



**March 2, 2010**

## **Depression in Ontario: What Predicts a First Mental Health Rehospitalization?**

### **Summary**

The purpose of this analysis was to identify various factors related to whether or not a person was readmitted following a first-ever stay in hospital for the treatment of depression. To do this, the analysis examined various socio-demographic, treatment, clinical and discharge environment characteristics and assessed their relationship to hospital readmission during various time periods following the first admission.

Data used for the analysis was primarily from the Ontario Mental Health Reporting System (OMHRS), which is a mandated reporting system for all admissions to designated mental health beds in Ontario. For more than 3,500 individuals initially discharged between April 1, 2006, and March 31, 2008, subsequent data was reviewed to determine whether and how quickly the individuals returned to a hospital in Ontario for a mental health-related stay (readmissions were identified in both OMHRS and the Discharge Abstract Database [DAD]). Approximately 19% of the individuals selected for the analysis were readmitted for a mental illness within one year.

The relationship between each of the characteristics and subsequent readmission varied depending on the length of time between the first and the second hospital stays. For example, people were more likely to be readmitted within 30 days of a first hospital stay for depression if they were unemployed, if their first stay was in a general hospital rather than a psychiatric hospital and if they were more depressed, were more at risk of self-harm or were more at risk of harm to others just prior to their first discharge from hospital.

Between 31 and 90 days after the first hospital stay for depression, people who were in a mental health bed in a general hospital were almost three times more likely to be readmitted than those who were in a psychiatric hospital, and people who had a co-existing anxiety disorder were one-and-a-half times more likely to be readmitted than those who did not have such a condition. In this medium-term period, individuals who reported that their needs for managing their illness were not met were more likely to be readmitted.

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Over the longer term, people were more likely to be readmitted between 91 and 365 days after the first hospital stay for depression if they were not in the labour force following the initial discharge or if the initial stay in hospital was longer than 30 days. As with medium-term readmissions, those who reported that their needs for managing their illness were not met were more likely to be readmitted during this period.

The results of this analysis and of the referenced research literature can help inform treatment planning and system-level management decisions for individuals diagnosed with depression. Identifying risk factors associated with first-ever rehospitalizations for depression may assist in altering the ultimate severity of the disease and the related effectiveness of various treatment interventions across the continuum of mental health services.

## Introduction

Being admitted to a hospital for mental illness can be highly disruptive to those living with it. At a system level, the direct economic costs of hospitalization constitute the single most expensive form of treatment for mental illness.<sup>1, 2</sup> In Canada, depression is the most commonly diagnosed mental illness among the hospitalized population. Its course can be chronic and characterized by recurrences.<sup>3</sup> Many of those hospitalized for depression experience a recurrence of severe symptoms and rehospitalization,<sup>4, 5</sup> even after achieving full remission.<sup>6</sup> For example, in 2005–2006, based on data from the DAD, about 10% of those hospitalized for depression in Canada were readmitted within 30 days, and about 30% were readmitted within 1 year.

Understanding the risk factors associated with hospital readmission among those diagnosed with depression can help in identifying the most vulnerable individuals and can facilitate system-level management and treatment planning over the course of the illness. Much of the work that has examined risk factors for readmission in depression identified previous hospitalization as a strong predictor.<sup>7, 8</sup> With depression, as with other mental illnesses, individuals with numerous previous mental health hospitalizations have been shown to have a greater vulnerability to subsequent rehospitalizations than those who have had fewer hospitalizations.<sup>6, 7</sup> The importance of previous hospitalizations has been demonstrated consistently, but it is somewhat limited in what it offers for managing the early stages of illness. In cases involving multiple hospitalizations, successive episodes have been shown to be characterized by increasing severity,<sup>8–12</sup> greater difficulty in providing effective treatment<sup>9</sup> and, in some cases, transition to a more severe illness, such as bipolar disorder.<sup>13, 14</sup> The implication is that, after initial hospitalization, a deleterious course of the illness may already be in progress.

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Considering these findings, as well as those on the enduring effects of early interventions,<sup>15</sup> a goal of this analysis was to assess socio-demographic, treatment, clinical and discharge environment risk factors for readmission after a first inpatient stay for depression. This represents an original approach to the issue of risk factors for psychiatric readmissions, in that most investigations of depression have focused on cases with a history of hospitalizations, and those investigations that have examined first episode or first hospitalization have typically focused on psychosis.<sup>16-19</sup>

A first hospitalization for depression does not necessarily reflect the onset of depression, as the illness may have remained untreated or may have been treated by other means for a period prior to hospitalization. However, first hospitalization may reflect a first major intervention in response to the onset of a severe phase of the illness. As such, it may demarcate outright entry into the mental health care system with, possibly, an ensuing transition to outpatient and community-based care; in this sense, it can have an important role in shaping the developing course of the illness.<sup>20</sup>

## Overview of Analysis

Potential risk factors for readmission were assessed by analyzing data for individuals with a first-ever inpatient stay for depression as captured in OMHRS for one year after their discharge.

### About the Ontario Mental Health Reporting System

OMHRS was established by the Canadian Institute for Health Information in 2005 through a partnership with the Ontario Ministry of Health and Long-Term Care to enable standardized data collection and reporting for adult inpatient mental health services in Ontario. During 2007–2008, 70 hospitals in Ontario participated in OMHRS, representing activity for 4,981 designated beds. Of the 70 hospitals, 15 were specialty psychiatric hospitals, which predominantly provide mental health services, and 55 were general hospitals with adult mental health beds, which provide services for a wide variety of health conditions in addition to mental health.

The data submitted to CIHI for the purposes of OMHRS is collected by hospital staff using a standardized clinical assessment instrument known as the Resident Assessment Instrument for Mental Health (RAI-MH©). The RAI-MH includes care planning, outcome measurement, quality improvement and case mix applications. The information collected through the RAI-MH is designed to inform decision-making by health care professionals and hospital administrators, as well as system planners and policy-makers at regional and provincial levels.

For more information about the Ontario Mental Health Reporting System, visit [www.cihi.ca/omhrs](http://www.cihi.ca/omhrs) or send an email to [omhrs@cihi.ca](mailto:omhrs@cihi.ca).

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The analysis examined how potential risk factors may differ as a function of the duration of the follow-up periods for the readmission outcome. The period immediately following hospital discharge is typically when the highest intensity of hospital readmissions occurs,<sup>21</sup> and therefore was identified as a critical period for follow-up mental health treatment.<sup>22</sup> However, recurrence of severe symptoms and consequent rehospitalization continue to manifest over the longer term,<sup>12, 23, 24</sup> with conditions surrounding the index hospital episode impacting readmissions differentially depending on the length of the follow-up period.<sup>20, 22, 25, 26</sup> To explore the impact of potential risk factors at different follow-up periods, the analysis examined models for 30-day (early), 31- to 90-day (medium-term) and 91- to 365-day (later) readmissions.

This analysis was restricted to individuals who were age 18 to 64 upon admission who experienced a first hospitalization for depression and who were discharged between April 1, 2006, and March 31, 2008. First hospitalization status was based on individuals' self-report and was validated, with a very high level of correspondence, by a review of five years of inpatient records. To be included in this analysis, individuals also had to have a valid health card number, an Ontario postal code of residence, an initial length of stay of four or more days and complete information on the potential readmission risk factors of interest.

In addition, the analysis examined diagnostic stability in first readmission cases by reporting on changes in mental illness diagnoses between the initial hospitalization and the readmission episode. In certain clinical groups, a first diagnosis of depression is related to heightened risk for the development of bipolar<sup>14</sup> and other disorders.<sup>24, 27</sup>

## What Are the Characteristics of Individuals Experiencing a First Hospitalization for Depression?

The analysis included 3,590 individuals who met the criteria described above. Table 1 describes these individuals according to four domains of potential readmission risk factors: socio-demographic, treatment, clinical and discharge environment. These individuals were more likely to be female than male; to be age 30 to 50 rather than 18 to 29 or 51 to 64; to live in an urban rather than rural setting; to be unmarried rather than married; and to have at least a high school education rather than less than a high school education. Upon discharge, 40% of patients were unemployed and 5.4% were homeless.

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The majority of individuals (80.7%) were reported to be on medication and compliant with the medication regime in the month before admission. A small proportion of individuals were reported as not compliant (9.2%) or not on medication (10.1%) during this period. Slightly more than one-quarter of individuals (25.7%) reported being involved with a community-based mental health service in the month before admission (not including medical general practitioners). Most individuals were admitted to a general hospital (85.7%) as opposed to a specialized psychiatric facility (14.3%) for the first depression-related hospitalization. The length of first hospital stay ranged from 4 days (a minimum boundary resulting from the corresponding eligibility criterion) to 260 days. Most individuals (63.9%) stayed 4 to 15 days, with 23.6% staying between 16 and 30 days and 12.5% staying more than 30 days.

Most individuals (94.9%) were rated as having no depression symptoms or mild depression symptoms at discharge. Nearly three-quarters of individuals (74.3%) were rated as having no symptoms of self-harm or mild symptoms of self-harm at discharge. More than three-quarters of patients (81.5%) were discharged with a rating of no symptoms of substance misuse, and the vast majority (95.0%) were rated as having no risk of harm to others or a mild risk of harm to others. Finally, 10.8% of patients had a comorbid anxiety disorder and 10.0% had a comorbid personality disorder.

At discharge, most patients (87.2%) reported having supports in place to manage daily activities or having no need for such supports, and 54.5% reported having supports in place for managing their illness or reported no need for such supports.

**Table 1 Characteristics of Patients Experiencing a First Hospitalization for Depression in Ontario, 2006 to 2008 (N = 3,590)**

Characteristic	Group	Percent
<b>Socio-Demographic Domain</b>		
Sex	Women	57.1
	Men	43.0
Age Upon Admission (Years)	18–29	26.0
	30–50	50.5
	51–64	23.4
Area of Residence	Urban	87.3
	Rural	12.7
Married or Common-Law	Yes	40.7
	No	59.3
Education	Less Than High School	20.6
	High School or More	79.4
Employment Status (Upon Discharge)	Employed	46.1
	Unemployed	40.7
	Not in Labour Force	13.2
Homeless (Upon Discharge)	Yes	5.4
	No	94.7
<b>Treatment Domain</b>		
Medication Compliance (Pre-Admission)	Compliant ( $\geq 80\%$ of Time)	80.7
	Not Compliant ( $< 80\%$ of Time)	9.2
	Not on Medication	10.1
Community-Based Mental Health Service (Pre-Admission)	Yes	25.7
	No	74.4
Type of Hospital	General	85.7
	Psychiatric	14.3
Length of Stay (Days)	4–15	63.9
	16–30	23.6
	More Than 30	12.5
<b>Clinical Domain</b>		
Depression Rating Scale Score (Upon Discharge)	0–5	94.9
	6–14 (Maximum)	5.2
Severity of Self-Harm Scale Score (Upon Discharge)	0–4	74.3
	5–6 (Maximum)	25.7
CAGE* Score (Upon Discharge)	0	81.5
	1–2	9.0
	3–4 (Maximum)	9.6
Risk of Harm to Others Scale Score (Upon Discharge)	0–2	95.0
	3–6 (Maximum)	5.0
Comorbid Anxiety Disorder	Present	10.8
	Absent	89.2
Comorbid Personality Disorder	Present	10.0
	Absent	90.0
<b>Discharge Environment Domain</b>		
Support Needs Met for Daily Activities (or No Need)	Yes	87.2
	No	12.8
Support Needs Met for Managing Illness (or No Need)	Yes	54.5
	No	45.5

**Note**

\* The CAGE questionnaire measures substance abuse. CAGE stands for “cut down, annoyed, guilty, eye-opener.”

**Source**

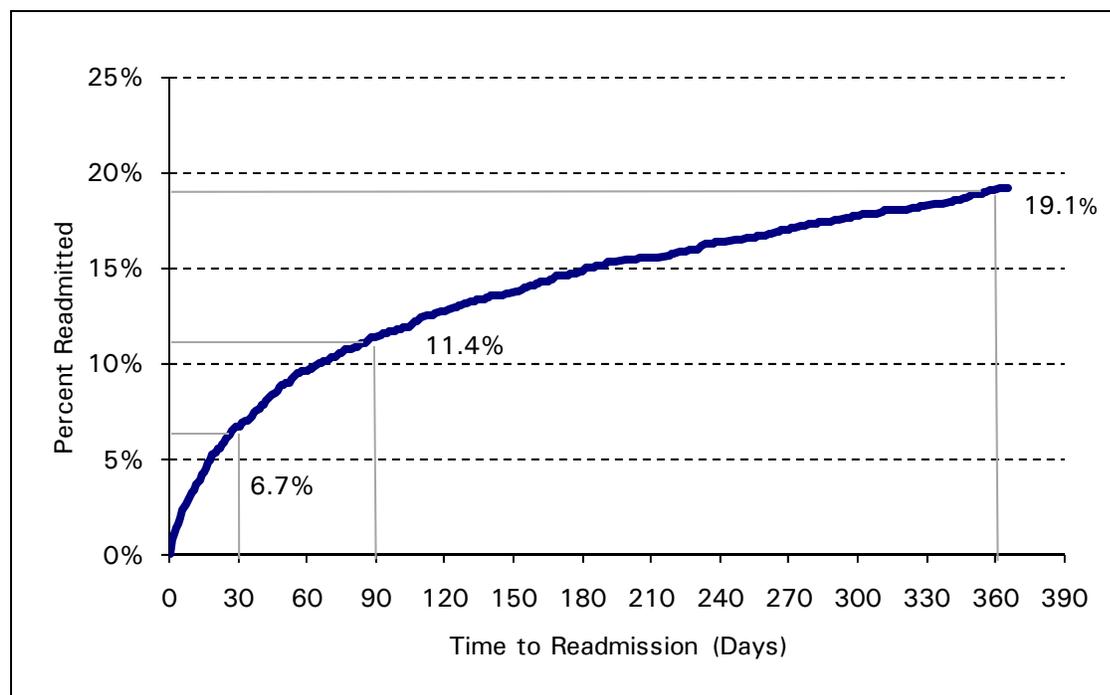
Ontario Mental Health Reporting System, Canadian Institute for Health Information.

# What Is the First Psychiatric Readmission Experience Following a First Hospitalization for Depression?

As described earlier, if an individual was discharged following a depression-related stay in a designated mental health bed in Ontario between April 1, 2006, and March 31, 2008, data from OMHRS and the DAD was examined to determine if he or she was readmitted within a year. Ontario DAD data pertains to discharges from designated acute care beds, of which some discharges may have been for a mental illness.

Figure 1 shows that the greatest risk for readmission among the sample population was within the first 30 days of discharge. In this period, 241 (6.7%) of the 3,590 patients were readmitted. With an additional 169 patients (4.7%) readmitted 31 to 90 days after discharge, the 90-day readmission rate rose to 11.4%. With another 279 patients (7.7%) readmitted 91 to 365 days after discharge, the one-year readmission rate rose to 19.1%.

**Figure 1 First Psychiatric Readmission Following a First Hospitalization for Depression**



**Sources**

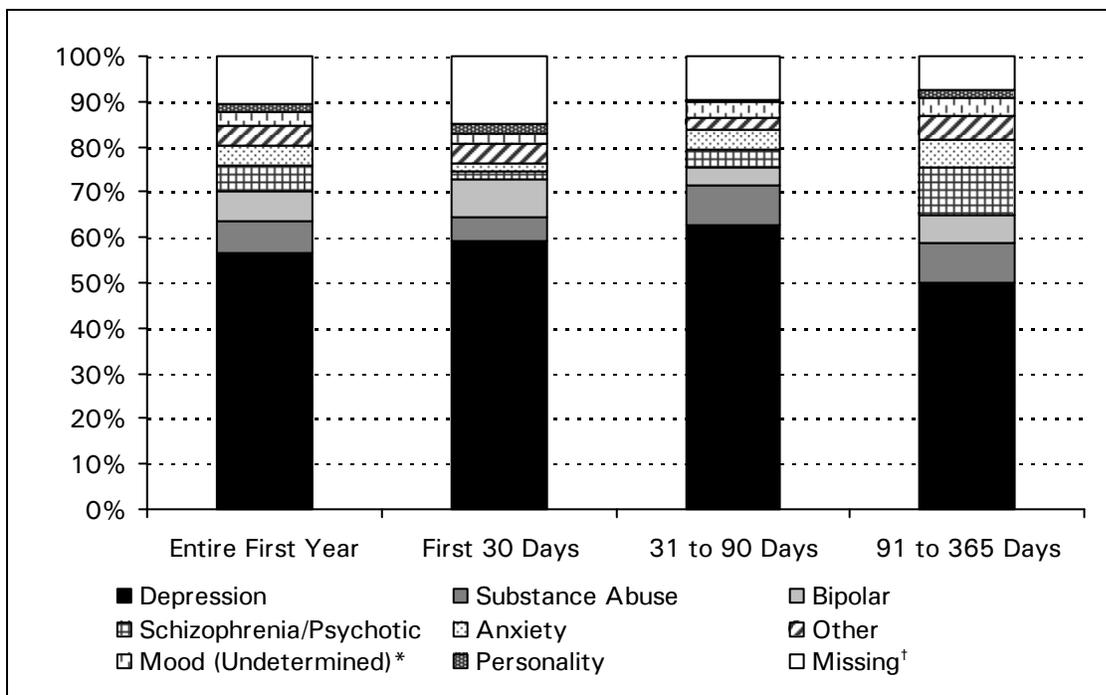
Ontario Mental Health Reporting System and Discharge Abstract Database, Canadian Institute for Health Information.

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Although this analysis was restricted to first hospital episodes for depression, the readmission episodes consisted of a more general diagnosis of psychiatric illness (see Appendix A for the specific diagnostic codes classified as “psychiatric” in this analysis). As a result, 300 of the 689 patients readmitted (43.5%) were readmitted with a diagnosis other than depression. As shown in Figure 2, the most common psychiatric diagnoses upon readmission (other than depression) were substance abuse, bipolar and schizophrenia/psychotic disorders. The distribution of readmission diagnoses varied over time, with slightly more bipolar diagnoses observed in the early readmission period and more schizophrenia/psychotic diagnoses observed in the later readmission period.

**Figure 2 First Psychiatric Readmission Diagnoses Following a First Hospitalization for Depression**



**Notes**

\* These records contain only the provisional diagnostic category of “mood disorder,” not the more specific DSM-IV codes that would distinguish between bipolar disorder and depression.

† These diagnoses are assumed to be psychiatric because the readmission record was observed in OMHRS, which contains only data for patients in designated adult mental health beds.

**Sources**

Ontario Mental Health Reporting System and Discharge Abstract Database, Canadian Institute for Health Information.

## What Are the Risk Factors for First Psychiatric Readmission Following a First Hospitalization for Depression?

The main goal of this analysis was to determine which characteristics were related to readmission following a first psychiatric hospital stay for depression. Recognizing that the factors affecting the risk of readmission may vary over time, three discrete readmission periods were examined:

- 30 days following first discharge (early readmission);
- 31 to 90 days following first discharge (medium-term readmission); and
- 91 to 365 days following first discharge (later readmission).

Table 2, as with Table 1, lists the characteristics examined for this analysis. In Table 2, however, the readmission risk conferred by each factor in each discrete time period is shown after accounting for the risk imposed by all other factors considered in this analysis. Risk estimates are only presented for factors if they were statistically significant ( $p < 0.05$ ). For more information, refer to Appendix B, which contains the complete regression results. For each potential risk factor presented in Table 2, one category was considered the reference group. Differences between other groups and the reference category are displayed as hazard ratios.

**Table 2 Risk Factors for Psychiatric Readmission Following a First Hospitalization for Depression**

Characteristic	Group	Effect* on Readmission Risk Within		
		30 Days of Discharge	31 to 90 Days of Discharge	91 to 365 Days of Discharge
<b>Socio-Demographic Domain</b>				
Sex	Women Men			
Age Upon Admission (Years)	18–29 30–50 51–64			
Area of Residence	Urban Rural			
Married or Common-Law	Yes No			
Education	Less Than High School High School or More			
Employment Status (Upon Discharge)	Employed Unemployed Not in Labour Force	Reference 1.40 (1.06–1.86)		Reference 1.48 (1.04–2.09)
Homeless (Upon Discharge)	Yes No			
<b>Treatment Domain</b>				
Medication Compliance (Pre-Admission)	Compliant (≥80% of Time) Not Compliant (<80% of Time) Not on Medication			
Community-Based Mental Health Service (Pre-Admission)	Yes No			
Type of Hospital	General Psychiatric		2.89 (1.53–5.46) Reference	
Length of Stay (Days)	4–15 16–30 More Than 30			Reference 1.65 (1.15–2.38)
<b>Clinical Domain</b>				
Depression Rating Scale Score (Upon Discharge)	0–5 6–14 (Maximum)	Reference 1.64 (1.05–2.59)		
Severity of Self-Harm Score (Upon Discharge)	0–4 5–6 (Maximum)	Reference 1.52 (1.16–2.00)		
CAGE† Score (Upon Discharge)	0 1–2 3–4 (Maximum)			
Risk of Harm to Others Score (Upon Discharge)	0–2 3–6 (Maximum)	Reference 1.60 (1.01–2.53)		
Comorbid Anxiety Disorder	Present Absent		1.68 (1.10–2.56) Reference	
Comorbid Personality Disorder	Present Absent			
<b>Discharge Environment Domain</b>				
Support Needs Met for Daily Activities (or No Need)	Yes No			
Support Needs Met for Managing Illness (or No Need)	Yes No		0.70 (0.51–0.97) Reference	0.74 (0.58–0.95) Reference

**Notes**

\* Effects are reported as hazard ratios with lower and upper confidence limits in brackets. Only statistically significant effects ( $p < 0.05$ ) are included in the table (for complete regression results, see Appendix B).

† The CAGE questionnaire measures substance abuse. CAGE stands for “cut down, annoyed, guilty, eye-opener.”

**Sources**

Ontario Mental Health Reporting System and Discharge Abstract Database, Canadian Institute for Health Information.

## Socio-Demographic Risk Factors

Among the socio-demographic characteristics examined, employment status appeared to have the most prominent impact on readmission. Unemployed patients had a 1.4-times higher risk of readmission in the early period relative to employed patients; however, unemployment conferred no risk for readmission in the medium-term or later periods. Individuals not in the labour force (students, pensioners, homemakers, etc.) had a 1.48-times higher risk of readmission relative to employed patients, but only in the later period. None of the remaining six socio-demographic characteristics was related to the risk of readmission.

## Treatment Risk Factors

Two of the four treatment characteristics examined showed a statistically significant relationship to readmission; the effects were period-specific. Relative to patients first hospitalized in a psychiatric facility, those first hospitalized in a general facility had a 2.89-times higher risk of readmission in the medium term. Relative to those whose initial stay was between 4 and 15 days, people who stayed more than 30 days had a 1.65-times higher risk of readmission in the later term. Medication compliance and contact with a community-based mental health service in the month before first admission were not significantly related to the risk of readmission.

## Clinical Risk Factors

Four of the six clinical characteristics examined were related to readmission; the effects were period-specific. High levels on three of the four symptom profiles included in this analysis increased the risk of early readmission. More specifically, high levels of depression symptoms upon discharge increased the risk of early readmission by 1.64 times, high levels of self-harm symptoms increased the risk of early readmission by 1.52 times and high levels of risk of harm to others increased the risk of early readmission by 1.6 times. Finally, having a comorbid anxiety disorder increased the risk of readmission in both the medium term, by 1.68 times, and in the later period, by 1.38 times. Substance abuse, as measured by the CAGE, and comorbid personality disorder were not related to the risk of readmission.

## Discharge Environment Readmission Risk Factors

Of the two discharge environment factors examined, only support for managing illness demonstrated a statistically significant relationship to readmission. Relative to patients with unmet needs in illness management, patients with met needs or no needs were at 0.70 times the risk of readmission in the medium term and 0.74 times the risk in the later period.

## Discussion

### Socio-Demographic Factors

*Employment*—The greater risk of readmission among unemployed individuals observed in the short term is in line with research that highlights the link between unemployment and depression.<sup>28, 29</sup> Beyond the benefits of socio-economic stability, having employment after a hospital discharge may suggest that the individual is returning to an environment with structure and may, therefore, more readily achieve social reintegration. In the longer term, those who were not in the workforce were more likely to be readmitted when compared with the unemployed group. This group is distinguished from the other two by the condition of having a defined social role (for example, as a student or homemaker) but, like unemployed individuals, no identified source of remuneration. Further investigation may seek to identify the differential impacts of economic or role-related benefits of employment among individuals with depression.

### Treatment Factors

*Medication compliance*—Although a lack of compliance with prescribed psychiatric medication has been shown to be a significant risk factor for readmission,<sup>30, 31</sup> in the current analysis it was not. The impact may have been attenuated by the fact that, in this instance, the construct reflects compliance before hospitalization rather than after discharge. Also, those who were not on medication prior to hospitalization may not have required medication or may not have had access to it.

*Hospital type*—Individuals discharged from general hospitals were significantly more likely to experience a readmission than those discharged from a specialized psychiatric hospital in the medium term: those discharged from general hospitals were almost three times as likely to be readmitted as those discharged from specialized psychiatric hospitals. Given that the analytical model controls for severity of depression as well as length of stay, the findings may reflect the effects of more specialized care in psychiatric hospitals. In the few depression studies that have examined types of hospital care in this manner, it was found that specialized psychiatric hospitals were better able to provide transitional and follow-up care<sup>32</sup> and that acute facilities could benefit from strengthening treatment alliances and links with outpatient services.<sup>33</sup> With general hospitals providing an increasing majority of psychiatric inpatient services,<sup>34, 35</sup> a more detailed comparison of practices and outcomes by facility type is merited.

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*Length of stay*—In light of the historically decreasing duration of hospital stays,<sup>34</sup> there has been an interest in investigating the impact of shorter stays on patient outcomes.<sup>36</sup> Evidence on the relationship between length of stay and readmission in depression is mixed.<sup>36</sup> Some findings suggest that shorter stays mean patients are being discharged sicker and are therefore at greater risk of rehospitalization.<sup>37</sup> Others report either no effect of length of stay<sup>23, 38</sup> or find longer stays related to higher readmission rates.<sup>39</sup> In one study that examined first hospital stays for depression specifically, no relationship was found between the duration of first hospitalization and the number of subsequent episodes of hospitalization.<sup>40</sup>

In the current analysis, individuals whose first hospitalization was for more than 30 days had a higher risk of readmission in the longer term than the reference group, whose stay was 4 to 15 days. This finding aligns with evidence showing that some patients respond to clinical treatment early on (within two weeks) and are therefore discharged earlier, whereas others are non-responders, hospitalized for longer periods and may endure a more difficult prognosis.<sup>41</sup>

It might have been expected that the effects of this hospital treatment factor would be observed in the period immediately after discharge (that is, closer in time to the hospital intervention). Future analyses could consider symptom improvement in concert with length of stay, as it has been found that longer episodes result in greater improvements for first inpatient treatment.<sup>23</sup> It may also be informative to consider baseline or admission severity, as this may indicate the need for longer stays and perhaps more dramatic improvement in symptoms before discharge. Finally, knowing more about the intensity and type of treatment provided during a hospital stay for depression would help clarify this line of inquiry.<sup>36</sup>

### Clinical Factors

*Depression severity, risk of harm to self, risk of harm to others*—Four of the six clinical factors were found to be significant risks for first hospital readmission. Three of these—severity of depression, severity of self-harm and risk of harm to others—emerged as significant clinical risk factors for early readmission. Taken individually, these factors have been shown to contribute to the course of depression.<sup>7, 36, 44</sup> Substance use, which has been associated with an exacerbation of depression symptoms and reduced medication and treatment compliance, ultimately resulting in more frequent hospitalization,<sup>42, 43</sup> was not statistically significant in this model.

Aggressiveness (with impulsivity), self-harm, substance use and depression symptoms have been investigated in combination for their contribution to suicidal behaviours<sup>45</sup> and related hospitalizations.<sup>43, 46, 47</sup> The findings from this analysis relating to these clinical factors corroborate previous work<sup>48</sup> and suggest that further analysis could focus on their collective impact and on links to suicidal behaviours. As these findings relate to potentially modifiable factors at the time of discharge from hospital, clinical risk management strategies for the discharge and early post-discharge periods that focus on these factors may be beneficial.

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*Anxiety disorders*—Anxiety disorders tend to be highly comorbid with depression,<sup>49</sup> for which they are commonly antecedent risk factors.<sup>49–51</sup> In the current analysis, the presence of a comorbid anxiety disorder resulted in a higher rate of later readmission. This is consistent with evidence indicating that the presence of a comorbid anxiety disorder makes the treatment of depression more difficult than a diagnosis of depression alone and is predictive of recurrence in depression.<sup>50, 52</sup> The emergence of a comorbid anxiety diagnosis as a risk factor in the later readmission period specifically is consistent with findings that indicate increased depression chronicity when anxiety is comorbid.<sup>53</sup>

### Discharge Environment

*Support for managing daily activities, support for managing illness*—The analysis of factors related to the discharge environment identified a lack of support with managing illness as a significant risk factor for readmission in the medium and longer terms. The importance of social support to reducing depression severity and risk of readmission is well established.<sup>54–56</sup> Although evidence for a buffering mechanism (whereby social support protects the individual from external stresses) is mixed,<sup>57–62</sup> substantiation of its practical benefits is evident.<sup>63</sup> The significance of social support in the medium and later readmission periods may reflect diminishing follow-up care, progressive difficulty in managing the impact of external stresses with the advancing course of the illness<sup>63</sup> and possibly signs of recurrence taking on a more recognizable form. This analysis may underscore the importance of assessing and planning for continued social support, which may help to attenuate severe depressive symptoms that require rehospitalization.

### Consistency of Diagnosis

As a follow-up to the main analysis, an assessment of diagnosis upon readmission was conducted to examine the consistency of depression diagnoses. In just more than half of the cases across all three follow-up periods, readmitted individuals had depression as the main diagnosis related to hospitalization. This is somewhat more variable than the figures reported by other research relating to a similar first episode sample.<sup>13</sup> As depression is occasionally a precursor to more severe bipolar disorder, the nature of the depression treatment can have implications for the onset and course of bipolar illness.<sup>14, 64</sup> Establishing a diagnosis can be a particularly challenging issue in first episode or first hospitalization cases of depression, as an individual's condition may be developing in nature and severity, and there may be limited diagnostic history upon which to draw. Future work on these preliminary findings may involve a more thorough analysis of factors predicting diagnosis consistency across admissions.

## Conclusion

The findings of this depression analysis go beyond the existing information on the predictive role of previous hospitalization in readmission. The analysis identified socio-demographic, treatment, clinical and discharge environment factors affecting the risk of readmission in individuals experiencing a first hospitalization for depression. In examining factors that identify those at risk for readmission, the analysis focused on a number that are modifiable. In addition to identifying certain risk factors for readmission, the analysis presented here may serve as a catalyst for more detailed analyses on the treatment and course of depression.

## About CIHI

The Canadian Institute for Health Information (CIHI) collects and analyzes information on health and health care in Canada and makes it publicly available. Canada's federal, provincial and territorial governments created CIHI as a not-for-profit, independent organization dedicated to forging a common approach to Canadian health information. CIHI's goal: to provide timely, accurate and comparable information. CIHI's data and reports inform health policies, support the effective delivery of health services and raise awareness among Canadians of the factors that contribute to good health.

Production of this analysis is made possible by financial contributions from Health Canada and provincial and territorial governments. The views expressed herein do not necessarily represent the views of Health Canada or any provincial or territorial government.

## Appendix A: Psychiatric Diagnostic Codes

For this analysis, psychiatric readmissions took place between April 2, 2006, and March 31, 2009 (inclusive). During this time, psychiatric admissions to Ontario facilities were primarily reported to OMHRS, though a few arising from admission to a designated acute care bed were reported to the DAD. Psychiatric admissions were captured in the DAD only for patients who had been discharged following a stay in an acute care bed.

### How Were Psychiatric Readmissions Identified in OMHRS?

In OMHRS, psychiatric diagnoses are captured as DSM-IV codes and/or provisional mental health categories; however, some records have neither code nor category. For records with DSM-IV codes, those with a primary diagnosis of codes 290 through 319 (inclusive) and 331.0 were potential psychiatric readmission records. For records with no DSM-IV codes, those in which any one of the 16 provisional mental health categories was selected were potential psychiatric readmission records. Finally, given that OMHRS records are generated for patients residing in designated adult mental health beds, OMHRS records with neither a DSM-IV code nor a provisional category were also considered potential psychiatric readmission records.

### How Were Psychiatric Readmissions Identified in the DAD?

During the period of interest for readmission in this analysis (April 2, 2006, to March 31, 2009), Ontario facilities reported diagnoses to the DAD as ICD-10 codes. As a result, records with a primary diagnosis of ICD-10 codes beginning with F or G30 were considered potential psychiatric readmission records.

## Appendix B: Complete Regression Results

The hazard ratios generated by multivariate proportional hazards regression models are shown in Table B1. The models included each of the socio-demographic, treatment, clinical and discharge environment characteristics considered in this analysis. Variance inflation factor estimates were generated to explore the possibility of multi-collinearity across the variables; these estimates did not reveal multi-collinearity in any of the models.

**Table B1 Hazard Ratios Generated by Multivariate Proportional Hazards Regression Models**

Characteristic	Potential Predictor	30-Day Readmission Model				31- to 90-Day Readmission Model				91- to 365-Day Readmission Model				
		HR	LCL	UCL	p-Value	HR	LCL	UCL	p-Value	HR	LCL	UCL	p-Value	
Socio-Demographic Domain	Sex													
	Women	0.89	0.68	1.15	0.371	1.00	0.73	1.37	0.997	1.28	1.00	1.64	0.053	
	Men	1.00				1.00				1.00				
	Age (Years)													
	18–29	1.09	0.75	1.60	0.652	1.01	0.64	1.59	0.964	0.98	0.68	1.40	0.907	
	30–50	0.99	0.71	1.37	0.948	0.94	0.64	1.37	0.740	1.00	0.74	1.34	0.983	
	51–64	1.00				1.00				1.00				
	Type of Residence													
	Urban	1.26	0.82	1.93	0.290	1.41	0.83	2.41	0.204	0.89	0.63	1.25	0.502	
	Rural	1.00				1.00				1.00				
Married or Common-Law	Yes	0.98	0.74	1.31	0.902	0.81	0.58	1.14	0.224	1.00	0.77	1.29	0.980	
	No	1.00				1.00				1.00				
Education	Less Than High School	1.17	0.86	1.57	0.315	0.87	0.58	1.29	0.488	0.82	0.60	1.12	0.208	
	High School or More	1.00				1.00				1.00				
Employment Status	Employed	1.00				1.00				1.00				
	Unemployed	<b>1.40</b>	<b>1.06</b>	<b>1.86</b>	0.018	1.05	0.75	1.47	0.776	1.15	0.88	1.50	0.300	
	Not in Labour Force	1.09	0.71	1.67		1.07	0.67	1.71	0.788	<b>1.48</b>	<b>1.04</b>	<b>2.09</b>	0.029	
Homeless (Upon Discharge)	Yes	1.36	0.84	2.18	0.207	0.63	0.28	1.45	0.280	0.84	0.48	1.48	0.548	
	No	1.00				1.00				1.00				
Treatment Domain	Medication Compliance (Month Before Admission)													
	Compliant (≥80% of Time)	1.00				1.00				1.00				
	Not Compliant (<80% of Time)	0.93	0.60	1.43	0.742	1.07	0.64	1.79	0.790	0.94	0.61	1.44	0.768	
	Not on Medication	0.73	0.46	1.15	0.173	0.52	0.26	1.03	0.061	0.97	0.65	1.47	0.898	
	Community Mental Health Contact (Month Before Admission)													
	Yes	0.90	0.66	1.22	0.490	1.16	0.82	1.62	0.400	0.83	0.62	1.10	0.186	
	No	1.00				1.00				1.00				
	Type of Hospital	General	1.54	0.97	2.47	0.069	<b>2.89</b>	<b>1.53</b>	<b>5.46</b>	0.001	1.08	0.75	1.55	0.687
		Psychiatric	1.00				1.00				1.00			
	Length of Stay (Days)	4–15	1.00				1.00				1.00			
16–30		1.17	0.87	1.57	0.305	1.41	1.00	2.00	0.053	1.23	0.92	1.64	0.158	
More Than 30		1.09	0.69	1.72	0.726	1.50	0.90	2.49	0.116	<b>1.65</b>	<b>1.15</b>	<b>2.38</b>	0.007	

**Table B1 Hazard Ratios Generated by Multivariate Proportional Hazards Regression Models (cont'd)**

Characteristic	Potential Predictor	30-Day Readmission Model				31- to 90-Day Readmission Model				91- to 365-Day Readmission Model			
		HR	LCL	UCL	p-Value	HR	LCL	UCL	p-Value	HR	LCL	UCL	p-Value
Clinical Domain	Depression Rating Scale Score (Upon Discharge)												
	0-5	1.00				1.00				1.00			
	6-14 (Maximum)	<b>1.64</b>	<b>1.05</b>	<b>2.59</b>	0.031	1.29	0.69	2.40	0.429	0.97	0.56	1.68	0.920
	Severity of Self-Harm Scale Score												
	0-4	1.00				1.00				1.00			
	5-6 (Maximum)	<b>1.52</b>	<b>1.16</b>	<b>2.00</b>	0.003	0.98	0.68	1.40	0.893	0.94	0.70	1.25	0.655
	CAGE* Score												
	0	1.00				1.00				1.00			
	1-2	1.11	0.72	1.72	0.630	0.93	0.53	1.62	0.787	1.45	0.99	2.11	0.055
	3-4 (Maximum)	1.38	0.95	2.02	0.092	0.98	0.57	1.69	0.947	1.35	0.92	1.99	0.130
Risk of Harm to Others Scale Score													
0-2	1.00				1.00				1.00				
3-6 (Maximum)	<b>1.60</b>	<b>1.01</b>	<b>2.53</b>	0.045	0.64	0.26	1.57	0.327	1.01	0.58	1.78	0.967	
Comorbid Anxiety Disorder													
Yes	0.99	0.64	1.51	0.951	<b>1.68</b>	<b>1.10</b>	<b>2.56</b>	0.016	1.38	0.98	1.96	0.069	
No	1.00				1.00				1.00				
Comorbid Personality Disorder													
Yes	1.29	0.89	1.89	0.181	1.06	0.65	1.73	0.826	0.94	0.62	1.42	0.758	
No	1.00				1.00				1.00				
Discharge Environment Domain	Has Support for Daily Activities (or No Need)												
	Yes	0.89	0.60	1.33	0.579	1.07	0.68	1.69	0.763	1.44	0.97	2.14	0.067
	No	1.00				1.00				1.00			
	Has Support for Managing Illness (or No Need)												
Yes	1.14	0.87	1.50	0.342	<b>0.70</b>	<b>0.51</b>	<b>0.97</b>	0.031	<b>0.74</b>	<b>0.58</b>	<b>0.95</b>	0.019	
No	1.00				1.00				1.00				

**Notes**

\* The CAGE questionnaire measures substance abuse. CAGE stands for "cut down, annoyed, guilty, eye-opener."

HR: hazard ratio.

LCL: lower confidence limit.

UCL: upper confidence limit.

Statistically significant effects (p-value) are bolded in the table above.

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