Predictors of Cumulative Length of Psychiatric Inpatient Stay Over One Year: A National Case Register Study

Yaacov Lerner, MD, and Nelly Zilber, D ès Sc

The Falk Institute for Mental Health Studies, Jerusalem, Israel

ABSTRACT

Background: Prior studies have shown inconsistent results regarding predictors of length of stay (LOS) and of readmission in psychiatric hospitals. "Cumulative LOS" over a given period, which reflects both LOS and readmission, has not been examined so far in a systematic way. The Israel Psychiatric Case Register in Israel made it possible to examine predictors of Cumulative LOS in a nationwide, representative sample.

Method: All hospitalization admissions during a six-month period in Israel were recorded and followed-up for one year. The variables predicting Cumulative LOS over one year were identified through a Cox regression.

Results: The median Cumulative LOS during one year was 43.0 days, and only 1.7% of the patients remained hospitalized for more than one year after admission. The variables significantly predicting longer Cumulative LOS were: Jewish ethnicity, a diagnosis of schizophrenia or other functional psychosis, prior hospitalization, compulsory admission and Northern and Jerusalem districts of hospitalization (which have a lower admission rate).

Limitations: Lack of information on severity of pathology and type of treatment.

Conclusion: Cumulative LOS, which reflects both the length of each inpatient episode and the rate of readmission, is affected not only by clinical factors, but also by the cultural background of the patient population and by administrative factors such as bed pressure

INTRODUCTION

During the last decades, deinstitutionalization has led to impressive changes in the use of psychiatric services all over the western world (1). Length of stay (LOS) in psychiatric hospitals has decreased dramatically (2), but some authors have claimed that readmission occurs consequently earlier (2-5). Other studies have not confirmed such a relationship (6-9). Anyhow, no definitive conclusion can be reached, since most studies are based on samples restricted to data of one hospital (5-9), or one insurance company (2-3). One study used a large population-based data set (4), but, even in this study, admission-data could be linked, for each individual patient, only to one hospital. Patients, however, can be hospitalized in several hospitals and even in several districts. Moreover, it is uncertain whether the above-mentioned findings can be generalized across different districts or hospitals, as both patient population and service-related variables may differ between them. In addition, insurers, administrators and policy makers are interested not only in the predictors of the length of each hospitalization or of readmission rates, but also, more importantly, in the predictors of the cumulative inpatient stay in a given year (10).

The Israel Psychiatric Case Register, which includes both demographic and cumulative clinical and administrative information on all patients admitted to a psychiatric hospital in Israel since 1950 (11), makes it possible to aggregate all episodes of inpatient care for each patient in a nation-wide sample and thus to measure the total length of inpatient stay over a given period of time ("Cumulative LOS"). Moreover, it is important to note that, in Israel, the government is the sole insurer of psychiatric care. Hospitals receive prospective financing

Address for Correspondence: ✉ Falk Institute, Kfar Shaul Hospital, Givat Shaul, Jerusalem 91060, Israel falk1@012.net.il

based on the number of beds and, thus, there are no insurance constraints on the length of stay.

The objective of the present study was to develop a prediction model for Cumulative LOS over one year.

We assume that after controlling for clinical and demographic variables, and given identical health insurance coverage (universal health coverage), differences among districts of hospitalization could be attributed to differences in the policy of the hospitals and to differences in the cultural and demographic characteristics of the population.

MATERIAL AND METHODS

DATABASE

A data file (without any identifying information on patients) was extracted from the Israel National Case Register of Psychiatric Hospitalizations. It consisted of all patients with at least one admission to a psychiatric hospital in Israel, during a six-month period (January 1, - June 30, 2004). A one-year follow-up was performed for each patient since this first admission during the six-month sample period. Clinical and administrative data were extracted from the Israel National Psychiatric Case Register for all hospitalization episodes. All patients who died during the follow-up period were excluded.

STUDY VARIABLES

The dependent variable concerning hospitalization was the Cumulative LOS during one year from date of admission for each patient. The independent variables were: demographic data (gender, age, ethnic group), clinical data (ICD-10 diagnosis, existence of prior hospitalization, legal status at admission – compulsory vs. voluntary) and district of hospitalization. The six districts differ in particular in their population characteristics. In 2005, the proportion of the Arabic population in the Northern district was 52%, in the Haifa district 24%, in the Jerusalem district 29%, compared to 8% in the Center, 1% in the Tel Aviv district and 13% in the Southern district (12). The Center and Tel Aviv districts were combined in the analysis, as hospitals in these two districts admit patients from both districts and they are also similar in their demographic breakdown.

The ICD-10 diagnoses were recoded into five diagnostic groups according to the main diagnosis: Disorders due to alcohol and drug abuse (F10-F19), schizophrenia and other functional psychoses (F20-F29), organic mental disorders (F00-F09), mood disorders (F30-F39) and neurotic and personality disorders (F40-F48 and F60-F69). Only 1.3% of the cases did not belong to any of these categories and were not included in the analysis. Comorbidity was not considered because only the main diagnosis is recorded in the Case Register.

DATA ANALYSIS

A survival (Kaplan-Meier) analysis of the outcome variable, Cumulative LOS, was performed for each patient. Since the studied variable revealed a decaying exponential rather than a normal distribution (data available on request), this analysis was preferred to ANOVA procedures which assume that the dependent variable is normally distributed (cf. Stevens et al., 13). In addition, survival analysis has the advantage of including censored data. A Cox regression allowed constructing a multi-factorial prediction model for Cumulative LOS over one year. The independent variables related to the first episode of the follow-up. Data analyses were carried out using SPSS/PC version 14.0.

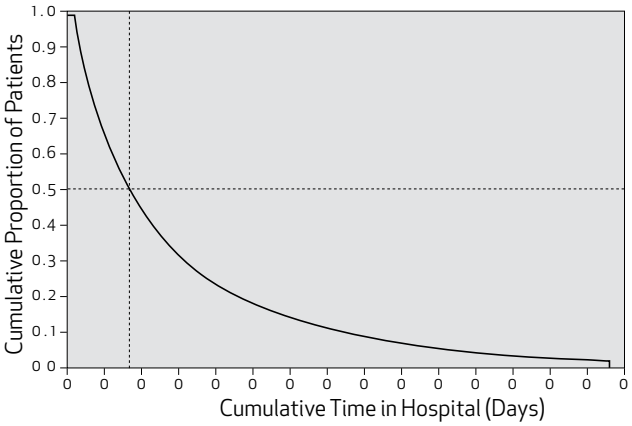
RESULTS

A total of 6,985 admitted patients were included in the study. About 58% were males, 84% were Jews; 63% of the patients were diagnosed as suffering from schizophrenia or other psychosis and 16% from an affective disorder; for 27% of the patients, the index admission was the first-in-life. The distribution of the patients by Cumulative LOS was the following: up to 30 days: 40%; 31-60 days: 22%; 61-90 days: 12%; 91-180 days: 16%; and > 180 days: 10%. The median Cumulative LOS over one year was 43.0 days (95% CI: 41.5-44.5) and only 1.7% of the patients accumulated more than one year in hospital (Fig. 1). In Table 1, the results of the Cox regression for Cumulative LOS are given. The variables significantly predicting longer Cumulative LOS were: Jewish ethnicity, a diagnosis of schizophrenia or other functional psychosis, prior hospitalization, compulsory admission and hospitalization in the Northern and Jerusalem districts.

DISCUSSION

The main strength of the present study is an analysis based on cumulative national data from the Israel Psychiatric Case Register, which enables the measure of cumulative length of stay in hospital for the individual patients, with non-biased nationwide data. Notwithstanding a study limitation (lack of information about individual patients' clinical characteristics other

Figure 1: *Survival Function of Cumulative Length of Stay in Hospital (Cumulative LOS)*



* Proportion of patients for whom the cumulative length of stay in hospital is greater than the corresponding x.

than diagnosis, such as severity of pathology and type of treatment), the analysis provides relevant data for policymaking and service delivery decisions.

Lengthy Cumulative LOS was found to be associated with both prior hospitalization and diagnosis of psychosis - consistent with other studies (13, 14) - and with compulsory hospitalization, as reported also by Blais et al. (15). It was also associated with elderly age and Jewish ethnicity. The finding that Arabs cumulate shorter periods of hospitalization may be attributed to the structure of the typically larger Arab family (16), consisting of many members, with strong ties between them (17). Such families might be more ready than Jewish families to accept back home and support the psychiatric patient, who can therefore be released earlier. Moreover, Arabs have been reported to have lower rates of psychiatric admissions than Jews (2.65/1000 vs. 3.50 among males, 1.02 vs. 2.51 among females) (18). This is probably due to culture-related negative attitudes towards psychiatric hospitalization (19).

Lengthy Cumulative LOS was also found to be associated with hospitalization in the Northern and Jerusalem districts of Israel. This lengthy Cumulative LOS could be related to the lower admission rates in these two districts: 3.9 and 3.8/1000 adult population respectively vs. 4.7 in the Haifa districts, 4.6 in the combined Tel Aviv and Center districts and 4.4 in the Southern district (Internal report of the Mental Health Services, Department of Information and Evaluation, Ministry of Health, Israel, 2006). The fact that the admission rates in the Northern and Jerusalem districts are lower can be explained by their higher concentration of Arabs (12).

Table 1. *Cox Regression Results for Predictor Variables of Cumulative LOS*

	N	Exp(B)	95% CI	Sig.
Age				0.73
Up to 65 years	5890	1.00		
66 years or more	671	1.02	0.93-1.11	
Gender				0.37
Male	3735	1.00		
Female	2826	1.02	0.97-1.08	
Ethnic Group				0.00
Jewish	5566	1.00		
Arab	695	1.31	1.20-1.42	0.00
Unknown	300	1.07	0.95-1.21	0.26
Diagnosis				0.00
Schizophrenia or other psychosis	4153	1.00		
Organic Disorder	304	1.33	1.18-1.50	0.00
Affective Disorder	1070	1.35	1.25-1.45	0.00
Neurotic and Personality Disorder	792	1.65	1.52-1.79	0.00
Drugs and Alcohol	238	1.70	1.48-1.94	0.00
Prior hospitalization				0.00
Yes	4848	1.00		
No	1713	1.43	1.35-1.52	
Legal Status at Admission				0.00
Compulsory Admission	1551	1.00		
Voluntary Admission	5010	1.12	1.05-1.19	
Hospital District				0.00
North District	685	1.00		
Haifa District	1236	1.17	1.06-1.28	0.00
Jerusalem District	694	1.04	0.93-1.15	0.52
Tel Aviv and Center District	3166	1.21	1.11-1.32	0.00
South District	780	1.55	1.39-1.72	0.00
Total	6561			

Values of Exp(B) greater than 1 indicate increased incidence of what can be called "discharge" (if the cumulative stay in hospital is considered as one continuous hospitalization), i.e., shorter cumulative stay than in the reference group.

Since the bed ratio is similar for all districts (except the South, with a lower bed ratio), a lower admission rate enables hospital staff to keep patients longer in hospital. This can explain the fact that the cumulative stay is the longest in the Northern and Jerusalem districts in spite

of the higher proportion of Arabs in the population.

Similar findings were reported by Harman et al. (20), who concluded that "unlike health services for other conditions, the variation in LOS for inpatient psychiatric treatment of depression or schizophrenia is quite dependent upon hospitals." In view of the impending Reform of Psychiatric Services, which will make services more dependent on financial constraints, a further study implying a clinical follow-up of the patients is needed in order to examine how to balance between financial constraints and the true needs of the patients.

CONCLUSION

Cumulative LOS of psychiatric patients, which reflects both the length of each inpatient episode and the rate of readmission, is affected not only by clinical factors, but also by the cultural background of the patient population and by administrative factors such as bed pressure.

References

1. Fakhoury W, Priebe S. The process of deinstitutionalization: An international overview. Curr Opin Psychiatry 2002;15:187-192.
2. Figueroa R, Harman J, Engberg J. Use of claims data to examine the impact of length of inpatient psychiatric stay on readmission rate. Psychiatr Serv 2004;55:560-565.
3. Wickizer TM, Lessler D. Do treatment restrictions imposed by utilization management increase the likelihood of readmission for psychiatric patients? Med Care 1998;36:844-850.
4. Heggestad T. Operating conditions of psychiatric hospitals and early readmission – effects of high patient turnover. Acta Psychiatr Scand 2001;103:196-202.
5. Heeren O, Dixon L, Gavirneni S, Regenold WT. The association between decreasing length of stay and readmission rate on a psychogeriatric unit. Psychiatr Serv 2002;55:76-79.
6. Lieberman PB, Witala ST, Elliott B, McCormick S, Goyette SB. Decreasing length of stay: Are there effects on outcomes of psychiatric hospitalization? Am J Psychiatry 1998;155:905-909.
7. Moran PW, Doerfler LA, Scherz J, Lish JD. Rehospitalization of psychiatric patients in a managed care environment. Ment Health Serv Res 2000;2:191-199.
8. Hodgson RE, Lewis M, Boardman AP. Prediction of readmission to acute psychiatric units. Soc Psychiatry Psychiatr Epidemiol 2001;36:304-309.
9. Thompson EE, Neighbors HW, Munday C, Trierweiler S. Length of stay, referral aftercare, and rehospitalization among psychiatric inpatients. Psychiatr Serv 2003;54:1271-1276.
10. Kolbasovsky A, Reich L, Futterman R. Predicting future hospital utilization for mental health conditions. J Behav Health Serv Res 2007; 34:34-42.
11. Lichtenberg P, Kaplan Z, Grinshpoon A, Feldman D, Nahon D. The goals and limitations of Israel's psychiatric case register. Psychiatr Serv 1999;50:1043-1048
12. Statistical Abstract of Israel 2005 No. 56. Central Bureau of Statistics. Jerusalem, 2005.
13. Stevens A, Hammer K, Buchkremer G. A statistical model for length of psychiatric in-patient treatment and an analysis of contributing factors. Acta Psychiatr Scand 2001;103:203-211.
14. Huntley DA, Cho DW, Christman J, Csernansky JG. Predicting length of stay in an acute psychiatric hospital. Psychiatr Serv 1998;49:1049-1053.
15. Blais MA, Matthews J, Lipkis-Orlando R, Lechner E, Jacobo M, Lincoln R, Gulliver C, Herman JB, Goodman AF. Predicting length of stay on an acute care medical psychiatric inpatient stay. Adm Policy Ment Health 2003;31:15-29.
16. Israel Central Bureau of Statistics, 2004: The Arab population of Israel, 2003.
17. Al-Haj M.. The Arab society in Israel. Soc Welfare 1994;14:249-264 (Hebrew).
18. Mental Health in Israel. Statistical Annual 2004. Ministry of Health, Israel.
19. Shurka E. Attitudes of Israeli Arabs towards the mentally ill. Int J Soc Psychiatry 1983;2:101-110.
20. Harman JS, Cuffel BJ, Kelleher KJ. Profiling hospitals for length of stay for treatment of psychiatric disorders. J Behav Health Serv Res 2004; 31:66-74.