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Hospital Length of Stay and Readmission for Individuals Diagnosed With Schizophrenia: Are They Related?

Summary

Pan-Canadian data show relatively high rates of readmission and declining lengths of stay (LOS) among individuals hospitalized for mental illness. In this Analysis in Brief the relationship between hospital readmissions and LOS was examined for individuals aged 15 to 65 years who were diagnosed with schizophrenia in an initial episode of hospitalization. The investigation revealed that shorter initial hospital stays were related to higher rates of readmission. A relationship was also found between initial LOS and the number of days until readmission to hospital for individuals diagnosed with schizophrenia. Individuals whose initial hospital stays were longer had longer intervals between hospitalizations. This association was observed for short-, medium- and longer-term readmissions, but in the case of both the likelihood of readmission and time to readmission, the relationship was most pronounced for short-term (or 30-day) readmissions.

Introduction

In Canada, as in other countries, the rates of re-hospitalization or readmission for mental illness are very high relative to those for most other diseases.¹⁻³ Among mental illnesses, readmission rates for schizophrenia and psychotic disorders are among the highest. The chronic, highly debilitating and refractory nature of these disorders means that stabilization of an individual's condition regularly requires long stays in hospital.

In light of this, the historical trend towards shorter hospital stays for mental illness prompts the question of whether less desirable outcomes, as reflected in unplanned hospital readmissions, can be expected. It might also be expected that as more time passes following a hospital stay, factors such as the availability of outpatient and community services would play a role in determining whether symptoms remain stable or there is a relapse that requires readmission to hospital.

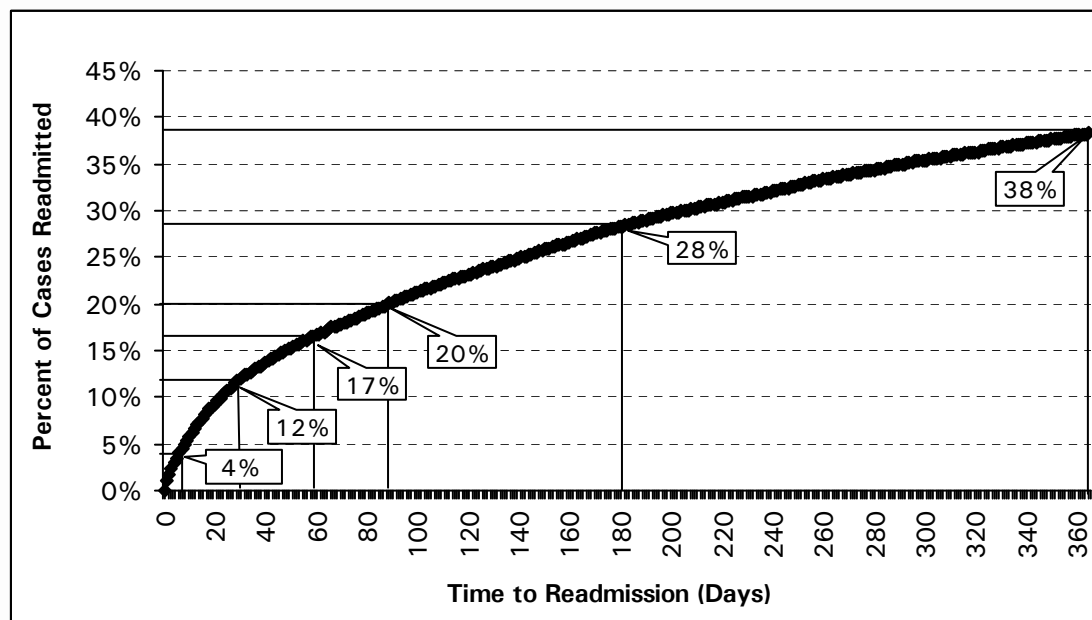
This analysis, which looks at the relationship between LOS in an index (i.e. initial) episode of schizophrenia and readmission to hospital, is based on data from CIHI's Hospital Morbidity Database for fiscal years 2003–2004 and 2004–2005. The data are from general hospitals in all Canadian provinces and include individuals between the ages of 15 and 65 who were discharged from an acute care hospital with a primary diagnosis of schizophrenia.

The time to readmission was calculated as the number of days between the initial discharge and a subsequent unplanned readmission for mental illness. Hospital readmission rates were examined for three time periods: short term, medium term, and longer term (1 to 30 days, 31 to 60 days and 61 to 90 days after the initial discharge, respectively). For each of these three time periods, readmissions were considered only for those individuals readmitted to hospital with a primary diagnosis of mental illness via an emergency department. In total, about 20 percent of these individuals were readmitted within 90 days of discharge, with an average time to readmission of 30.7 days.

What are the characteristics of people diagnosed with schizophrenia who are readmitted to hospital?

Short-term readmissions represented the largest single category, with almost 12% of individuals being readmitted within 30 days of discharge from hospital. This is also demonstrated in Figure 1, which allows for an examination of the hospital readmission rate for schizophrenia over a one-year period. After one week, more than 4% of individuals diagnosed with schizophrenia had been readmitted to hospital for a mental illness. The proportion rises most quickly within the first 30 days of follow-up, and then more gradually to about 28% at 180 days and about 38% after one year.

Figure 1 One-Year Hospital Readmissions for Individuals Diagnosed With Schizophrenia



Note

More detailed information on the distribution of readmissions is provided in Appendix A.

Source

Hospital Morbidity Database, Canadian Institute for Health Information, 2003–2004 and 2004–2005.

Table 1 presents descriptive statistics for individuals diagnosed with schizophrenia who were tracked over one year. Readmissions for these individuals were examined for a follow-up period of 90 days after discharge and comparisons were made across the three readmission intervals, as well as for the entire 90-day interval.

Since the readmission categories are mutually exclusive, individuals that are readmitted are not included in subsequent categories; therefore the analysis only considered the first readmission to hospital following the initial hospital stay in the period of interest.

In each of the three categories, the average length of the initial hospital stay was shorter for individuals who were eventually readmitted than for those who were not. Also, among those who were readmitted, a longer average LOS for the initial hospital stay appeared to correspond to a longer time to readmission. Together, these findings suggest that individuals diagnosed with schizophrenia who had longer hospital stays were readmitted less often and spent greater time in the community prior to a readmission than those who had shorter hospital stays.

Table 1 Differences in Rate of Readmission, Age, Gender, Average LOS, Average Time to Readmission and Co-Occurring Substance Disorder by Category of Readmission for Individuals Diagnosed With Schizophrenia*

	N	Percent	Average Age	Percent Female	ALOS (Days)	Average Time to Readmission (Days)	% With Co-Occurring Substance Disorder
Short-Term Readmission?							
Yes	2,102	11.9	36.7	43.0	15.3	12.4	18.8
No	15,549	88.1	38.0	41.4	19.2	--	17.6
Total	17,651	100					
Medium-Term Readmission?							
Yes	824	5.4	37.2	35.3	17.0	44.5	21.7
No	14,582	94.6	38.0	41.8	19.3	--	17.4
Total	15,406	100					
Longer-Term Readmission?							
Yes	608	4.2	37.4	43.8	18.1	75.5	15.1
No	13,894	95.8	38.0	41.7	19.4	--	17.5
Total	14,502	100					
Any Readmission Within 90 Days?							
Yes	3,534	20.0	36.9	41.3	16.2	30.7	18.9
No	14,117	80.0	38.1	41.7	19.3	--	17.5
Total	17,651	100					

Note

* First readmission to hospital within the one-year period of observation only.

Source

Hospital Morbidity Database, Canadian Institute for Health Information, 2003–2004 and 2004–2005.

For individuals diagnosed with schizophrenia, is the length of an initial stay in hospital related to the likelihood of readmission?

Statistical models were developed to examine the relationship between hospital LOS and readmission more thoroughly.ⁱ The models tested the relationship between LOS for each of the readmission categories while controlling for gender, comorbid substance disorder status, age and province of residence.

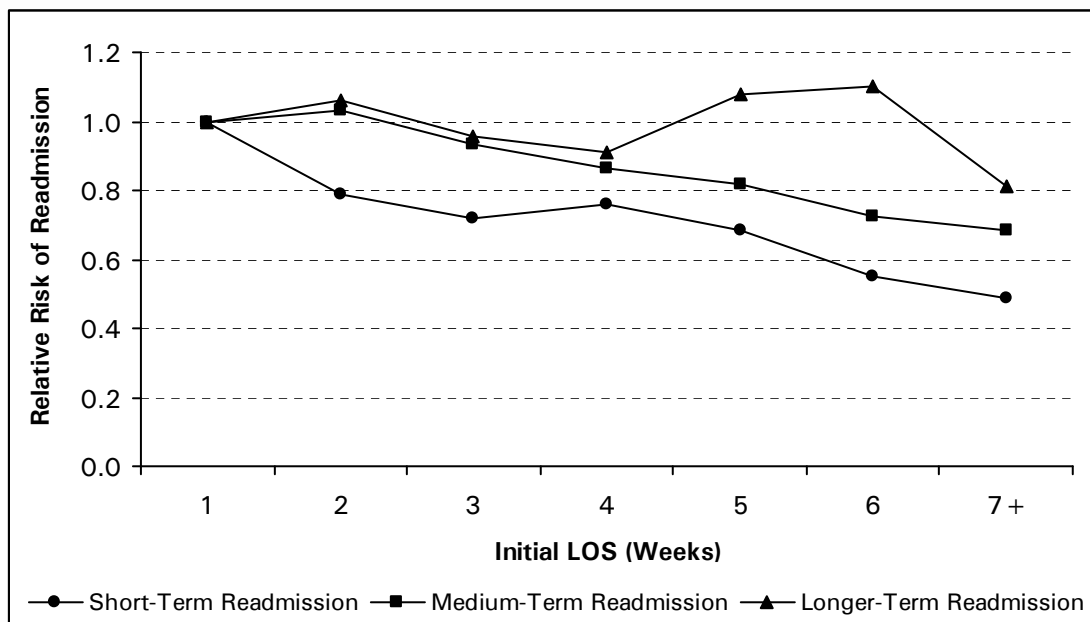
The results suggest that, for each of the three readmission categories, longer initial hospital stays were associated overall with a lower likelihood of readmission. This association was most prominent for short-term readmissions (within 30 days) and was progressively diminished in the case of medium- and longer-term readmissions.

Figure 2 presents the risk of readmission by length of initial hospital stay relative to a reference group of individuals who stayed in hospital for one week or less. In the case of those individuals readmitted within 30 days, for example, individuals whose initial hospital stays were between one and two weeks long were 21% less likely to be readmitted than those whose hospital stays were one week or less. This difference is amplified when those with the longest stays (seven weeks or more) are considered. Individuals whose initial hospital stays were seven weeks or longer were less than half as likely to be readmitted within 30 days when compared to those whose hospital stays were one week or less.

For individuals diagnosed with schizophrenia who were readmitted within 31 to 60 days, those whose initial hospital stay was seven weeks or longer were 32% less likely to be readmitted when compared to those whose stays were one week or less. For individuals readmitted between 61 and 90 days following an initial discharge, the overall relationship is statistically significant but less clear. Those whose initial stay was seven weeks or longer were 19% less likely to be readmitted as compared to those whose stay was one week or less; however, those whose initial stay was 5 or 6 weeks had a slightly higher likelihood of readmission when compared to those who stayed 1 week or less.

i. These are presented in greater detail in Appendix A.

Figure 2 Relative Risk of Readmission by LOS for Individuals Diagnosed With Schizophrenia



Source

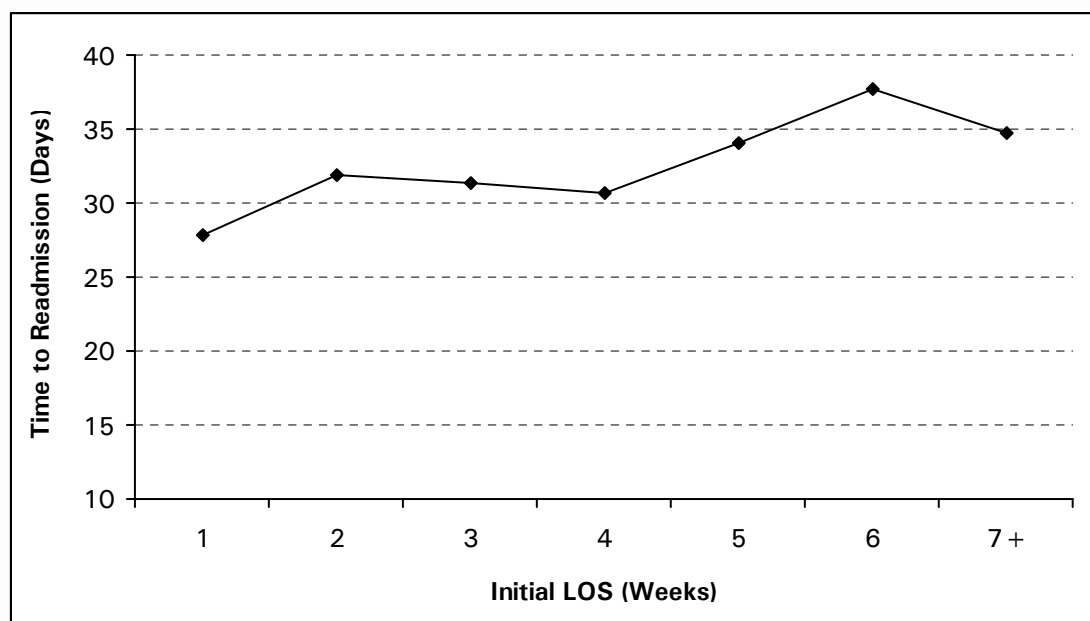
Hospital Morbidity Database, Canadian Institute for Health Information, 2003–2004 and 2004–2005.

Taken collectively, comparisons across the categories of short-, medium-, and longer-term readmissions demonstrate that the relationship between readmission and LOS, although still statistically significant overall, was less clear as the follow-up period grew longer. The greater ambiguity in the association between LOS and longer-term readmissions may relate to the influence of a number of intervening factors.

For individuals diagnosed with schizophrenia, does the length of an initial stay in hospital influence the length of time before being readmitted?

A subsequent analysis examined the relationship of hospital LOS and the number of days to readmission. The results, illustrated in Figure 3, suggest that for all individuals readmitted to hospital within 90 days, those with longer lengths of stay in the initial episode generally had longer periods between hospitalizations.

Figure 3 LOS and Time to Readmission for Individuals Diagnosed With Schizophrenia and Readmitted Within 90 Days



Source

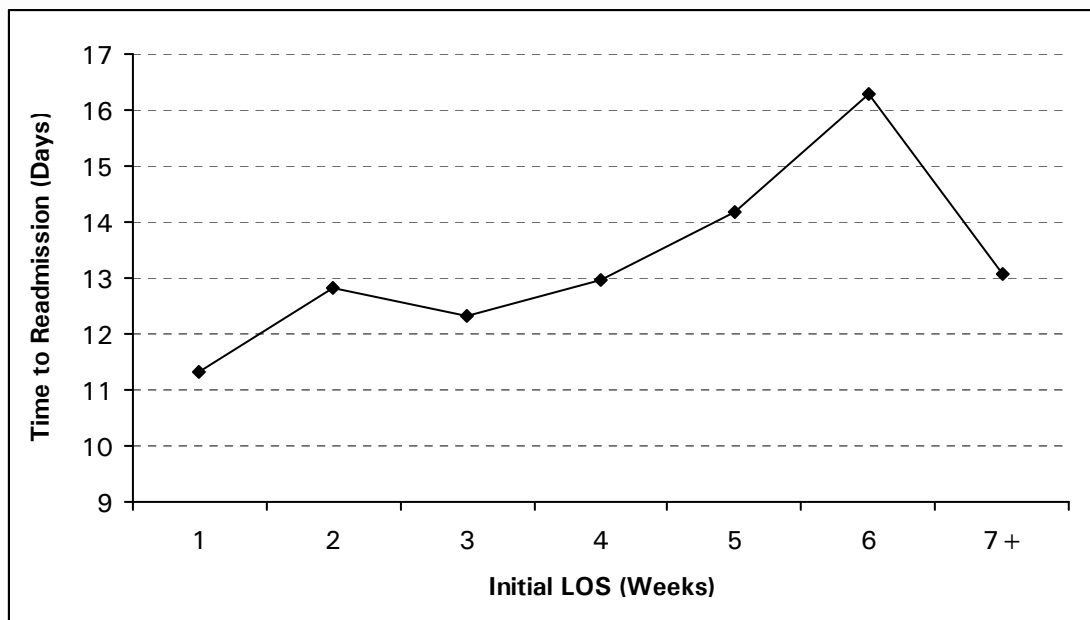
Hospital Morbidity Database, Canadian Institute for Health Information, 2003–2004 and 2004–2005.

Analysis in Brief

Taking health information further

As in the preceding analysis on the likelihood of readmission, the relationship between LOS and time to readmission is most prominent for individuals readmitted within 30 days. Figure 4 shows that individuals whose initial hospital stay lasted one week or less had the shortest time between initial discharge and 30-day readmission—just over 11 days. By contrast, those individuals whose initial hospital stay lasted six weeks had, on average, more than 16 days between hospitalizations.

Figure 4 LOS and Time to Readmission for Individuals Diagnosed With Schizophrenia and Readmitted Within 30 Days



Source
Hospital Morbidity Database, Canadian Institute for Health Information, 2003–2004 and 2004–2005.

Conclusions

This analysis found a relationship between hospital LOS and readmission for mental illness among individuals diagnosed with schizophrenia in an initial episode. Those who were hospitalized longer in an index episode were less likely to be readmitted and, among those who were readmitted, stayed longer in the community. This association between longer initial hospital stays and more desirable outcomes has been reported elsewhere.⁴⁻⁶

Further examination of this association may be instructive for the development and refinement of hospital and community treatment guidelines pertaining to schizophrenia, as readmission to hospital is often suggestive of a relapse.^{5, 7, 8}

For individuals hospitalized due to schizophrenia, an extended period of hospital care may be necessary to stabilize psychotic symptoms and to re-establish a regime of anti-psychotic medication. In addition to the availability of community care and access to anti-psychotic medications, considering the length of hospital stay can assist clinicians in assessing the likelihood of costly readmission to hospital for individuals diagnosed with schizophrenia.^{9, 10} These findings should be considered in the context of the decreasing duration of inpatient stays for mental illness that has been observed over the past few years.¹

The relationship between length of hospital stay and readmission appeared to be strongest when short-term readmissions were considered, and progressively less so for medium- and longer-term readmissions. This can reasonably be expected as a function of the proximity of the outcome and the episode of hospital care.¹¹ Later readmissions are probably more likely to reflect the influence of factors beyond inpatient hospitalization, such as effective transitional care, the availability of community and family supports, access to primary care, housing and continued access and adherence to prescribed medications.

The data used for this analysis do not incorporate factors such as the type of inpatient care provided, the severity of the illness in the initial hospitalization or the availability of outpatient and community care. Further investigation considering such broader factors could provide more context on the relationship between LOS and readmission for individuals diagnosed with schizophrenia. The Ontario Mental Health Reporting System (OMHRS), a CIHI reporting system in place since October 2005 and specifically designed for inpatient mental health services, can now be used to further explore additional factors influencing LOS and readmission, among other outcomes, for a range of mental illnesses.

Appendix A

Poisson Regression

Poisson regression was used to examine the relationship between hospital readmission for individuals diagnosed with schizophrenia in an index episode and their LOS in an acute care hospital. The main effects model tested the relationship between LOS and the readmission rate controlling for age in initial episode, gender, the presence or absence of substance-related disorder as comorbid condition and province of residence. The time from discharge to readmission was used as an offset or regression variable with a constant coefficient of 1 for each observation. To corroborate the findings, the model was also tested using Cox proportional hazard regression, which yielded nearly identical results.

Model Fit

Model fit statistics were generated for the three models (short-, medium-, and longer-term readmission) examined in this analysis. All three models provided a significantly better fit to the data than respective null models. Additionally, a comparison of fit between the three models revealed that the model for short-term readmissions fit the data best, followed by the model for medium-term readmissions, and the model for longer-term readmissions had the poorest (but still acceptable) fit to the data.

Main Effects

The type 3 analysis in Table 2 provides the main effects of LOS on hospital readmissions while controlling for co-occurring substance disorder status, age, gender and province of residence for the three follow-up periods of interest. For all three follow-up periods (short-, medium-, and longer-term), LOS had a statistically significant relationship with the likelihood of readmission, while holding all the other variables constant. Furthermore, the effect of LOS was largest in the short-term model and progressively smaller in the medium- and longer-term models.

Survival Distribution Function

The data measure the number of days to readmission after discharge. The event of interest is readmission. To take censored cases into account, and to depict the overall readmission rate over a one-year period of observation, the Kaplan-Meier method was used to generate a general survival function.

Table 2 Likelihood Ratio Statistics of Type 3 Analyses for the Models Examining the Relationship Between LOS and Readmission for Individuals Diagnosed With Schizophrenia

Variable	DF Num.	DF Denom.	Chi-Square	Probability
Short-Term Readmission (Up to 30 Days After Discharge)				
LOS	6	17,631	122.47	<0.01
Co-Occurring Substance-Related Disorder	1	17,631	0.97	NS
Age	4	17,631	28.65	<0.01
Gender	1	17,631	11.47	<0.01
Province of Residence*	7	17,631	17.10	<0.05
Medium-Term Readmission (31 to 60 Days After Discharge)				
LOS	6	15,386	39.80	<0.01
Co-Occurring Substance-Related Disorder	1	15,386	13.76	<0.01
Age	4	15,386	10.27	<0.05
Gender	1	15,386	23.84	<0.01
Province of Residence*	7	15,386	13.66	NS
Longer-Term Readmission (61 to 90 Days After Discharge)				
LOS	6	14,482	15.09	<0.05
Co-Occurring Substance-Related Disorder	1	14,482	9.14	<0.01
Age	4	14,482	15.58	<0.01
Gender	1	14,482	4.81	<0.05
Province of Residence*	7	14,482	14.86	<0.05

Notes

* Due to difficulties posed by their relatively small numbers, data for the four Atlantic provinces (Newfoundland and Labrador, New Brunswick, Nova Scotia and Prince Edward Island) were combined.
 DF Num. = Degrees of freedom in the numerator.
 DF Denom. = Degrees of freedom in the denominator.
 NS = Not significant.

Technical Notes

Data Source

The analyses presented here are based on data from CIHI's Hospital Morbidity Database for fiscal years 2003–2004 and 2004–2005.

Inclusion Criterion

Episodes of hospitalization were included if the most responsible diagnosis in an index episode was schizophrenia or a psychotic disorder. Hospitalization occurred in acute care inpatient hospitals, and cases were drawn from all provinces in Canada. Cases were tracked in the data for 1 year after an index discharge and were deemed readmitted if they were re-hospitalized for a mental illness via the emergency department within the given period. The analyses were based on data for individuals who were between the ages of 15 and 65 years at the time of the index episode of hospitalization.

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