Disruptions in Primary Care among People with Schizophrenia in Ontario, Canada, During the COVID-19 Pandemic

Perturbations des soins de première ligne chez les personnes souffrant de schizophrénie en Ontario, Canada durant la pandémie de la COVID-19

Ellen Stephenson, PhD1, Abban Yusuf, BSc2, Jessica Gronsbell, PhD3, Karen Tu, MD, MSc1,4,5, Osnat Melamed, MD, MSc, MCFP1,6, Tezeta Mitiku, MD7, Peter Selby, MBBS, CCFP, FCFP, MHSc, dipABAM, DFASAM1,6 and Braden O’Neill, MD, DPhil, CCFP1,2,8

Abstract

Objective: To investigate how primary care access, intensity and quality of care changed among patients living with schizophrenia before and after the onset of the COVID-19 pandemic in Ontario, Canada.

Methods: This cohort study was performed using primary care electronic medical record data from the University of Toronto Practice-Based Research Network (UTOPIAN), a network of > 500 family physicians in Ontario, Canada. Data were collected during primary care visits from 2643 patients living with schizophrenia. Rates of primary care health service use (in-person and virtual visits with family physicians) and key preventive health indices indicated in antipsychotic monitoring (blood pressure readings, hemoglobin A1c, cholesterol and complete blood cell count [CBC] tests) were measured and compared in the 12 months before and after onset of the COVID-19 pandemic.

Results: Access to in-person care dropped with the onset of the COVID-19 pandemic. During the first year of the pandemic only 39.5% of patients with schizophrenia had at least one in-person visit compared to 81.0% the year prior. There was a corresponding increase in virtual visits such that 78.0% of patients had a primary care appointment virtually during the pandemic period. Patients prescribed injectable antipsychotics were more likely to continue having more frequent in-person appointments during the pandemic than patients prescribed only oral or no antipsychotic medications. The proportion of patients who did not have recommended tests increased from 41.0% to 72.4% for blood pressure readings, from 48.9% to 60.2% for hemoglobin A1c, from 57.0% to 67.8% for LDL cholesterol and 45.0% to 56.0% for CBC tests during the pandemic.

1Department of Family and Community Medicine, Temerty Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada
2MAP Centre for Urban Health Solutions, Li Ka Shing Knowledge Institute, St. Michael’s Hospital, Toronto, Ontario, Canada
3Department of Statistical Sciences, University of Toronto, Toronto, Ontario, Canada
4Department of Family and Community Medicine, North York General Hospital, Toronto, Ontario, Canada
5Department of Family and Community Medicine, Toronto Western Hospital, Toronto, Ontario, Canada
6Centre for Mental Health and Addiction (CAMH), Toronto, Ontario, Canada
7Department of Psychiatry, University of Ottawa, Ottawa, Ontario, Canada
8Department of Family and Community Medicine, St. Michael’s Hospital, Unity Health Toronto, Toronto, Ontario, Canada

Corresponding Author:
Braden O’Neill, MD, DPhil, CCFP, MAP Centre for Urban Health Solutions, Li Ka Shing Knowledge Institute, St. Michael’s Hospital, 209 Victoria Street, Toronto, Ontario, Canada MSB 1T8.
Email: braden.oneill@unityhealth.to
**Conclusions:** There were substantial decreases in preventive care after the onset of the pandemic, although primary care access was largely maintained through virtual care. Addressing these deficiencies will be essential to promoting health equity and reducing the risk of poor health outcomes.

**Abrégé**

**Objectif:** Investiguer comment l'accès, l'intensité et la qualité des soins de première ligne ont changé chez les patients vivant avec la schizophrénie avant et après le début de la pandémie de la COVID-19 en Ontario, Canada.

**Méthodes:** La présente étude de cohorte a été menée à l'aide des données des dossiers médicaux électroniques des soins de première ligne du réseau de recherche basé sur la pratique de l'Université de Toronto (UTOPIAN), un réseau de > 500 médecins de famille de l'Ontario, Canada. Les données ont été recueillies durant les visites au cours des années précédentes et après le début de la pandémie de la COVID-19.

**Résultats:** L'accès à des soins en personne a chuté avec l'arrivée de la pandémie de la COVID-19. Durant la première année de la pandémie, seulement 39.5% des patients souffrant de schizophrénie avaient au moins une visite en personne comparé à 81.0% l'année précédente. Il y a eu une augmentation correspondante des visites virtuelles de sorte que 78.0% des patients avaient virtuellement un rendez-vous dans les soins de première ligne durant la période pandémique. Les patients qui étaient prescrits des antipsychotiques injectables étaient plus susceptibles de continuer d'avoir des rendez-vous en personne plus fréquents durant la pandémie que les patients qui n'étaient pas prescrits que des antipsychotiques par voie orale ou pas du tout. La proportion des patients qui n'avaient pas de tests recommandés a augmenté de 41.0% à 72.4% pour les lectures de la pression artérielle, de 48.9% à 60.2% pour l'hémoglobine glyquée, de 57.0% à 67.8% pour le cholestérol LDL et de 45.0% à 56.0% pour la numération sanguine complète durant la pandémie.

**Conclusions:** Il y a eu des diminutions substantielles des soins préventifs après le début de la pandémie, bien que l'accès aux soins de première ligne ait été largement maintenu grâce aux soins virtuels. Il sera essentiel de tenir compte de ces déficiences pour promouvoir l'équité en santé et réduire le risque de mauvais résultats de santé.

**Keywords**

schizophrenia, COVID-19, primary health care, health care quality, access and evaluation, Ontario, Canada, electronic health record

**Introduction**

People with serious mental illnesses such as schizophrenia have markedly worse health status than the general population and die 10–25 years sooner than those without these conditions. Those with schizophrenia have more comorbidities such as diabetes and dyslipidemia than people without this condition, while often having lower access to healthcare services. The primary cause of premature mortality among this population is cardiovascular disease, for which primary care plays a key role in prevention and treatment.

There were substantial gaps in the availability of primary care services for those living with serious mental illnesses pre-pandemic, including a much higher use of emergency services among this demographic.

The COVID-19 pandemic upended healthcare systems around the world. One of the key changes has been a rapid and sustained increase in the use of telemedicine and virtual care, particularly in primary care settings. Telemedicine during the COVID-19 pandemic has been defined as ‘the use of electronic information and telecommunication technology to get the health care [needed] while practicing social distancing’. Examples include ‘virtual care’ appointments with primary care physicians delivered via phone call or video chat.

On March 11, 2020, the WHO declared COVID-19 a pandemic and then the Government of Ontario, Canada declared a state of emergency on March 17, 2020, which included orders for hospitals and outpatient providers in primary and secondary care to cancel or postpone all health services deemed ‘non-urgent’. In response to these health policy changes, Ontario experienced a rapid decrease in in-person primary care visits and a concomitant increase in virtual visits. Prior to the pandemic, there were 110 in-person office visits for every 1 virtual visit in primary care in Ontario; after the pandemic onset, virtual visits outnumbered in-person office visits at a rate of 2.5:1. This switch from in-person to virtual visits was a global phenomenon.

This rapid expansion of telemedicine has been critiqued for the additional complexities it places on providers and patients. These challenges may be even more concerning for those with complex medical conditions such as schizophrenia. Changes in healthcare delivery may be stressful...
for patients with schizophrenia; some of the challenges include being unable to see providers’ faces due to masks, longer wait times or having to meet with new providers due to staffing shortages. Impaired cognition experienced by people with this condition, compounded by multiple negative social determinants of health may cause difficulties adhering to COVID-19 guidelines and adjusting to changes in the structure of the healthcare system resulting from the pandemic. Communication barriers, such as access to and use of new technologies, may hinder provision and receipt of adequate care.

A recent study from the United States showed decreases in mental health outpatient visits, emergency department use and medication dispensing among people with serious mental illness (schizophrenia, schizophrenia-related disorders and bipolar I); this study did not describe changes in the quality of care provided and was not focused on primary care.

Given the marked poorer health experienced by people with schizophrenia, and the possibility that health outcomes and care may have worsened among these patients, we aimed to assess the effect of the COVID-19 pandemic on their care. This paper describes how primary care health service use and key preventive health indices indicated in antipsychotic monitoring have changed after the onset of the COVID-19 pandemic among people with schizophrenia accessing primary care in Ontario, Canada. Describing these changes may lead to identifying intervention targets, ensuring that deficiencies in important aspects of primary care for people with schizophrenia are addressed in the future.

Methods

Study Design

We conducted a longitudinal cohort study of family medicine patients with schizophrenia in the University of Toronto Practice-Based Research Network (UTOPIAN). Data from electronic medical records (EMRs) were used to identify patients with schizophrenia and assess primary care health service use during the first year of the COVID-19 pandemic (March 14, 2020–March 13, 2021) and a pre-pandemic period covering the same dates the year before the pandemic (March 14, 2019–March 13, 2020). The start of the pandemic period was defined based on the introduction of new billing codes for the provision of virtual care. Prior to this policy change, the use of virtual care was extremely limited. The study is reported in accordance with The Reporting of Studies Conducted Using Observational Routinely Collected Health Data (RECORD) guidelines. The completed RECORD checklist is included as Supplementary Information (see eMethods 1 and eTable 1 in Supplementary Materials).

Data Source and Setting

We used data from the UTOPIAN Data Safe Haven (dfcm.utoronto.ca/utopian-data-safe-haven), a primary care EMR database with records collected from primary care practices in Ontario, Canada. Data extracted as of August 31, 2021, were used for this project. Records that meet minimum data quality criteria are available for use in research studies; the criteria used to assess data quality can be found in eMethods 2 of the Supplementary Material.

Eligibility Criteria

Eligibility was assessed separately for the pre-pandemic and pandemic periods such that patients could be eligible for inclusion in one or both periods. This design allowed for the inclusion of new patients who joined the practice over time or who were newly diagnosed with schizophrenia and recognized that some patients will leave the practice over time. Patients were enrolled in the cohort based on the following criteria: (1) their first family physician visit occurred before March 14 of 2019 or 2020 (the start of the observation period), (2) they had at least two family physician visits within three years before March 13 of 2019 or 2020 (the end of the observation period), and (3) they were 18 years or older and had evidence of a schizophrenia diagnosis documented in the EMR before March 14 of 2019 or 2020 (the start of the observation period). Patients with schizophrenia were identified based on current or past medical history in the cumulative patient profile, billing codes and medications (see eMethods 3 for description of case detection rules and eTable 2 for a list of antipsychotic medications used to help identify patients with schizophrenia). This approach ensures that people are not classified as having schizophrenia as a result of only being on antipsychotic medication, given that antipsychotics are routinely used in many other conditions. Similar rule-based definitions have demonstrated good clinical face validity and have been used previously with UTOPIAN EMR data.

Outcome Measures

Billing codes were used to assess both access to care (i.e., no visit vs at least one visit) and intensity of service use (i.e., number of visits). As in previous studies using UTOPIAN EMR data, visits were further classified based on format of care delivery (in-person or virtual). Four indices for quality of care were created to capture distinct services provided: (a) at least one test for hemoglobin A1c, (b) at least one test for LDL cholesterol, (c) at least one test for white blood cell count (as a measure of CBC tests), and (d) at least one blood pressure measurement. Guidelines for the
management of patients prescribed antipsychotic medication (including those with schizophrenia) recommend yearly assessment of these diabetes and cardiovascular risk factors (CBC, A1c, lipid measurement and blood pressure measurement) at least once annually\textsuperscript{31} but are not recommended to be done yearly in the general population.

**Measures of Demographics and Clinical Characteristics**

The UTOPIAN database includes measures of demographic characteristics (sex, age, neighborhood income quintile), chronic conditions (e.g., diabetes, hypertension) and medication history. Neighborhood-level income quintiles were derived based on the patient’s residential postal codes using Statistics Canada’s Postal Code Conversion Files.\textsuperscript{32} Patients with a current or past medical history of diabetes or hypertension were identified based on all information available within the EMR at the time of data extraction using existing case definitions for UTOPIAN EMR data.\textsuperscript{30} Patients were classified based on their history with antipsychotic medications as having been prescribed at least one injectable antipsychotic medication, only oral antipsychotic medications or no antipsychotic medications. Injectable and oral antipsychotics were distinguished based on the name, frequency and form of the medication as captured in the EMR (see eMethods 4 and eTables 3–4).

**Statistical Analysis**

For the pre-pandemic and pandemic periods, we calculated the proportion of patients who had at least one visit of any format, at least one visit in-person, the mean number of visits per patient for all visits and for in-person visits and the proportion of patients who had a blood pressure reading, a hemoglobin A1c test, an LDL cholesterol test.

Intensity of Care

Patients with a current or past medical history of diabetes or hypertension were identified based on all information available within the EMR at the time of data extraction using existing case definitions for UTOPIAN EMR data.\textsuperscript{30} Patients were classified based on their history with antipsychotic medications as having been prescribed at least one injectable antipsychotic medication, only oral antipsychotic medications or no antipsychotic medications. Injectable and oral antipsychotics were distinguished based on the name, frequency and form of the medication as captured in the EMR (see eMethods 4 and eTables 3–4).

**Access to Care**

Access to in-person care dropped substantially in the first year of the pandemic with only 39.5% of patients having at least one in-person visit with their family physician compared to 81.0% the year before (Figure 1A; Table 2). The increased use of virtual care meant that the proportion of patients with at least one visit of any format was only slightly reduced from 81.0% to 78.0% in the pandemic compared to the pre-pandemic period. This means that 38.5% of patients had only virtual visits during the first year of the pandemic. Patients who were older, female and who had comorbid diabetes or hypertension were more likely to access care relative to other patients (Figure 2A), and the magnitude of these effects was similar in the pre-pandemic and pandemic periods.

**Intensity of Care**

On average, patients with schizophrenia visited their family physician four times per year before the pandemic, and with the introduction of virtual visits, this was maintained during the pandemic (Table 2; Figure 1B). However, the number of in-person visits per patient dropped substantially during the pandemic to a mean of 1 per year (Table 2;
Table 1. Demographic and Clinical Characteristics of the Population.

|                                | Total (N = 2643) | Both periods (N = 2188) | Pre-pandemic period only (N = 197) | Pandemic period only (N = 258) |
|--------------------------------|------------------|------------------------|-----------------------------------|-------------------------------|
| **Sex**                        |                  |                        |                                   |                               |
| Female                         | 1210 (45.78%)    | 1012 (46.25%)          | 77 (39.09%)                       | 121 (46.90%)                  |
| Male                           | 1433 (54.22%)    | 1176 (53.75%)          | 120 (60.91%)                      | 137 (53.10%)                  |
| **Mean age as of March 14, 2019 (SD)** | 49.70 (16.01)    | 50.49 (15.72)          | 46.22 (16.42)                     | 45.66 (17.21)                 |
| **Age group (as of March 14, 2019)** |                  |                        |                                   |                               |
| 18–34 years                    | 563 (21.30%)     | 420 (19.20%)           | 62 (31.47%)                       | 81 (31.40%)                   |
| 35–49 years                    | 718 (27.17%)     | 588 (26.87%)           | 59 (29.95%)                       | 71 (27.52%)                   |
| 50–64 years                    | 870 (32.92%)     | 758 (34.64%)           | 43 (21.83%)                       | 69 (26.74%)                   |
| 65 years and older             | 492 (18.62%)     | 422 (19.29%)           | 33 (16.75%)                       | 37 (14.34%)                   |
| **Neighborhood income quintile** |                  |                        |                                   |                               |
| Lowest                         | 1060 (40.11%)    | 904 (41.32%)           | 66 (33.50%)                       | 90 (34.88%)                   |
| Low-mid                        | 499 (18.88%)     | 407 (18.60%)           | 40 (20.30%)                       | 52 (20.16%)                   |
| Middle                         | 370 (14.00%)     | 315 (14.40%)           | 22 (11.17%)                       | 33 (12.79%)                   |
| Mid-high                       | 296 (11.20%)     | 243 (11.11%)           | 23 (11.68%)                       | 30 (11.63%)                   |
| Highest                        | 307 (11.62%)     | 246 (11.24%)           | 21 (10.66%)                       | 40 (15.50%)                   |
| Missing                        | 111 (4.20%)      | 73 (3.33%)             | 25 (12.70%)                       | 13 (5.04%)                    |
| **Diabetes comorbidity**       |                  |                        |                                   |                               |
| Diabetes                       | 601 (22.74%)     | 534 (24.41%)           | 29 (14.72%)                       | 38 (14.73%)                   |
| No diabetes                    | 2042 (77.26%)    | 1654 (75.59%)          | 168 (85.28%)                      | 220 (85.27%)                  |
| **Hypertension comorbidity**   |                  |                        |                                   |                               |
| Hypertension                   | 685 (25.92%)     | 615 (28.11%)           | 27 (13.71%)                       | 43 (16.67%)                   |
| No hypertension                | 1958 (74.08%)    | 1573 (71.89%)          | 170 (86.29%)                      | 215 (83.33%)                  |
| **Antipsychotic medications**  |                  |                        |                                   |                               |
| Injectable medication           | 384 (14.53%)     | 326 (14.90%)           | 25 (12.69%)                       | 33 (12.79%)                   |
| Non-injectable medications only| 1833 (69.35%)    | 1517 (69.33%)          | 126 (63.96%)                      | 190 (73.64%)                  |
| No medications                 | 426 (16.12%)     | 345 (15.77%)           | 46 (23.35%)                       | 35 (13.57%)                   |

Figure 1. Access, intensity and quality of primary care services during the pre-pandemic and pandemic periods. (A) Changes in patient accessing of primary care pre-pandemic compared to pandemic period. (B) Changes in intensity of primary care visits pre-pandemic compared to pandemic period. (C) Changes in quality of care indices pre-pandemic compared to pandemic period.

Figure 1B). Having been prescribed an antipsychotic medication became a stronger predictor of the number of in-person visits a patient had during the pandemic than it was pre-pandemic (RR = 1.52, 95% CI = 1.20, 1.92; Figure 2B). During the pandemic, patients prescribed injectable antipsychotics visited in-person more often (M = 1.45 visits per patient, 95% CI = 1.14, 1.87) than patients prescribed only oral medications (M = 0.89 visits per patient, 95% CI = 0.75, 1.06) or no antipsychotic medications (M = 1.02 visits per patient, 95% CI = 0.71, 1.47), whereas there was
Table 2. Primary Care Health Service use among People with Schizophrenia Before and After the COVID-19 Pandemic Onset.

| Period       | Pre-pandemic (N = 2385) | Pandemic (N = 2446) |
|--------------|-------------------------|----------------------|
| **Access measures** |                         |                      |
| Visits, any format, n (%) |                         |                      |
| No visit     | 453 (18.99%)            | 538 (22.00%)         |
| 1 or more visits | 1932 (81.01%)           | 1908 (78.00%)        |
| Visits, in-person, n (%) |                         |                      |
| No in-person visit | 453 (18.99%)            | 1479 (60.47%)        |
| 1 or more in-person visits | 1932 (81.01%)           | 967 (39.53%)         |
| **Intensity measures** |                         |                      |
| Number of visits per patient, mean (SD) | 3.89 (4.32)            | 4.55 (6.40)          |
| Number of in-person visits per patient, mean (SD) | 3.89 (4.32)            | 0.97 (2.22)          |
| **Quality of care measures** |                         |                      |
| Blood pressure measurement, n (%) |                 |                      |
| No measurement | 979 (41.05%)            | 1770 (72.36%)        |
| 1 or more measurements | 1406 (58.95%)           | 676 (27.64%)         |
| LDL cholesterol, n (%) |                         |                      |
| No test       | 1360 (57.02%)           | 1658 (67.78%)        |
| 1 or more tests | 1025 (42.98%)           | 788 (32.22%)         |
| Hemoglobin A1c, n (%) |                         |                      |
| No test       | 1165 (48.85%)           | 1472 (60.18%)        |
| 1 or more tests | 1220 (51.15%)           | 974 (39.82%)         |
| White blood cell count, n (%) |                         |                      |
| No test       | 1072 (44.95%)           | 1370 (56.01%)        |
| 1 or more tests | 1313 (55.05%)           | 1076 (43.99%)        |

Figure 2. Factors associated with primary care health services use among people with schizophrenia. (A) Factors associated with patient access to primary care in pandemic versus pre-pandemic period. (B) Factors associated with intensity of primary care visits in pandemic versus pre-pandemic period. (C) Factors associated with quality of care measures in pandemic versus pre-pandemic period.
no difference in frequency of visits based on medication status before the pandemic (M = 4.05, 95% CI = 3.57, 4.60 for patients prescribed injectable medications, M = 3.75, 95% CI = 3.49, 4.05 for patients prescribed oral medications and M = 3.51, 95% CI = 3.04, 4.06 for patients on no medications).

**Quality of Care**

In the year prior to the pandemic, more than 40% of patients were missing tests for important health indices. This worsened during the pandemic (Table 2; Figure 1C). Before the pandemic, 41.1% of patients with schizophrenia had no records of blood pressure measurements; however, during the pandemic, the proportion of patients with schizophrenia having no blood pressure measurements rose to 72.4%. Missing A1c tests rose from 48.9% pre-pandemic to 60.2% during the pandemic. Similarly, there was an increase in missing cholesterol tests, from 57.0% to 67.8% during the pandemic period. Missing CBC tests increased from 45.0% pre-pandemic to 55.0% during the pandemic period. People who were older, female, diagnosed with diabetes or hypertension or prescribed antipsychotic medication were more likely to receive these tests relative to other patients (Figure 2C), and the magnitude of these effects was similar in the pre-pandemic and pandemic periods.

**Discussion**

This study is the first to use detailed clinical information to evaluate primary care utilization and quality among people living with schizophrenia as a result of the COVID-19 pandemic. Most patients in this study had regular access to primary care, visiting their family physician at least once per year. However, annual testing for preventive care measures such as blood pressure assessment and recommended lab tests was lower. Consistent with other research on primary care utilization, we found that older adults, women and patients with comorbid health conditions were more likely to receive primary care services. We did not find that neighborhood income was associated with access, intensity or quality of primary care among people living with schizophrenia, which is encouraging from a health equity perspective.

**Pandemic Effects on Access to Care**

Once the Government of Ontario started to discourage ‘non-urgent’ primary and secondary healthcare services, lower rates of in-person attendance to primary care appointments began to be observed across Ontario. We also observed a decrease in the number of patients visiting their family physician in-person. The proportion of patients who had at least one in-person primary care visit during the first year of the pandemic was half of what it was in the year before the pandemic began. However, the rapid increase in the use of virtual care meant that some access to care was maintained.

**Pandemic Effects on Intensity of Care**

In conjunction with the increased use of virtual care, we observed an increase in the frequency of primary care visits. Similar increases in the intensity of care have been observed for other patient groups and different types of primary care visits. Although the number of in-person visits per patient decreased for most patients, there was some evidence that in-person visits were appropriately prioritized based on patient needs. Patients prescribed injectable antipsychotics had more frequent in-person visits during the pandemic compared to patients prescribed oral medications. This is likely because some medications, like injectable antipsychotics, must be administered in-person. This is likely a welcome finding from an equity perspective. In addition, patients on injectable antipsychotics are particularly vulnerable as they often have a history of treatment non-compliance, more frequent relapse and impaired insight. Although there are no Canadian studies about emergency department visits among people with schizophrenia during the COVID-19 pandemic, an overview of studies from other countries showed either no change in emergency department visits or a decline, suggesting that there was no substantial decompensation in mental status necessitating emergency care a result of changes in outpatient care provision.

**Pandemic Effects on Quality of Care**

Most primary prevention of cardiovascular disease occurs in the primary care setting. Routine (at least yearly) screening of blood pressure, glycosylated hemoglobin (Hb1Ac) and cholesterol levels are recommended in Canada and are particularly warranted among individuals taking antipsychotic medications; however, these are conducted in less than a third of patients. Reduction in frequency of completion of HbA1c tests in the general population is associated with poorer glycemic control and increased progression to chronic kidney disease. Several studies across multiple contexts have demonstrated that patients with schizophrenia and other serious mental illnesses are less likely to receive metabolic screening, compared to the general population. The proportion of patients who had completed HbA1c, cholesterol levels and white blood cell tests during the study period dropped by 10–30 percentage points. These gaps in testing for physical comorbidities may have been influenced by the rise of virtual primary care visits, which make the logistics of ordering laboratory testing more complicated, including having to get the lab requisition to either the patient (through mail or email) or to the laboratory (through email or fax). Given the increased risk
of cardiovascular disease among people with schizophrenia, it is concerning that the completion of blood pressure readings after the onset of the pandemic dropped by >50%. Reductions in appropriate hypertension screening and monitoring may lead to poorer outcomes\(^4\);\(^40\);\(^42\); a Canadian study of older adults found that increased cardiovascular screening and management was associated with reductions in heart attacks and strokes.\(^41\)

**Limitations**

Data analysed in this study were from primary care EMRs in Ontario, Canada. EMRs contain detailed clinical information not available in other health data sources (e.g., records of blood pressure assessments); however, there are limitations. Primary care EMRs contain incomplete data on patients’ health conditions such that diagnostic status can sometimes be difficult to determine\(^43\); for example, there is incomplete documentation of smoking status and cessation counselling in the UTOPIAN database, and therefore, despite this being an important risk factor for cardiovascular disease, we did not include this variable in this analysis. The data available in the UTOPIAN database might not wholly describe all patients living with schizophrenia in Ontario. Our study was limited to patients who had recent contact with a family physician. Patients who are not attached to a family medicine practice or do not have access to a family physician are under captured in these data. Some of the ‘encouraging’ findings related to frequency of in-person visits and equitable use of primary care services among people living in neighborhoods at different income quintiles may reflect the fact that practices in UTOPIAN are more likely to be academic practices providing team-based care than the Ontario average.\(^44\) Patients who were female, older age and higher income are overrepresented in the UTOPIAN database relative to the Ontario population, but this is consistent with characteristics of health care users in general.\(^17\) The more concerning findings related to decreased lab test and blood pressure measurement completion therefore may reflect a ‘best case’ scenario, and it is possible that people with schizophrenia receiving care outside this network may have worse access and quality of care. Primary care providers in UTOPIAN receive ‘push’ notifications from the Ontario Laboratories Information System when any blood tests are ordered by other providers (such as psychiatrists). Although there is the possibility of tests occasionally not being ‘pushed’ to providers, this would only occur when the system malfunctions, and therefore, ‘missing’ tests can be interpreted to have not been completed at any point. Data in this study were excluded from family physicians practicing in ‘team-based capitation’ models, and therefore, it was not possible to compare results between those models and those who accessed care from non-team-based capitation or fee-for-service type settings.\(^45\)

**Conclusion**

This study of over 2500 patients with schizophrenia in Ontario, Canada, demonstrated substantial reductions in the completion of recommended laboratory testing after the onset of the COVID-19 pandemic. Although there were some encouraging findings related to access and intensity of care, overall this demonstrates the detrimental effects of the COVID-19 pandemic. Further work to address these identified deficits is urgently required to support people with schizophrenia. These results demonstrate the importance of developing and evaluating proactive approaches to primary care management of people with schizophrenia, to optimize the primary prevention of cardiovascular disease. Further work assessing the effect of these changes in care on outcomes including incident cardiovascular disease and mortality will be essential to determine the extent to which patients may have been harmed by these changes in care. Although overall primary care access was maintained for a substantial proportion of people with schizophrenia in this study, these results do not describe what happened to people who did not attend primary care after the onset of the COVID-19 pandemic; further research including qualitative exploration of primary care non-attenders will be essential to improving primary care for people with schizophrenia.

**Data Access**

Data were obtained from the UTOPIAN Data Safe Haven (dfcm.utoronto.ca/utopian-data-safe-haven), a primary care EMR database with records collected from primary care practices in Ontario, Canada. We used data extracted as of August 31, 2021, for this study. The datasets generated and/or analysed during the current study are not publicly available due to limitations of ethical approval involving patient data and anonymity but are available from the corresponding author on reasonable request.

**Acknowledgements**

The authors thank Jemisha Apajee for assistance with statistical analysis.

**Declaration of Conflicting Interests**

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Braden O’Neill is a member of the Ontario Health Primary Care Expert Panel on Guidelines for Clinically Appropriate Use of Virtual Care.

**Funding**

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the Canadian Institutes of Health Research (grant number 45030). Braden O’Neill and Karen Tu receive salary
support as Clinician-Investigators from the Department of Family and Community Medicine, University of Toronto.

**ORCID iDs**
Abban Yusuf https://orcid.org/0000-0001-6189-6857
Osnat Melamed https://orcid.org/0000-0002-9663-2226
Peter Selby https://orcid.org/0000-0001-5401-2996
Braden O’Neill https://orcid.org/0000-0003-2164-8263

**Supplemental Material**
Supplemental material for this article is available online.

**References**

1. Gatov E, Rosella L, Chiu M, Kurdyak PA. Trends in standardized mortality among individuals with schizophrenia, 1993–2012: a population-based, repeated cross-sectional study. CMAJ. 2017;189(37):E1177–E1187.

2. Livingston, JD. Structural stigma in health-care contexts for people with mental health and substance use issues: a literature review. Ottawa, Canada: Mental Health Commission of Canada; 2020.

3. Kurdyak P, Vigod S, Duchen R, et al. Diabetes quality of care and outcomes: comparison of individuals with and without schizophrenia. Gen Hosp Psychiatry. 2017;46:7–13. doi:10.1016/j.genhosppsych.2017.02.001.

4. Weiss AP, Henderson DC, Weilburg JB, et al. Treatment of cardiac risk factors among patients with schizophrenia and diabetes. Psychiatr Serv. 2006;57(8):1145–1152. doi:10.1176/ps.2006.57.8.1145.

5. Fiorillo A, Sartorius N. Mortality gap and physical comorbidity of people with severe mental disorders: the public health scandal. Ann Gen Psychiatry. 2021;20:52. doi:10.1186/s12991-021-00374-y.

6. Smith DJ, Langan J, McLean G, et al. Schizophrenia is associated with excess multiple physical-health comorbidities but low levels of recorded cardiovascular disease in primary care: cross-sectional study. BMJ Open. 2013;3(4). doi:10.1136/bmjopen-2013-002808.

7. Lawrence D, Kisely S. Inequalities in healthcare provision for people with severe mental illness. J Psychopharmacol. 2010;24(4 Suppl):61–68. doi:10.1177/1359786810382058.

8. Liu J, Brown J, Morton S, et al. Disparities in diabetes and hypertension care for individuals with serious mental illness. Am J Manag Care. 2017;23(5):304–308. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6643695/

9. Brien S, Grenier L, Kapral ME, et al. Taking Stock: A Report on the Quality of Mental Health and Addictions Services in Ontario. An HQO/ICES Report.; 2015. https://www.hqontario.ca/Portals/0/Documents/pr/theme-report-taking-stock-en.pdf accessed 2021 November 30.

10. Melamed OC, Hahn MK, Agarwal SM, et al. Physical health among people with serious mental illness in the face of COVID-19: concerns and mitigation strategies. Gen Hosp Psychiatry. 2020;66:30–33. doi:10.1016/j.genhosppsych.2020.06.013.

11. Kurdyak P, Gandhi S, Holder L, et al. Incidence of access to ambulatory mental health care prior to a psychiatric emergency department visit among adults in Ontario, 2010–2018. JAMA Netw Open. 2021;4(4):e215902–e215902. doi:10.1001/jamanetworkopen.2021.5902.

12. Chiu M, Gatov E, Fung K, et al. Deconstructing the rise in mental health–related ed visits among children and youth in Ontario, Canada. Health Aff. 2020;39(10):1728–1736. doi:10.1377/hlthaff.2020.00232.

13. Tanne JH, Hayasaka E, Zastrow M, et al. COVID-19: How doctors and healthcare systems are tackling coronavirus worldwide. Br Med J. 2020;368. doi:10.1136/bmj.m1090.

14. Bhaskar S, Nurtazina A, Mittoo S, et al. Editorial: telemedicine during and beyond COVID-19. Front Public Heal. 2021;9:233. doi:10.3389/fpubh.2021.662617.

15. Glazier RH, Green ME, Wu FC, et al. Shifts in office and virtual primary care during the early COVID-19 pandemic in Ontario, Canada. CMAJ. 2021;193(6):E200–E210. doi:10.1503/cmaj.202303.

16. Stephenson E, O’Neill B, Gronsbell J, et al. Changes in family medicine visits across sociodemographic groups after the onset of the COVID-19 pandemic in Ontario: a retrospective cohort study. CMAJ Open. 2021;9(2):E651–E658. doi:10.9778/cmaj.o.20210005.

17. Stephenson E, Butt DA, Gronsbell J, et al. Changes in the top 25 reasons for primary care visits during the COVID-19 pandemic in a high-COVID region of Canada. PLoS One. 2021;16(8):e0255992. doi:10.1371/journal.pone.0255992.

18. Centers for Disease Control and Prevention. COVID-19: Telemedicine—What does it mean and why should you care? Published 2020. https://www.cdc.gov/coronavirus/2019-ncov/clinicians/telemedicine.html [accessed 2021 December 27].

19. Cucinotta D, Vanelli M. WHO Declares COVID-19 a pandemic. Acta Biomed. 2020;91(1):157–160. doi:10.23775/abm.v91i1.9397.

20. COVID-19 Intervention Timeline in Canada. Canadian Institute for Health Information. Published 2021. https://www.cihi.ca/en/covid-19-intervention-timeline-in-canada [accessed 2021 December 27].

21. Ministry of Health. Primary Care Changes in Response to Corona Virus (COVID-19) Effective March 14, 2020. 2020.

22. Tu K, Kristiannson R, Gronsbell J, et al. Changes in primary care visits arising from the COVID-19 pandemic: an international comparative study by INTRePID the International Consortium of Primary Care Big Data Researchers. BMJ Open. 2022;12(5):e059130.

23. Alami H, Lehoux P, Attieh R, et al. A not so quiet” revolution: systemic benefits and challenges of telehealth in the context of COVID-19 in Quebec (Canada). Front Digit Heal. 2021;3:133. doi:10.3389/fdgth.2021.721898.

24. Padala SP, Dennis RA, Caceda R. Why COVID-19 is especially difficult for those with schizophrenia: reasons and solutions. Prim Care Companion CNS Disord. 2020;22(5):26175. doi:10.4088/PCC.20com02739.
25. Miu AS, Vo HT, Palka JM, et al. Teletherapy with serious mental illness populations during COVID-19: telehealth conversion and engagement. Couns Psychol Q. 1–18. Published online 2020. doi:10.1080/09515070.2020.1791800.

26. Busch AB, Huskamp HA, Raja P, et al. Disruptions in care for medicare beneficiaries with severe mental illness during the COVID-19 pandemic. JAMA Netw Open. 2022;5(1):e2145677–e2145677. doi:10.1001/jamanetworkopen.2021.45677.

27. Ontario Ministry of Health. Changes to the Schedule of Benefits for Physician Services (Schedule) in response to COVID-19 influenza pandemic effective March 14, 2020. Published 2020. https://www.health.gov.on.ca/en/pro/programs/ohip/bulletins/4000/bul4745.aspx [accessed 2022 January 5].

28. Agarwal P, Kithulegoda N, Umpierre R, et al. Telemedicine in the driver’s seat: new role for primary care access in Brazil and Canada: the Besour Papers: a series on the state of family medicine in Canada and Brazil. Can Fam Physician. 2020;66(2):104–111. https://pubmed.ncbi.nlm.nih.gov/32060190

29. Nicholls SG, Quach P, von Elm E, et al. The REporting of studies conducted using observational routinely-collected health data (RECORD) statement: methods for arriving at consensus and developing reporting guidelines. PLoS One. 2015;10(5):e0125620. doi:10.1371/journal.pone.0125620.

30. Tu K, Sodhi S, Kidd MR, et al. University of Toronto Family Medicine Report: Caring for Our Diverse Populations. 2020. https://issuu.com/dfcm/docs/university_of_toronto_family_medicine_report_-_car

31. Pringsheim T, Kelly M, Urness D, et al. Physical health and drug safety in individuals with schizophrenia. Can J Psych. 2017;62(9):673–683.

32. Statistics Canada. No Postal Code OM Conversion File Plus (PCCF+). Published 2017. https://www150.statcan.gc.ca/n1/en/catalogue/82F0086X

33. Government of Canada. Schizophrenia in Canada. Published 2020. https://www.canada.ca/en/public-health/services/publications/diseases-conditions/schizophrenia-canada.html [accessed 2022 April 19].

34. Stubbs B, Vancampfort D, De Hert M, et al. The prevalence and predictors of type two diabetes mellitus in people with schizophrenia: a systematic review and comparative meta-analysis. Acta Psychiatr Scand. 2015;132(2):144–157. doi:10.1111/acps.12439.

35. Breeze LC, Majumdar SR, Patten SB, et al. Prevalence of cardiovascular risk factors and disease in people with schizophrenia: a population-based study. Schizophr Res. 2010;117(1):75–82. doi:10.1016/j.schres.2009.12.016.

36. Brissos S, Veguilla MR, Taylor D, et al. The role of long-acting injectable antipsychotics in schizophrenia: a critical appraisal. Ther Adv Psychopharmacol. 2014;4(5):198–219. doi:10.1177/2045125314540297.

37. Jagadheesan K, Danivas V, Irat Q, et al. A 6-month study on the pattern of emergency department presentations for schizophrenia and other psychotic disorders during COVID-19 lockdown. Psychiatry Res. 2021;303:114081. doi:10.1016/j.psychres.2021.114081.

38. Melamed OC, LaChance LR, O’Neill BG, et al. Interventions to improve metabolic risk screening among children and adolescents on antipsychotic medication: a systematic review. J Child Adolesc Psychopharmacol. 2021;31(1):63–72. doi:10.1089/cap.2020.0115.

39. Imai C, Li L, Hardie R-A, et al. Adherence to guideline-recommended HbA1c testing frequency and better outcomes in patients with type 2 diabetes: a 5-year retrospective cohort study in Australian general practice. BMJ Qual Saf. 2021;30(9):706–714. doi:10.1136/bmjqs-2020-012026.

40. Fuchs FD, Whelton PK. High blood pressure and cardiovascular disease. Hypertension. 285–292. Published online 2020. doi:10.1161/HYPERTENSIONAHA.119.14240

41. Kaczorowski J, Chambers LW, Dolovich L, et al. Improving cardiovascular health at population level: 39 community cluster randomised trial of Cardiovascular Health Awareness Program (CHAP). Br Med J. 2011;342(7794):422. doi:10.1136/bmj.d442.

42. Guirguis-Blake JM, Evans CV, Webber EM, et al. Screening for hypertension in adults: updated evidence report and systematic review for the US preventive services task force. JAMA. 2021;325(16):1657–1669. doi:10.1001/jama.2020.21669.

43. O’Neill B, Kalia, S, Ailazradeh, B, et al. Agreement between primary care and hospital diagnosis of schizophrenia and bipolar disorder: a cross-sectional, observational study using record linkage. PLOS One 2020:e0210214.

44. Queenan JA, Williamson T, Khan S, et al. Representativeness of patients and providers in the Canadian Primary Care Sentinel Surveillance Network: a cross-sectional study. CMAJ Open. 2016;4(1):E28–E32. doi:10.9778/cmaj.open.20140128.

45. Primary Care Payment Models in Ontario. Ministry of Health and Ministry of Long-Term Care. Queen’s Printer for Ontario. 26 March 2020. [accessed 2022 August 24].