A Case-Control Study of Factors Associated With Multiple Psychiatric Readmissions

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Objective: **This case-control study explored factors associated with multiple psychiatric admissions, focusing on service-related and individual-level factors.** *Methods:* **The case group consisted of 307 adults admitted to either of two public psychiatric hospitals in southern Brazil during a 12-month period; they had had three or more psychiatric admissions in the two years before the current admission. To account for the recurrent nature of psychiatric admissions, a concurrent case-control design was adopted, which allowed patients in the case group to return at discharge to the population at risk of readmission. The control group consisted of individuals who had their first inpatient readmission in 2006 (N=354). A hierarchical model with four levels was used for data analysis.** *Results:* **Individuals who had been referred to community psychosocial support units after their most recent discharge had about 20% lower odds of multiple readmissions than those referred to usual outpatient care. Those who lived closer to the hospital (residents of the same city) were more likely to have multiple readmissions. The adjusted multivariate hierarchical analysis revealed that a diagnosis of schizophrenia or psychotic symptoms was associated with multiple readmissions, as were younger age at first admission and a greater number of previous admissions.** *Conclusions:* **The study suggests that community psychosocial support services play a strong role in preventing multiple psychiatric admissions. Further research is needed to identify the specific components of these services that reduce readmission and to analyze their cost-effectiveness.** (*Psychiatric Services* **60:786–791, 2009**)

The beneficial aspects of reforms in the structure and delivery of psychiatric care, especially deinstitutionalization, have long been recognized, as have their drawbacks (1). After nearly five decades of intense psychiatric reform activity in several countries, it has become clear that deinstitutionalized individuals who have severe mental illness or who have difficulty accessing outpatient psychiatric services are prone to frequent hospital readmissions, and such trends have been observed in a multitude of contexts (2–8).

Psychiatric readmissions are a consequence of a complex combination of factors that go beyond the severity of the psychiatric disease and include availability of services, quality and continuity of care, and family and social support, among others. Several studies have identified strong predictors of readmission, such as poor treatment adherence (9–13), low level of education (11,14), deficient follow-up after hospital discharge (14), involuntary admission (3,15), lack of social or family support (11,16), and diagnoses of schizophrenia (17) and substance use disorders (10,18).

Even though the negative consequences of multiple psychiatric admissions have been well documented (19), readmission rates have been increasing worldwide (14,16,20). The same phenomenon has been observed in Brazil, where readmission rates range between 30% and 59% during the first four months after discharge (21,22). Mental health care reform in Brazil has attempted to reduce the separation of mental health care from general medical care by reducing the number of tertiary hospitals, increasing (not proportionally) the number of psychiatric beds in general hospitals, and creating community-based services that collaborate with primary care units and coordinate treatment, referrals, and social support. Community Psychosocial Care Centers (Centros de Atenção Psicosocial, or CAPS) were created to play these roles and also to act as substitutes for psychiatric beds. These centers provide intensive day hospital care (23,24).

A better understanding of factors that reduce the likelihood of multiple psychiatric admissions is needed. Such knowledge can help planners to set priorities and to make appropriate services and resources available to patients and their families after hospital discharge. Given the gap in knowledge, the objective of this study was to investigate factors associated with multiple psychiatric ad-

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missions among adults age 18 and over. Specifically, our study focused on the role of service-related factors, such as registration with the primary care unit after discharge and use of community mental health services, and individual-level factors, such as treatment and medication adherence.

Methods
Study design and setting
This case-control study selected incident (as opposed to prevalent) cases from the two major public psychiatric hospitals in Porto Alegre, southern Brazil, during a 12-month period from January through December 2006. These hospitals, which receive public funds to cover admissions and serve mainly the greater Porto Alegre area, have a combined capacity for 310 inpatients. In a pilot study we observed that rates of readmission to the two hospitals were comparable and ranged between 40% and 60% in the five months before the study.

We calculated that a sample size of 300 in the case group and 300 in the control group was needed to permit detection of a relative rate of 1.5, with an alpha of .05 and a beta of .80. Cases were defined on the basis of number of admissions during the data collection phase; that is, individuals who had three or more psychiatric admissions in the two years before the current admission (N=307) were included. Given the recurrent nature of psychiatric admissions, a concurrent case-control design was adopted with the objective of estimating the relative rate of admission for the "exposures" under study. The case-control design allowed individuals in the case group to return to the population at risk after hospital discharge.

Individuals who had their first inpatient readmission during the study period (N=354) constituted the control group. Individuals in both the case group and the control group who had a previous admission that lasted more than six months were excluded, because exposure to the risk factors for readmission may not have been comparable for these patients. Only readmissions that occurred more than 48 hours after a discharge were counted as a readmission. Data for a subgroup of 41 individuals in the con-

trol group who had one or more readmissions in 2006 (subsequent to the index admission) were included in analyses for both groups and were also analyzed separately. Written informed consent was obtained after a complete description of the study to the participants.

Variables
Sociodemographic factors included age group (18–29, 30–49, and 50–69 years), gender, ethnicity (white or nonwhite), socioeconomic status–adjusted quintiles of the National Wealth Score (25), marital status (married or not married), employment (employed versus unemployed, retired, or receiving a disability pension), and living arrangement (with or without family). Factors related to psychiatric admission history were age at first admission (in years), length of first admission (in days), number of lifetime admissions, type of first admission or the earliest admission for which data were available (voluntary or involuntary), and diagnostic group (mood or anxiety disorders, substance use disorders, and schizophrenia or psychotic symptoms). Factors related to treatment after the most recent discharge (that is, the discharge preceding the current admission) included treatment adherence (outpatient visits and medication), use of subsidized or free medication, use of psychotherapy, distance from the place of residence to the hospital (in the same city, in the same metropolitan area, or outside the metropolitan area), type of outpatient services used (CAPS or usual care), and attending or being registered with the hospital's primary care unit after discharge.

Data sources and measurement
Data were collected in the same way for individuals in the case and control groups. Sociodemographic information was obtained during patient interviews by use of a precoded, structured questionnaire. Characteristics of previous psychiatric admissions, *ICD-10* diagnosis, and treatment were abstracted from hospital records. The research team made daily visits to the hospitals to identify patients who were readmitted. After pa-

tients gave written informed consent, interviews were conducted and chart information was abstracted. For individuals who had previous admissions to hospitals other than the study hospitals, the research team abstracted data from the other charts.

Data analysis
After descriptive statistical analysis, multivariate analysis was conducted according to a predefined conceptual model. The model included four hierarchical levels or blocks of variables. The first (distal) level included all socioeconomic variables; the second level included psychiatric diagnosis and comorbid substance use disorder; the third level included psychiatric admission history and details of previous hospital admissions; the fourth (proximal) level contained the variables related to postdischarge events, such as adherence to medication, adherence to other forms of treatment, contact with the primary care unit, and distance from place of residence to the hospital.

For univariate and multivariate analyses, the variable sex was kept in the model and variance estimates were adjusted for hospital clustering. Poisson regression was used to estimate the relative rate of exposure for the case and control groups. Only variables with a p value of ≤.05 in the univariate analyses were included in the subsequent modeling procedures, defined as an intralevel multivariate analysis. The variables that had a p value of ≤.05 after adjustment in the intralevel phase of the multivariate analysis were entered into the hierarchical analysis. As defined in the conceptual framework, the variables from the distal level entered the hierarchical model first, followed by those from the second, third, and fourth levels. To report the effect of distal-level variables, the estimate of each variable was obtained before introduction of variables from the next level. Similarly, for each subsequent level, estimates were obtained before the introduction of the next group of variables. Variables in the multivariate model within each level and variables at the proximal level in the final model were kept in the model when the corresponding p value was ≤.05.

All analyses were conducted with the Stata statistical package, version 10.0.

The protocol of this study was approved by the research ethics boards of both hospitals, according to national recommendations for scientific studies involving human subjects.

Results

Of the 307 patients in the case group and 354 in the control group, most were white and nonmarried (Table 1). The mean±SD age of the overall sample was 35.9±11.1 years. There were 214 males (69%) in the case group and 231 males (65%) in the control group. Individuals in the case group were relatively younger at first admission than those in the control group (27.3±9.6 years and 30.7±11 years, respectively; p<.001). The first admission was also longer for those in the case group compared with the control group (33.2±22.5 and 30.7±22.3 days, respectively), but the difference was not statistically significant.

As shown in Table 1, the univariate analysis found an inverse association between wealth and multiple readmissions. Patients in the highest wealth quintile had lower odds of multiple readmissions (adjusted relative rate [ARR]=.77) than those in the lowest quintile). Patients with multiple readmissions were more likely to be unmarried and unemployed, retired, or receiving a disability pension, even after intralevel adjustments. Patients with schizophrenia or psychotic symptoms were more likely than patients with mood or anxiety disorders to have multiple readmissions (ARR=1.16).

Several factors related to first psychiatric admission were associated with multiple subsequent readmissions (Table 1). Age at first admission was inversely associated with multiple readmissions; patients who were younger at first admission were more likely to experience multiple readmissions, even after adjustment for current age. Those whose first admission was involuntary had higher odds of multiple readmissions than those with an involuntary first admission (or the first admission for which data were available).

Patients who received subsidized or free medication (that is, distrib-uted by the government or a health service provider) were more likely than those who did not receive it to have multiple readmissions, even after adjustment for the wealth index (ARR=1.24). Individuals who had been referred to CAPS after the previous discharge were about 20% less likely than those referred to usual care to experience multiple readmissions (ARR=.79). Those who attended scheduled outpatient psychiatric appointments after the previous discharge had a lower likelihood of multiple readmissions than those who did not attend; however, adherence to medication was not a significant predictor of readmission. Individuals who lived in the same city as the hospital had a higher likelihood of readmission than those who lived in the greater metropolitan area (ARR=1.27) (Table 1).

The final multivariate hierarchical analysis is presented in Table 2. Even after adjustment for sociodemographic characteristics (level 1), a diagnosis of schizophrenia or psychotic symptoms was associated with multiple readmissions, as was age at first admission and number of previous admissions. Individuals who were referred to CAPS after the most recent hospital discharge were 20% less likely than those referred to usual care to have multiple readmissions, even after adjustment for sociodemographic characteristics, diagnosis, and factors related to the first psychiatric admission.

Discussion

In Brazil, where this study was conducted, psychiatric and general medical care is funded through universal public coverage. Users of private care were thus not included in the sample, which limits the generalizability of our findings. To compare patients with a high number of readmissions and those with a low number, we used a conservative method of selecting patients for the control group, which should also be taken into account when interpreting these results because this selection method may have reduced the strength of the associations.

Results from this case-control study confirm previous findings of an asso-ciation between multiple readmissions and age at first admission, number of previous admissions (26,27), type of first admission (involuntary) (28), lower socioeconomic status (15), and a diagnosis of severe mental illness (schizophrenia and psychotic symptoms) (14,26,27). Level of education was not associated with hospital readmission in this study. One previous study found such an association (14), whereas others did not (10,29, 30). The lack of association may be a function of the limited variation in level of education in this sample.

Disease progression, and the greater frequency of hospital admissions that may accompany progression, are likely to reduce the probability of maintaining employment, which explains the association between lack of employment and multiple readmissions. Similar findings in regard to employment were reported in 1996 by Wieselgren and Lindstrom (31) and were attributed to disease progression. The relationship between multiple admissions and not being married is also consistent with previous findings (20,22,32). However, reverse causality may explain both associations, which indicates that studies with different designs are necessary to elucidate this relationship.

Lower socioeconomic status was a strong predictor of multiple hospital admissions. Individuals in the highest wealth quintile were almost 20% less likely to be readmitted to the hospital than those in the lowest quintile, although this association has been questioned in previous studies (22). We attribute our ability to identify such an association to use of a validated wealth score that is based on assets and calculated by taking into account the large geographical variation in socioeconomic status observed in Brazil (25).

We found no association between adherence to medication and multiple psychiatric admissions, although an inverse association has been reported in the literature. The absence of such findings may be a consequence of the study design, in which some individuals in the control group also experienced multiple readmissions (in the study year). Other possible explanations are that adherence to medication was self-reported by the

Table 1

Four-level analytical model of predictors of multiple readmissions among inpatients with three or more prior admissions in the past two years and a concurrently matched control group

Level and Variable	Control group (N=354)		Case group (N=307)		Relative rate	95% CI	Adjusted relative rate[a]	95% CI
	N	%	N	%				
Level 1								
Race								
White (reference)	274	77	239	78				
Nonwhite	80	23	68	22	.98	.81–1.19	.96	.78–1.17
Age								
18–29 (reference)	53	15	41	13				
30–49	171	48	164	53	1.10	.89–1.37	1.09	.90–1.32
50–69	130	37	102	33	.98	.77–1.24	1.00	.80–1.26
National Wealth Score[b]								
Low 20 (reference)	46	13	60	20				
Low 40	105	30	83	27	.79	.72–0.87	.80	.71–0.9
Mid 20	97	27	90	29	.85	.80–.91	.87	.80–.95
Top 40	67	19	50	16	.76	.73–.79	.77	.72–.81
Top 20	39	11	24	8	.68	.56–.83	.77	.66–.89
Marital status								
Married (reference)	90	25	50	16				
Not married	264	74	257	84	1.36	1.18–1.57	1.32	1.05–1.66
Employment status								
Employed (reference)	71	20	36	12				
Retired or receiving disability benefits	153	43	166	54	1.57	1.53–1.61	1.58	1.57–1.58
Unemployed	130	37	105	34	1.37	1.35–1.39	1.36	1.33–1.38
Lives with family								
No (reference)	54	15	66	21				
Yes	300	85	240	78	.81	.69–.95	.90	.71–1.13
Level 2								
Diagnostic group								
Mood or anxiety disorder (reference)	145	41	113	37				
Substance use disorder	101	29	76	25	.94	.84–1.06	.94	.84–1.06
Schizophrenia or psychotic symptoms	108	31	118	38	1.11	1.10–1.13	1.16	1.15–1.16
Level 3								
Age at first admission (risk per year older)	—	—	—	—	.98	.98–.99	.99	.98–.99
Length of first admission (risk per day longer)	—	—	—	—	1.00	1.00–1.01	1.00	1.00–1.00
Number of admissions (risk per admission)	—	—	—	—	1.03	1.02–1.03	1.02	1.02–1.03
Type of first admission[c]								
Voluntary (reference)	164	46	129	42				
Involuntary	190	54	178	58	1.09	1.02–1.17	1.04	1.02–1.07
Level 4								
Registered with a primary care unit								
No (reference)	201	57	158	52				
Yes	153	43	149	49	1.13	.93–1.36	1.18	.99–1.40
Receives subsidized or free medication								
No (reference)	39	11	25	8				
Yes	274	77	255	83	1.22	1.00–1.50	1.24	1.04–1.48
Type of outpatient care								
Usual (reference)	334	94	296	96				
Community Psychosocial Care Center	20	6	11	4	.75	.70–.80	.79	.77–.80
Attended scheduled outpatient appointments								
No (reference)	101	29	97	32				
Yes	253	72	210	68	.93	.86–1.01	.87	.82–.92
Adherent to medication								
Yes (reference)	124	35	121	39				
No	230	65	184	60	.92	.79–1.07	.93	.81–1.07
Adherent to psychotherapy								
No (reference)	296	84	261	85				
Yes	58	16	45	15	.93	.89–.97	.95	.89–1.01
Proximity to hospital								
Same city	175	49	184	60	1.29	1.12–1.48	1.27	1.08–1.48
Metropolitan area (reference)	121	34	79	26				
Outside metropolitan area	58	16	44	14	1.08	.80–1.45	1.03	.85–1.25

[a] Adjusted for variables in the same level
[b] Lower quintile indicates lower income.
[c] Or earliest admission for which data were available

Table 2

Final four-level multivariate model (Poisson regression) of predictors of multiple hospital readmissions

Level and variable	ARR[a]	95% CI
Level 1		
National Wealth Score[b] (reference: low 20)		
Low 40	.76	.74–.78
Mid 20	.83	.81–.84
Top 40	.73	.64–.82
Top 20	.73	.57–.92
Married (reference: not married)	1.33	1.13–1.57
Employment status (reference: employed)		
Retired or receiving disability benefits	1.59	1.52–1.67
Unemployed	1.34	1.30–1.37
Level 2		
Diagnostic group (reference: mood or anxiety disorder)		
Substance use disorder	.96	.85–1.08
Schizophrenia or psychotic symptoms	1.08	1.07–1.09
Level 3		
Age at first admission (per year older)	.99	.98–.99
Number of admissions (per admission)	1.02	1.02–1.03
Involuntary first admission (reference: voluntary)[c]	1.06	.99–1.13
Level 4		
Outpatient care at community Psychosocial Care Center (reference: usual care)	.79	.74–.84

[a] Adjusted relative rate. Adjusted for variables in the same level
[b] Lower quintile indicates lower income
[c] Or earliest admission for which data were available

patient or family members and that it may be a proxy for severity of the psychiatric illness. When analyses excluded data for individuals in the control group who had multiple admissions in the study year (that is, after the index admission), the results were not altered. However, when the analysis was limited to patients with schizophrenia or psychotic symptoms, adherence to medication was associated with a significantly lower likelihood of experiencing multiple admissions (data not shown).

A diagnosis of schizophrenia was not as strongly associated with multiple readmissions as in previous studies (28). The type of first admission was associated with multiple readmissions only before the analysis adjusted for socioeconomic status and psychiatric diagnosis. This association has been observed in previous studies (3,4,10,15,17) but has been deemed less important than psychiatric diagnosis (28). Although involuntary admission may be linked to a greater likelihood of noncompliance with treatment after discharge, which would lead to hospital readmission

(33), this hypothesis is not supported by our findings.

Our results suggest that CAPS played an important and beneficial role in reducing psychiatric readmissions. Patients referred to these units were less likely to be readmitted than those referred to usual outpatient services, such as primary care units or hospital-based outpatient clinics. This association was significant even after adjustment for adherence to medication and other treatment and to receipt of subsidized medication (Table 1). The finding that referral to CAPS seems to have prevented readmission for two out of ten psychiatric patients is of great interest and should be further explored. The importance of improving social support and providing psychosocial care to reduce the use of inpatient services has been previously demonstrated (34–36). The services provided by these centers address several social gaps facing patients, and center staff serve as case managers. However, CAPS are limited in their ability to accept new patients; the CAPS network is being

rapidly scaled up, but it still falls short of the current demand.

CAPS, which are funded by the federal government, offer specialized mental health services that provide outpatient care as day or night treatment (24). These were created as part of the psychiatric reform program implemented in Brazil after the adoption of the Caracas Declaration (37) in the early 1990s. Although the network of these services has been expanded since then, and now includes two newly developed, specialized services targeting children and individuals with substance use disorders, little research has been conducted to evaluate the impact of CAPS, to describe the model, or to understand its cost-effectiveness. A recent review of the distribution of CAPS in Brazil found that 848 CAPS were registered as of June 2006 (22). The authors observed that the distribution of CAPS was uneven within the country and that the density was .9 CAPS per 200,000 population. Nevertheless, the progress of the implementation of these initiatives varies widely in Brazil and is still insufficient (22). Brazil's public health system provides treatment and access to psychotropic medication through municipal allocation of federal funds, and there has been a clear shift from hospital to community psychiatric care. Nevertheless, access to and coverage of community mental health services are deficient, and public investment in mental health has not been a priority of psychiatric reform efforts (1).

Our conservative choice of the concurrent case-control design allowed us to estimate the relative rate while also taking into account the possibility of multiple admissions because cases return to the population at risk after discharge (38). Our method of choosing patients for the control group is supported by previous studies of psychiatric readmission (20,21). However, some of the patients in the control group subsequently had multiple readmissions during the study year; the associations we found may have been stronger if the control group consisted only of patients who were not readmitted during the study year.

Conclusions

In light of our findings, the model of care offered by community mental health services should be further explored to identify the specific components responsible for the reduction of psychiatric readmissions.

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