
Level of Function at Discharge as a Predictor of Readmission Among Inpatients With Schizophrenia

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KEY WORDS

- cognition
- interpersonal relations
- patient readmission
- schizophrenia
- task performance and analysis

OBJECTIVE. We retrospectively assessed the effect of social-, cognitive-, and task-oriented functioning levels at hospital discharge on the readmission rate of patients with schizophrenia.

METHOD. We assessed the functional capability of 71 inpatients (37 men and 34 women), mean age 41.3 (standard deviation = 11.9 yr), who underwent daily occupational therapy interventions, at admission and at discharge using a comprehensive function score. We examined readmission rates up to 6.8 yr after discharge.

RESULTS. Function scores improved significantly during the hospital stay ($p < .001$). Patients with a higher comprehensive function score (75th percentile) at the end of the index admission had a significantly lower readmission rate ($p < .05$). A higher comprehensive function score (75th percentile) at discharge was a better predictor for readmission than the Brief Psychiatric Rating Score (25th percentile).

CONCLUSION. These findings demonstrate the predictive value of occupational therapy functional monitoring at discharge for risk of readmission and the importance of cognitive/functional interventions for long-lasting remission.

Odes, H., Katz, N., Noter, E., Shamir, Y., Weizman, A., & Valevski, A. (2011). Level of function at discharge as a predictor of readmission among inpatients with schizophrenia. *American Journal of Occupational Therapy, 65*, 314–319. doi: 10.5014/ajot.2011.001362

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Schizophrenia is a heterogeneous disorder with variations in the severity of the symptoms and in course and presentation (Davidson & McGlashan, 1997). Cognitive and functional impairments are core features of schizophrenia (Mohamed, Paulsen, O’Leary, Arndt, & Andreasen, 1999). Psychiatric rehabilitation may improve social inclusion and functioning in patients with severe mental illness (Wilcock, 2005). The term *psychiatric rehabilitation* is a broad label that includes training and supportive interventions intended to increase functional status (Bond, Drake, Becker, & Mueser, 1999). Functional disability results in low employment rates and is a hallmark of many patients with schizophrenia (Lehman et al., 2002).

Comprehensive treatment of patients with schizophrenia focuses on alleviating psychotic symptoms, improving psychosocial function, and decreasing the rate of rehospitalization. Many studies have shown that readmission in schizophrenia is a multifactorial phenomenon whose probability is increased by early onset of the disorder (Vyas, Hadjulis, Vourdas, Byrne, & Frangou, 2007), male gender (Lin et al., 2006), substance abuse (Linszen, Dingemans, & Lenior, 1994), marital status (i.e., being unmarried; Lacro, Dunn, Dolder, Leckband, & Jeste, 2002), higher number of previous hospitalizations (Roick et al., 2004), and short length of previous hospital stay. Nonadherence to medication and a low-quality support system (Olesen & Mortensen, 2002) are additional risk factors for rehospitalization.

Browne, Courtney, and Meehan (2004) suggested that people with schizophrenia who were discharged to boarding houses are significantly more likely to

be rehospitalized. Marom, Munitz, Jones, Weizman, and Hermesh (2005) found that patients living in families characterized by high levels of expressed criticism of patients with schizophrenia were significantly more likely to relapse and require a longer hospital stay.

Level of education is another risk factor for readmission of patients. Suzuki, Yasumura, Fukao, and Otani (2003) found that patients who did not enter senior high school (Grade 9) or those who quit senior high school (Grade 11) were at greater risk of rehospitalization. Moreover, supportive structured education programs for patients with psychiatric disabilities improved their basic academic skills, enhanced professional behavior and social skills, and resulted in return to the work environment (Gutman, Kerner, Zombek, Dulek, & Ramsey, 2009).

Suzuki et al. (2003) also found that function, measured on admission by the Global Assessment of Functioning (GAF; American Psychiatric Association [APA], 2000) score, presented a risk factor for rehospitalization. Function was also found to correlate significantly with adherence to treatment. GAF, however, is less useful for identifying specific functional deficits or improvements within specific domains of functioning (Dickerson, 1997). Although discharged asymptomatic patients function better in social contexts (San, Ciudad, Alvarez, Bobes, & Gilaberte, 2007), symptomatic improvement is not a direct indicator of function.

Since its emergence at the beginning of the 20th century in the United States, occupational therapy has contributed considerably to the treatment and rehabilitation of people with severe mental health problems (Duncan, 2006). Likewise, a combined program of occupational therapy and supportive employment was shown to reduce the risk of rehospitalization in a Japanese psychiatric hospital when it was implemented with the continuing involvement of a clinical team (Oka et al., 2004). Therefore, it would be important for occupational therapists to regularly assess functional performance in daily living skills and to evaluate a patient's probable level of function in the community at discharge.

Various clinical scales have been used to describe the severity of the disorder, but they provide little information on prognosis and function (González-Blanch et al., 2008). Neurocognitive deficits are a core feature of schizophrenia and a significant cause of functional disability. It is, however, difficult to pinpoint which cognitive operations may be associated with poor function in patients with schizophrenia (Jaeger et al., 2006). A quantitative questionnaire based on occupational, behavioral, and cognitive theories to assess the functioning of inpatients with schizophrenia receiving occupational therapy may help predict function and tenure in the community.

We examined the impact of the level of social-, cognitive-, and task-oriented levels of function at the time of hospital release on the rate of readmission among patients with schizophrenia.

Method

Participants

The charts of 71 patients with schizophrenia admitted consecutively to a closed psychiatric ward in an Israeli hospital from 1999 to 2000 were reviewed. Because all patients from a specific catchment area are readmitted to the same ward, we were able to monitor the readmission of all patients. The duration of follow-up was 6.8 yr. Exclusion criteria were disorders that ruled out the diagnosis of schizophrenia as defined by the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; APA, 2000), including mental retardation, substance dependence, neurological diseases or damage, and other psychiatric conditions. All patients with a history of substance abuse during the previous 6 mo were excluded as well.

Instruments

Patients were assessed for cognitive-, social-, and target-oriented functions by a detailed weekly comprehensive functional assessment scale (MEDYN; Odes et al., 2006; see Appendixes 1 and 2, available online at www.ajot.ajotpress.net; navigate to this article, and click on "supplemental materials"). The questionnaire was designed by members of two occupational therapy clinics in Geva Mental Health Center in Israel. The questionnaire score is determined by the direct inspection of a patient's function (social and cognitive) in an occupational therapy setting, with quantification of the results.

The questionnaire consists of 18 items covering three areas: (1) general/social behavior, (2) cognition, and (3) task behavior. The items are all rated on a scale of 1 (lowest level of functioning) to 5 (highest level). The reported internal consistency of the questionnaire was relatively high ($r = .76$), as was the interrater reliability, which was examined for all 18 items ($r_s = .65-.95$). Intercategory correlations were significant ($p < .001$; Odes et al., 2006). The scale includes three subscales: (1) Cognitive-, (2) Social-, and (3) Task-Oriented Function. The subscales are calculated as follows: Items 1–6 are social skills, Items 7–10 are cognitive skills, and Items 11–18 are task behavior skills. The assessment was conducted by two certified psychiatric occupational therapists.

Two senior psychiatrists carried out the clinical assessments at admission and discharge using the Brief Psychiatric Rating Score (BPRS; Overall & Gorham, 1962).

Procedure

All patients received occupational therapy in group settings according to the Allen Cognitive Levels (ACL) model (Allen & Allen, 1987). Sessions took place 5 days a week, 3–4 hr each session, and consisted of social, cognitive, and functional skill training. The training included a cognitive-behavioral format and involved frequent use of motivational interviewing, modeling, behavioral rehearsal with coaching and corrective positive feedback, problem-solving exercises, in-ward exercises, and homework assignments in individual and group settings.

Data Collection

This study was approved by the institutional review board of the Geha Mental Health Center. The medical charts of the participating patients were reviewed for a readmission until the end of 2005 (up to 6.8 yr of follow-up). The information on medication adherence was retrieved from the patient's medical files.

Data Analysis

SPSS Version 17.0 (SPSS Inc., Chicago) was used to examine the differences in the mean values of the dependent variable associated with the effect of the controlled independent variables. The paired *t* test was used to compare the total comprehensive function scores at admission and discharge as well as for the three subscales. To determine the change of severity of psychosis (according to the BPRS), we also used the paired *t* test. Pearson's correlations were calculated to evaluate the relationship between the comprehensive function score and the BPRS at the time of discharge.

We used the Kaplan–Meier (1958) analysis to compare tenure rates in the community (i.e., the probability for time to readmission among the patients who received rehabilitation treatment). To demonstrate the level of importance of high functioning as a predictor for read-

mission, we selected the patients with the best functioning scores and those with the lowest functioning scores. Patients were grouped according to their comprehensive function score at discharge, specifically, those with higher scores (75th percentile, scores >71/90) and those with lower scores (<75th percentile, score <71/90). The same method was applied for BPRS assessment. Grouping was according to BPRSs (which decreased as clinical condition improved), with a cutoff score between the groups at 30 points (<30 points = <25th percentile).

A stepwise Cox regression model (Cox & Oakes, 1984) was used to identify significant independent predictors for readmission; “length of time to readmission” was the dependent variable. BPRSs (<25th percentile), comprehensive function scores (<75th percentile) at discharge, age at index admission, living conditions (i.e., independent living, living with one's family, staying at a hostel, being homeless), gender, age at first admission, years of formal education, medication type, and adherence to medication were considered independent variables. The results are expressed as mean ± standard deviation (*SD*).

Results

Participant demographic characteristics are displayed in Table 1. All patients were diagnosed according to *DSM-IV-TR* criteria by two senior psychiatrists. At the time of hospital admission, 49 patients (69%) were living with their families, 12 (17%) lived alone, 9 (13%) lived in protected shelters, and 1 was homeless.

We noted significant improvement throughout the patients' hospitalization period in total functional scores as well as on the three subscales (Table 2). The baseline BPRSs and comprehensive functional scores did not correlate significantly ($p = .08$), whereas an inverse correlation of the scores reached a level of significance at the end of the hospitalization period ($p < .01$, $r = -.37$). No gender-based differences with regard to BPRS and functional scores at the time of discharge were found.

The patients' pharmacological treatment was determined by their clinical requirements: 25 patients (35%) received atypical neuroleptics, and the rest received typical

Table 1. Demographic and Clinical Characteristics of the Study Group

Parameter	Total; <i>N</i> = 71	Men; <i>n</i> = 37	Women; <i>n</i> = 34
Age, yr; <i>M</i> ± <i>SD</i>	41.0 ± 11.1	38.1 ± 10.2	44.1 ± 12.5
Family status: Single/not single	62/9	32/5	30/4
Level of formal education, yr; <i>M</i> ± <i>SD</i>	11.8 ± 2.6	11.4 ± 2.3	12.3 ± 2.8
Length of illness, yr; <i>M</i> ± <i>SD</i>	16.0 ± 11.6	15.5 ± 11.0	16.4 ± 12.3
No. of previous hospitalizations; <i>M</i> ± <i>SD</i>	6.8 ± 5.7	6.5 ± 7.0	6.5 ± 7.0

Note. *M* = mean; *SD* = standard deviation.

Table 2. Study Group Change in Test Scores

Clinical Parameter	Baseline; <i>M</i> ± <i>SD</i>	Discharge	Paired <i>t</i> (70)	<i>p</i>
BPRS	43.5 ± 10.2	34.00 ± 6.90	9	<.001
Comprehensive functional score	56.1 ± 14.0	61.00 ± 14.8	3.4	<.001
Cognitive score	12.1 ± 3.17	13.79 ± 3.44	-4.9	<.001
Social scores	20.5 ± 3.33	21.80 ± 3.90	-2.6	<.05
Task-oriented scores	23.6 ± 5.10	25.30 ± 6.30	-2.3	<.05

Note. BPRS = Brief Psychiatric Rating Score; *M* = mean; *SD* = standard deviation.

antipsychotics. No significant difference was found between medical treatment with regard to BPRS or functional scores at the final assessment.

The mean length of stay in the hospital was 135 ± 68 days, with a median of 85.5 days; 94.3% of patients needed >30 days of hospitalization. The patients' charts were reviewed for the number of rehospitalizations before the index admission: 51 patients (72%) had repeated hospitalizations before the index admission (median = 5 admissions, mean = 6.7 ± 6.4).

During the 6.8-yr study period, 46 patients (65%) were readmitted. The risk for readmission for patients who scored >71 points (75th percentile; *n* = 16) on the functional scale was significantly lower than those who scored <71 points (log rank, *p* < .01; Figure 1). The patients with a higher function score (≥75th percentile) were readmitted at longer intervals than the others (1,575 ± 223 days vs. 834 ± 130 days). By contrast, patients who scored >50th percentile did not differ from others in risk for readmission during the study period. Separate analysis of each of the three domains (i.e., Cognitive-, Social-, and Task-Oriented Functioning) showed similar results (*ps* < .05 for all). By contrast, patients who scored lower on the BPRS (<30 points or within the 25th percentile) at the time of hospital discharge did not differ significantly from the others with regard to risk for readmission during the study period.

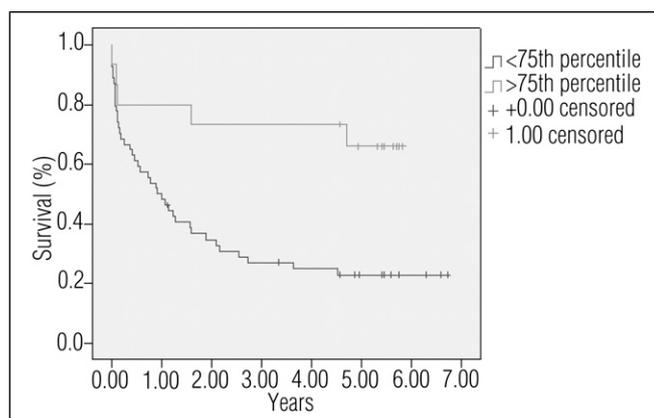


Figure 1. Survival analysis: Risk of readmission in high-functioning patients (75th percentile vs. others, *p* < .01).

Note. Patients with better functionality were readmitted with longer intervals between admissions during the years of follow-up compared with others.

The application of the Cox regression model revealed similar results. Three predictors were found to be significant for a lower readmission rate (Table 3). A higher function score (>75th percentile) had the greatest impact on readmission rate as expressed by Exp(B) (*p* < .001; Table 3). The mean comprehensive functional score at hospital discharge was significantly higher (66.8 ± 15.7 vs. 57.7 ± 13.5, *t*[69] = 2.5, *p* < .05) among patients who were not readmitted (*n* = 24; 34%) than among patients who were rehospitalized (*n* = 46; 66%) during the study period. The 16 patients who improved markedly in their total functioning did not differ from others in their length of stay in the hospital. The adherence to medication since the last admission revealed that 33 (47%) did not take their medications as prescribed (lower dosage or no medication). At the time of hospital discharge, 19 of the 23 patients (83%) who were being treated with antipsychotic depot medications were readmitted, whereas 27 out of 46 patients (59%) who were being treated with oral medications were readmitted ($\chi^2[1] = 4.7$, *p* < .05), indicating that depot medication did not attenuate the rate of readmission during a long follow-up period.

Discussion

The main finding of this study is that a detailed quantitative assessment of function before discharge can predict long-term outcome as expressed by the rate of rehospitalization. Although level of function was compared between inpatients and outpatients in a previous study (Suzuki et al., 2003), the assessment in the current study was conducted on inpatients with repeated hospitalizations. In our study, the relapse rate of patients with schizophrenia was similar to that reported by Huber (1997), with 46 of 71 patients (65%) having been rehospitalized during the 6.8 yr of follow-up. Most of our patients were repeatedly hospitalized. The issues of repeat admissions and length of hospitalization have been studied extensively, and the requirement of a short length of stay was associated with an improved remission rate (Johnstone & Zolse, 2000; Low & Draper, 2009).

A possible link between level of function and rate of readmission has not been investigated before. Given that

Table 3. Variables in the Equation Cox Regression Analysis (Stepwise)

Predictor	β	SE	Wald	df	p <	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
Functionality score >75th percentile	1.51	0.50	9.08	1	.001	4.53	1.70	12.11
Gender	-0.95	0.33	8.17	1	.002	0.39	0.20	0.74
Depot medications	0.68	0.33	4.32	1	.05	1.98	1.04	3.77

Note. Three predictors were found to be significant for a lower readmission rate. A higher functional score (>75th percentile) had the greatest impact on readmission rate as expressed by Exp(B), $p < .001$. SE = standard error; Wald = a parametric statistical test; df = degrees of freedom; Exp(B) = predicted change in the hazard for a unit increase in the predictor; CI = confidence interval.

some patients need longer periods of hospitalization to function adequately outside the hospital setting (Mahendran, Mythily, Chong, & Chan, 2005), it is possible that, at least among frequently admitted patients, the role of function is crucial for better prognosis.

In the current study, improvement in psychotic symptoms at the end of hospital admission correlated with the patient's function score, as was shown in other studies (Schennach-Wolff et al., 2009). The comprehensive function score at hospital discharge, however, was found to be a better predictor of rehospitalization than symptom relief as measured by the BPRS. Consequently, for better patient risk prediction of readmission, occupational therapists may use functional assessment to provide the treatment team with important information on the patient's ability to function and the likelihood of readmission.

The fact that symptom relief at the time of hospital discharge correlated with functioning is not surprising and only underlines the fact that clinical improvement is the traditional target of drug treatment. There was no clinical difference (BPRS) between patients treated with typical antipsychotics and those treated with atypical drugs. Oral medications were found to be associated with lower rates of rehospitalization. Twenty of 71 patients (23%) were treated with depot antipsychotics; this treatment did not attenuate the risk for rehospitalization. Moreover, adherence to taking medications was similar for depot- and oral-treated patients, indicating that other factors play a role in adherence.

It is likely, however, that the decision for maintenance treatment with a depot antipsychotic had been based on a history of poor medication adherence and an anticipated risk for rehospitalization. Therefore, the actual relationship between oral medication and rate of readmission remains unclear. Similar to the findings of others (Suzuki et al., 2003), this study found that adherence to medication, as measured by patients' self-report, is not a predictor of rehospitalization. The 16 patients who demonstrated a marked improvement (75th percentile) did not differ significantly from the others by age at index hospital admission, duration of disease, age at first admission, mean length of hospital stay, gender, living conditions, or med-

ication type. The unique clinical and demographic characteristics that contributed to a better prognosis in this subgroup are unclear.

Limitations and Future Research

The major limitations of this study include the relatively small sample size, the lack of detailed information concerning community medical treatment during the follow-up period, the level of functioning after discharge from hospital, and the subjective nature of the reporting of adherence to prescribed treatment.

In conclusion, improvement of comprehensive functioning, as measured by the ACL model, plays a major role in the rehabilitation process among patients diagnosed with schizophrenia who have long hospital stays and repeated admissions. It appears that a high level of functioning at the time of hospital discharge may protect these patients from repeated admissions and lead to a better prognosis. These findings emphasize the importance of cognitive-functional interventions for longer remission. Prospective studies with different models of interventions are needed to determine the measures necessary to prevent frequent readmissions and the revolving-door phenomenon. ▲

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