Article

Factors Associated with Readmission within 30 Days of Hospital Discharge of Psychiatric Patients: Case-Control Study

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Abstract

Background: Readmission, defined as any admission after discharge from the same hospital, has negative implications for health outcomes. This study aims to identify the sociodemographic and clinical factors associated with hospital readmission among psychiatric patients.

Methodology: This case-control study analyzed 202 clinical records of patients admitted to a psychiatric hospital between 2019–2021. The sample was selected using simple random sampling. Qualitative variables were presented using frequencies, percentages, and chi-square tests for association. Quantitative variables were described using central tendency measures and dispersion of data, investigated with the Kolmogorov-Smirnov test, Student's *t*-test or Wilcoxon test as appropriate. Regression analysis was conducted to determine factors linked to readmission. $p < 0.05$ was considered.

Results: Women accounted for a higher readmission rate (59%). Patients diagnosed with schizophrenia had a higher readmission rate (63%), experienced longer transfer times to the hospital during readmissions, and had shorter hospital stays. Polypharmacy and pharmacological interactions were associated with readmission. Olanzapine treatment was identified as a risk factor for readmission (ExpB = 3.203, 95% CI 1.405–7.306, $p = 0.006$).

Conclusions: The findings suggest avoiding polypharmacy and medications with high side effect profiles to reduce readmissions. This study offers valuable insights for clinical decision-making from admission to discharge planning, aiming to enhance the quality of care.

Keywords

hospitalization; hospital readmission; mental disorders; psychiatric services

Introduction

Early readmission has negative effects on health outcomes. Multiple hospitalizations worsen the prognosis of psychiatric patients, in addition to contributing to increased healthcare costs [1]. The concept of readmission period has been defined in various studies across different time periods [2]. However, most recent studies agree and use the 30-day period from discharge to readmission as the benchmark for hospital readmission [3]. Hospital readmission can affect 40% to 60% of patients with a mental disorder in the first year following discharge, leading to escalated costs in health systems and negative impacts on the patient's support network and social connections [4].

Hospital readmission is directly linked to the length of stay. Consequently, stays that are excessively short hinder patients as they prevent them from receiving necessary treatment or may even result in higher number of crises or relapses following discharge. Conversely, excessively long stays do not promote adequate recovery [5]. Therefore, hospitalization should emphasize a brief stay and discharge the patient when therapeutic objectives have been achieved [1,6]. Several studies indicate that hospital stays of less than 15 days or exceeding 30 days amplify the risk of premature readmission, particularly among patients with schizophrenia, major depression, or severe personality disorders [7–9].

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The period immediately after hospital discharge is a high-risk period for readmission that diminishes progressively. Sociodemographic factors such as male gender, unemployed or low education, among others, influence readmission [10,11].

Variables like living alone, disability or unemployment are crucial predictors of early hospitalization among psychiatric patients. Inadequate community support, residing in an urban environment and unstable outpatient follow-up are associated with hospital readmission within 30 days of discharge [12].While clinical factors are less frequently documented, but need to be analyzed as they are derived from medical decisions.

Our objective was to identify the sociodemographic and clinical factors associated with hospital readmission among patients in a public psychiatric hospital in Mexico City.

Materials and Methods

A case-control study was designed. Clinical records of patients from a public psychiatric hospital located in the south of Mexico City were analyzed. The hospital has 300 beds for patients with acute mental disorders with an average inpatient stay of 24 days. About 48,000 outpatient consultations are provided annually. In the period 2019–2021, there were 6956 hospitalizations. This study complied with the provisions of the Regulations of the General Health Law on Health Research in force, Article 17, Section I: research without risk [13]. It also complies with the Declaration of Helsinki.

Sample Size and Selection Criteria

Sample size: The finite sample size formula was used with the following parameters: confidence level (Z) = 1.96, percentage of population with the desired attribute (p) = 8%, percentage of population without the desired attribute (q) = 92%, maximum accepted estimation error (e) = 5%, universe size (N) = 6956, n = 111. Clinical records of cases and controls were selected from the hospital discharge database by simple random sampling. The records of 13 cases and 7 controls were not located in the clinical archive; the final sample was 202 records.

Case selection criteria: clinical records of patients who were readmitted within 30 days of hospital discharge. Selection criteria for controls: clinical records of patients who were not readmitted within 30 days of hospital discharge. Exclusion criteria: records not located in the clinical archive, records of patients who were discharged by family request or with a stay of less than 72 hours.

Variables

The sociodemographic variables were: (1) age, (2) sex, (3) marital status, (4) schooling, (5) occupation, (6) time of transport to hospital (time in which the patient travels from their place of residence to the hospital).

The clinical variables were: (7) type of hospitalization (voluntary, involuntary, medical indication [when there is a risk to self or others and there is no legal responsibility]), (8) reason for admission, (9) diagnosis, (10) years of illness, (11) medical comorbidity, (12) psychiatric comorbidity, (13) days of hospitalization, (14) adherence to treatment defined as the clinician's perception of medication intake (good, fair or poor), (15) polypharmacy (>3 psychopharmaceuticals), (16) drug interactions (effects detected by the clinician with respect to antipsychotic treatment), (17) antipsychotic equivalent dose (equivalent to 1 mg Olanzapine), (18) outpatient follow-up, and (19) time between discharge and return to outpatient care.

Statistical Analysis

Qualitative variables were described with frequencies, percentages and measures of dispersion and central tendency (mean, median standard deviation or interquartile range) as appropriate to describe quantitative variables. The chi-square test was used to test the association of nominal variables with readmission or non-readmission. The distribution of quantitative values was tested with the Kolmorodov-Smirnov test. Subsequently, to determine whether there are significant differences in the quantitative variables between readmissions and non-readmissions, the Wilcoxon rank sum test was used for variables with free distribution and the Student t-test for those with normal distribution. A regression analysis was performed with the dependent variable readmission to identify the factors associated with hospital readmission. Data were collected in IBM SPSS Statistics software (SPSS, version 26.0; International Business Machines Corporation; Armonk, NY, USA).

Results

A total of 202 files were reviewed, of which 98 files were of patients who were readmitted and 104 files were of patients who were not readmitted. Regarding, sociodemo-

Table 1. Comparative sociodemographic characteristics of readmissions and non-readmissions before 30 days of hospital discharge (*n* = 202).

		No readmission	Readmission	Total (%)	χ^2	
		n = 104 (%)	*n* = 98 (%)		Value	*p*
Sex	Woman	50 (48.1)	58 (59.2)	108 (53.5)	2.502	0.114
	Man	54 (51.9)	40 (40.8)	94 (46.5)		
Civil status	Single	97 (93.3)	89 (90.8)	186 (92.1)	0.416	0.519
	Married	7 (6.7)	9 (9.2)	16 (7.9)		
Schooling	Elementary	40 (38.5)	31 (31.6)	71 (35.1)	1.393	0.707
	Secondary	31 (29.8)	32 (32.7)	63 (31.2)		
	High school	10 (9.6)	13 (13.3)	23 (11.4)		
	Bachelor's degree	23 (22.1)	22 (22.4)	45 (22.3)		
Occupation	Unemployment	90 (86.5)	89 (90.8)	179 (88.6)	3.364	0.644
	Craftsmen	2 (1.9)	2 (2.0)	4 (2.0)		
	Employment	6 (5.8)	3 (3.1)	9 (4.5)		
	Agriculture or farming	2 (1.9)	0 (0.0)	2 (1.0)		
	Student	1 (1.0)	2 (2.0)	3 (1.5)		
	Professional	3 (2.9)	2 (2.0)	5 (2.5)		

graphic variables, the frequency of data is similar and there were no statistically significant differences between cases and controls. See Table 1.

Concerning clinical characteristics, 66.3% of the patients who were readmitted had a diagnosis of schizophrenia. The clinical perception of poor adherence to treatment was higher in patients who were not readmitted ($p = 0.090$). 67.3% of patients who were readmitted had polypharmacy, in contrast to 51.9% of those who were not readmitted ($p < 0.05$). See Table 2.

Pharmacological interactions among patients who were readmitted were 42.9% compared to those who were not readmitted at 26.9% ($p = 0.017$). Regarding the type of antipsychotic, 54.1% of readmissions were treated with olanzapine. More patients treated with haloperidol or risperidone were identified who did not readmit 38.5% and 21.2%, respectively.

The type of antipsychotic used at the time of hospitalization marked statistically significant differences between readmissions and non-readmissions. Outpatient follow-up was lower in patients who were readmitted, as only 23.5% attended their follow-up appointment. See Table 2.

According to the Kolmogorov-Smirnov test, only the age variable had a normal distribution ($p > 0.05$). There were with statistically significant differences between cases and controls for the variable age ($p = 0.011$). The Wilcoxon rank sum test showed the values are statistically significant for the variables antipsychotic equivalent dose (median 6.7 mg vs median 10 mg) and days of hospitalization (median 18 vs median 22 days) $p = 0.001$ and $p = 0.009$ respectively. The variables time of transfer to hospital and time between discharge and outpatient follow-up were higher in patients who were readmitted in both, but there was no statistical significance. See Table 3.

Regression analysis showed adequate adjustment in the Hosmer and Lemeshow test = 4.459, gl = 8, $p = 0.814$. The variables voluntary hospitalization and outpatient follow-up were protective factors for readmission but without statistical significance, while having medical comorbidity, psychiatric comorbidity and polypharmacy increased the risk of hospital readmission within 30 days of discharge ExpB = 1.126, ExpB = 1.370 and ExpB = 1.834 respectively, although there was no statistical significance.

The multinomial analysis for the antipsychotic variable had adequate fit (-2LLL) = 32.543, X2 = 15.746, gl = 3, $p = 0.001$, showed that having been treated with olanzapine was a risk factor for hospital readmission ExpB = 3.203, 95% CI 1.405–7.306, $p = 0.006$. See Table 4.

Discussion

The objectives of this study were to identify the factors associated with hospital readmission and whether clinical factors are more relevant for readmission. In both groups, we observed that the mean number of days of hospitalization fell within the recommended range. However, patients who were readmitted spent more days in hospital compared to patients who were not readmitted. Additionally, the time taken of transfer to the hospital was longer among read-

Table 2. Comparison of clinical characteristics of readmissions and non-readmissions within 30 days of hospital discharge (*n* = 202).

		No readmission	Readmission	Total = 202 (%)	χ^2	
		n = 104 (%)	*n* = 98 (%)		Value	*p*
Type of admission	Voluntary	11 (10.6)	7 (7.1)	18 (8.9)	0.874	0.646
	Involuntary	89 (85.6)	86 (87.8)	175 (86.6)		
	Medical indication	4 (3.8)	5 (5.1)	9 (4.5)		
Reason for admission	Errors of judgment	48 (46.2)	42 (42.9)	90 (44.6)	9.358	0.096
	Suicidal behavior	24 (23.1)	13 (13.3)	37 (18.3)		
	Imperative hallucinations	8 (7.7)	4 (4.1)	12 (5.9)		
	Heteroaggressivity Ph/V*	8 (7.7)	18 (18.4)	26 (12.9)		
	Negativism Pham/F^{+}	9 (8.7)	12 (12.2)	21 (10.4)		
	Delusions of harm	7 (6.7)	9 (9.2)	16 (7.9)		
Diagnosis	Schizophrenia	61 (58.7)	65 (66.3)	126 (62.4)	14.351	0.045
	Psychosis	0	1 (1.0)	1 (0.5)		
	Bipolar disorder	14 (13.5)	14 (14.3)	28 (13.9)		
	Depressive disorder	9 (8.7)	4 (4.1)	13 (6.4)		
	PDSSA**	4 (3.8)	6 (6.1)	10 (5.0)		
	Personality disorder	9 (8.7)	1 (1.0)	10 (5.0)		
	Mental disability	1 (1.0)	5 (5.1)	6 (3.0)		
	Others	6 (5.8)	2 (2.0)	8 (4.0)		
Medical comorbidity	Yes	49 (47.1)	55 (56.1)	104 (51.5)	1.639	0.200
Psychiatric comorbidity	Yes	96 (92.3)	93 (95.9)	189 (94.0)	1.139	0.286
Treatment adherence	Good	0	4 (4.1)	4 (2.0)	4.826	0.090
	Regular	17 (16.3)	19 (19.4)	36 (17.8)		
	Bad	87 (83.7)	75 (76.5)	162 (80.2)		
Polypharmacy	Yes	54 (51.9)	66 (67.3)	120 (59.4)	4.977	0.026
Pharmacological interactions	Yes	28 (26.9)	42 (42.9)	70 (34.7)	5.657	0.017
Antipsychotics	Olanzapine	28 (26.9)	53 (54.1)	81 (40.1)	15.540	0.001
	Haloperidol	40 (38.5)	23 (23.5)	63 (31.2)		
	Quetiapine	14 (13.5)	9 (9.2)	23 (11.4)		
	Risperidone	22 (21.2)	13 (13.3)	35 (17.3)		
Outpatient consultation follow-up	Yes	38 (36.5)	23 (23.5)	61 (30.2)	4.088	0.043

*Ph/V, Physical/Verbal; $^{+}$Pham/F, Pharmaceuticals/Food; **PDSSA, Psychotic Disorder Secondary to Substance Abuse.

mitted patients, potentially explaining why they may miss their follow-up appointment after discharge or experience delayed return to the outpatient care. Notably, certain factors such as younger age and a longer hospital stay were significantly associated with psychiatric hospital readmission in this study, which was also reported in previous studies [14,15].

Our results revealed that more than half of the patients who were readmitted had a diagnosis of schizophrenia, aligning with numerous previous studies that have identified a diagnosis of schizophrenia or other psychotic disorders serve as a predictor of readmission [16]. Diagnoses such as bipolar disorder and depression exhibited similar tendencies, being more likely to result in readmission [17].

Furthermore, polypharmacy was associated with hospital readmission in our study. It is noteworthy that the type of antipsychotic and the equivalent dose were also associated with rehospitalization, particularly patients treated with olanzapine being admitted more frequently, a finding not previously reported. Therefore, it is recommended to avoid polypharmacy and refrain from using drugs with a higher side effect profile.

Poor adherence to treatment was associated with no readmission. One potential explanation for this is that the side effects of polypharmacy prompt some patients to suspend treatment and seek outpatient care before experiencing a relapse, while other only return to the hospital when a new hospitalization is necessary. However, this data should be investigated.

Table 3. Statistic difference of quantitative variables (*n* = 202).

	No readmission		Readmission		*t* Student test	
	Mean	Sd	Mean	Sd	Value	*p*
Age	44.08	13.9	39.3	12.3	2.555	0.011
					Wilcoxon test	
	Median	IQR	Median	IQR	Value	*p*
Time of transport to hospital	116	67	127	63	9008	0.274
Amount of reasons for admission	2	1	1	1	9671	0.453
Days of hospitalization	18	13	22	14	9480	0.009
Years of illness	15.5	20	17	20	10,440.5	0.781
Equivalent dose of antipsychotic	6.7	5	10	3.3	8983	0.001
Time between discharge and return to outpatient consultation	46	63	123	728	683	0.655

Sd, Standard Deviation; IQR, Interquartile range.

Table 4. Variables included in analysis regression for psychiatric hospital readmission.

	B	Standard error	Wald	gl	Sig.	ExpB	95% CI to ExpB	
							Inferior	Superior
Regression analysis								
Sex (women)	0.465	0.293	2.511	1	0.113	1.591	0.896	2.827
Type of admission (voluntary)	–0.317	0.527	0.361	1	0.548	0.729	0.260	2.045
Medical comorbidity	0.119	0.319	0.139	1	0.709	1.126	0.603	2.105
Psychiatric comorbidity	0.315	0.659	0.228	1	0.633	1.370	0.376	4.986
Polypharmacy	0.607	0.327	3.449	1	0.063	1.834	0.967	3.480
Outpatient monitoring	–0.577	0.331	3.032	1	0.082	0.562	0.293	1.075
Multinomial analysis								
Olanzapine	1.164	0.421*	7.659	1	0.006	3.203	1.405	7.306
Haloperidol	–0.027	0.437*	0.004	1	0.950	0.973	0.413	2.291
Quetiapine	0.084	0.552*	0.023	1	0.879	1.088	0.369	3.211

*error deviation.

Medical and psychiatric comorbidities are also factors associated with readmission. One study found that the impact of physical comorbidities was greater in patients with affective and substance use disorders. The presence of physical health problems and higher Charlson Comorbidity Index scores may worsen the course of the mental disorder during hospitalization, leading to readmissions for psychiatric and non-psychiatric reasons. Hence, these factors should be assessed and addressed at the time of discharge to prevent readmission [18–20]. However, it is noteworthy that our study found low association of medical or psychiatric comorbidity with readmissions, contrary to reports in previous studies.

The main strength of our work is that it is the first to be described in a public hospital in Mexico, serving as a reference for further research and extensions of the topic. Overall, this study highlights the association of poorly tolerated drugs and polypharmacy with readmission in acute episodes of patients with severe mental disorders.

However, our study has limitations. Scales for clinical assessment of symptom severity, adherence to treatment and drug interactions were not included, as their use is irregular in the hospital where the study was conducted. Additionally, data were collected from physical clinical records, raising the possibility of completely or inadequate collection. Moreover, there may be a sample bias, as the hospital where the study was conducted primarily treats patients with acute psychosis, potentially underrepresenting other disorders.

Conclusions

Measuring early readmissions, within 30 days of discharge, is an indicator of the efficiency of psychiatric services [21]. Our findings suggest that clinical factors play a significant role in patient readmission, particularly variables such as receiving treatment with olanzapine, having medical or psychiatric comorbidities and polypharmacy,

sociodemographic factors showed no difference between the groups, which does not coincide with the literature.

This study offers valuable insights for clinical decision-making spanning from the patient´s admission to the hospital to discharge planning. These insights have the potential to enhance the quality of care provided to patients.

Availability of Data and Materials

Materials for the preparation of the work are available upon request from the corresponding author.

Author Contributions

HCR and MEM contributed substantially to the conception, design, and writing of the manuscript. HCR and MMT have contributed to data collection or data analysis and interpretation and have critically reviewed for important intellectual content. All authors approved the final version and collaborated sufficiently on the work to take public responsibility for the content. All authors assume responsibility for all aspects of the work to ensure that questions regarding the accuracy or completeness of any part of the work are adequately investigated and resolved.

Ethics Approval and Consent to Participate

This study complies with the Declaration of Helsinki. It was submitted to the Research and Research Ethics Committees of the Hospital Psiquiátrico Fray Bernardino Álvarez and was approved with registration number CI-1021; they approved that informed consent was not included since the study was retrospective and clinical records were consulted.

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Conflict of Interest

The authors declare no conflict of interest.

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