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The association between readmission rates and length of stay for schizophrenia: A 3-year population-based study

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Abstract

Objective: A nationwide population-based dataset was used to explore the association between length of stay (LOS) and 30-day readmission rates for hospitalized patients with schizophrenia in Taiwan.
Methods: The National Health Insurance Research Database was used for the years 2001–2003 and included a total of 29,373 patients with schizophrenia divided equally into four groups according to LOS of index hospitalization. After adjusting for hospital, physician and patient characteristics, a multivariate regression analysis was used to determine the relationship between LOS and 30-day readmission rates.
Results: After discharge from their index hospitalization, 12,468 (42.5%) patients with schizophrenia were readmitted within 30 days. The adjusted odds ratio for 30-day readmission rates was increased for shorter LOS.
Conclusions: Healthcare providers should exert caution while trying to reduce LOS within the current cost-conscious environment and balance it with creating a minimal status necessary for discharge.

Keywords: Length of stay; Schizophrenia; Readmission rates

1. Introduction

Although the prevalence of schizophrenia in Taiwan is less than 1%, the total amount of funds for the treatment of chronic mental diseases (mainly schizophrenia), in all hospitals under Taiwan's Na-

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tional Health Insurance (NHI) system was approximately US$220,000,000 in 2001, the third largest expenditure for major injuries or illnesses in Taiwan (two-thirds arising from in-patient services). In order to control medical expenses more efficiently, a reduction in the length of stay (LOS) for hospitalized patients with schizophrenia is clearly an important strategic goal.

If, however, a patient is not adequately treated, such a patient will likely be readmitted to hospital (Epstein et al., 1991; Figueroa et al., 2004; Heeren et al., 2002). Numerous studies have investigated the association between length of stay and readmission rates for psychiatric patients, with varied results; although some studies have found that a reduction in LOS was associated with increased readmission rates for psychiatric services (Appleby et al., 1993; De Francisco et al., 1980; Figueroa et al., 2004; Heeren et al., 2002; Thomas et al., 1996), others have found no correlation (Lyons et al., 1997), and still others have even found that longer LOS increased readmission rates (Edward-Chandran et al., 1996; Feigon and Hays, 2003; Geller et al., 1998).

Since most of the studies were conducted in North America and are specific to few hospital settings; it is uncertain whether their findings can be generalized to other countries or regions and across different hospitals, particularly those where the healthcare delivery systems differ markedly (Appleby et al., 1993; De Francisco et al., 1980; Edward-Chandran et al., 1996; Epstein et al., 1991; Feigon and Hays, 2003; Geller et al., 1998; Heeren et al., 2002; Lyons et al., 1997; Thomas et al., 1996). In this paper, we use a population-based dataset in Taiwan to revisit the same issues.

2. Methods

2.1. Database

Hospitalization data from the National Health Insurance Research Database (NHIRD) covering the years from 2001 to 2003 were used. The NHIRD provides all in-patient medical benefit claims for over 21 million individuals, around 96% of the Taiwanese population, enrolled in Taiwan's National Health Insurance (NHI) program.

2.2. Study sample

The sample consisted of 31,415 patients, each of whom had been hospitalized with the International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM) principal diagnosis code 295 (schizophrenic disorders) from January 2001 to

Table 1
The 30-day readmission rates of LOS groups and groups by hospital, physician and patient characteristics for schizophrenia patients, 2001–2003 (n=29,373)

Variables	Total No.	%	Readmissions (%)	p value
LOS Group (days)				<0.001
Short (1–13)	7007	23.9	47.0	
Medium (14–26)	7548	25.7	44.9	
Long (27–40)	7564	25.8	40.2	
Very–Long (≥41)	7254	24.7	37.9	
Groups by hospital characteristics				
Hospital level				<0.001
Medical center	5744	19.6	18.5	
Regional hospital	16,192	55.1	50.3	
District hospital	7437	25.3	43.9	
Hospital ownership				<0.001
Public	18,100	61.6	50.1	
NFP	7179	24.4	27.8	
FP	4094	14.0	34.3	
Hospital location				<0.001
Northern	11,283	38.4	49.2	
Central	6726	22.9	34.4	
Southern	9202	31.3	38.1	
Eastern	2162	7.4	50.8	
Teaching status				0.187
Yes	22,928	78.1	42.3	
No	6445	21.9	43.2	
Groups by physician characteristics				
Physician gender				0.261
Male	26,644	90.7	42.3	
Female	2729	9.3	43.5	
Physician age				<0.001
<41	16,948	57.7	44.4	
41–50	10,096	34.4	39.9	
>50	2329	7.9	39.8	
Groups by patient characteristics				
Patient gender				<0.001
Male	16,696	56.8	43.3	
Female	12,677	43.2	41.4	
Patient age				<0.001
<40	16,451	56.0	39.8	
40–60	11,100	37.8	42.7	
>60	1822	6.2	46.3	

December 2003. Since medical expenses for compulsory hospitalizations were not covered by the NHI program, only voluntary admissions were included.

The index hospitalization was defined as the patient's first admission to an acute care hospital during the study period. Patients dying in hospital ($n=6$), discharged against medical advice ($n=1615$), and transferred to other hospitals ($n=422$) during the index hospitalization, were excluded in order to permit a reasonable window of opportunity for all patients to return to hospitals. Ultimately, we were left with a study sample of 29,373 patients with schizophrenia.

2.3. Length of stay (LOS) groups

In an attempt to better reflect the relationship between LOS and 30-day readmission rates, the different LOS periods were categorized into 4 groups: ≤13 days (hereafter referred to as the short-LOS group), 14–26 days (medium-LOS group), 27–40 days (long-LOS group) and ≥41 days (very-long-LOS group).

2.4. Statistical analysis

The SAS statistical package (SAS System for Windows, Version 12.0) was used for all analyses. Since it is suggested, in HEDIS 2000, that the 30-day readmission rate provides an appropriate measure of mental healthcare quality, this was taken as the key-dependent variable in our study. The relationship between LOS groups and 30-day readmission rates was examined by one-way ANOVA and was further verified in a multivariate regression analysis after adjusting for hospital, physician, and patient characteristics. A two-sided p value of less than, or equal to, 0.05 was considered to be statistically significant.

3. Results

There were 12,468 (42.5%) patients with a diagnosis of schizophrenia readmitted within 30 days after discharge from the index hospitalization. Those who were readmitted had, on average, a significantly shorter LOS for the index hospitalization than those who were not readmitted (28.6 days vs. 29.7 days, $p<0.001$). Table 1 shows the 30-day readmission rates of LOS groups and groups according to hospital, physician and patient characteristics. As can be seen from the table, there is a discernible decline in 30-day readmission rates from shorter to longer LOS groups.

After adjusting for hospital characteristics, comprising of hospital ownership, hospital level, hospital teaching status and geographical location, and physician and patient characteristics, both comprised of age and gender (with the age of physicians acting as a surrogate for practice experience), there was still a decline in the odds ratio of 30-day readmission for the longer LOS groups. However, as seen in Table 2, differences in the readmission rates between short-LOS and medium-LOS groups, and between long-LOS and very-long-LOS groups were insignificant.

4. Discussion

By utilizing a large population-based dataset, the results, for the most part, indicate that a very short length of stay on an index admission is significantly related to increased 30-day readmission rates. It is likely that patients with longer stays are most likely to improve clinically to a greater degree before discharge and thus cope better outside the hospital than those with much shorter stays (Appleby et al., 1993; De Francisco et al., 1980; Figueroa et al., 2004; Heeren et al., 2002; Thomas et al., 1996).

Because the NHI program in Taiwan has a unique combination of characteristics, such as universal coverage, a single-payer payment system with the

Table 2
Adjusted odds ratios for 30-day readmissions, by LOS group, 2001–2003 ($n=29,373$)

LOS Group	Adjusted OR[a]			
	Short (1–13 days)	Medium (14–26 days)	Long (27–40 days)	Very Long (≥41 days)
Short (1–13 days)	1.00	0.98 (0.92–1.05)[b]	1.26 (1.18–1.36)	1.30 (1.21–1.40)
Medium (14–26 days)	1.02 (0.95–1.09)	1.00	1.29 (1.21–1.38)	1.33 (1.24–1.42)
Long (27–40 days)	0.79 (0.74–0.85)	0.78 (0.72–0.83)	1.00	1.03 (0.96–1.10)
Very long (≥41 days)	0.77 (0.72–0.82)	0.75 (0.70–0.81)	0.97 (0.91–1.04)	1.00

[a] Adjustment is by multiple logistic regression analyses, adjusting for hospital, physician and patient characteristics.
[b] Figures in parentheses are 95% confidence intervals.

government as the sole insurer, comprehensive benefits, and access to any medical institution of the patient's choice, our findings therefore provide some reinforcement of the negative relationship between LOS and readmission rates found in previous studies under a completely different healthcare delivery system.

The negative relationship between LOS and readmission rates raises some major concerns about quality of care. Researchers have argued that a healthcare system, such as 'managed care' in the US, will tend to reduce LOS due to the economic incentives to save on medical expenditure. However, whether discharging patients from hospital sooner does in fact lead to any savings on medical costs is questionable, since decreasing LOS may actually have a negative impact financially as a result of the high readmission rates (Figueroa et al., 2004; Geller et al., 1998; Heeren et al., 2002; Wells et al., 1999).

There are two limitations of this study that need to be noted: (1) psychiatric diagnoses reported by physicians or hospitals are less accurate than those made in a face-to-face structured interview; and (2) although the dataset is population-based, it lacks variables that can affect both readmission rates and length of stay, such as socioeconomic status and the severity of illness, all of which may result in biased results.

Nevertheless, these data indicate a clear need for the development of a more adequate, or minimal, discharge standards for schizophrenia patients that will aid in preventing relapse and readmission.

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