients with T2DM in 2023 (N = 480)

Code	Min	Max	Mean
E11	0	22	4
E11.0	1	7	3
E11.1	3	7	5
E11.2	2	6	3
E11.3	2	3	2
E11.4	1	4	3
E11.5	1	18	4
E11.6	1	15	4
E11.7	2	8	4
E11.8	1	17	4
E11.9	1	9	3

Referrals were predominantly received from other hospitals, comprising 470 visits (98%). The admission diagnosis was most frequently consistent with the final diagnosis, accounting for 66% of cases.

Table 5. Referral Source and Diagnosis Consistency among NHI Patients with T2DM in 2023 (N = 480)

Variabel	Frequency (Visits)	Percentage (%)
Referral Source		
Primary healthcare	10	2
Other hospitals	470	98
Diagnostic Consistency		
Inconsistent	163	34
Consistent	317	66

Among the 317 inpatient visits in which the admission diagnosis was consistent with the final diagnosis, discharge outcomes and secondary diagnoses were subsequently analyzed. Figure 2 illustrates that most patients were discharged in recovered condition, representing 310 visits (98%). Nevertheless, a small number of cases involved discharge against medical advice or upon patient request, accounting for 4 visits (1%).

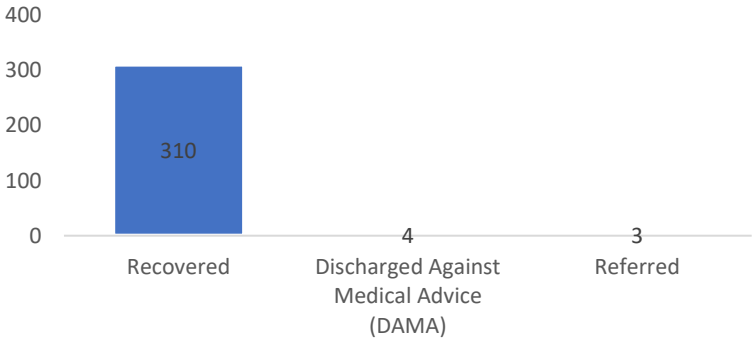

Figure 2. Discharge Status among NHI Patients with T2DM in 2023 (N = 317)

As illustrated in Figure 3, secondary diagnoses among patients with a final diagnosis of type 2 diabetes mellitus were predominantly classified as other conditions, encompassing a wide range of diagnoses and accounting for 159 visits (50%). Among specific secondary diagnoses, hypertension was the most frequently recorded, observed in 95 visits (30%).

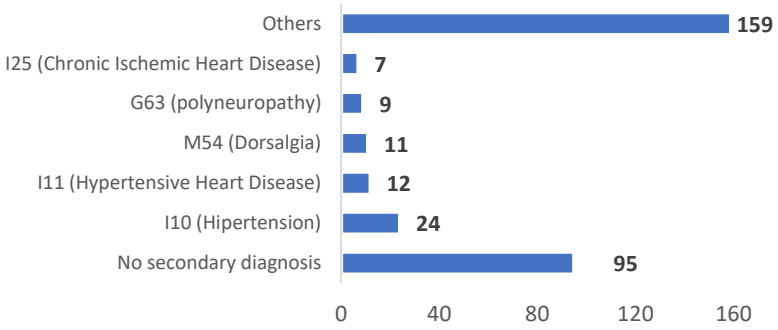

Figure 3. Secondary diagnoses among NHI Patients with T2DM in 2023 (N = 317)

DISCUSSION

Based on ICD-10 coding for type 2 diabetes mellitus, this study identified variability in the length of hospital stay. Previous studies have reported that 20.1% of patients with diabetes aged ≥40 years exhibit symptoms suggestive of peripheral arterial disease (PAD). However, these symptoms are often subtle or unrecognized, leading to delayed diagnosis. The presence of complications has been shown to significantly influence the length of hospital stay, as patients with diabetes-related complications require more complex treatment and management (17).

Within the framework of NHI program, patient referrals follow a hierarchical system, starting at primary healthcare facilities *(FKTP)* and subsequently progressing to secondary or tertiary referral facilities *(FKRTL)*. In this study, most referrals originated from other hospitals. When considered in the context NHI referral system, this finding suggests that inpatient admissions may have occurred due to limited resources or capacity at the referring hospitals to manage the patients' clinical conditions. Both vertical and horizontal referrals are implemented based on diagnostic considerations, case complexity, and the availability of supporting medical equipment. Referrals are considered appropriate when the referring facility lacks the capacity to deliver adequate healthcare services (18).

Diagnosis is a complex process that involves collecting clinical information, interpreting findings, forming and refining hypotheses, and verifying them to reach a final diagnosis (19). The primary diagnosis is determined as the final diagnosis selected by the attending physician at discharge, based on the condition associated with the longest duration of care. Clinical developments during hospitalization may lead to discrepancies between the admission and final diagnoses (20). Within the NHI framework, reimbursement is based on the final diagnosis, despite potential discrepancies between the admission and final diagnoses. The present study found a high level of diagnostic consistency.

In this study, many patients discharged status had recovered. Hospitals implement their own policies for managing patient discharge after hospitalization through discharge planning, which includes planning for follow-up care or ongoing treatment after discharge. Comprehensive discharge management enables more optimal quality of patient care (21). In line with this approach, under NHI system, inpatient care claims are not reimbursed when patients are discharged against medical advice (22).

Vascular disease as a secondary diagnosis occurs in patients with diabetes. This is in line with this study where vascular disease predominates as a secondary diagnosis. In people with diabetes, elevated blood glucose levels (hyperglycemia) disrupt intravascular fluid balance, resulting in increased body fluid volume. This condition damages blood vessels and increases peripheral arterial resistance, leading to hypertension. Over time, it can cause cardiovascular disease (CVD) and chronic kidney disease (CKD), the leading causes of death in people with diabetes (23).

In the context of chronic disease management, Indonesia's referral back system *(Program Rujuk Balik/PRB)* aims to mitigate healthcare costs by optimizing the patient care pathway. Following inpatient treatment, patients receive hospital-based outpatient monitoring until clinical stability is achieved, at which point they are referred back to primary care facilities for continued management (24). Ultimately, this program aims to minimize the risk of rehospitalization among post-discharge patients. Effective post-discharge diabetes management is pivotal in

mitigating the risk of hospital readmission (25–27). Multicomponent care transitions, involving coordinated discharge and specialist led follow-up, are proven to enhance diabetes management outcomes (28–32).

Chronic disease management is fundamentally grounded in the Continuity of Care (COC) framework, which emphasizes a seamless transition and sustained coordination between different levels of healthcare services. COC constitutes a critical dimension of primary healthcare quality, particularly for patients with chronic conditions such as diabetes who require longitudinal monitoring and robust coordination across service levels spanning from primary and secondary care to the referral back system. Empirical evidence suggests that CoC significantly mitigates the risk of hospitalization (33–35).

CONCLUSION

Results showed that during 2023, there were 480 inpatient visits involving 317 patients with an initial diagnosis of T2DM, with an average hospitalization frequency of one and an interval between treatments of 69 days. Length of stay tended to increase in patients with complications, with hypertension being the most dominant secondary diagnosis. Most referrals came from other hospitals, the concordance between admission and discharge diagnoses reached 66%, and the majority of patients were discharged in recovered condition. This study was limited to capturing inpatient utilization with an initial diagnosis of T2DM from *BPJS Kesehatan* sample data. It is imperative that all stakeholders including the government, healthcare providers, and *BPJS Kesehatan,* synchronize the integration between hospital-based care and primary healthcare facilities. Prioritizing a seamless clinical data exchange is fundamental to ensuring Continuity of Care (CoC) and mitigating the risk of fragmented clinical management for T2DM patients.

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