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ORIGINAL PAPER

Impact of length of stay for first psychiatric admissions on the ratio of readmissions in subsequent years in a large Brazilian catchment area

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Abstract
Purpose This study aims to verify the impact that the length of stay has on the rates of readmission for patients who were first admitted to various inpatient psychiatric units in a large catchment area in a middle-income country.
Methods The study included all patients who were first admitted to the 108 acute psychiatric beds available in the catchment area of Ribeirão Preto, Brazil, for a period of 8 years. Demographic features, inpatient unit of discharge, diagnosis and length of stay were assessed by bivariate analysis. An analysis of the time span between first admission and readmission was also conducted using survival curves estimated by the Kaplan–Meier formula. For the analyses of the risk of readmissions, a logistic regression analysis was conducted.
Results From a total of 6261 patients admitted in the period of the survey, approximately one-third (2006) had at least one other readmission during the follow-up period. The rates per year of early readmission (within 90 days after discharge) varied from 16.1 to 20.9 %. The risk of readmission was higher immediately after discharge. The survival analysis showed that ultrashort length of stay (1–2 days) was associated with reduced odds of readmission, but multivariate logistic analysis showed no association between length of stay and the odds of readmissions. The predictors of early readmission included the diagnosis of depressive, bipolar, psychotic, and non-alcohol-related disorders, younger ages and unemployment.
Conclusions Duration of the first psychiatric admission was not associated with a higher risk of readmissions. Predictors for early readmissions of first-time-admitted psychiatric patients seem to be more related to the severity of the psychiatric diagnosis and demographic characteristics.

Keywords Length of stay · Psychiatric readmission · Mental health services · Psychiatric emergency

Introduction

Worldwide, there is a trend towards the establishment of mental health systems characterized by a balanced care model, in which a wide range of inpatients and community-based services can be provided according to the patients' needs and the level resources available. It is increasingly considered that the proper implementation and development of these systems should be based on ethical principles and the best scientific evidence available [1]. An important issue related to the planning and management of the current mental health systems refers to the influence of length of stay (LOS) in the patient's risk of readmissions because the reduction in the number of psychiatric beds and the expansion of community-based care in several regions of the world seem to be related to a decrease in the number and in the duration of psychiatric admissions [2].

Readmission rates have been widely considered as an indicator of the dynamics of a health system. Psychiatric

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readmissions seem to be related to a complex combination of factors that go beyond the clinical features of the mental disorders themselves, such as severity of symptoms and presence of comorbidity [3]. These factors include the number of previous admissions [4], incomplete inpatient treatment during previous admission [5], reduced availability of community-based services, poor quality follow-up, low adherence to treatment after discharge [6], lack of social networks and poor housing [7]. Of these factors, previous hospitalization is the predictor most consistently associated with early readmission, with a greater risk within the 30 days after discharge [8].

The relationship between LOS and readmission is still, however, debated. Some studies have indicated that brief hospitalizations could lead to an increase in readmissions and to the "revolving door" phenomenon [9, 10], but other studies have indicated the opposite impact, i.e. a lower risk of readmissions due to brief hospitalization [11]. In a review about predictors of readmission, it has been shown that the majority of the studies did not find association between LOS and readmission, but the only study that pointed to an association between LOS and early readmission presented a short mean of LOS (7 days) [8]. To date, ultrashort-stay hospitalizations have not yet been systematically evaluated [12]. A study published recently has shown that patients with a very short stay ("zero-day") had a lower risk of readmission, but those with low LOS (1–5 days) were most likely to have an early readmission, within 90 days after discharge [13].

LOS can be influenced by several factors, such as the patients' age and the severity of the mental disorder [14], but also by the mental health service features, such as management patterns used for inpatient units [15], or acceleration of the discharge planning process, because of high bed occupancy and the need to increase the bed availability [16, 17]. As a result, it can be expected that the rates and risk of readmissions may vary across mental health settings. To date, however, the majority of the studies on LOS were conducted in high-income countries, with centralized health care systems [18].

Brazil is a middle-income country that follows policies of lower use of hospital beds and increased use of community-based services [19], likewise many high-income countries are aiming to reduced costs of hospital-based care [20]. Nevertheless, overall Brazilian public health care system, including the mental health sector, is highly unique. More specifically, it is decentralized and fragmented, with health care services being financed and provided by municipal, state and federal levels of government [21]. As a result, it is incomparable to health care systems previous investigated in studies on psychiatric readmission.

We previously reported elevated prevalent rates of ultrashort (1–2 days; 37.6 %) or short (3–10 days; 25.5 %) LOS of psychiatric admissions in a large catchment area in Brazil [22]. These increased rates of brief hospitalizations warrant investigation, since it could be associated with a risk of higher rates of readmissions due to premature discharges.

Therefore, this study aimed to verify the impact of the LOS on the risk of psychiatric readmissions of patients who were admitted for the first time to acute inpatient psychiatric units in a large catchment area in Brazil, in an 8-year follow-up study. We were particularly interested in analysing the risk of readmissions due to short LOS, but because factors related to both the mental disorder and the mental health system could influence the occurrence of readmissions, we also verified the stability over years and the impact on rates of readmission of demographic and clinical features of psychiatric patients in their first psychiatric admission in the catchment area.

Participants and methods

Context of the study

This study was conducted in the XIII Regional Health Department of São Paulo State, Brazil, which is a catchment area composed of 26 municipalities, with a population of approximately 1200,000 inhabitants and a per capita annual income of approximately U$ 10,000 [23, 24] where Ribeirão Preto is the main city in the area. Since the 1990s, the regional and local health authorities have made changes in the mental health policies, aiming to change from an almost exclusively psychiatric hospital-based care to a network of community mental health services that are developed gradually [25]. The mental health services network of the Ribeirão Preto catchment area, during the study period (2000–2007), consisted of the following:

(1) Community-based mental health services, with psychiatric and psychological care available in 24 of the 26 municipalities. Of these, 25 worked on a purely outpatient basis, and only two provided some type of day-care. The other two municipalities provided care only by psychologists and referred to neighbouring municipalities for mental health care from other professionals;
(2) Outpatient specialized clinics (for specific disorders or ages) and a day-hospital (with 16 vacancies) located at a general hospital managed by a governmental university;
(3) Long-term residential care services managed by municipal and state health offices;
(4) Acute inpatient psychiatric beds (108 in total) were distributed in wards located in a psychiatric hospital (PH 80 beds), in a general hospital (GH 22 beds),

and in an emergency psychiatry unit (EP 6 beds) located in an emergency general hospital. Psychiatrists and nurses, working together with other medical specialities, basically composed the EP staff. The GH and the PH provided a multidisciplinary team of psychiatrists, psychologists, nurses, social worker, occupational therapists, with specific therapeutic programs focused mainly on symptomatic control, but inclusive social rehabilitation and cognitive enhancement. The EP and the GH were also learning scenarios for undergraduate medical students and medical residents.

Since its inception, the mental health network has established an advisory group with monthly meetings composed of representatives of all mental health services linked to the national system of health (Portuguese: Sistema Único de Saúde, SUS) in the catchment area, as stated by Brazilian health law [21]. This advisory group has proposed, over the years, multiple guidelines for the efficient operation of the network, which were applied by the local health authorities. These guidelines included:

(1) The establishment of a two-way system of referrals between community-based services and inpatient psychiatric services through telephone contacts, which ensured both prompt inpatient admissions upon request as well as appointments in specialized community services within 10 days after discharge;
(2) The guarantee of supply of psychotropic medications throughout treatment, including periods of transference between services;
(3) The orientation for admission in psychiatric wards only when the community-based services could not handle the patient's needs.
(4) Clear routing standards for the indication of psychiatric admissions: mental health services could refer to the GH, PH and EP, while the general emergency and primary health care services could only refer to the EP;
(5) Definition of the profile of patients to be referred to each inpatient unit. The EP was in charge of the management of acute psychiatric patients, with the possibility of brief admissions (until 72 h). Patients in need of longer hospitalizations and without other decompensated medical conditions were mainly referred to the PH. The psychiatric beds in the GH were primarily allocated to patients in their first episode of mental disorders, with other concomitant medical conditions requiring more complex care from other specialties; with severe mental disorders, refractory to the treatment, and to the elderly persons and the adolescents. More specifically, the psychiatric diagnosis was not to be an attribute to be considered in the referral process to one of the three acute psychiatric units, except by the diagnosis of substance-related disorders (alcohol and non-alcohol), in which case patients with intoxication/withdrawal syndromes were forwarded to the EP and patients who needed longer hospital stay were referred to the PH.
(6) Administrative constraints for the admission in one of the three inpatient units of patients living outside the catchment area of Ribeirão Preto.

During the period in which this study was conducted, decisions about the need of a psychiatric hospitalization were made primarily by the psychiatric emergency staff, which used evidence-based protocols for diagnosis [26] and treatment [27]. As previously reported [22], 60 % of the total of psychiatric admissions in the catchment area occurred initially in the emergency psychiatric service, 31 % in the psychiatric hospital and 9 % in the general hospital. Around 2/3 of the patients initially admitted in the emergency unit, which constitutes 38 % of the total of psychiatric admissions, were discharged after a very short length of stay (1–2 days of admission). The remaining patients initially admitted in the EP were transferred to the GH (6 % of the total of admissions) or to the HP (16 % of the total admissions). The decision about the transfers from the emergency unit was based on the judgment of the emergency psychiatrist about the clinical need of a hospitalization longer than the time administratively expected for admission in the emergency setting (more than 72 h). Transfers between GH and PH represented less than 1 % of the total of admissions.

Participants

The study included all patients who were admitted for the first time in one of the 108 acute psychiatric beds of the Ribeirão Preto catchment area, from 1 January 2000 until 31 December 2007. We defined the first admission as the first formal hospitalization of the patient in one of the included inpatient units of the catchment area under study.

To identify the first-admitted patients, we combined administrative databases provided by each inpatient unit of all patients admitted in a 10-year period, into a single database, such that the information related to admissions and readmissions could be reliably cross-referenced and analysed. A detailed description of the structured database has been published elsewhere [22].

Due to administrative limitations, a single database combining information from the three inpatients units of the Ribeirão Preto catchment area was available only from 1998 to 2007. Even though, this period can be particularly interesting for the purpose of this study because during these years, the number of psychiatric beds and

community-based services in the region remained stable, and the number of psychiatric beds available was enough to supply the demands for hospitalization. Therefore, there was no waiting time between the indication and effectuation of admissions, or for the transfers between units, nor lack of availability of hospital beds, what can be confounders for both LOS and readmission. We included in our analyses years from 2000 to 2007, aiming to minimize the risk of including patients with psychiatric admissions in our catchment area prior to the years under study.

Patients who stayed for few hours in the EP were excluded from the analysis, because a person was formally considered an inpatient of an emergency psychiatric service only after a period of observation of at least 12 h.

The study was approved by the Research Ethics Committee of the Clinic Hospital of the Ribeirão Preto Medical School, University of São Paulo (protocol no. 8216/05).

Extracted data

Given patients could be referred between units, mainly from the emergency unit to the psychiatric hospital or to the psychiatric wards of the general hospital, the unit of admission was defined according to the inpatient unit from which the patient was definitely discharged to community-based services.

The main study outcome was readmission, which was defined as the occurrence of a new admission after admission for the first time in any of the three acute psychiatric inpatient units belonging to Ribeirão Preto catchment area. When a patient had more than one readmission in the catchment area, only the first readmission was considered and the same patient was not considered twice.

Length of stay (LOS) was the main exposure variable in our study. The estimate LOS was defined by the total number of days that the patient consecutively occupied a psychiatric bed, independent of the inpatient unit. Further, LOS was categorized into four levels: (a) ultrashort (1–2 days); (b) short (3–10 days); (c) intermediate (11–30 days); and (d) long (more than 30 days). This grouping of the LOS was based on the profile of psychiatric admissions of the Ribeirão Preto catchment area, where the majority of the admissions lasted from 1 to 2 days (38 %) or from 3 to 10 days (26 %), and just 11 % lasted more than 30 days [22]. This also enabled us to meet the objective of investigating the specific impact of the ultrashort stays in the risk of new admissions.

In addition to LOS, the following exposure variables were included: (a) socio-demographic features: age, gender, professional activity, and marital status; (b) hospital unit of discharge of the first psychiatric admission: emergency unit, general hospital and psychiatric hospital; and (c) diagnosis according to the International Classification of Diseases (ICD-10): neurotic and anxiety disorders (F40–F49), psychotic disorders, including schizophrenia (F20–F29), bipolar disorder (F30, F31), depressive disorders (F32–F34), personality disorders (F60–F69), alcohol-related disorders (F10), other substance-related disorders (F11–F19), and other mental disorders (mainly F00–F09 and F70–79).

Time of follow-up was defined as the number of months between the day of discharge of the first admission and the day of a new psychiatric admission, in the case of the patients who were readmitted. For patients who were not readmitted, time of follow-up was defined by the number of months between the date of discharge and the last date of observation (i.e. 31 December 2007).

Statistical analyses

For the purpose of descriptive analysis, we first estimate the rate of first admissions per 100,000 inhabitants, based on the number of first admissions and the total population of the Ribeirão Preto catchment area per year [23]. We then analysed the changes over the years of the first-admitted patients in regard to demographic features, inpatient unit of discharge, length of stay and diagnosis using linear regression, with Bonferroni correction for multiple comparisons (0.05/8 (number of years) = 0.00625). We also compared the profile of the patients first admitted in the three inpatient units and the relationship between diagnosis and length of stay (supplemental material). Demographic and clinical profile of the patients admitted in the inpatient units under study was assessed using the non-parametric Chi-square test and one-way ANOVA, with Bonferroni post hoc analysis.

For an analysis of the time span between the LOS of the first psychiatric admission in the catchment area and readmission, we initially tested the proportional hazards of the variables extracted for the analysis, but the Cox regression proportional hazards assumption was not met [χ^2 (28) = 45.8, $p = 0.018$]. Therefore, the survival curves were estimated using the Kaplan–Meier formula, using the "log-rank" Mantel–Cox test to assess for differences.

For the main analyses of the risk of readmissions, a logistic regression analysis was conducted including the following categorical variables: LOS, gender, age, occupational status, marital status, inpatient unit of the first admission, and diagnosis. Results were presented in the form of odds ratios (OR) with 95 % confidence intervals (95 % CI). We tested the collinearity of these explanatory variables, and no substantial correlation [variation inflation index (VIF) higher than 10] was shown. Initially, each variable was fitted in a univariate logistic regression model. The variables that reached statistical significance ($p < 0.05$) in the univariate analyses were included in a

multivariate stepwise forward binary logistic regression model. Given there was a variation in periods of exposition to the risk of readmission; we adjusted the multivariate model for time of follow-up.

The period immediate after discharge is consistently shown to be a risk for early admission [8], and thus we performed additional logistic regression analysis to verify the effect of LOS on early readmission, here defined as a new admission within 90 days of discharge of the first admission, as previously proposed [13]. Initially we compared the patients with an early readmission with those without a readmission in the inpatient units of the catchment area during the period under investigation. For this purpose, we excluded the patients admitted in the last year of the survey (2007), aiming to avoid the inclusion of patients without a significant period of follow-up. The exposure variables were the same describe earlier, including year of the first admission, and following the same procedures described earlier. Next, we conducted sensitive analyses by reanalysing the data using only the patients that were readmitted. We compared those who were readmitted within 90 days after discharge with those who were readmitted after 90 days of discharge, including the same exposure variables, except year of the first admission (supplemental material).

All data analyses were conducted using the Software STATA SE, version 11.0 [28].

Results

Demographic and clinical features of first admissions over time

Overall, 6261 individuals were admitted for the first time in one of the psychiatric inpatient units of the catchment area of Ribeirão Preto during the period of the survey (2000–2007): 2834 (45.3 %) were admitted in the EP, 1128 (18.0 %) in the GH and 2299 (36.7 %) in the PH. The vast majority of the patients (96.7 %) came from municipalities that belonged to the catchment area under study. As can be seen in Table 1, the rate of first psychiatric admission was 65.8 per 100,000 inhabitants in 2000 and 65.2 in 2007. The highest rate was observed in 2004 (74.1/100,000) and the lowest in 2002 (57.7/100,000 inhabitants). The majority of first-admitted patients were male, unemployed, single and with age varying from 20 to 39 years. No significant changes across the years were detected in the proportion of first-admitted patients regarding gender, marital bonding and age, except for an increase in the proportion of admissions of unemployed people over the years ($p = 0.005$).

Although some fluctuations during the years in the proportions of first admissions in each of the three inpatients units were observed, these differences did not reach statistical significance. Similarly, there were no significant changes across the years regarding the length of stay.

Over the years, there was a significant increase in first admissions due to personality disorders ($p = 0.001$) and a significant decrease in first admissions due to psychotic disorders ($p = 0.002$). No significant changes were observed regarding the admission of patients with other diagnoses.

As expected, the length of stay was significantly shorter ($p < 0.001$) in the emergency unit (mean = 1.4, SD = 1.1) than in the psychiatric wards of the general hospital (mean = 20.5, SD = 34.2) and in the psychiatric hospital (mean = 20.9, SD = 68.6). The majority of the patients with ultrashort LOS (1–2 days) were admitted in the emergency unit (91.8 %), although this kind of admission also occurred in the general hospital (5.1 %) and in the psychiatric hospital (4.3 %) (Table 2). There was a higher proportion of male and unemployed patients admitted in the psychiatric hospital, in comparison with the emergency unit and the psychiatric wards in the general hospital. On the other hand, the general hospital admitted a higher proportion of youngest and oldest patients, in comparison to the psychiatric hospital. The three inpatient units admitted a variety of mental disorders, although with some differences in the distribution of the proportion of each diagnosis. In comparison with the psychiatric and the general hospital, the emergency unit admitted a lower proportion of patients with the diagnosis of psychotic or bipolar disorders and a higher proportion of patients with the diagnosis of personality or neurotic disorders. Depressive patients were admitted mainly in the emergency unit and in the general hospital. Alcohol and other substance-related disordered patients were mainly admitted in the psychiatric hospital, although a significant portion of patients with the diagnosis of alcohol-related disorders was managed only in the emergency unit.

Predictors of psychiatric readmissions

Of the total of 6261 patients admitted in the study period, 2006 (32.0 %) had at least a new psychiatric admission in one of the inpatient units of the catchment area of Ribeirão Preto. In regard to socio-demographic variables, the comparison between patients who were readmitted and those with a single admission showed no significant differences in gender ($p = 0.233$) or occupation ($p = 0.268$), but the youngest ($p < 0.001$) and single ($p = 0.005$) patients showed higher proportions of readmissions.

Patients whose first admission lasted 1–2 days ($p < 0.001$) and occurred in the emergency unit

Table 1 Demographic and clinical features of psychiatric patients first admitted in the catchment area of Ribeirão Preto, according to the year of admission

	2000 ($n = 747$)	2001 ($n = 702$)	2002 ($n = 676$)	2003 ($n = 738$)	2004 ($n = 892$)	2005 ($n = 830$)	2006 ($n = 841$)	2007 ($n = 835$)	*P*
Rates of first admission (per 100,000 inhabitants)	65.8	60.7	57.7	61.6	74.1	66.8	66.7	65.2	
General features (%)									
Males ($n = 3543$)	60.2	58.8	55.6	57.6	54.1	52.8	57.4	56.9	0.202
Unemployed ($n = 4289$)	58.9	62.6	71.8	68.2	64.3	76.1	77.3	79.0	0.005*
Single ($n = 3780$)	67.6	67.9	67.1	63.9	62.6	62.4	67.4	64.2	0.188
Age (%)									
Up to 20 years ($n = 634$)	10.0	9.3	10.2	10.6	9.6	10.4	11.5	9.7	0.383
20–39 years ($n = 3129$)	50.9	54.7	48.0	48.9	48.5	48.2	50.4	52.0	0.685
40–59 years ($n = 2056$)	33.9	31.1	36.1	31.0	33.3	34.0	31.6	32.8	0.715
60 years or more ($n = 420$)	5.2	5.0	5.6	9.5	8.6	7.4	6.6	5.5	0.545
Hospital service (%)									
Emergency unit ($n = 2834$)	47.4	45.4	31.8	32.2	49.1	56.5	43.9	51.7	0.356
General hospital ($n = 1128$)	13.3	24.5	29.3	23.3	14.2	14.8	20.0	8.3	0.256
Psychiatric hospital ($n = 2299$)	39.4	30.1	38.9	44.4	36.7	28.7	36.1	40.0	0.957
Length of stay (%)									
1–2 days ($n = 2758$)	45.2	44.0	32.2	34.0	47.2	53.9	44.5	47.9	0.321
3–10 days ($n = 1711$)	21.8	27.8	36.5	30.4	24.3	22.8	30.3	26.5	0.980
11–30 days ($n = 1271$)	24.2	19.7	21.6	25.2	20.0	17.3	18.0	17.5	0.047
31 days or more ($n = 521$)	8.7	8.5	9.6	10.4	8.5	6.0	7.1	8.1	0.197
Diagnosis (%)									
Neurotic disorders ($n = 293$)	5.1	3.5	4.5	3.3	7.0	5.6	5.2	3.9	0.690
Personality disorders ($n = 481$)	6.1	6.2	6.9	8.7	8.4	8.5	8.7	9.6	0.001*
Depressive dis. ($n = 1031$)	8.3	10.4	17.4	17.7	22.1	20.2	19.8	18.0	0.026
Bipolar disorders ($n = 758$)	13.8	15.3	14.0	14.6	10.3	11.5	11.0	11.3	0.023
Psychotic disorders ($n = 1382$)	27.8	29.6	23.8	24.7	21.8	18.5	19.8	19.4	0.002*
Alcohol-related dis. ($n = 1213$)	25.2	22.1	20.4	19.3	17.2	20.4	18.7	18.4	0.024
Other subst.-related d. ($n = 503$)	6.6	6.2	6.9	8.7	8.4	8.5	8.7	9.6	0.029
Others ($n = 383$)	7.1	5.9	6.4	7.7	5.6	7.2	5.7	5.5	0.313

* Statistically significant (*P* corrected for multiple comparisons <0.00623)

($p < 0.001$) showed lower frequencies of psychiatric readmissions in the following years than did patients with more prolonged hospitalizations. As shown in Fig. 1, the analysis of survival curves showed a lower risk of readmission in patients hospitalized for an ultrashort time [χ^2 (3) = 40.28, $p < 0.001$].

As shown in Table 3, five variables (LOS, inpatient unit, diagnosis, age and marital status) met the entry threshold of statistical significance ($p < 0.05$) and were entered in a multivariate stepwise forward binary logistic regression model of predictors of readmission. A multivariate model, adjusted for the time of follow-up, showed no statistically significant impact of LOS or marital status on odds rate of readmission. However, age, diagnosis and inpatient unit remained as predictors for psychiatric readmission. Younger people were more likely to be readmitted compared with patients aged 60 years or more (up to 20 years old—OR 2.02, 95 % CI 1.41–2.90; 20–39 years old—OR 1.95, 95 % CI 1.44–2.65; 40–59 years—OR 1.59, 95 % CI 1.16–2.17). Patients with the diagnosis of bipolar disorders (OR 2.39, 95 % CI 1.63–3.52), psychotic disorders (OR 2.31, 95 % CI 1.60–3.33), alcohol-related disorders (OR

Table 2 Demographic and clinical features of psychiatric patients first admitted in the catchment area of Ribeirão Preto, from 2000 to 2007, according to the service of admission

	Emergency unit ($n = 2834$)	General hospital ($n = 1128$)	Psychiatric hospital ($n = 2299$)	*P*
Length of stay				
Mean (SD)	1.4 (1.1)	20.5 (34.2)	20.9 (68.6)	<0.001
Median	1.0	9.0	12.0	
Range (days)	1–14	1–418	1–2111	
Categories (%)				<0.001
1–2 days ($n = 2758$)	91.8	5.1	4.3	
3–10 days ($n = 1711$)	8.0	52.2	38.9	
11–30 days ($n = 1271$)	0.2	24.2	43.1	
31 days or more ($n = 521$)	0	18.3	13.7	
General features (%)				
Males ($n = 3543$)	52.8	47.3	65.9	<0.001
Unemployed ($n = 4289$)	62.8	65.6	80.7	<0.001
Single ($n = 3780$)	65.5	65.0	65.3	0.944
Age (%)				<0.001
Up to 20 years ($n = 634$)	11.8	15.5	5.6	
20–39 years ($n = 3129$)	50.3	45.0	52.4	
40–59 years ($n = 2056$)	30.8	29.0	37.5	
60 years or more ($n = 420$)	7.1	10.5	4.5	
Diagnosis (%)				<0.001
Neurotic disorders ($n = 293$)	8.5	4.0	1.0	
Personality disorders ($n = 481$)	11.6	5.6	4.8	
Depressive disorders ($n = 1031$)	21.5	20.3	10.3	
Bipolar disorders ($n = 758$)	6.8	23.2	14.2	
Psychotic disorders ($n = 1382$)	16.4	29.3	27.4	
Alcohol-related disorders ($n = 1213$)	21.5	6.3	25.0	
Other substance-related dis. ($n = 503$)	6.4	3.8	12.8	
Others	7.4	7.4	4.5	

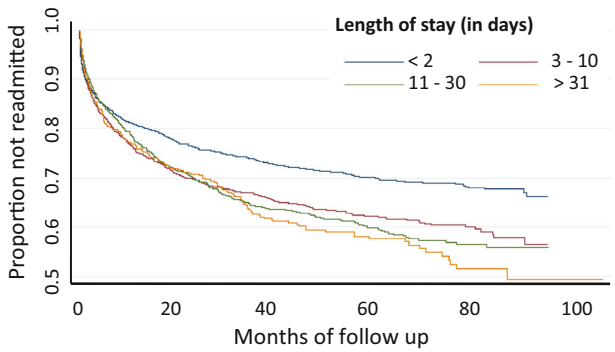

Fig. 1 Survival curves for risk of readmission using LOS

1.55, 95 % CI 1.07–2.25), and other mental disorders (OR 2.08, 95 % CI 1.38–3.13) were also more likely to be readmitted, in comparison with patients with neurotic disorders. In the same direction, first admission in the general hospital (OR 1.62, 95 % CI 1.18–2.22) increased the risk of a new admission in the following years.

Time of follow-up (OR 0.93, 95 % CI 0.93–0.94) also showed a significant association with readmission, suggesting that for each month after discharge of a first psychiatric admission without a new admission, the chance of readmission dropped by 7 %.

Predictors of early readmission (within 90 days after discharge)

Of the total of the readmissions occurred in the period, 45.0 % occurred within 90 days after the discharge. The ratio of readmissions varied from 16.1 %, in 2001, to 20.9 %, in 2004.

Table 3 Logistic regression analyses examining the length of stay and the demographic and clinical features of psychiatric patients first admitted ($n = 6261$) in the catchment area of Ribeirão Preto, Brazil, from 2000 to 2007, as predictors for the occurrence of psychiatric readmissions

	Readmission		Crude OR (95 % CI)	*P*	Adjusted OR (95 % CI)	*P*
	No (4255)	Yes (2006)				
Length of stay						
1–2 days	71.5	28.5	1.00			
3–10 days	66.3	33.7	1.28 (1.12–1.45)	<0.001	1.06 (0.80–1.42)	0.677
11–30 days	64.7	35.3	1.37 (1.19–1.58)	<0.001	1.21 (0.86–1.71)	0.265
31 days or more	62.8	37.2	1.49 (1.22–1.81)	<0.001	1.12 (0.76–1.66)	0.561
Hospital Service						
Emergency unit	71.2	28.8	1.00			
General hospital	63.1	36.9	1.47 (1.25–1.68)	<0.001	1.62 (1.18–2.22)	0.003
Psychiatric hospital	66.3	33.7	1.26 (1.12–1.42)	<0.001	1.28 (0.94–1.74)	0.119
Diagnosis						
Neurotic disorders	78.5	21.5	1.00			
Personality disorders	72.8	27.2	1.37 (0.97–1.93)	0.075	1.11 (0.74–1.67)	0.600
Depressive disorders	72.0	28.0	1.42 (1.04–1.94)	0.026	1.17 (0.81–1.69)	0.400
Bipolar disorders	59.1	40.9	2.53 (1.85–3.46)	<0.001	2.39 (1.63–3.52)	<0.001
Psychotic disorders	61.9	38.1	2.24 (1.66–3.03)	<0.001	2.31 (1.60–3.33)	<0.001
Alcohol-related disorders	73.5	26.5	1.31 (0.97–1.79)	0.081	1.55 (1.07–2.25)	0.021
Other substance-related dis.	63.2	36.8	2.12 (1.52–2.96)	<0.001	1.28 (0.86–1.91)	0.230
Other mental disorders	67.8	32.2	1.65 (1.16–2.34)	0.006	2.08 (1.38–3.13)	<0.001
Gender						
Male	68.3	31.7	1.00			
Female	67.5	32.5	1.04 (0.94–1.16)	0.472		
Age						
More than 60 years	77.9	22.1	1.00			
40–59 years	70.3	29.7	1.48 (1.16–1.90)	<0.001	2.02 (1.41–2.90)	<0.001
20–39 years	66.0	34.0	1.81 (1.42–2.31)	<0.001	1.95 (1.44–2.65)	<0.001
Up to 20 years old	62.6	37.4	2.10 (1.59–2.78)	<0.001	1.59 (1.16–2.17)	0.004
Marital status						
Married/partnered	69.1	30.9	1.00			
Single/divorced/widowed	65.6	34.4	1.17 (1.04–1.32)	0.007	1.05 (0.90–1.22)	0.548
Occupational status						
Employed/homemaker/student	68.3	31.7	1.00			
Unemployed	67.3	32.7	1.05 (0.93–1.18)	0.430		
Time of follow-up					0.93 (0.93–0.94)	<0.001

In the unadjusted analysis, no significant effects were observed considering the year of the first admission, length of stay, inpatient unit and marital status on the risk of early admission (Table 4). Four variables (age, gender, occupational status and diagnosis) met the entry threshold of statistical significance ($p < 0.05$) and were entered in a multivariate stepwise forward binary logistic regression model of predictors of early readmission. Patients with the diagnosis of depressive (OR 1.72, 95 % CI 1.11–2.65), bipolar (OR 2.12, 95 % CI 1.35–3.33), psychotic (OR 1.95, 95 % CI 1.27–2.99), non-alcohol-related (OR 2.31, 95 % CI 1.43–3.74) and other mental disorders (OR 1.83, 95 % CI 1.11–3.03) were more likely to be early readmitted, compared with patients with neurotic disorders. Likewise, age lower than 60 years (OR 1.50, 95 % CI 1.02–2.20; OR 1.90, 95 % CI 1.31–2.77; OR 2.28, 95 % CI 1.49–3.48) and unemployment (OR 1.24, 95 % CI 1.02–1.50) was significantly associated with an increased risk of early admission.

Table 4 Logistic regression analyses examining the length of stay and the demographic and clinical features of psychiatric patients first admitted ($n = 4330$) in the catchment area of Ribeirão Preto, Brazil, from 2000 to 2006, as predictors for the occurrence of early psychiatric readmissions (within 90 days)

	Readmission		Crude OR (95 % CI)	*P*	Adjusted OR (95 % CI)	*P*
	No (3550)	Yes (780)				
Year of first admission						
2000	81.0	19.0	1.00			
2001	83.9	16.1	0.82 (0.59–1.12)	0.210		
2002	82.1	17.9	0.93 (0.68–1.27)	0.643		
2003	83.0	17.0	0.87 (0.64–1.18)	0.378		
2004	79.1	20.9	1.12 (0.85–1.48)	0.412		
2005	82.5	17.5	0.90 (0.68–1.20)	0.412		
2006	82.9	17.1	0.88 (0.66–1.17)	0.381		
Length of stay						
1–2 days	82.6	17.4	1.00			
3–10 days	81.0	19.0	1.12 (0.93–1.35)	0.250		
11–30 days	83.1	16.9	0.97 (0.78–1.20)	0.781		
31 days or more	79.0	21.0	1.27 (0.95–1.69)	0.109		
Hospital service						
Emergency unit	82.4	17.6	1.00			
General hospital	79.8	20.2	1.18 (0.96–1.45)	0.109		
Psychiatric hospital	82.6	17.4	0.99 (0.83–1.18)	0.875		
Diagnosis						
Neurotic disorders	87.5	12.5	1.00			
Personality disorders	83.4	16.6	1.39 (0.86–2.25)	0.180	1.40 (0.86–2.28)	0.172
Depressive disorders	81.6	18.4	1.57 (1.02–3.15)	0.034	1.72 (1.11–2.65)	0.015
Bipolar disorders	77.6	22.4	2.02 (1.29–2.82)	0.002	2.12 (1.35–3.33)	0.001
Psychotic disorders	79.3	20.7	1.83 (1.20–2.78)	0.005	1.95 (1.27–2.99)	0.002
Alcohol-related disorders	88.1	11.9	0.94 (0.61–1.47)	0.799	1.11 (0.70–1.76)	0.665
Other substance-related dis.	74.8	25.2	2.35 (1.48–3.75)	<0.001	2.31 (1.43–3.74)	0.001
Other mental disorders	80.9	19.1	1.66 (1.02–2.70)	0.043	1.83 (1.11–3.03)	0.018
Gender						
Male	83.1	16.9	1.00			
Female	80.6	19.4	1.18 (1.01–1.38)	0.038	1.04 (0.86–1.25)	0.690
Age						
More than 60 years	88.4	11.6	1.00			
40–59 years	84.9	15.1	1.36 (0.94–1.97)	0.107	1.50 (1.02–2.20)	0.042
20–39 years	80.6	19.4	1.84 (1.29–2.64)	<0.001	1.90 (1.31–2.77)	0.001
Up to 20 years old	74.2	25.8	2.67 (1.78–3.99)	<0.001	2.28 (1.49–3.48)	<0.001
Marital status						
Married/partnered	82.6	17.4	1.00			
Single/divorced/widowed	80.6	19.4	1.14 (0.97–1.35)	0.119		
Occupational status						
Employed/homemaker/student	84.8	15.2	1.00			
Unemployed	80.4	19.6	1.36 (1.14–1.63)	0.001	1.24 (1.02–1.50)	0.030

Discussion

This study aimed to verify the impact of length of stay of psychiatric admissions on the rates of readmissions in a large number of first admission psychiatric patients ($n = 6261$) from a large catchment area (around 1,200.000 inhabitants) in Brazil, over a long period of time (8 years). Changes over time in the clinical profile of the patients in first admission and the impact of some demographic and clinical variables in the risk of readmissions were also assessed. The main result of the study was that the hypothesis of an association between short length of stay and an increased risk of readmissions was not confirmed, even when specifically examining the relationship between ultrashort stays and the risk of early readmission.

The demographic profile of the patients first time admitted in the Ribeirão Preto catchment area is similar to those described in other studies [29]. Most of the people admitted were young, male, single, and unemployed, thus confirming the relationship between non-protective social factors and psychiatric admissions [30]. This pattern seems to be relatively stable because the rate of first admissions per 100,000 inhabitants remained relatively stable over the years and the comparison of the patients first admitted from 2000 to 2007 showed no significant changes in the demographic profile, except for an increase in the admissions of unemployed patients. Likewise, no significant changes over time in admission rates were observed across types of inpatient units, as well as of the categories of length of stay.

Over the years, there was a decrease in the rates of first admission of psychotic patients, what can be due to local policies, such as the presence of specialized services in all municipalities and the guarantee of distribution of psychotropic drugs, which probably allowed the management of these patients in the community-based services. We also observed an increase of admissions due to personality disorders over the years. A possible explanation could be the fact that no new community-based services were created in the studied region from 1998 to 2007, and the available resources were not sufficient to address a growing demand from non-psychotic patients. This can also be due the absence of a policy for developing the capacity to manage mental disorders in primary health care in the region of Ribeirão Preto [31]. These features may have led to a gradual increase in the numbers of patients with mild disabilities in the community-based services and the consequent difficulty of accessing such services by patients who have a more severe impairment and need for effective treatments to reduce the risk of psychiatric hospitalization [32].

Different characteristics of the patients first time admitted to one of the inpatient units under study probably reflect the organization of the mental health system of the catchment area. For instance, the higher proportion of young people in the general hospital can be due to the policy of admitting adolescents and first episode psychosis patients preferentially to the general hospital. Similarly, elderly patients have a higher risk of clinical comorbidities, which was a criterion for admission in the general hospital.

The distribution of diagnoses among inpatient units can be also explained by the suitability of the inpatient units to the symptomatology and natural course of different mental disorders. It is expected that more severe mental disorders, such as psychotic and bipolar disorders will need a more prolonged period of hospitalization and therefore, will be discharged from the units designed for more prolonged length of stays, such as the general and the psychiatric hospitals. On the other hand, the higher proportion of substance-related disorders admitted in the emergency room is due to the role of the emergency hospital in the management of intoxication and withdrawal syndromes [33].

Nevertheless, considering only the first-time admissions to the emergency unit ($n = 2834$), we can see a balance in the distribution among broader diagnosis categories (neurotic/personality disorders = 20.1 %; depressive disorders = 21.5 %, bipolar/psychotic disorders = 23.2 %; substance-related disorders = 27.9 %). These data show that a significant portion of patients, even those with more severe mental disorders, and in need of a acute care provided by an emergency setting, was sufficiently managed within very few days of hospitalization.

The high rate of first-time admissions in the emergency unit was clearly unexpected, considering the few number of beds in this unit. These rates are likely due to the significant portion of ultrashort hospitalizations observed during the study period, which occurred mainly in the emergency unit. The high rates of ultrashort length of stay/emergency admissions can be due to the organization of the local mental health system that provided a close and constant contact between the emergency unit and the community-based service, with the guarantee of an appointment within 10 days after discharge. These data support the assumption that emergency psychiatric units effectively integrated with community-based services can mitigate the need for longer hospital stays by improving the operation of the mental health system [34], thus leading to the admission in specialized psychiatric inpatient units of only those patients who really need more extended inpatient care.

Approximately one-third of the first-admitted patients were readmitted during the follow-up, which is similar to other studies [35], although different rates, which can vary from 15 to 80 %, of readmission can be found, depending on the methodologies applied [36, 37]. Our data also

confirmed that there is a greater risk of readmission in the period immediately after discharge, and this risk tends to decrease as time goes by. When we considered only the occurrence of early readmission (within 90 days after discharge) the rate per year varied from 16.1 to 20.9 %, which is similar to the rates described previously [13, 38, 39]. This relatively low proportion of readmissions observed can also be explained by the characteristics of the mental health network of the region with an effective integration among inpatient units and community-based services, which ensures the engagement of the patient in the therapeutic interventions provided by the community-based services soon after discharge.

Although readmission rates are largely used as an indicator of the efficiency of mental health services/systems, there are some controversies about the validity of this concept [8], since a new admission is not necessarily a negative outcome, particularly those occurring several months after discharge, which can be simply due to the cyclic course of several mental disorders.

A relationship between lack of social support and psychiatric readmission is described [40], however, our findings did not show significant evidence of the influence of demographic variables that can indirectly give some information about social protection, except by the association between unemployment and early readmission. This is in agreement with a previous data showing that, after controlling for prior psychiatric admissions, unemployment and living in supervised residential facilities were predictors of shorter time-to-readmission within 12 months of discharge [41]. Our results also showed that, in the comparison of early readmission (within 90 days after discharge) with late readmission (more than 90 days after discharge), unemployment was the only significant predictor of early admission (supplemental material).

The association between risk of readmissions and younger age groups is consistent with some reports that young patients were more likely to be readmitted [42]. A possible explanation for this finding could be that young patients are more likely to be living with their parents, who may take necessary action in the event of any relapse or exacerbation of symptoms [43]. Another important aspect associated with the younger age groups is the non-adherence to treatment because many crises may appear because of the non-acceptance of treatment, which may, in turn, lead to readmissions [8].

The relationship between length of stay and readmissions shows contradictory results. Some studies have found that shorter lengths of stay were associated with readmission [9, 10], whereas others have not [8, 11]. Our first analysis, without considering the time of readmission, although only statistically significant in the univariate analyses, that patients with longer rather than shorter lengths of stay were more likely to be readmitted, can be related to the severity of the mental disorder itself, independent of the LOS of the first admission. Confirming this hypothesis, our data show that the best predictor of readmission is the diagnosis of severe mental disorders such as psychotic and bipolar disorders, with around twofold increased risk of readmission compared with neurotic disorders. Likewise, the higher risk of readmission in patients admitted to the general hospital is probably due to the local policies of admission of more severe patients in the psychiatric wards of the general hospital.

When we considered the risk of early readmission, no impact of the LOS was observed, what is similar to data from Chinese patients followed during an year after discharge [44], but different from other studies which found an association between short LOS with early readmission 30–90 days after discharge [13, 45]. In contrast to previous studies [8, 13], in our study, the diagnosis was a significant predictor of early readmission. These can be due to differences in the samples, since our data are based on first-time psychiatric admissions, which are likely to include patients with shorter duration of the mental disorders. It has been shown that previous admissions are an important predictor of readmissions [8]. However, the number of previous admissions can also be related with the chronicity, duration of the illness and non-adherence to treatment, which can also contribute to new admissions.

Overall, our results suggest that short periods of hospitalizations are not associated with a risk of readmissions. Shorter length stays can be feasible if the community-based services are able to quickly accommodate patients soon after hospital discharge, to manage residual symptoms and to guarantee the maintenance of clinical stability [46]. Some studies [17, 47] have shown a direct relationship among the deficient organization of the mental health system, LOS and psychiatric readmission, when more prolonged hospitalizations can work as a protective factor for readmission in disorganized health systems [48].

This study has several limitations. It is based on data from a single region in Brazil; therefore, caution for generalizations to other regions and countries is necessary. Our database is based on a secondary source, with data collected for administrative purposes, the diagnoses were performed in inpatient units through clinical evaluation without a standardized interview and we did not include any direct evaluation of the community-based services or the inpatient units. An important limitation is the fact that our databases lacked some important outcomes such as the occurrence of deaths, migratory movements and the use of private medical services. Moreover, although it is unlikely, considering the policies of regionalization adopted by government laws, we do not have information regarding admissions in other catchment areas. Nevertheless, this

study comprised a representative sample from a large population living in a large catchment area, who were analysed during their first psychiatric admission, in different inpatient units, which allowed an extensive analysis of admissions for several consecutive years.

Conclusions

In summary, we have shown that short periods of hospitalization of first-admitted psychiatric patients were not associated with a higher risk of readmissions. Short length of stays can be useful to reduce costs in the management of patients in the early stages of mental disorders, when there is an effective integration between inpatient units and community-based services. The risk of readmission was higher in the periods immediately after discharge; the further away the discharge, the lower the risk of a new admission. The significant predictors of early readmissions were clinical (diagnosis of depressive, bipolar, psychotic, and non-alcohol-related disorders) and demographic features (younger ages and unemployment) that seem to be related to the severity of mental disorder and its impact in the global functioning in the early phases of the mental disorders, when first admission frequently occurs. Therapeutic interventions focused on the risk factors of early readmission since the first years of the course of mental disorders can help to avoid subsequent psychiatric admissions.

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