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Involuntary hospitalization among young people with early psychosis: A population-based study using health administrative data

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ABSTRACT

Objective: Early psychosis is an important window for establishing long-term trajectories. Involuntary hospitalization during this period may impact subsequent service engagement in people with newly diagnosed psychotic disorder. However, population-based studies of involuntary hospitalization in early psychosis are lacking. We sought to estimate the proportion of people aged 16 to 35 years with early psychosis in Ontario who are hospitalized involuntarily at first admission, and to identify the associated risk factors and outcomes.
Methods: Using linked population-based health administrative data, we identified incident cases of non-affective psychosis over a five-year period (2009–2013) and followed cases for two years to ascertain the first psychiatric hospitalization. We used modified Poisson regression to model sociodemographic, clinical, and service-related risk factors, and compared service-related outcomes for cases admitted on an involuntary versus voluntary basis.
Results: Among 17,725 incident cases of non-affective psychosis, 38% were hospitalized within two years, and 81% of these admissions occurred on an involuntary basis (26% of cohort). Sociodemographic factors associated with an increased risk of involuntary admission included younger age (16–20), and first-generation migrant status. The strongest risk factors were poor illness insight, recent police involvement, and admission to a general (versus psychiatric) hospital. Outcomes associated with involuntary admission included increased likelihood of control intervention use and a shorter length of stay.
Conclusions: One in four young people with first-episode psychosis will have an involuntary admission early in the course of their illness. Our findings highlight areas for intervention to improve pathways to care for people with psychotic disorder.

1. Introduction

The first two to five years of psychotic illness are a crucial period for the establishment of long-term outcomes (Harrison et al., 2001), and symptomatic and functional recovery is improved with early treatment initiation (Crumlish et al., 2009; Marshall et al., 2005; Perkins et al., 2005). However, contacts with health services during this period may involve negative interactions, such as with police or emergency services (Anderson et al., 2010). Involuntary hospitalization has been described as a negative contact with the healthcare system and an undesirable health care experience (Cole et al., 1995; Morgan et al., 2004). Physicians in Ontario, Canada, and similarly in other jurisdictions, have an obligation to detain someone against their will in cases where there is high likelihood of harm to the patient or others, or deterioration of the patient should they not remain in a psychiatric facility (Ontario Hospital Association, 2016). While this may be viewed as necessary by some patients and caregivers (Cairns et al., 2015; Gerson et al., 2009; O'Donoghue et al., 2010), involuntary hospitalization has also been associated with poor treatment engagement (Bonsack et al., 2006; Compton, 2005) and dissatisfaction with health services (Boydell et al., 2012; Kallert et al., 2008; Leavey et al., 1997). Negative contacts occurring during the early "critical period" of psychotic illness, such as involuntary hospitalization, may be particularly detrimental by adversely affecting service engagement, and initiating a trajectory of negative experiences and coercion (Morgan et al., 2004). Importantly,

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having an involuntary first admission increases the likelihood of readmissions occurring on an involuntary basis (Kallert et al., 2008).

Evidence to date suggests that a wide range of factors can affect the likelihood of involuntary admission in early psychosis. Sociodemographic factors such as ethnicity (Archie et al., 2010; Mann et al., 2014; Morgan et al., 2005), and factors related to socioeconomic status (Morgan et al., 2005) and social support (Cole et al., 1995; Cougnard et al., 2004; Huber et al., 2012; Morgan et al., 2005) have been implicated. Clinical factors associated with involuntary admission include aggression (Foley et al., 2005; Huber et al., 2012), violence (Foley et al., 2005), risk of harm to others (Morgan et al., 2005), substance abuse (Opsal et al., 2011), medication adherence (Verdoux et al., 2000), and lack of insight (Kelly et al., 2004). Service-related factors have also been identified, including family physician (FP) involvement (Burnett et al., 1999; Cole et al., 1995), criminal justice referral (Morgan et al., 2005), and contact with an early intervention or at-risk/prodromal service (Chen et al., 2011; Fusar-Poli et al., 2016a; Goldberg et al., 2006; Petrakis et al., 2012; Valmaggia et al., 2015). However, few of the studies identifying these factors broadly considered the sociodemographic, clinical, and service-related factors together. The studies that have explored these factors together have also been limited in size and scope (Cole et al., 1995; Cougnard et al., 2004; Morgan et al., 2005), with the largest exploratory risk factor study to date limited to 469 patients in the United Kingdom (Morgan et al., 2005).

Much less is known about the impact of involuntary admissions on service-related outcomes in early psychosis. There is some evidence from the broader literature on psychiatric admissions which suggests that involuntary admissions may be associated with higher readmission rates and longer length-of-stay (Kallert et al., 2008). In early psychosis, limited findings to date suggest that involuntary hospitalization is not associated with increased risk of readmission (Cougnard et al., 2006; Fennig et al., 1999; Levine, 2008; Opjordsmoen et al., 2010). Much less is known about length-of-stay, with one study observing a shorter stay in females admitted involuntary, but a similar length-of-stay in males admitted involuntarily, compared to those admitted voluntarily (Levine, 2008).

There have been few large-scale studies examining involuntary hospitalization in a population-based sample of young people with early psychosis. As well, there have been no large-scale studies examining risk factors associated with involuntary admission, and few examining outcomes associated with this practice. The purpose of this study was to examine involuntary hospitalization at first admission in a population-based early psychosis sample using linked health administrative data covering the entire population of Ontario, Canada over a 7-year period. We sought to: (i) determine the proportion of young people with early psychosis who are involuntarily hospitalized at first admission; (ii) to identify the sociodemographic, clinical, and service-use factors associated with this practice; and (iii) to examine the service-related outcomes associated with involuntary hospitalization. We hypothesized that involuntary hospitalization will be a common occurrence and that individual sociodemographic, clinical, and service-use factors would be independently associated with involuntary admission. We also hypothesized that involuntary hospitalization would lead to poor service-related outcomes.

2. Methods

2.1. Data sources

We used patient-level linked population-based health administrative data housed at the Institute for Clinical Evaluative Sciences (ICES). The Ontario Mental Health Reporting System (OMHRS) includes data on all psychiatric admissions to Ontario facilities with designated adult mental health beds. The OMHRS database contains data on clinical assessment of inpatients that are conducted using the Resident Assessment Instrument – Mental Health (RAI-MH), which is a standardized, minimum assessment tool for clinical use (Hirdes et al., 2002, 2000). The Discharge Abstract Database (DAD) contains data for all inpatient acute discharges from non-psychiatric beds. The Ontario Health Insurance Plan (OHIP) covers all medically necessary health services for nearly the entire population of Ontario, and billing claims for physician services and outpatient visits are captured in the OHIP Claims Database. The National Ambulatory Care Reporting System (NACRS) includes information on emergency department (ED) visits. We obtained demographic information from the Registered Persons Database (RPDB) which covers all people in Ontario eligible for OHIP, and migrant status from the Immigration, Refugees, and Citizenship Canada (IRCC) Permanent Resident database. These datasets were linked using unique encoded identifiers and analyzed on-site at ICES.

2.2. Study design, setting, and cohort definition

We constructed a retrospective cohort of incident cases of non-affective psychosis in Ontario over a 5-year period (calendar years 2009 to 2013, inclusive). We used a validated algorithm to identify incident cases of non-affective psychotic disorder among young people aged 16 to 35 years within the ICES data holdings, defined as: (i) one hospitalization in OMHRS or DAD with a primary discharge diagnosis of schizophrenia, schizoaffective disorder, or psychosis not otherwise specified (NOS); or (ii) at least two physician billings or emergency department visits in the OHIP Claims Database or NACRS with a diagnostic code for schizophrenia, schizoaffective disorder, or psychosis NOS in a 12-month period (Kurdyak et al., 2015). We considered the first date of contact with services for non-affective psychosis to be the index date. The exclusion period for prevalent cases was up to 20 years, depending on the time-frame of each database. Incident cases were followed-up to identify the first hospitalization for any mental health reason within the two-year period following the index date. In cases where the index diagnosis occurred by hospitalization, this event was used as the first hospitalization. We excluded cases where the status at admission was missing, and where the admission was informal (i.e., patient was admitted on the consent of a substitute decision-maker) or forensic. We also excluded cases post-hoc where the diagnosis at hospitalization changed to affective or organic psychosis. A complete list of the codes used to define the study cohort and the study variables is available in the online supplement, Tables S1 and S2. We followed the Reporting of studies Conducted using Observational Routinely-collected health Data (RECORD) guidelines for observational studies (Online Table S3; Benchimol et al., 2015).

2.3. Involuntary hospitalization

We defined an involuntary hospitalization as a patient admitted under a Form 1 or a Form 3 under the Ontario *Mental Health Act*. A Form 1 is an Application for Psychiatric Assessment, which provides authority for any person to take the patient to a psychiatric facility where he or she may be detained for up to 72 h (Ontario Hospital Association, 2016). A Form 3 is a Certificate of Involuntary Admission which allows the patient to be involuntarily admitted for up to two weeks (Ontario Hospital Association, 2016).

2.4. Factors associated with involuntary hospitalization

To examine factors associated with involuntary hospitalization and outcomes following involuntary admission, we limited the sample to OMHRS records due to the availability of detailed clinical data from the RAI-MH. The RAI-MH is conducted within three days of admission by a member of the clinical team using information obtained through interview with the patient, caregiver(s), observation of the patient, other clinical staff, and/or review of medical records. The RAI-MH has demonstrated acceptable inter-rater reliability and convergent validity (Hirdes et al., 2008, 2002; Martin et al., 2009). We selected potential

risk factors to include in our analysis a priori, based on clinical relevance and a comprehensive literature review.

2.4.1. Sociodemographic variables

We examined sociodemographic and social support variables potentially associated with involuntary hospitalization including age, gender, rural place of residence, neighbourhood-level income quintile, and first-generation migrant status (immigrant/refugee). We also examined social support factors including living alone, whether the patient's last residence was considered temporary, and caregiver burden (patient's social network feels overwhelmed by illness).

2.4.2. Clinical variables

We included the index diagnosis at cohort entry, as well as the main diagnosis associated with the hospitalization (psychotic illness versus other). All other clinical variables were derived from the RAI-MH. We included the time between index diagnosis and hospitalization to account for differences between those hospitalized on the index date versus those hospitalized at a later date. We included insight into mental health, current problems with substance/alcohol use, and medication adherence. We included an indicator of prior trauma, defined as stressful life events related to the development of post-traumatic stress disorder (PTSD). We included Global Assessment of Functioning (GAF) score, and InterRAI rating scales to assess symptom and behaviour severity (interRAI). These included: the Positive Symptoms Scale (0 to 12 scale), Negative Symptoms Scale (0 to 12 scale), Mania Rating Scale (0 to 20 scale), Depression Rating Scale (0 to 14 scale; Burrows et al., 2000), Self-Care Index (0 to 6 scale), Severity of Self-Harm (0 to 6 scale), Risk of Harm to Others (0 to 6 scale; Neufeld et al., 2012) and Aggressive Behavior Scale (0 to 12 scale; Perlman and Hirdes, 2008). For all scales, higher scores indicate greater severity. See Table S2 in the online supplement for additional information on the items included in these measures.

2.4.3. Service-use variables

We examined police involvement in the seven days prior to admission, contact with a community-based mental health agency or outpatient clinic in the 30 days prior to admission, and psychiatric admissions in the past two years. FP involvement was defined as a FP visit for a mental health reason in the six months prior to admission. FP visits were identified in OHIP billing claims using a validated algorithm, which included a visit with any mental health service code, pediatric service code, or general service code, with an associated mental health diagnostic code (Steele et al., 2004). We also included the hospital type of the index admission, categorized as specialty psychiatric facility versus a psychiatric bed in a general hospital.

2.5. Outcomes following involuntary hospitalization

We examined use of a control intervention, length-of-stay, and readmission for a mental health reason and for any non-mental health reason within 30 days of discharge from the index hospitalization. Control intervention use was defined as any one of the following in the first three days after admission: acute control medication, mechanical restraint, chair prevents rising, physical or manual restraint by staff, confinement to unit, confinement to room, or use of a seclusion room.

2.6. Data analysis

Descriptive characteristics were summarized using frequencies and proportions for categorical data, and means/medians and standard deviations (SD)/interquartile ranges (IQR) for continuous data. We compared the distribution of risk factors and outcomes between voluntary and involuntary groups using standardized differences, with a difference of >0.1 suggestive of significant imbalance between groups (Austin, 2009; Yang and Dalton, 2012).

For our exploratory risk factor analysis, we used modified Poisson regression to calculate unadjusted and adjusted prevalence ratios (PR) with 95% confidence intervals (CI) to measure the effect of each factor on the likelihood of involuntary admission (Zou, 2004). All sociodemographic, clinical, and service-use factors were considered simultaneously in a multivariable regression analysis. Although the variables related to self-harm, self-care, and risk of harm to others are directly related to the criteria for an involuntary admission, we chose to adjust for these to explore other factors that may be associated with an involuntary admission independent of the criteria for a reason for admission. We used an augmented backward elimination (ABE) selection procedure to identify meaningful variables in our final model. This procedure can be differentiated from stepwise selection methods by the use of a change-in-estimate criterion. The ABE procedure first assessed each variable from a multivariable model fit with the initial working set using a conservative p-value cut-off of 0.2. Variables not meeting statistical significance were added back one at a time to test for confounding effects, assessed by examining the changes within the other estimates in the model upon addition of the excluded variable (i.e., the change-in-estimate criterion). Variables resulting in a significant change-in-estimate criterion ($\tau > 0.05$) were retained in the model. The final model contains variables that are either strongly associated with the outcome, or potential confounding factors (Dunkler et al., 2014). We used a SAS macro for the ABE selection procedure (Dunkler and Heinze, 2014).

For our outcome analysis, we used the modified Poisson regression model to estimate risk ratios (RR) for binary outcomes and the negative binomial regression model for length-of-stay. We calculated unadjusted estimates, as well as estimates adjusted for potential confounding factors—age, gender, income quintile, migrant status, living alone, residential instability, caregiver burden, substance/alcohol use, positive symptoms, negative symptoms, mania, depression, risk of harm to others, self-care index, self-harm, GAF score, prior trauma, and psychiatric admissions in the past two years (Chen et al., 2016; Stewart et al., 2014). For control intervention use, we additionally included the aggressive behaviour score in the model. We calculated overall estimates, and stratified by hospital type (general versus psychiatric), given that variables such as length-of-stay and control intervention use may vary substantially between hospital types (Canadian Institute for Health Information, 2011; Chen et al., 2016).

Variables with two-sided 95% CIs excluding unity were considered statistically significant, and patients with missing data were excluded from our analyses (2% of the sample). For all models, we conducted sensitivity analyses in which we recalculated estimates with standard errors robust to clustering at the institution level using PROC GENMOD, to assess whether accounting for clustering changed our findings (Zou and Donner, 2013). The findings were consistent with our main analyses and are not presented. All analyses were conducted in SAS Enterprise Guide (Version 6.1).

3. Results

Our cohort included 18,645 incident cases of non-affective psychosis over the 5-year case accrual period, and their baseline characteristics are presented in Table S4. Over the two-year follow-up, 7147 (38%) people experienced a hospital admission for a mental health reason. The mean time from diagnosis to first hospitalization was 5.1 months (SD= 6.5). We excluded 1512 cases that were either forensic or informal admissions, had missing admission status, or a diagnosis change to affective or organic psychosis at hospitalization. The resulting sample included 5635 cases (30%) who experienced a hospital admission after a first diagnosis of psychotic disorder to a psychiatric or medical bed on a voluntary or involuntary basis — this is the sample that was included in the analysis for our first objective. Within this sample, 5184 cases were hospitalized to a psychiatric bed and were included in the analysis for

our second and third objectives. Refer to the online supplement, Fig. S1 for cohort inclusion/exclusions.

3.1. Involuntary hospitalizations

Descriptive characteristics of involuntary hospitalizations are summarized in Table 1. Within the full early psychosis cohort, 26% of patients (95% CI = 25%–26%) experienced an involuntary hospitalization within two years of diagnosis. Among voluntary or involuntary inpatients (N = 5635), 81% were hospitalized involuntarily (95% CI = 80%–82%). Most involuntary admissions were short-term (≤72 h under a Form 1), in 70% of involuntary cases.

3.2. Factors associated with involuntary hospitalization

Findings for sociodemographic variables are summarized in Table 2. Among sociodemographic factors, age and migrant status were selected for inclusion in the final model. The oldest age group of 31 to 35 years had a 7% lower risk of involuntary admission compared to the youngest age group of 16 to 20 years (PR = 0.93, 95% CI = 0.89–0.97). The risk of involuntary admission for immigrants and refugees was 5% (PR = 1.05, 95% CI = 1.02–1.09) and 9% (PR = 1.09, 95% CI = 1.04–1.14) higher than non-migrants, respectively.

Findings for clinical variables are summarized in Table 3. In the final adjusted model, an index diagnosis of psychosis NOS and hospitalization due to psychotic disorder (versus other mental health reasons) were associated with a higher risk of involuntary admission. Insight was the strongest clinical risk factor—limited and no insight were associated with a 19% and 25% increase in risk of involuntary admission compared to those with full insight, respectively (limited insight: PR = 1.19, 95% CI = 1.12–1.28; no insight: PR = 1.25, 95% CI = 1.16–1.34). Medication non-adherence was associated with an 8% increase in the risk of involuntary admission (PR = 1.08, 95% CI = 1.04–1.11), and those not on medication had a 9% increase in the risk of an involuntary first admission (PR = 1.09, 95% CI = 1.05–1.13). Prior trauma was associated with a 5% decrease in the risk of involuntary admission (PR = 0.95, 95% CI = 0.92–0.98). Current problems with substance/alcohol use were associated with a higher risk of involuntary admission, albeit findings were not statistically significant in the final adjusted model. Depressive symptoms were associated with a lower risk of involuntary admission (PR = 0.99, 95% CI = 0.99–1.00), whereas mania symptoms (PR = 1.01, 95% CI = 1.00–1.01), self-harm (PR = 1.02, 95% CI = 1.01–1.03), risk of harm to others (PR = 1.02, 95% CI = 1.01–1.02), and aggressive behaviour (PR = 1.01, 95% CI = 1.00–1.01) were all associated with an increased risk of involuntary admission.

Findings from service-use variables are summarized in Table 4. Recent police involvement was associated with a 15% higher risk of involuntary admission (PR = 1.15, 95% CI = 1.13–1.18) and hospitalization in a general facility resulted in a 27% increase in risk (PR = 1.27, 95% CI = 1.20–1.35). Prior contact with a community-based mental health service was associated with a lower risk of involuntary admission (PR = 0.96, 95% CI = 0.93–0.99).

3.3. Outcomes following involuntary hospitalization

Outcomes following involuntary hospitalization are described in Table 5. Involuntary patients were 51% more likely to have a control intervention used in the 3-days following admission (RR = 1.51, 95% CI = 1.41–1.62). Involuntary admission was also associated with a shorter length-of-stay (RR = 0.79, 95% CI = 0.75–0.84). There were no differences between voluntary and involuntary groups in the risk of 30-day readmission. The adjusted risk of control intervention use following involuntary admission was higher in psychiatric hospitals compared to general hospitals (Psychiatric: RR = 2.18, 95% CI = 1.61–2.95; General: RR = 1.32, 95% CI = 1.15–1.52). No other differences between psychiatric and general hospitals were observed.

4. Discussion

This study aimed to describe the risk factors for and outcomes of involuntary hospitalization in a population-based sample of young people with early psychosis in Ontario. We observed that approximately one in four early psychosis patients in Ontario experienced an involuntary hospitalization at first admission, and the majority of admissions were involuntary (81%). We found that adolescents, as well as immigrant or refugee groups, were more likely to be hospitalized involuntarily. We additionally observed a number of clinical and service-use factors associated with involuntary admission, however, the strongest risk factors across categories were poor insight, police involvement in the past seven days, and admission to a general facility (versus psychiatric). Involuntary admission was associated with an increased likelihood of control intervention use within the first three days of admission, and a shorter length-of-stay, but was not associated with 30-day readmission.

Estimates of the prevalence of involuntary admissions in early psychosis from large-scale registry studies in other settings are comparatively low, ranging from 10% to 66% of inpatients (Chiang et al., 2017; Kiviniemi et al., 2011; Levine, 2008) and 10% of all patients with early

Table 1
Descriptive characteristics of voluntary and involuntary first admissions.

	Voluntary (N = 1089)		Involuntary (N = 4546)	
	%	95% CI	%	95% CI
Percentage of total sample	6	6, 7	26	25, 26
Percentage of hospitalized sample	19	18, 20	81	80, 82
Mental Health Act form used for admission[a]				
Form 1 (Application for Psychiatric Assessment)[b]	N/A	N/A	3162	70
Form 3 (Certificate of Involuntary Admission)[c]	N/A	N/A	1384	30
Reason(s) for admission[a,d]				
Threat or danger to self	352	36	2080	50
Threat or danger to others	83	8	1406	34
Inability to care for self due to mental illness	302	31	2084	50
Problem with addiction/dependency	259	26	1130	27
Specific psychiatric symptoms	795	81	3250	77
Involvement with criminal justice system, forensic admission	27	3	252	6

CI = confidence interval.
[a] Data pertain only to people hospitalized in OMHRS (this information was not available in DAD).
[b] A Form 1 is a short-term involuntary admission, valid for up to 72 h.
[c] A Form 3 is valid for up to 2 weeks.
[d] Categories are not mutually exclusive, so patients may have more than one reason for admission.

Table 2
Sociodemographic characteristics in voluntary and involuntary groups, and unadjusted and adjusted modified Poisson regression of the association between each sociodemographic factor and involuntary status.

	Voluntary (N = 983)	Involuntary (N = 4208)	Standardized difference[a]	Unadjusted PR (95% CI)	Adjusted PR[b] (95% CI)
	N (%)	N (%)			
Age (years)					
16–20	287 (29)	1441 (34)	0.10	Reference	Reference
21–25	260 (27)	1368 (33)	0.13	1.01 (0.98, 1.04)	1.01 (0.98, 1.04)
26–30	224 (23)	807 (19)	0.09	0.94 (0.90, 0.98)	0.97 (0.94, 1.01)
31–35	205 (21)	592 (14)	0.18	0.89 (0.85, 0.93)	0.93 (0.89, 0.97)
Gender					
Female	404 (41)	1413 (34)	0.16	Reference	
Male	572 (59)	2795 (66)	0.16	1.07 (1.04, 1.10)	–
Rural residence	91 (9)	362 (9)	0.02	0.98 (0.94, 1.03)	–
Income quintile					
5 (highest)	163 (17)	600 (14)	0.07	Reference	
4	169 (18)	693 (17)	0.02	1.02 (0.97, 1.07)	–
3	179 (19)	788 (19)	0.01	1.04 (0.99, 1.09)	–
2	204 (21)	853 (21)	0.01	1.03 (0.98, 1.08)	–
1 (lowest)	253 (26)	1231 (30)	0.08	1.05 (1.01, 1.10)	–
Migrant status					
Non-immigrant	834 (86)	3297 (78)	0.19	Reference	Reference
Immigrant	110 (11)	666 (16)	0.13	1.08 (1.04, 1.11)	1.05 (1.02, 1.09)
Refugee	32 (3)	245 (6)	0.12	1.11 (1.06, 1.16)	1.09 (1.04, 1.14)
Living alone	198 (20)	774 (19)	0.05	0.98 (0.94, 1.01)	–
Patient's last residence considered temporary	293 (30)	1158 (28)	0.06	0.98 (0.95, 1.01)	–
Patient's social network feels overwhelmed by illness	340 (35)	1927 (46)	0.22	1.09 (1.06, 1.12)	–

PR = prevalence ratio; CI = confidence interval.
[a] Standardized difference >0.1 indicates significant differences between groups.
[b] Adjusted for all other sociodemographic (Table 2), clinical (Table 3), and service-use (Table 4) factors selected for inclusion in the final model with augmented backward elimination. Factors without an adjusted estimate in this column were not selected for inclusion in the final model.

psychosis (Øhlenschlaeger et al., 2008). Although variance across countries is expected due to differences in legislation, psychiatric services, patient characteristics, and ethics and attitudes of professionals (Dressing and Salize, 2004; Keown et al., 2016; Wang et al., 2015), these estimates emphasize the high prevalence of involuntary admissions in early psychosis in Ontario. This trend is consistent with psychiatric admissions for other conditions in Ontario (Lebenbaum et al., 2018) suggesting the high proportion is not unique to early psychosis, and may be a reflection of system-level factors such as the availability of psychiatric hospital beds, which have been linked to rates of involuntary admissions (Keown et al., 2011; Myklebust et al., 2014). Canada is among the countries with the lowest number of psychiatric hospital beds per capita at 0.35 per 1000 inhabitants (OECD, 2018).

We found that the youngest age group (16–20) had a higher risk of involuntary admission, which may be influenced by differences in symptom course and severity for those with adult versus adolescent onset. Adolescent-onset is associated with more severe expression of illness, lower premorbid social/emotional adjustment, cognitive impairments, bizarre behaviour, and negative symptoms, which may affect the differences in likelihood of involuntary admission between these groups (Abidi et al., 2017; Ballageer et al., 2005).

Our finding that migrant status is associated with an increased risk of involuntary admission is unique compared to previous studies. Differences in service utilization have been observed among migrants in Ontario (Anderson et al., 2017), however our adjustment for service-use factors suggest these differences in contact with services do not fully explain the differential risk by migrant status. Other contributing factors may include language and communication barriers, higher levels of social disadvantage, or more pronounced stigma leading to social isolation and delay in help-seeking (Norredam et al., 2010). Further research is needed to understand the inequities in involuntary admission among immigrant and refugee groups to adequately address the mental health care needs of these vulnerable patients.

Patients with limited or no insight were one of the highest risk groups for an involuntary admission. This is consistent with previous evidence, and was hypothesized to be related to reduced adherence among those with lack of insight (Kelly et al., 2004; Lincoln et al., 2007). Patients with poor insight are challenging to engage in treatment, and coercive measures may be the only option (McEvoy et al., 1989; O'Reilly, 2004). Community treatment orders may be a useful alternative to ensure treatment of these patients in a less restrictive setting (O'Reilly, 2004). However, legislation in Ontario precludes the use of community treatment orders in first-episode cases. Revisiting current mental health laws in Ontario to permit compulsory community treatment as a first option may be useful in providing less restrictive treatment options where appropriate (Gray and O'Reilly, 2005).

Hospitalization in a general facility was the strongest risk factor for involuntary admission across all risk factor categories. This is likely related to the role of general hospitals as a front-line contact for people experiencing mental health emergencies. Currently in Ontario, only one ED exists exclusively for people with mental health issues, suggesting that accessing specialized psychiatric services in emergency situations can be challenging (Ministry of Health and Long-Term Care, 2016). Furthermore, acute care mental health service use in Ontario is increasing, without a corresponding increase in outpatient service use, pointing to increasing demand for mental health services in general hospital emergency departments (Chiu et al., 2018). Police involvement in the seven days prior to admission was another strong service-use factor associated with involuntary admission. The upstream factors leading to police involvement are likely the same factors that lead to an involuntary hospitalization, and there have been recent increases in the frequency of police involvement in mental health crises in Ontario (Durbin et al., 2010). Overall, these service-level factors suggest that broader system-level issues are contributing to an over-reliance on emergency services for psychiatric care when the symptoms of psychosis reach a crisis state, consequently leading to involuntary admission. Importantly, we also observed that recent contact with community mental health services prior to admission decreased the likelihood of involuntary admission. Future studies aimed at understanding how people with early psychosis can be better served in the community to avoid reaching a crisis state necessitating emergency intervention and police involvement are warranted.

Table 3
Clinical characteristics in voluntary and involuntary groups, and unadjusted and adjusted modified Poisson regression of the association between each clinical factor and involuntary status.

	Voluntary (N = 983)	Involuntary (N = 4208)	Standardized difference[a]	Unadjusted PR (95% CI)	Adjusted PR[b] (95% CI)
	N (%)	N (%)			
Index diagnosis					
Schizophrenia spectrum	478 (49)	1582 (38)	0.23	Reference	Reference
Psychosis NOS	498 (51)	2626 (62)	0.23	1.09 (1.06, 1.13)	1.05 (1.02, 1.08)
Hospitalized due to psychotic disorder	520 (53)	2975 (71)	0.36	1.17 (1.13, 1.20)	1.07 (1.04, 1.10)
Time from diagnosis to hospitalization					
At diagnosis	181 (19)	1131 (27)	0.20	Reference	Reference
>1 day to 6 months	470 (48)	1637 (39)	0.19	0.90 (0.87, 0.93)	0.96 (0.93, 1.00)
>6 months to 1 year	167 (17)	651 (16)	0.04	0.92 (0.89, 0.96)	0.96 (0.92, 1.00)
>1 year to 1.5 years	98 (10)	464 (11)	0.03	0.96 (0.92, 1.00)	1.00 (0.95, 1.04)
>1.5 years to 2 years	60 (6)	325 (8)	0.06	0.98 (0.93, 1.03)	1.01 (0.96, 1.06)
Insight					
Full	227 (23)	347 (8)	0.42	Reference	Reference
Limited	623 (64)	2404 (57)	0.14	1.31 (1.23, 1.41)	1.19 (1.12, 1.28)
None	121 (13)	1444 (34)	0.54	1.53 (1.43, 1.63)	1.25 (1.16, 1.34)
Current problems with substance/alcohol use	445 (46)	2261 (54)	0.16	1.06 (1.04, 1.09)	1.02 (1.00, 1.05)
Medication adherence					
No problems with adherence	570 (58)	1487 (35)	0.48	Reference	Reference
Problems with adherence	249 (26)	1605 (38)	0.27	1.20 (1.16, 1.24)	1.08 (1.04, 1.11)
Not on medication	88 (9)	689 (16)	0.22	1.23 (1.18, 1.27)	1.09 (1.05, 1.13)
Missing/unknown	69 (7)	427 (10)	0.11	1.19 (1.14, 1.24)	1.08 (1.03, 1.13)
Prior trauma	368 (38)	1288 (31)	0.15	0.94 (0.91, 0.97)	0.95 (0.92, 0.98)
	Median (IQR)	Median (IQR)			
Positive Symptoms Scale-Short (0—12)	2 (0–5)	4 (1–6)	0.40	1.02 (1.02, 1.03)	–
Negative Symptoms Scale (0–12)	2 (0–6)	2 (0–6)	0.08	1.00 (0.99, 1.00)	1.00 (0.99, 1.00)
Depression Rating Scale (0–14)	3 (1–4)	3 (1–5)	0.04	1.00 (1.00, 1.01)	0.99 (0.99, 1.00)
Mania Rating Scale (0—20)	0 (0–3)	2 (0–6)	0.50	1.02 (1.02, 1.02)	1.01 (1.00, 1.01)
Self-Care Index (0–6)	1 (1–2)	2 (1–4)	0.49	1.04 (1.04, 1.05)	1.00 (0.99, 1.00)
Severity of Self-Harm (0–6)	2 (0–3)	2 (1–3)	0.11	1.01 (1.00, 1.02)	1.02 (1.01, 1.03)
Risk of Harm to Others (0–6)	1 (0–2)	2 (1–5)	0.67	1.06 (1.05, 1.06)	1.02 (1.01, 1.02)
Aggressive Behaviour Scale (0–12)	0 (0–0)	0 (0–3)	0.65	1.04 (1.03, 1.04)	1.01 (1.00, 1.01)
	Mean (SD)	Mean (SD)			
GAF Score (0—100)[c]	41.5 (13.1)	45.5 (12.8)	0.46	0.99 (0.99, 0.99)	1.00 (0.99, 1.00)

PR = prevalence ratio; CI = confidence interval; NOS = not otherwise specified; IQR = interquartile range; SD = standard deviation; GAF = global assessment of functioning.
[a] Standardized difference >0.1 indicates significant differences between groups.
[b] Adjusted for all other sociodemographic (Table 2), clinical (Table 3), and service-use (Table 4) factors selected for inclusion in the final model with augmented backward elimination. Factors without an adjusted estimate in this column were not selected for inclusion in the final model.
[c] 126 cases missing.

Involuntary admission was strongly associated with an increased use of control interventions, suggesting that patients involuntarily admitted are likely to experience further coercion, independent of symptom and behavior severity. This association is concerning, given the potential impact of involuntary admission and control intervention use on patient satisfaction (Smith et al., 2014) and feelings of trauma (Lu et al., 2017). We observed a stronger effect in psychiatric hospitals than in general hospitals – data suggest that control interventions are used more frequently in general hospitals irrespective of voluntary/involuntary status, which may explain why the effect of involuntary admission on control intervention use was more pronounced in psychiatric hospitals (Canadian Institute for Health Information,

Table 4
Service-use characteristics in voluntary and involuntary groups, and unadjusted and adjusted modified Poisson regression of the association between each service-use factor and involuntary status.

	Voluntary (N = 983)	Involuntary (N = 4208)	Standardized difference[a]	Unadjusted PR (95% CI)	Adjusted PR[b] (95% CI)
	N (%)	N (%)			
Police involvement (past 7 days)	55 (6)	1453 (35)	0.78	1.29 (1.26, 1.31)	1.15 (1.13, 1.18)
Contact with a community-based mental health service or outpatient clinic (past 30 days)	424 (44)	1335 (32)	0.25	0.90 (0.88, 0.93)	0.96 (0.93, 0.99)
One or more psychiatric hospital admissions (past 2 years)	544 (56)	2199 (52)	0.07	0.97 (0.95, 1.00)	0.99 (0.96, 1.02)
Hospital type					
Psychiatric	242 (25)	337 (9)	0.43	Reference	Reference
General	734 (75)	3831 (91)		1.38 (1.29, 1.47)	1.27 (1.20, 1.35)
	Median (IQR)	Median (IQR)			
Number of FP visits for a mental health reason (past 6 months)	1 (0–4)	1 (0–3)	0.15	0.99 (0.98, 0.99)	1.00 (0.99, 1.00)

PR = prevalence ratio; CI = confidence interval; IQR = interquartile range; FP = family physician.
[a] Standardized difference >0.1 indicates significant differences between groups.
[b] Adjusted for all other sociodemographic (Table 2), clinical (Table 3), and service-use (Table 4) factors selected for inclusion in the final model with augmented backward elimination. Factors without an adjusted estimate in this column were not selected for inclusion in the final model.

Table 5
Service-related outcomes in voluntary and involuntary groups, and unadjusted and adjusted associations between involuntary status and each outcome using modified Poisson regression or negative binomial regression.

	Voluntary (N = 983)	Involuntary (N = 4208)	Standardized difference[a]	Unadjusted RR (95% CI)	Adjusted RR[b] (95% CI)
	N (%)	N (%)			
Control intervention use within 3 days of admission	443 (46)	3270 (78)	0.71	1.71 (1.59, 1.83)	1.51 (1.41, 1.62)[c]
Readmission within 30 days for a mental health reason	84 (9)	425 (10)	0.05	1.17 (0.94, 1.47)	1.04 (0.82, 1.33)
Readmission within 30 days for a non-mental health reason	15 (2)	84 (2)	0.04	1.30 (0.76, 2.25)	1.05 (0.58, 1.90)
	Median (IQR)	Median (IQR)			
Length of stay	14 (8–27)	14 (8–23)	0.06	0.83 (0.79, 0.89)	0.79 (0.75, 0.84)

RR = risk ratio; CI = confidence interval; IQR = interquartile range.
[a] Standardized difference >0.1 indicates meaningful imbalance between groups.
[b] Adjusted for age, gender, income quintile, migrant status, living alone, residential instability, social network feels overwhelmed by illness, diagnosis, substance/alcohol use, prior trauma, Positive Symptoms Scale, Negative Symptoms Scale, Mania Rating Scale, Depression Rating Scale, Self-Care Index, Severity of Self-Harm, Risk of Harm to Others, Global Assessment of Functioning, and psychiatric admissions in the past two years.
[c] Adjusted for all factors listed above, as well as the Aggressive Behavior Scale.

2011). Involuntary hospitalization was also associated with a shorter length-of-stay, which may be related to the high proportion of short-term involuntary admissions under a Form 1, which is valid for 72 h.

4.1. Strengths and limitations

To our knowledge, this study is the largest and most comprehensive to date of involuntary hospitalization in early psychosis, and the first to provide comprehensive data from a Canadian setting. Our population-based approach allowed us to examine involuntary admissions in all hospitals within our study setting, compared to previous studies which examined single or selected sites (Cole et al., 1995; Cougnard et al., 2004; Morgan et al., 2005). We have also investigated risk factors not well explored in the prior literature, including migrant status, insight, mania symptoms, prior trauma, and hospital type, as well as outcomes such as length-of-stay. The use of administrative data allowed us to avoid the selection bias present in prospective studies because of the requirement for informed consent, which is problematic to obtain from involuntary patients (Fulford and Howse, 1993). We included outpatient data to identify incident cases of psychosis, which is important for complete case ascertainment rather than relying solely on inpatient data (Jörgensen et al., 2010; Simon et al., 2017).

A notable limitation to our findings is that the algorithm used for case definition has high sensitivity of 94% and a specificity of 50% (Kurdyak et al., 2015), therefore our cohort is highly inclusive of incident cases of non-affective psychosis, but may include misclassified individuals. The algorithm was validated for chronic cases of non-affective psychosis (Kurdyak et al., 2015), so we do not know how or whether its performance varies for first episode cases. We included the diagnosis of psychosis NOS, which is associated with diagnostic instability, and our cohort may contain some cases of affective psychosis – however, it has been estimated that only 7% of people are subsequently diagnosed with affective psychosis (Fusar-Poli et al., 2016b), so we expect this number to be small. The database we used contains information for adult psychiatric beds only, therefore the results are not generalizable to youth admitted to pediatric psychiatry beds or to people admitted to medical beds. We were limited to the variables present in the databases and were unable to explore potentially important variables identified in our literature search, including enrollment in early psychosis intervention services. Data on immigrant and refugee status is limited to migrants who landed in Ontario, therefore we may have misclassified some individuals in the non-immigrant reference group.

4.2. Conclusions

Involuntary hospitalization may be viewed as a negative interaction that could have consequences for young people with early psychosis newly engaging with the mental health care system, and the proportion with involuntary status at first admission is substantial. We identified groups particularly vulnerable to experiencing an involuntary admission, including adolescents, immigrant and refugees, and people with poor insight, suggesting strategies are needed to better address their health care needs. Service-use factors, including admission to a general hospital and police involvement, demonstrated some of the largest effects in increasing the likelihood of involuntary admission. We need a better understanding of how community services can be improved for groups at high risk of involuntary hospitalization, and how we can improve uptake of these services, to improve pathways to care for young people with early psychosis.

Conflict of interest
The authors have no conflicts of interest to declare.

Contributors
RR was involved in the conception and design of the study, in the analysis and interpretation of data, and in writing the first and subsequent drafts of the paper. KKA, AGM, GZ, ML, and PK were involved in the conception and design of the study, in the interpretation of data, and in the critical revision of the article for intellectual content. LL and SS were involved in the design and construction of the cohort, interpretation of data, and in the critical revision of the article for intellectual content. All authors have contributed to and approved the final manuscript.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.schres.2019.01.043.

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