

Aretrospective study: Analysis of factors related to readmission of schizophrenia patients

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Abstract

Background: Hospital readmission among patients with schizophrenia is an important indicator of healthcare quality and the effectiveness of community-based support. Readmissions are influenced by a complex interplay of clinical and environmental factors that affect patients' long-term recovery and stability.

Purpose: This study aimed to identify factors associated with hospital readmission among patients with schizophrenia at the Bali Provincial Mental Hospital.

Methods: A retrospective cross-sectional study was conducted using medical records of patients diagnosed with schizophrenia who received treatment at the Bali Provincial Mental Hospital in 2023. From a total population of 2,669 eligible medical records, 401 were selected through simple random sampling. Data were analyzed using descriptive statistics, chi-square tests for bivariate analysis, and multivariable logistic regression to identify factors independently associated with readmission.

Results: Four factors were significantly associated with hospital readmission among patients with schizophrenia: age (*p* = 0.038), residual symptoms (*p* = 0.003), medication adherence (*p* < 0.001), and comorbidities (*p* < 0.001). Among these, medication adherence was the strongest predictor of readmission, with an adjusted odds ratio (AOR) of 83.902.

Conclusion: Age, residual symptoms, medication adherence, and comorbidities were independently associated with hospital readmission among patients with schizophrenia. Strengthening medication adherence through family supervision and comprehensive management of residual symptoms and comorbid conditions may help reduce the risk of readmission and improve long-term clinical outcomes.

Keywords: comorbidity; medication adherence; readmissions; residual symptoms schizophrenia

Introduction

Hospital readmission, defined as an unplanned return to hospital following discharge for the same or a related condition within a specified period, is widely recognized as an important indicator of healthcare quality, continuity of care, and the effectiveness of disease management. Frequent readmissions increase healthcare utilization, impose substantial economic burdens on healthcare systems, and are associated with poorer clinical outcomes and reduced quality of life (Hou et al., 2024; Kum Ghabowen et al., 2024; Owusu et al., 2022).

Schizophrenia is a chronic, severe mental disorder affecting approximately 24 million people worldwide, representing one of the leading causes of disability among mental illnesses (Solmi et al., 2023). Despite substantial advances in pharmacological and psychosocial interventions, schizophrenia remains characterized by recurrent relapses that frequently require rehospitalization. Mental health services, particularly those caring for individuals with schizophrenia and other severe mental disorders,

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report substantially higher rates of unplanned readmissions, reaching up to 43%. These elevated rates reflect the multifactorial challenges of relapse prevention and maintaining continuity of care across hospital and community settings (Zhou et al., 2023). Moreover, systematic reviews have reported long-term rehospitalization rates ranging from 33% to 55%, highlighting the persistent burden of recurrent hospitalization among individuals with severe mental illness (Sato et al., 2023).

Hospital readmission in schizophrenia is a multifactorial phenomenon resulting from complex interactions among clinical, demographic, environmental, and psychosocial factors. Clinically, poor adherence to antipsychotic treatment remains one of the strongest predictors of relapse and subsequent readmission. Medication non-adherence may result from limited insight into illness, inadequate motivation for treatment, distressing medication side effects, or misconceptions regarding the necessity of long-term therapy. These factors substantially reduce treatment effectiveness and increase the likelihood of relapse requiring rehospitalization (Owusu et al., 2022; Pitanupong et al., 2022). Consequently, nurses play a pivotal role in preventing avoidable readmissions through early identification of relapse, patient education, medication monitoring, discharge planning, and coordination of multidisciplinary follow-up care.

Psychosocial determinants also contribute substantially to readmission risk. Family involvement facilitates medication adherence, supports recognition of early warning signs of relapse, and promotes continuity of community-based care. Conversely, inadequate family support has consistently been associated with poorer treatment adherence and higher relapse rates. In addition, both public stigma and self-stigma may discourage individuals with schizophrenia from seeking treatment, maintaining social functioning, and engaging with mental health services, thereby increasing the likelihood of clinical deterioration and rehospitalization (Mlay et al., 2024). Although these factors are recognized as important determinants, they were not included in the present study because the retrospective design relied exclusively on routinely collected medical records, which did not systematically document family functioning or perceived stigma.

In addition to psychosocial influences, several clinical characteristics have been associated with hospital readmission. Individuals with schizophrenia frequently experience multiple chronic comorbidities, including cardiovascular disease, diabetes mellitus, hypertension, and dyslipidemia, which complicate treatment and increase healthcare utilization. These comorbid conditions have been associated with higher mortality, prolonged hospitalization, increased healthcare costs, and greater risks of rehospitalization (Goldfarb et al., 2022; Yu et al., 2024). Persistent psychotic symptoms, including hallucinations, delusions, and disorganized

behaviour, further increase relapse risk despite ongoing treatment. Disease subtype and illness severity may also influence readmission patterns, although findings remain inconsistent across healthcare settings (Rivelli et al., 2024; Witkowski et al., 2023).

Previous studies investigating predictors of schizophrenia readmission have produced inconsistent findings. Several studies have identified demographic variables, including age, sex, marital status, and employment, as significant predictors, whereas others have reported that treatment-related variables such as previous hospitalization history, illness severity, medication adherence, and comorbidities exert stronger influences than sociodemographic characteristics (Cabello-Rangel et al., 2024; Han et al., 2020; Virtanen et al., 2024). Although schizophrenia is one of the leading causes of psychiatric hospitalization in Indonesia, evidence regarding factors associated with hospital readmission remains limited. Existing Indonesian studies have primarily examined relapse, medication adherence, or selected patient characteristics rather than comprehensively evaluating multiple clinical and sociodemographic predictors of hospital readmission. Consequently, the available evidence is fragmented and insufficient to inform targeted readmission prevention strategies.

Bali Provincial Mental Hospital is the principal referral psychiatric hospital in Bali and manages a substantial number of patients with schizophrenia each year. A preliminary review conducted in March 2024 indicated that 3,330 hospital admissions involving schizophrenia occurred during 2022, placing schizophrenia among the five most frequently treated diagnostic categories at the hospital. Furthermore, hospital records demonstrated an increasing trend in schizophrenia-related readmissions, rising from 20.37% in 2021 to 25.72% in 2022 and 36.99% in 2023. A pilot review of 30 medical records found that 36.67% of patients experienced readmission, with nearly three-quarters of these patients being readmitted more than once. These findings indicate a considerable clinical burden and underscore the need to identify factors contributing to recurrent hospitalization.

Given the inconsistent findings reported in previous studies, the limited evidence available from Indonesia, and the increasing burden of schizophrenia readmissions in Bali, further investigation is warranted. Unlike many earlier studies that examined isolated predictors using predominantly bivariate analyses, the present study employed a retrospective design with multivariate analysis to simultaneously evaluate the independent contributions of sociodemographic and clinical factors associated with hospital readmission. Identifying these determinants is expected to provide stronger evidence for developing targeted interventions aimed at reducing avoidable readmissions and improving continuity of care for individuals living with schizophrenia (Tasijawa et al.,

Table 1. Demographic and Clinical Characteristics of Patients with Schizophrenia at Bali Provincial Mental Hospital (N = 401)

Variable	Frequency	Percentage (%)
Age		
17-25 Years	43	10.8
26-35 Years	102	25.4
36-45 Years	102	25.4
46-55 Years	154	38.4
Gender		
Male	265	66.1
Female	136	33.9
Occupation		
Employee	194	48.4
Unemployed	207	51.6
Residual Symptoms		
Yes	59	14.7
No	342	85.3
Types of Schizophrenia		
Hebephrenic schizophrenia	217	54.1
Paranoid schizophrenia	153	38.2
Other types of schizophrenia	31	7.7
Medication Compliance		
Compliant	77	19.2
Non-compliant	324	80.8
Comorbidity		
Yes	197	49.1
No	204	50.9
Readmission Event		
Yes	155	38.7
No	246	61.3

Source: Primary Data, 2024

2021).

Therefore, this study aimed to examine the factors associated with hospital readmission among patients with schizophrenia at Bali Provincial Mental Hospital in 2023 using a retrospective analytical approach.

Materials and Methods

Design

This study employed a retrospective cross-sectional design using secondary data extracted from medical records. The design enabled the simultaneous assessment of demographic and clinical characteristics associated with hospital readmission among patients with schizophrenia treated at Bali Provincial Mental Hospital, Indonesia. Medical records from 1 January to 31 December 2023 were reviewed, while data extraction was conducted in July 2024.

Sample

The study population comprised 2,669 medical records of patients diagnosed with schizophrenia who received inpatient treatment at Bali Provincial Mental Hospital during 2023. A total of 401 medical records were selected using simple random sampling, ensuring that each eligible record had an equal probability of selection. The sample size represented approximately 15% of the target population, which was considered sufficient to provide stable estimates for multivariable logistic regression analysis while maintaining the feasibility of retrospective data collection. Eligible records met the following inclusion criteria: (1) patients aged 17–55 years and (2) a diagnosis of schizophrenia based on the International Classification of Diseases, Tenth Revision (ICD-10), codes F20.0–F20.9. Medical records of patients under the responsibility of Social Services (neglected patients) and those discharged against medical advice were excluded because incomplete treatment episodes could influence

Table 2. Bivariate Analysis of Factors Associated with Hospital Readmission Among Patients with Schizophrenia (N = 401)

Variable	Readmission Event				X2	P-value
	Yes		No			
	n	%	n	%		
Age						
17-25 Years	11	7.10	32	13.01	8.425	0.038
26-35 Years	33	21.29	69	28.05		
36-45 Years	40	25.81	62	25.20		
46-55 Years	71	45.81	83	33.74		
Gender						
Male	100	64.52	165	67.07	0.277	0.598
Female	55	35.48	81	32.93		
Occupation						
Employee	69	44.52	125	50.81	1.510	0.219
Unemployed	86	55.48	121	49.19		
Residual Symptoms						
Yes	33	21.29	26	10.57	8.710	0.003
No	122	78.71	220	89.43		
Types of Schizophrenia						
Hebephrenic schizophrenia	93	60.00	124	50.41	3.575	0.167
Paranoid schizophrenia	51	32.90	102	41.46		
Other types of schizophrenia	11	7.10	20	8.13		
Medication Compliance						
Compliant	1	0.65	76	30.89	56.079	0.000
Non-compliant	154	99.35	170	69.11		
Comorbidity						
Yes	102	65.81	95	38.62	28.125	0.000
No	53	34.19	151	61.38		

Source: Primary Data, 2024

Table 3. Goodness-of-Fit Statistics for the Multivariable Logistic Regression Model

Parameter	Mark
Significance of Hosmer and Lemeshow Test	0.906
Significance of Omnibus Tests of Model Coefficients	0.000
Initial -2 Log likelihood (step 0)	535.072
-2 Log likelihood (step 1)	413.591
Nagelkerke R Square	0.355

Source: Primary Data, 2024

readmission outcomes.

Data collection

Data were obtained exclusively from anonymized medical records. Because this retrospective study relied entirely on secondary data, no questionnaires, interviews, or direct patient contact were involved. Data extraction was performed using a structured documentation form developed by the research team. The following variables were collected: Sociodemographic characteristics: age,

sex, education level, marital status, occupation, and religion. Clinical characteristics: schizophrenia subtype, residual symptoms, medication adherence, comorbidities, readmission status, frequency of readmission, and time to readmission. Data collection followed standardized medical record review procedures, including institutional authorization, screening of eligibility criteria, extraction of study variables, verification of data completeness, coding, and entry into the statistical database for analysis.

Data analysis

Statistical analyses were performed using IBM SPSS Statistics version 20 (IBM Corp., Armonk, NY, USA). Descriptive (univariate) statistics were used to summarize the distribution of sociodemographic and clinical characteristics. Categorical variables are presented as frequencies and percentages. Bivariate analyses were performed using the Chi-square test to examine associations between each independent variable and hospital readmission. Variables with a significance level of $p < 0.05$ were considered statistically significant. Crude odds ratios (ORs) with 95% confidence intervals (95% CIs) were calculated to estimate the strength of these associations.

Variables demonstrating statistical significance in the bivariate analysis, together with clinically relevant variables identified from previous literature, were entered into a multivariable binary logistic regression model to identify independent predictors of hospital readmission. Adjusted odds ratios (AORs) with 95% confidence intervals were reported. Model adequacy was evaluated using the Omnibus Test of Model Coefficients, the Hosmer–Lemeshow goodness-of-fit test, Nagelkerke's R^2 , the classification table, and overall model accuracy. Statistical significance was established at $p < 0.05$.

Ethical consideration

Ethical approval was obtained from the Research Ethics Committee of the Institute of Technology and Health Bali (Approval No. 04.0249/KEP-ITEKES-BALI/VI/2024). Institutional permission to conduct the study was also granted by the Director of Bali Provincial Mental Hospital (Approval No. B.41.000.9.2/8692/PENJNONMED/RSJ). As the study involved retrospective review of anonymized medical records without direct patient involvement, the requirement for written informed consent was waived by the ethics committee in accordance with institutional and national ethical guidelines. All extracted data were de-identified before analysis to ensure patient confidentiality and privacy.

Results

Participant Characteristics

The characteristics of the study participants were described using data extracted from the medical records of patients with schizophrenia. Descriptive statistics were used to summarize the demographic and clinical characteristics of the study sample.

Based on Table 1, the largest proportion of participants was aged 46–55 years (38.4%). Most participants were male (66.1%) and unemployed (51.6%). The majority had no residual symptoms (85.3%), were diagnosed with hebephrenic schizophrenia (54.1%), and were non-adherent to medication (80.8%). Approximately half of the participants had no documented comorbidity (50.9%). Overall, 61.3% of patients did not experience hospital readmission during the study

period, whereas 38.7% experienced at least one readmission.

Bivariate analysis

The associations between demographic and clinical characteristics and hospital readmission were examined using the Chi-square test.

As shown in Table 2, age, residual symptoms, medication adherence, and comorbidity were significantly associated with hospital readmission (all $p < 0.05$). In contrast, gender, employment status, and schizophrenia subtype were not significantly associated with hospital readmission ($p > 0.05$). Among the variables examined, medication adherence demonstrated the strongest bivariate association with hospital readmission ($\chi^2 = 56.079$, $p < 0.001$), followed by comorbidity ($\chi^2 = 28.125$, $p < 0.001$). Patients with residual symptoms were also significantly more likely to experience readmission than those without residual symptoms ($\chi^2 = 8.710$, $p = 0.003$). In addition, age was significantly associated with hospital readmission ($\chi^2 = 8.425$, $p = 0.038$). However, no statistically significant associations were observed for gender ($\chi^2 = 0.277$, $p = 0.598$), employment status ($\chi^2 = 1.510$, $p = 0.219$), or schizophrenia subtype ($\chi^2 = 3.575$, $p = 0.167$).

Multivariate analysis

Multivariate logistic regression analysis was performed to identify independent factors associated with hospital readmission among patients with schizophrenia.

The overall model demonstrated a good fit to the observed data, as indicated by the Hosmer–Lemeshow goodness-of-fit test (χ^2 , $p = 0.906$). The Omnibus Test of Model Coefficients was statistically significant ($p < 0.001$), indicating that the set of predictor variables significantly improved the model compared with the intercept-only model. Model fit was further supported by a reduction in the $-2 \log$ likelihood from 535.072 in the null model to 413.591 in the final model. The Nagelkerke R^2 value was 0.355, indicating that approximately 35.5% of the variance in hospital readmission was explained by the variables included in the model. After adjustment for other variables, medication adherence remained the strongest independent factor associated with hospital readmission, followed by comorbidity and residual symptoms. Age was also independently associated with hospital readmission, whereas gender, employment status, and schizophrenia subtype were not retained as significant predictors in the final model (Table 3).

The adjusted odds ratios (AORs) from the multivariable logistic regression model are presented in Table 4. Medication adherence emerged as the strongest independent factor associated with hospital readmission (AOR = 83.90, 95% CI: 11.32–621.64, $p < 0.001$). In addition, residual symptoms ($p = 0.002$) and comorbidity ($p < 0.001$) remained significantly associated with hospital readmission

Table 4. Multivariable Logistic Regression Analysis of Factors Associated with Hospital Readmission Among Patients with Schizophrenia at Bali Provincial Mental Hospital (N = 401)

Variable	Readmission Event				AOR	95% CI	P-value
	Yes		No				
	n	%	n	%			
Residual Symptoms							
Yes	33	21.29	26	10.57	0.335	0.169-0.663	0.002
No	122	78.71	220	89.43			
Medication Compliance							
Compliant	1	0.65	76	30.89	83.902	11.324-621.644	0.000
Non-compliant	154	99.35	170	69.11			
Comorbidity							
Yes	102	65.81	95	38.62	0.294	0.185-0.466	0.000
No	53	34.19	151	61.38			

Source: Primary Data, 2024

after adjustment for other variables. The wide confidence interval observed for medication adherence indicates substantial uncertainty around the estimated effect size, suggesting that the magnitude of the association should be interpreted with caution. Nevertheless, medication adherence remained the strongest predictor of hospital readmission in the final multivariable model.

Discussion

Readmission among Patients with Schizophrenia at Bali Provincial Mental Hospital

Hospital readmission remains an important indicator of treatment effectiveness and continuity of care among individuals with schizophrenia. Although most patients in the present study did not experience readmission during the observation period, a substantial proportion required rehospitalization, indicating that recurrent hospitalization continues to represent a significant clinical challenge.

The present study found that schizophrenia readmission remains a common clinical outcome, consistent with evidence from previous research. A nationwide study reported a one-year readmission rate of 23.7%, demonstrating that recurrent hospitalization continues to impose a substantial burden on mental health services (Pinho et al., 2023). Similarly, a systematic review reported long-term rehospitalization rates ranging from 33% to 55% among individuals with severe mental illness, suggesting that repeated hospitalization remains a persistent challenge despite ongoing treatment (Sato et al., 2023). Comparable findings have been reported in previous studies, with cumulative readmission rates of 16.69% within 30 days and 33.79% within one year among patients with schizophrenia (Han et al., 2020). Together, these findings support the present results and indicate that reducing schizophrenia readmission requires not only effective inpatient treatment but also sustained

community-based follow-up and continuity of care after hospital discharge (Han et al., 2020; Pinho et al., 2023; Sato et al., 2023).

The occurrence of readmission is likely influenced by multiple interacting factors rather than a single determinant. Previous studies have identified poor medication adherence, inadequate continuity of outpatient care, delayed recognition of relapse symptoms, insufficient post-discharge follow-up, and suboptimal discharge planning as important contributors to repeated hospitalization among patients with schizophrenia. Medication non-adherence has consistently been associated with an increased risk of relapse and rehospitalization, while timely outpatient follow-up and continuity of community-based mental health services have been shown to reduce the likelihood of readmission (Abdullah-Koolmees et al., 2021; Barliana et al., 2023). Although these variables were not directly measured in the present study because of its retrospective design, they provide plausible explanations for the continued occurrence of readmission among a proportion of patients.

Another important consideration is the role of psychosocial support following hospital discharge. Family involvement, continuity of community mental health services, and timely outpatient follow-up have been shown to improve treatment adherence, facilitate early recognition of symptom recurrence, and reduce the risk of rehospitalization among individuals with schizophrenia (Ye et al., 2023). Conversely, stigma toward mental illness may discourage individuals from seeking help promptly, reduce engagement with ongoing treatment, and ultimately compromise recovery and continuity of care (Thornicroft et al., 2022). Because information regarding family support, stigma, and community-based services was unavailable in the medical records, these factors could not be evaluated in the present study and should be considered in future prospective research.

From a clinical perspective, these findings highlight the importance of strengthening transitional

care after hospital discharge. Current guidelines and evidence support comprehensive discharge planning, psychoeducation, medication adherence support, family involvement, and coordinated community-based follow-up to promote continuity of care and improve recovery among individuals with schizophrenia (Thongsalab et al., 2023). Although recent evidence regarding the effect of transitional discharge interventions on readmission remains inconclusive, these interventions may improve patient functioning, satisfaction with care, and engagement with community mental health services. Integrating these strategies into routine psychiatric care may enhance long-term clinical stability while reducing the personal and economic burden associated with recurrent hospitalization.

Age and Its Association with Hospital Readmission Among Patients with Schizophrenia

The present study identified a statistically significant association between age and hospital readmission among patients with schizophrenia. This finding suggests that age may influence the likelihood of rehospitalization, although the underlying mechanisms are likely multifactorial and should be interpreted cautiously given the retrospective cross-sectional design of the study.

Previous studies have reported inconsistent findings regarding the relationship between age and psychiatric readmission. Although age has been identified as a potential predictor of readmission, its effect appears to vary across healthcare settings and is often influenced by coexisting clinical and psychosocial factors (Pinho et al., 2023). Similarly, evidence suggests that the risk of readmission is determined by multiple interacting factors, including illness severity, previous hospitalization, treatment adherence, and continuity of outpatient care, rather than age alone. These findings suggest that age is unlikely to be an independent determinant of rehospitalization but may interact with other patient- and healthcare-related factors.

One possible explanation for the observed association is that middle-aged and older adults with schizophrenia frequently experience greater physical health burdens, longer disease duration, and accumulated functional impairment than younger patients. Individuals with chronic schizophrenia have a substantially higher prevalence of cardiometabolic disease, cognitive impairment, and reduced functional capacity, all of which may complicate treatment and increase vulnerability to relapse requiring hospitalization. Furthermore, increasing age is often accompanied by multiple medical comorbidities and more complex medication regimens, creating additional challenges for long-term disease management (Correll et al., 2022).

From a clinical perspective, these findings emphasize the importance of age-sensitive discharge planning and long-term follow-up for

patients with schizophrenia. Older individuals may benefit from comprehensive physical health assessment, medication optimization, psychosocial support, and coordinated community-based mental health services to improve continuity of care and reduce the likelihood of recurrent hospitalization. Future prospective studies should investigate whether the relationship between age and readmission is mediated by disease duration, comorbidity burden, functional status, medication adherence, and access to community mental health services (Pinho et al., 2023).

Gender and Its Association with Hospital Readmission Among Patients with Schizophrenia

The present study found no statistically significant association between gender and hospital readmission among patients with schizophrenia. Although male patients constituted a larger proportion of the study population and accounted for more readmission episodes, the similarity in readmission rates between men and women suggests that gender alone may not be an independent predictor of rehospitalization. This finding is consistent with previous studies indicating that demographic characteristics, including gender, have limited predictive value once clinical and treatment-related factors are considered. Systematic reviews have consistently identified medication adherence, illness severity, previous hospitalization, continuity of care, and substance use as stronger predictors of psychiatric readmission than demographic variables, while cohort studies have likewise demonstrated that healthcare utilization patterns and clinical characteristics contribute more substantially to rehospitalization than sex (Owusu et al., 2022; Pinho et al., 2023; Virtanen et al., 2024; Zhou et al., 2023).

Although gender was not independently associated with readmission in the present study, previous research suggests that relapse and rehospitalization are primarily driven by illness severity, persistent psychotic symptoms, treatment adherence, and psychosocial support rather than biological sex alone (Hou et al., 2024; Mlay et al., 2024; Witkowski et al., 2023). Because these clinical and behavioral factors were not comprehensively assessed in the present study, it was not possible to determine whether they mediated the observed pattern of readmission among male patients.

The absence of a significant association between gender and readmission suggests that strategies to reduce rehospitalization should prioritize modifiable clinical and psychosocial factors rather than demographic characteristics alone. Interventions that improve medication adherence, strengthen discharge planning, enhance family involvement, and ensure continuity of community-based mental health services have demonstrated benefits in reducing relapse and rehospitalization among individuals with schizophrenia regardless of

sex (Abdullah-Koolmees et al., 2021; Rodriguez et al., 2024; Thongsalab et al., 2023; Ye et al., 2023). Future prospective studies should further investigate whether gender influences readmission indirectly through mediating factors such as substance use, treatment adherence, illness severity, or social support.

Employment Status and Its Association with Hospital Readmission Among Patients with Schizophrenia

The present study found no statistically significant association between employment status and hospital readmission among patients with schizophrenia. Although unemployment was common among the study population and a greater proportion of unemployed patients experienced readmission, employment status was not identified as an independent predictor of rehospitalization. This finding is consistent with recent evidence indicating that employment status alone has limited predictive value for psychiatric readmission after clinical characteristics and treatment-related factors are considered. Systematic reviews have shown that medication adherence, previous hospitalization, illness severity, continuity of outpatient care, and substance use are more consistent predictors of psychiatric readmission than sociodemographic characteristics, including employment status (Owusu et al., 2022; Zhou et al., 2023). Similarly, nationwide and prospective cohort studies have reported that recurrent hospitalization is more strongly associated with clinical complexity and patterns of healthcare utilization than occupational status (Pinho et al., 2023; Virtanen et al., 2024).

Although employment status was not significantly associated with readmission in the present study, unemployment remains an important indicator of impaired psychosocial functioning among individuals with schizophrenia. Employment promotes social participation, financial independence, daily structure, and meaningful engagement, all of which facilitate functional recovery and community reintegration. Conversely, unemployment is commonly associated with poorer psychosocial functioning, reduced quality of life, and social exclusion among individuals with schizophrenia, although these factors do not necessarily lead directly to hospital readmission when adequate treatment and community-based mental health services are available (Mlay et al., 2024; Thongsalab et al., 2023; Thornicroft et al., 2022).

The lack of a significant association observed in this study may reflect the multifactorial nature of psychiatric readmission. Clinical factors, including medication adherence, residual symptoms, previous hospitalization, illness severity, and comorbidities, are consistently identified as stronger determinants of rehospitalization than employment status alone (Cabello-Rangel et al., 2024; Han et al., 2020; Hou et al., 2024; Virtanen et al., 2024). Consequently, employment should be viewed as an important

component of functional recovery rather than an independent predictor of hospital readmission.

From a nursing perspective, these findings highlight the importance of adopting a recovery-oriented approach that extends beyond symptom management. Psychiatric nurses should collaborate with multidisciplinary teams to promote psychosocial rehabilitation, vocational support, family engagement, and community reintegration. Although employment status was not independently associated with readmission in the present study, interventions that improve occupational functioning, strengthen recovery-oriented care, and enhance community participation may contribute to long-term recovery, improve quality of life, and support sustained community living among individuals with schizophrenia (Rodriguez et al., 2024; Thongsalab et al., 2023; Ye et al., 2023). Future longitudinal studies are warranted to determine whether improvements in employment status indirectly reduce readmission through enhanced treatment adherence, functional recovery, or social support.

Residual Symptoms and Their Association with Hospital Readmission Among Patients with Schizophrenia

The present study demonstrated a statistically significant association between residual symptoms and hospital readmission among patients with schizophrenia. Although most patients in the study were recorded as having no residual symptoms, this distribution reflects the characteristics of the overall study population rather than the relationship between residual symptoms and readmission. Therefore, the observed association should be interpreted based on the inferential statistical analysis rather than the absolute frequencies alone.

Residual symptoms are persistent manifestations that remain after remission of acute psychotic episodes and commonly include diminished motivation, reduced emotional expression, cognitive impairment, social withdrawal, and functional decline. Although generally less prominent than acute positive symptoms, these persistent symptoms may substantially impair daily functioning, compromise treatment adherence, and increase vulnerability to relapse (Pitanupong et al., 2022; Witkowski et al., 2023). The present findings are consistent with previous studies demonstrating that residual symptoms are associated with poorer clinical outcomes and an increased likelihood of relapse and rehospitalization. Patients with persistent residual symptoms have been reported to experience significantly higher relapse rates and poorer long-term outcomes than those achieving more complete symptom remission (Pitanupong et al., 2022). Likewise, persistent negative and cognitive symptoms have been identified as important predictors of functional impairment, reduced treatment adherence, relapse, and recurrent psychiatric hospitalization (Hou et al., 2024; Rivelli et al., 2024; Witkowski et al., 2023).

Several mechanisms may explain this association. Residual symptoms may reduce patients' ability to recognize early warning signs of relapse, adhere to prescribed treatment, and actively participate in psychosocial rehabilitation. Persistent impairments in motivation, cognition, and social functioning may also hinder successful community reintegration following hospital discharge, thereby increasing the likelihood of subsequent psychiatric deterioration requiring rehospitalization. Nevertheless, because this study employed a retrospective cross-sectional design, causality cannot be established, and residual symptoms should be interpreted as an important clinical correlate rather than a direct cause of hospital readmission.

From a clinical perspective, these findings underscore the importance of comprehensive post-discharge assessment that extends beyond the resolution of acute psychotic symptoms. Psychiatric nurses should routinely monitor residual symptoms during follow-up visits, reinforce medication adherence, provide psychoeducation to patients and their families, and collaborate with multidisciplinary teams to implement psychosocial rehabilitation and relapse-prevention strategies. Early identification and effective management of residual symptoms may improve functional recovery and reduce the likelihood of preventable hospital readmission among individuals with schizophrenia (Rodriguez et al., 2024; Thongsalab et al., 2023; Ye et al., 2023).

Schizophrenia Subtype and Its Association with Hospital Readmission

The present study found no statistically significant association between schizophrenia subtype and hospital readmission. Although hebephrenic schizophrenia was the most frequently recorded diagnosis in the study population, schizophrenia subtype was not independently associated with the likelihood of rehospitalization. This finding is consistent with current psychiatric classification systems and contemporary evidence indicating that traditional schizophrenia subtypes have limited prognostic value for predicting relapse, functional outcomes, or hospital readmission. Both the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR) and the International Classification of Diseases (ICD-11) have abandoned the traditional schizophrenia subtypes because of their limited diagnostic stability, low predictive validity, and minimal contribution to treatment decision-making. Consequently, recent research has increasingly emphasized symptom severity, functional impairment, treatment response, and psychosocial factors rather than diagnostic subtype when evaluating the risk of relapse or hospital readmission.

The predominance of hebephrenic schizophrenia observed in the present study differs from findings reported in some Indonesian studies, where undifferentiated schizophrenia was more common. This discrepancy may reflect differences in patient

characteristics, referral patterns, or diagnostic practices across healthcare settings rather than true epidemiological variation. Because diagnoses in the present study were obtained from routine medical records coded according to ICD-10, the distribution of schizophrenia subtypes should be interpreted within the context of the hospital's clinical classification system.

The absence of a significant association between schizophrenia subtype and readmission suggests that recurrent hospitalization is more strongly influenced by modifiable clinical and psychosocial factors than by diagnostic subtype alone. Previous studies have consistently demonstrated that medication adherence, residual symptoms, previous hospitalization, illness severity, comorbidities, and continuity of community mental healthcare are more reliable predictors of psychiatric readmission than diagnostic subtype (Han et al., 2020; Hou et al., 2024; Owusu et al., 2022; Pinho et al., 2023; Virtanen et al., 2024; Zhou et al., 2023). These findings are consistent with the multivariable analysis of the present study, which identified medication adherence as the strongest determinant of hospital readmission.

From a clinical perspective, these findings support a person-centred approach to schizophrenia management that prioritizes comprehensive assessment of symptom control, treatment adherence, psychosocial functioning, and recovery needs rather than relying solely on diagnostic subtype. Psychiatric nurses should therefore focus on individualized discharge planning, relapse prevention, medication management, and coordinated community follow-up to reduce the risk of recurrent hospitalization regardless of schizophrenia subtype. Interventions that strengthen medication adherence, psychosocial rehabilitation, and continuity of community-based mental health services remain central to reducing avoidable rehospitalization among people living with schizophrenia (Rodriguez et al., 2024; Thongsalab et al., 2023; Ye et al., 2023).

Medication Adherence and Its Association with Hospital Readmission Among Patients with Schizophrenia

Medication adherence was the strongest factor associated with hospital readmission among patients with schizophrenia in the present study. This finding underscores the critical role of sustained antipsychotic treatment in maintaining symptom stability and reducing the likelihood of recurrent hospitalization. Consistent with the multivariable analysis, medication adherence remained the most influential factor associated with readmission after adjustment for demographic and clinical characteristics, highlighting its importance as a modifiable target for intervention.

The present findings are consistent with a growing body of evidence demonstrating that poor medication adherence is among the

strongest predictors of relapse and psychiatric rehospitalization. Previous systematic reviews and cohort studies have consistently identified medication adherence, together with illness severity, previous hospitalization, and continuity of care, as key determinants of psychiatric readmission (Owusu et al., 2022; Virtanen et al., 2024; Zhou et al., 2023). Furthermore, non-adherence to antipsychotic treatment has been shown to significantly increase the risk of rehospitalization among individuals with psychotic disorders, while better adherence is associated with fewer hospitalizations and improved long-term clinical outcomes (Abdullah-Koolmees et al., 2021; Barliana et al., 2023).

Medication non-adherence among individuals with schizophrenia is multifactorial. Poor insight into illness, adverse effects of antipsychotic medications, cognitive impairment, limited family support, inadequate continuity of community mental healthcare, and psychosocial challenges have all been identified as barriers to sustained adherence (Mlay et al., 2024; Owusu et al., 2022; Thongsalab et al., 2023). Because the present study relied on retrospective medical record data, these underlying determinants could not be examined directly. Nevertheless, they may partially explain why medication adherence demonstrated the strongest association with hospital readmission.

Notably, the magnitude of the association observed in this study was greater than that reported in many previous investigations and should therefore be interpreted cautiously. Large odds ratios may reflect differences in patient characteristics, healthcare delivery, documentation practices, sample composition, or the distribution of exposure variables within the study population. Consequently, although medication adherence was the strongest factor associated with readmission in this study, prospective multicentre investigations are needed to confirm the magnitude and generalizability of this association.

From a clinical and nursing perspective, these findings emphasize that improving medication adherence should remain a priority in efforts to reduce preventable psychiatric readmissions. Psychiatric nurses play a pivotal role by providing individualized psychoeducation, routinely assessing barriers to adherence, collaborating with patients and families to develop shared care plans, and recognizing early warning signs of relapse. Structured discharge planning, family psychoeducation, community-based follow-up, psychosocial rehabilitation, and the appropriate use of long-acting injectable antipsychotics for selected patients with recurrent non-adherence have all been shown to improve treatment continuity and reduce the risk of rehospitalization (Rodriguez et al., 2024; Ye et al., 2023). Strengthening these evidence-based interventions may enhance long-term recovery while reducing the clinical and economic burden associated with recurrent hospitalization among individuals with schizophrenia.

Comorbidity and Its Association with Hospital Readmission Among Patients with Schizophrenia

The present study demonstrated a statistically significant association between comorbidity and hospital readmission among patients with schizophrenia. This finding suggests that patients with coexisting medical or psychiatric conditions are more likely to experience recurrent hospitalization than those without additional health conditions, highlighting the importance of comprehensive management of multimorbidity in schizophrenia care. This finding is consistent with growing evidence indicating that comorbid conditions substantially influence the clinical course of schizophrenia. Previous studies have demonstrated that psychiatric and physical comorbidities, including cardiometabolic disorders, are associated with poorer clinical outcomes, increased healthcare utilization, and a greater likelihood of psychiatric readmission (Cabello-Rangel et al., 2024; Han et al., 2020; Owusu et al., 2022; Virtanen et al., 2024). In addition, predictive models of schizophrenia readmission have identified comorbidity as an important contributor to recurrent hospitalization alongside illness severity, medication adherence, and previous hospitalization (Hou et al., 2024).

Several mechanisms may explain this association. Comorbid physical illnesses often require complex medication regimens, frequent healthcare visits, and coordinated management across multiple specialties. Concurrent psychiatric conditions may further increase symptom severity, reduce treatment adherence, impair insight, and diminish patients' ability to recognize early warning signs of relapse. Together, these factors complicate disease management and increase susceptibility to recurrent hospitalization. Nevertheless, because this study employed a retrospective cross-sectional design, the temporal relationship between comorbidity and readmission cannot be established, and causality should not be inferred. Another important consideration is the bidirectional relationship between schizophrenia and physical health. Individuals living with schizophrenia have a substantially higher prevalence of cardiometabolic disorders than the general population because of shared lifestyle risk factors, reduced access to preventive healthcare, and the metabolic adverse effects of antipsychotic medications. These comorbid conditions contribute to poorer overall health outcomes and increase the complexity of long-term disease management, underscoring the need to integrate physical and mental healthcare (Goldfarb et al., 2022; Yu et al., 2024).

From a nursing perspective, these findings emphasize the importance of integrated and person-centred care for individuals with schizophrenia and multimorbidity. Psychiatric nurses should routinely assess both physical and mental health status, monitor for metabolic complications associated with antipsychotic therapy, reinforce medication

adherence, and collaborate with multidisciplinary teams to coordinate the management of coexisting illnesses. Comprehensive discharge planning that incorporates physical health monitoring, patient and family education, and timely community follow-up may improve continuity of care and reduce the likelihood of preventable readmissions among individuals living with schizophrenia (Rodriguez et al., 2024; Thongsalab et al., 2023; Ye et al., 2023).

Primary Determinant of Hospital Readmission Among Patients with Schizophrenia

The present study identified medication adherence as the strongest independent factor associated with hospital readmission among patients with schizophrenia. Compared with other demographic and clinical variables, medication adherence demonstrated the greatest contribution to the multivariable model, highlighting its central role in maintaining clinical stability and reducing the likelihood of recurrent hospitalization. Because medication adherence is a modifiable factor, this finding has important implications for clinical practice and mental health policy.

The strong association observed in this study is consistent with previous evidence identifying medication non-adherence as one of the most important predictors of relapse and psychiatric rehospitalization. Systematic reviews and cohort studies have consistently demonstrated that poor adherence to antipsychotic treatment substantially increases the risk of relapse and hospital readmission, whereas sustained adherence is associated with fewer hospitalizations and improved long-term clinical outcomes (Abdullah-Koolmees et al., 2021; Barliana et al., 2023; Owusu et al., 2022; Zhou et al., 2023). These findings support the present study and reinforce the importance of continuous pharmacological treatment as a cornerstone of schizophrenia management.

Notably, the magnitude of the association observed in the present study was considerably greater than that reported in many previous investigations. Although this finding underscores the importance of medication adherence, the estimated odds ratio should be interpreted cautiously. Large effect estimates may reflect differences in patient characteristics, healthcare delivery, documentation practices, sample composition, or the distribution of exposure variables within the study population. Furthermore, because this study employed a retrospective cross-sectional design, causal relationships cannot be established. Prospective multicentre studies are therefore warranted to confirm the magnitude of this association and evaluate its generalizability across diverse clinical settings.

Several mechanisms may explain why medication adherence is strongly associated with hospital readmission. Continuous antipsychotic treatment helps maintain symptom stability, reduces

the risk of relapse, supports functional recovery, and facilitates sustained engagement with mental health services. Conversely, treatment discontinuation may result in symptom exacerbation, impaired insight, reduced treatment engagement, and increased vulnerability to psychiatric deterioration requiring hospitalization (Abdullah-Koolmees et al., 2021; Barliana et al., 2023; Hou et al., 2024). Medication adherence should therefore be regarded not merely as compliance with pharmacotherapy but as an essential component of comprehensive long-term schizophrenia management.

These findings have important implications for psychiatric nursing practice. Given that medication adherence was identified as the strongest modifiable factor associated with hospital readmission, interventions to improve adherence should be prioritized throughout the continuum of care. Psychiatric nurses play a pivotal role in providing individualized psychoeducation for patients and families, monitoring medication-related adverse effects, identifying barriers to adherence, conducting regular medication reviews, and recognizing early warning signs of relapse during follow-up. Coordinated discharge planning, family psychoeducation, community-based follow-up, psychosocial rehabilitation, and individualized treatment planning including consideration of long-acting injectable antipsychotics for selected patients with recurrent non-adherence may improve treatment continuity and reduce the risk of rehospitalization (Rodriguez et al., 2024; Thongsalab et al., 2023; Ye et al., 2023). Strengthening these evidence-based interventions may enhance long-term recovery while reducing the clinical and economic burden associated with recurrent hospitalization among individuals with schizophrenia.

Conclusions

This study demonstrated that medication adherence was the strongest independent factor associated with hospital readmission among patients with schizophrenia at Bali Provincial Mental Hospital. In addition to medication adherence, age, residual symptoms, and comorbidities were significantly associated with readmission, whereas gender, employment status, and schizophrenia subtype were not. These findings underscore that clinical factors, particularly those that are potentially modifiable, play a more important role in predicting readmission than demographic characteristics. The results highlight the importance of strengthening relapse prevention strategies through comprehensive medication adherence programs, early identification and management of residual symptoms, and integrated care for patients with coexisting medical conditions. As medication adherence emerged as the most influential predictor of readmission, interventions aimed at improving treatment continuity should be prioritized throughout the continuum of care.

From a clinical perspective, Bali Provincial

Mental Hospital should strengthen multidisciplinary collaboration involving psychiatrists, psychiatric nurses, psychologists, primary care physicians, pharmacists, and social workers to provide coordinated, person-centred care for individuals with schizophrenia. Strategies such as individualized psychoeducation, routine medication adherence monitoring, comprehensive discharge planning, family engagement, community-based follow-up, home visitation programs, and the appropriate use of long-acting injectable antipsychotics for patients with recurrent non-adherence may contribute to reducing preventable hospital readmissions.

Future research should employ prospective longitudinal or multicentre study designs to establish temporal relationships between risk factors and readmission. In addition, future studies should incorporate psychosocial variables that were unavailable in the present retrospective study, including family support, perceived stigma, socioeconomic conditions, treatment insight, and access to community mental health services, to provide a more comprehensive understanding of the determinants of hospital readmission among individuals with schizophrenia.

Declaration of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this study.

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Data Availability

The datasets generated and/or analyzed during the current study are not publicly available because they contain confidential patient information. However, de-identified data are available from the corresponding author upon reasonable request and with permission from Bali Provincial Mental Hospital, subject to applicable ethical and institutional regulations.

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