Evaluation of Hepatitis C Screening and Treatment Among Psychiatry Inpatients

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Abstract

Objective: To evaluate uptake of hepatitis C virus (HCV) testing and treatment among psychiatry inpatients at Canada's largest mental health institution, the Centre for Addiction and Mental Health (CAMH).

Methods: We reviewed medical records for all forensic and long-stay mental health patients from January 2017 to May 2021 to examine rates of HCV testing (antibody and RNA), treatment, and follow-up and completed a logistical regression to identify predictors associated with HCV antibody (Ab) screening among inpatients.

Results: Of 1,031 patients, 73% (n = 753) were male, mean age was 44 years (range: 20–92), and mean length of stay was 7.1 months (range: 0 days–24 years). Most, 83% (n = 856), were diagnosed with schizophrenia spectrum disorders. In total, 652/1,031 (63%) of individuals in this cohort received HCV Ab screening. When broken down by admission rather than individual, 570/1,303 (44%) forensic admissions had an associated HCV Ab screening, and 318/1,450 (22%) non-forensic admissions had an associated HCV Ab screening. Individuals admitted to a forensic unit and those diagnosed with schizophrenia or substance use disorders were more likely to undergo HCV Ab screening, while individuals of Asian ethnicity were less likely (all $P < .05$). HCV Ab positivity was 4.9%, and most (84%, n = 27) HCV Ab–positive individuals had subsequent RNA testing, of whom 56% (n = 15) tested HCV RNA positive. Of 15 RNA-positive individuals, 10 initiated treatments, 7 on-site at CAMH and 3 at a local hepatology center. A total of 7 individuals (1 treated by specialists and 6 on-site) achieved sustained virological response or cure. The remaining 3 were lost to follow-up, 2 of whom were treated at the hepatology clinic.

Conclusions: Based on the high prevalence of HCV, mental health inpatients should be included in groups for whom universal screening is recommended. Since on-site treatment was more successful than referral to external hepatology specialists, utilizing inpatient admission as an opportunity for HCV screening and treatment should receive more consideration.

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Chronic hepatitis C virus (HCV) infection leads to more years of life lost than any other infectious disease in Ontario, Canada, with disease burden increasing as complications of chronic infections increase each year.[1,2] Early detection and treatment of HCV prevent advanced liver disease including cirrhosis, liver failure, and liver cancer. Individuals with mental illness are disproportionately represented among those with HCV infection, with the prevalence of HCV among inpatients with serious mental illness reported as an average of 17.4% in North American studies, compared to less than 1% prevalence among the general Canadian population.[1,3] Despite the high prevalence and burden of HCV, those with mental illness are often underserved and experience significant barriers to care, with care sometimes being completely inaccessible.[4]

HCV is diagnosed after initial detection of HCV antibodies (HCV Ab), which indicate exposure to the virus, followed by testing for HCV RNA to confirm active infection. If both HCV Ab and HCV RNA are detected, an evaluation of liver disease using either serum panels or transient elastography is required to determine whether cirrhosis is present. Prior to 2014, HCV was treated using interferon-based therapy, which was not well tolerated, had a long duration, required intensive monitoring and the expertise of a more complex care team, and had cure rates of 50% or less.[5–7] The development of all oral, highly effective, and extremely well-tolerated direct-acting antivirals (DAAs) that are used for only 8–12 weeks revolutionized HCV treatment. With simple regimens that are active against all 6 major HCV genotypes and achieve cure rates reliably > 95%, treatment has moved

Clinical Points

- People with mental illnesses who are inpatients at psychiatric institutions are at high risk of hepatitis C infection, but the prevalence is unknown. This study shows an overall prevalence of 5%, supporting universal hepatitis C screening among inpatients in psychiatric facilities.
- Not treating inpatients at psychiatric facilities on-site leads to poor treatment rates, loss to follow-up, and inequitable access to treatment. On-site treatment by generalists provides a more accessible opportunity for hepatitis C treatment for psychiatric inpatients.

out of specialty clinics and is now regularly prescribed by generalists. Across Canada, there is variability in which types of providers can autonomously prescribe DAAs, with pharmacists able to prescribe DAAs in 1 province and registered nurses, even those who can prescribe other medications, unable to do so in any province. While non-specialist physicians and nurse practitioners can prescribe DAAs in 90% of Canadian provinces, there are additional barriers such as the use of approved prescriber lists of specific specialists. In Ontario, where the present study took place, specialists, and non-specialist physicians and nurse practitioners with training, can prescribe DAAs.[8] A negative HCV RNA test 12 weeks after treatment completion confirms that treatment was successful and is referred to as sustained virologic response (SVR), which is a true cure of infection.[7,9] The complexity and risks, especially neuropsychiatric side effects, associated with treatment with interferon, most notably depression, anxiety, cognitive dysfunction, and triggering of psychosis, excluded many people with mental illness or substance use from treatment, greatly limiting past treatment uptake in this population disproportionately affected by HCV.[10] However, effective DAA treatments pose no additional risks, aside from potential drug interactions, in people with mental illness.

Despite the advances and availability of treatment, people with serious mental illnesses continue to face barriers to treatment. For inpatients in mental health facilities, leaving the hospital, accessing transportation, and experiencing unpredictable changes in the status of mental illness, coupled with the rigidity of hospital appointments, all impact an individual's ability to attend appointments located off-site and booked in advance.[11] The Toronto Centre for Liver Disease reported a 75% no-show rate for psychiatric inpatients referred for HCV treatment following discharge from hospital. Treatment by specialists, however, is not the only option for care. Increasing access to treatment by training non-specialists to provide HCV treatment can effectively remove steps from this process, avoiding the need for referrals and reducing loss to follow-up for those with medically uncomplicated cases.[12]

The ASCEND trial and others have shown that HCV treatment with DAAs by non-specialists, such as primary care providers and psychiatrists, is both feasible and results in non-inferior outcomes compared to treatment by specialists.[12–17] Hospitalists providing primary care to inpatients at psychiatric institutions are well-placed to diagnose and treat HCV; however, to do so, improved awareness and training about HCV among hospitalists are needed. Long-term and forensic inpatients face particular challenges to HCV care given their prolonged admissions, limiting the services they can readily receive to care provided on-site due to barriers to transfer to off-site specialist clinics. Strategies to provide HCV care to psychiatry inpatients would address this important equity issue.[4,18] To better understand the burden of disease and the existing treatment uptake rate, we aimed to evaluate inpatient HCV testing and treatment at Canada's largest mental health institution, the Centre for Addiction and Mental Health (CAMH), in Toronto, Ontario, Canada.

METHODS

CAMH is a large psychiatric hospital located in downtown Toronto that provides emergency, outpatient, and inpatient mental health care. There are a total of 22 inpatient units, with 7 forensic units and 3 units dedicated to psychosis treatment and recovery along with several acute units, geriatric units, a concurrent youth unit, and a medical withdrawal unit. Inpatients at CAMH receive comprehensive care from a team consisting of psychiatrists and generalists. A team of hospitalists, both family physicians and nurse practitioners, provide general care to inpatients during their stay. Admitted patients have access to care from hospitalists who serve as primary care providers for inpatients and work closely together with psychiatric care teams.

At CAMH, HCV screening is done at the discretion of the hospitalist assigned to a given unit. Screening may be done at admission, upon discussion with the patient at the initial medical history and physical appointment, or at another time during their stay. Completion of the history and physical, obtaining consent for bloodwork requisitions if appropriate, and subsequent phlebotomy take variable amounts of time and may be challenging depending on the mental status of the patient. DAAs are accessible to everyone with chronic HCV infection in Ontario, and, since 2018, evidence of stage 2 fibrosis is no longer required for treatment access. Liver disease severity was assessed by hospitalists through the use of serum biomarkers (APRI or FIB-4) to exclude cirrhosis, and follow-up ultrasound was provided on-site as needed.[19,20] Hospitalists were able to consult virtually with specialists from the Toronto Centre for Liver Disease on an as needed basis.

In collaboration with the CAMH research and analytics team and hospitalist team, we compiled a list of individuals who had been admitted to 1 or more of 10 units that participated in this study, which included the 7 forensic and 3 psychosis treatment and recovery units described above, from January 1, 2017, to May 31, 2021. In 2019, specialists from the Toronto Centre for Liver Disease provided training on the screening and treatment of HCV to CAMH hospitalists. We then conducted a review of medical records to evaluate rates of HCV Ab and HCV RNA testing, treatment initiation, and completion of treatment to SVR.

Descriptive statistics in the form of means, standard deviations, medians, and interquartile ranges were used to describe continuous measures. Testing and treatment were described using frequencies and proportions. Logistic regression was used to evaluate associations between demographic and clinical predictor variables and undergoing HCV Ab screening. We estimated unadjusted and adjusted odds ratios (aORs) with 95% confidence intervals (CIs) and evaluated significance at a threshold of $P < .05$. Multiple imputation by predictive means matching was used to impute missing variables, and inferences were combined from 20 imputed datasets and 50 iterations.[21,22] As a sensitivity analysis, regression results were also compared to estimates using the complete case analysis method.

This study was deemed a quality improvement project by the CAMH Research Ethics Board.

RESULTS

Study Population

There were 1,031 individuals admitted to forensic (59%, n = 609) or non-forensic (41%, n = 422) inpatient units from January 2017 to May 2021 (Table 1). The mean age of the cohort was 44 years (range: 20–92 years), and 73% (n = 753) were male. During the study period, there were a total of 2,753 admissions to all 10 units, with a mean of 505 admissions per year and 2.7 admissions per individual (range: 1–29 admissions). Upon admission, 34% (n = 347) of the cohort did not provide a housing status or did not know their housing status, 17% (n = 147) reported renting or living in an apartment, 12% (n = 103) reported being homeless, and the remainder reported living at a health care facility, with family or friends, or in a community or group home. The mean length of all admissions was 7.1 months (range: 0 days to 24 years, 95% CI, 6.3–7.8 months, IQR: 3.4 months, median: 33 days) (Table 1). The most common diagnosis in this cohort was schizophrenia spectrum and other psychotic disorders, with 83% of the total cohort having diagnoses in this *DSM* category. When studied by unit type, 86% of non-forensic inpatients and 82% of forensic inpatients were diagnosed with schizophrenia spectrum and other psychotic disorders.

Table 1.

Demographic and Clinical Characteristics of 1,031 Individuals in Participating Psychiatric Inpatient Units

Characteristic	
Individuals in forensic units, n (%)	609 (59%)
Individuals in non-forensic units, n (%)	422 (41%)
Age, mean	44 years
Sex, n (%)	
Male	753 (73%)
Female	275 (27%)
Total admissions during or overlapping with study period	2,753
Admissions per year, mean	505
Admissions per individual, mean (range)	2.7 (1–29)
Length of all admissions, mean	7.1 months (SD = 19); range: 0 days–24 years; 95% CI, 6.3–7.8 months
Length of all admissions, median	33 days; IQR: 3.4 months
Individuals diagnosed with schizophrenia spectrum and other psychotic disorders, n (%)	856 (83%)
Individuals diagnosed with schizophrenia spectrum and other psychotic disorders in forensic units, n (%)	499 (82%)
Individuals diagnosed with schizophrenia spectrum and other psychotic disorders in non-forensic units, n (%)	363 (86%)

Abbreviation: IQR = interquartile range.

HCV Ab Screening and Positivity

In total, 63% (n = 652) of the cohort was screened for HCV Ab during the study period (Table 2). Each person was tested an average of 1.2 times in forensic units (range: 0–8 tests per person) and 0.8 times in non-forensic units (range: 0–10 tests per person) during the study period. By unit type, 74% (n = 450) of forensic inpatients and 48% (n = 202) of non-forensic inpatients were screened for HCV Ab. Screening occurred in 32% (888/2,753) of all admissions, including in 44% (570/1,303) of admissions for individuals who had been admitted to forensic units and 22% (318/1,450) of admissions for individuals admitted to non-forensic units (Table 2). Screening rates increased throughout 2017 and 2018, remained consistent at these volumes for the majority of 2019, and then decreased dramatically in 2020 and continued to decrease in 2021. HCV Ab screening was not conducted for 36% (n = 376) of the cohort, the majority of whom were non-forensic inpatients (58%, n = 220, of those not screened).

Of the 652 tested, 32 individuals (4.9%) were found to be HCV Ab–positive, 64% (n = 18) of whom were represented in forensic units (Table 2). Of 32 Ab-positive individuals, 28 were newly diagnosed infections during the study period, and 4 were previously known positive. The average age of HCV Ab–positive individuals was 47 years, and 63% (n = 20) were male. The 32 HCV Ab–positive individuals had been admitted 105 times in total, with an average length of stay of 9.6 months.

Table 2.

HCV Ab Screening Trends of Psychiatric Inpatients January 2017–May 2021 and Characteristics of HCV Ab–Positive Individuals

HCV Ab screening and positivity	
Total individuals screened, n (%)	652 (63%)
Total individuals screened in forensic units, n (%)	450 (74%)
Total individuals screened in non-forensic units, n (%)	202 (48%)
Tests per individual in forensic units, mean (range)	1.2 (0–8)
Tests per individual in non-forensic units, mean (range)	0.8 (0–10)
Mean no. of individuals screened each year, n (%)	135 (65%)
Admissions with screening completed	888 (32%)
Admissions for forensic individuals with screening completed	570 (44%)
Admissions for non-forensic individuals with screening completed	318 (22%)
Total HCV Ab–positive individuals (HCV Ab positivity), n (%)	32[a] (4.9%)
HCV Ab–positive individuals in forensic units, n (%)	18 (64%)
HCV Ab–positive individuals in non-forensic units, n (%)	10 (36%)
Age of HCV Ab–positive individuals, mean	47 years; SD = 11.2
Age of HCV Ab–positive individuals, median	45 years; IQR: 19.3
Sex of HCV Ab–positive individuals, n (%)	
Male	20 (63%)
Female	12 (37%)
Total admissions of HCV Ab–positive individuals	105
Length of all admissions of HCV Ab–positive individuals, mean (range)	9.6 months (0 days–18 years)
HCV Ab–positive individuals diagnosed with schizophrenia spectrum and other psychotic disorders, n (%)	25 (78%)
HCV Ab–positive individuals diagnosed with bipolar and related disorders, n (%)	6 (19%)
HCV Ab–positive individuals diagnosed with other disorders	4 (9%)
HCV Ab–positive individuals diagnosed with substance related and addictive disorders	8 (25%)

[a]Four of 32 Ab+ individuals were known positive and so did not have HCV Ab testing or had HCV Ab testing completed prior to 2017.
Abbreviations: HCV Ab = hepatitis C virus antibody, IQR = interquartile range.

Table 3.

Logistic Regression Results to Identify Factors Associated With HCV Ab Screening of Psychiatric Inpatients Using Multiple Imputation Methods (N = 1,026 Observations)[a]

	Unadjusted		Adjusted	
Characteristic	OR (95% CI)	*P* value	aOR (95% CI)	*P* value
Age	0.99 (0.98 to 1.00)	.053	0.99 (0.98 to 1.00)	.18
Male sex (ref = female)	1.07 (0.81 to 1.43)	.63	0.75 (0.54 to 1.03)	.080
Ethnicity (ref = White)				
Asian	0.66 (0.44 to 0.98)	**.037**	0.60 (0.39 to 0.92)	**.020**
Black	1.21 (0.86 to 1.69)	.27	0.86 (0.59 to 1.25)	.43
Indigenous	2.63 (0.75 to 9.18)	.13	1.47 (0.41 to 5.21)	.55
Latin American	0.52 (0.23 to 1.18)	.12	0.50 (0.21 to 1.18)	.11
Middle Eastern	1.22 (0.61 to 2.43)	.58	0.88 (0.42 to 1.84)	.74
Other	1.04 (0.67 to 1.62)	.86	0.75 (0.46 to 1.22)	.25
Stable/non-facility housing status (ref = unstable/facility/ reported as unknown)	0.63 (0.48 to 0.83)	**.001**	0.98 (0.70 to 1.36)	.88
Forensic unit admission (ref = non-forensic admission)	3.23 (2.48 to 4.21)	**<.001**	3.40 (2.48 to 4.67)	**<.001**
Neurocognitive disorders[b]	1.03 (0.55 to 1.93)	.92	1.51 (0.71 to 3.22)	.28
Neurodevelopmental disorders[b]	0.44 (0.28 to 0.69)	**<.001**	0.73 (0.43 to 1.25)	.25
Schizophrenia/ schizophrenia spectrum disorders[b]	1.57 (1.13 to 2.19)	**.007**	1.89 (1.20 to 2.99)	**.006**
Bipolar and related disorders[b]	0.93 (0.55 to 1.55)	.78	1.33 (0.70 to 2.54)	.39
Substance related and addictive disorders[b]	1.63 (1.10 to 2.42)	**.014**	1.61 (1.05 to 2.48)	**.029**
Personality disorders[b]	0.89 (0.53 to 1.48)	.65	0.57 (0.33 to 1.01)	.054

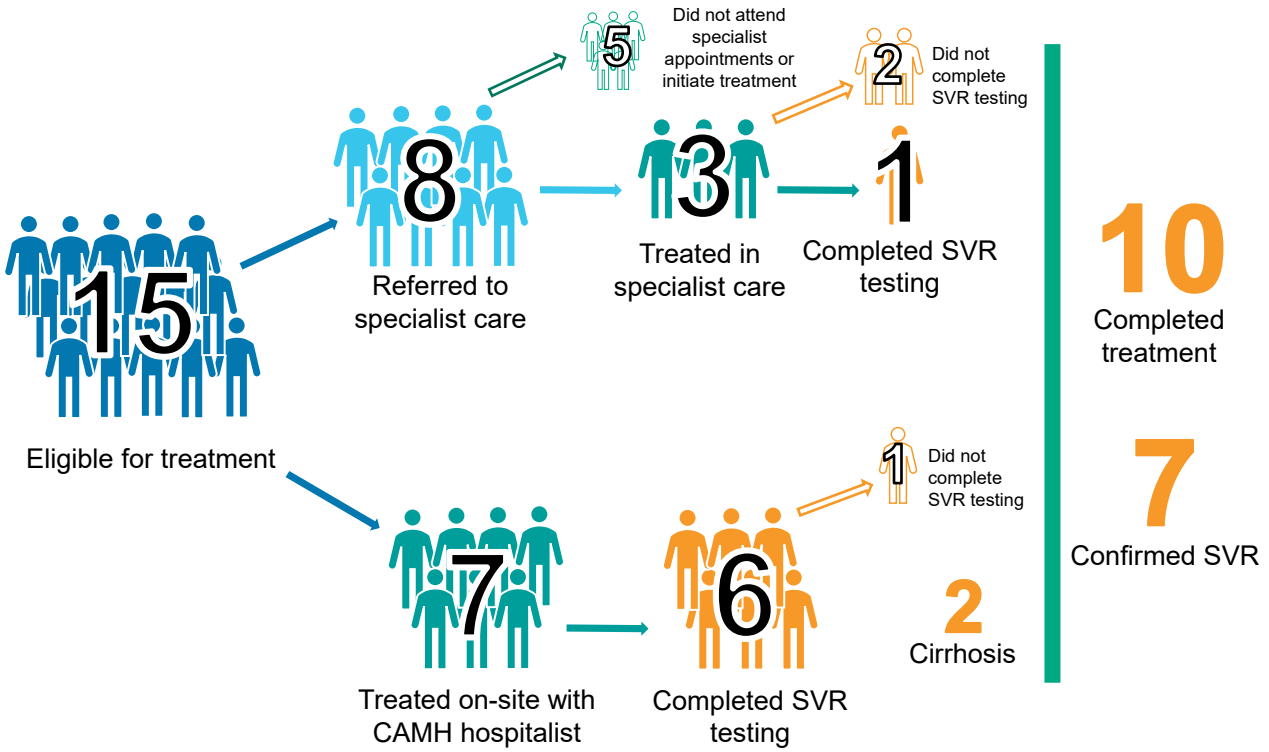
[a]Multiple imputation was used to account for observations missing sex (n = 3), ethnicity (n = 40), and/or housing status (n = 175). Estimates were inferred from 20 imputed datasets and 50 iterations. Bolded values represent significant values at a threshold of $P < .05$.
bFor each psychiatric disorder listed, the reference group is absence of the diagnosis.
Abbreviations: aOR = adjusted odds ratio, CI = confidence interval, ref = reference group, HCV Ab = hepatitis C virus antibody, OR = odds ratio.

Factors Associated With HCV Ab Screening

Multiple imputation was used to account for observations missing sex (n = 3), ethnicity (n = 40), and/or housing status (n = 175). Logistic regression was run on 1,026 observations, after excluding those who were known positive (n = 5) (Table 3). Multivariable regression results demonstrated that individuals who reported their ethnicity as Asian (aOR = 0.60 [95% CI, 0.39 to 0.92], $P = .020$) were less likely to receive HCV Ab screening in comparison to those who reported their ethnicity as White. Individuals admitted to a forensic unit (aOR = 3.40 [95% CI, 2.48 to 4.67], $P < .001$), diagnosed with schizophrenia spectrum disorders (aOR = 1.89 [95% CI, 1.20 to 2.99], $P = .006$), and/or diagnosed with a substance-related or addictive disorder (aOR = 1.61 [95% CI, 1.05 to 2.48], $P = .029$) were more likely to undergo HCV Ab screening.

In contrast, when using the complete case analysis method (Supplementary Table 1), multivariable regression was run on n = 848 observations (17% missing). In contrast to the multiple imputation method, Latin American ethnicity was identified as a significant predictor, and schizophrenia/schizophrenia spectrum disorders was not of significant effect ($P = .068$). Individuals with Asian (aOR = 0.58 [95% CI, 0.36 to 0.92], $P = .020$) and Latin American (aOR = 0.29 [95% CI, 0.10 to 0.77], $P = .015$) ethnicity were less likely to undergo HCV Ab screening. Individuals admitted to a forensic unit (aOR = 3.87 [95% CI, 2.74 to 5.49], $P < .001$) or diagnosed with a substance related and

Figure 1.
Care Pathway for Inpatients at CAMH With HCV from Diagnosis to SVR



Abbreviations: CAMH = Centre for Addiction and Mental Health, HCV = hepatitis C virus, SVR = sustained virologic response.

addictive disorder (aOR = 1.82 [95% CI, 1.14 to 3.00], *P* = .015) were more likely to receive HCV Ab screening.

HCV RNA Testing and Positivity

Of the 32 HCV Ab–positive inpatients, HCV RNA testing was performed in 27 (84%) a median of 2 months after receipt of Ab-positive results (range: 0–46 months) and after an average of 1.5 Ab test results (range: 1–4 Ab tests prior to first RNA test). Among the 27 tested, 15 (56%) were found to be HCV RNA positive. These 15 HCV RNA–positive individuals, 67% of whom were represented in forensic units, had been admitted to CAMH inpatient units 51 times, were an average of 49 years of age, and were majority male (53%, n = 8).

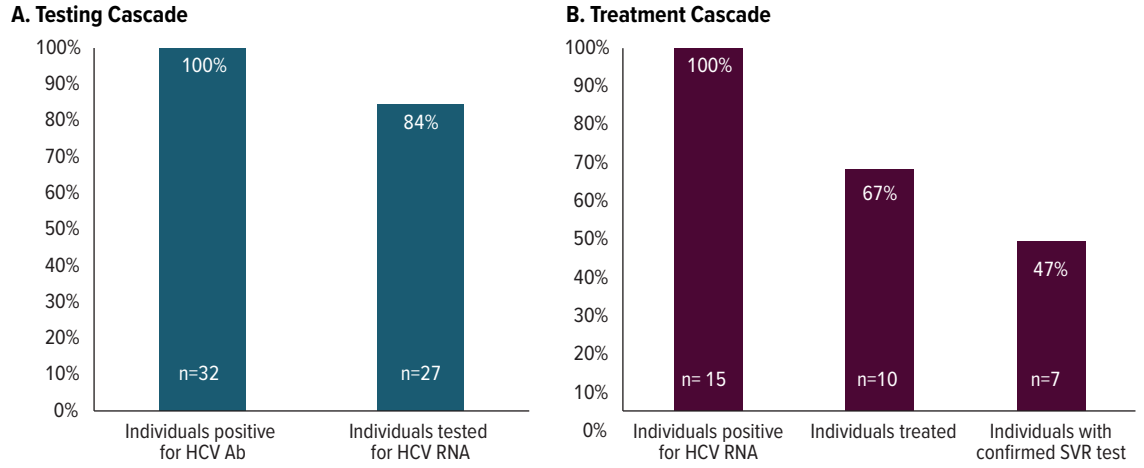
HCV Treatment

All 15 HCV RNA–positive individuals in the cohort were eligible for treatment between January 2017 and May 2021 (Figure 1). Over half (n = 8) of those eligible for treatment were referred to local specialist centers for treatment initiation, but only 3 attended appointments and initiated treatment. Although treatment was completed in all 3, only 1 individual followed up with testing for SVR to confirm cure, while the other 2 were lost to follow-up with no SVR testing. The remaining 7 HCV RNA–positive individuals initiated treatment at CAMH with their hospitalist. Notably, 2 of these 7 patients had evidence of compensated cirrhosis, with the diagnosis of cirrhosis based on serum biomarkers in 1 individual and on ultrasound in the other (Figure 1). Of the 7 treated by hospitalists, 6 individuals completed treatment, and, following treatment, all 6 were confirmed to be cured with SVR testing (Figure 1). Whether initiated on-site or off-site, it took between 1 and 36 months to start treatment after receiving a positive test result, with a median time between test result receipt and treatment initiation of 5 months.

Quality Improvement: Screening Remaining Patients

While 36% of the individuals in this cohort did not have HCV Ab screening during the study period, 11% (n = 41) of those who were not screened remain at CAMH at the time of writing. Of those who are still inpatients at CAMH, 22% (n = 9) have received screening since the initial medical record review, 11% (n = 1) of whom were HCV Ab–positive, but none tested HCV RNA positive. The remainder of this group is available to be approached or re-approached for screening by hospitalists as this quality improvement project continues.

Figure 2.
HCV Cascade of Care for Psychiatric Inpatient Units at CAMH[a]



[a]The cascade of care in inpatient units at CAMH for each step of HCV testing and treatment from detection of antibodies and active infection to treatment and confirmation of cure (SVR).
Abbreviations: CAMH = Centre for Addiction and Mental Health, HCV = hepatitis C virus, SVR = sustained virologic response.

DISCUSSION

Medical record reviews of inpatients at CAMH in Toronto, consisting of forensic and non-forensic inpatients, showed that the prevalence of HCV in this group is high (Ab positivity = 4.9%; RNA positivity = 56%) compared to the prevalence of HCV in the general population (< 1%). Despite this, screening rates in the cohort at large and in either forensic or non-forensic inpatients did not exceed 63%. Over time, screening rates were increasing in 2017 and 2018, plateaued in 2019, and then decreased in 2020, without recovering in 2021. Trends in screening rates were likely influenced by a number of factors. In 2018, Canadian guidelines for the management of HCV were updated, increasing awareness and coverage accessibility of DAA therapies, which may have increased motivation for screening.[23] In addition, a high level of buy-in to complete HCV testing among CAMH hospitalists and initiation of a consultation and training partnership with Toronto Centre for Liver Disease hepatologists in 2019 likely contributed to maintenance of increases in screening rates until 2020.[24] In 2020, the COVID-19 pandemic brought most routine services, such as non-COVID infectious disease screening and care services, to a halt. Public health measures, recurring outbreaks, and staffing challenges resulted in sustained reductions in screening rates into 2021.[25] The trend seen among inpatient units at CAMH mirrors that of HCV testing across the entire province of Ontario during the pandemic.[25]

Although prevalence of HCV was higher than in the general population, it was lower than in other "high-risk" populations and some other prior studies in psychiatric facilities.[3] HCV Ab prevalence is particularly high in centers offering services specifically to people who use drugs, such as opioid agonist therapy clinics (45%), drug treatment centers (29%), and community outreach centers (14%).[26,27] Testing was more frequent among inpatients at CAMH with a known substance use disorder, but extensive data from Canada and elsewhere have shown that risk factor–based screening is suboptimal due to poor recognition of risk factors by providers and limited acknowledgment of risk factors by patients, leading to a high undiagnosed rate. Universal screening increases recognition of HCV and is also associated with reduced stigma and improved uptake by patients and providers. Universal screening is cost-effective even at relatively low population prevalence. The US Centers for Disease Control and Prevention has recently recommended universal 1-time screening in all adults, and birth cohort (1945–1975) screening in Canada has been shown to be cost-effective, with the estimated prevalence of ~1.5% suggesting that universal screening in CAMH would very likely be cost-effective as well.[28]

Time between HCV tests and between diagnosis and treatment had medians of 2 and 5 months, respectively. Each step from screening to treatment led to losses to follow-up (Figure 2), despite inpatients being connected to health care services. Additionally, on average, patients were admitted with sufficient time to be diagnosed and initiate and complete treatment. The largest loss to follow-up was between receipt of HCV RNA positive results and initiation of treatment, with 10 of 15 (67%) individuals treated, 7 by hospitalists on site and 3 by specialists at other centers. All individuals who were receiving HCV care by their hospitalist initiated treatment on-site, and most (6 of 7) completed posttreatment RNA testing to confirm SVR. Conversely, of the 8 individuals referred for

care with external specialists, only 3 initiated treatment, and a single patient completed SVR testing. These results show that on-site treatment is an opportunity to improve the quality of care and the rigorousness of follow-up for this group, efforts that are likely to positively impact their health beyond HCV infection resolution, and the outcomes of those admitted to these units in the future.

Other studies, though none in inpatient mental health settings, have described the HCV care cascade and shown similar results. Studies in hospital emergency departments have shown improvement in treatment completion rates when treatment is initiated in inpatient care or during admission and support models of care that use hospitalizations for mental illnesses as an engagement point for HCV care.[29,30]

Since on-site treatment was more successful than referral to external hepatology specialists, training hospitalists is likely an effective strategy to facilitate progression from diagnosis to cure. Referral leads to loss to follow-up, while care on-site promotes streamlined access to care. As the largest mental health institution in Canada, with units caring for patients often admitted many times or for periods ranging months to years, often under mandatory circumstances, CAMH has an opportunity to use these findings to provide services to a group who is routinely underserved, but for whom care could be dramatically improved with simple process improvements and staff training. The findings of this project, and the group of individuals still available for screening and follow-up, have allowed the study team to continue to develop a Quality Improvement Plan to sustainably improve the way HCV services are delivered. Hospitalists will be an essential part of the quality improvement process and ensure that consideration is given to barriers to improvements and ways to overcome them.

It is also important to acknowledge that infection with HCV affects psychological, mental, and cognitive well-being.[31–33] While depression and cognitive dysfunction beyond the impact of the disease diagnosis alone are common extrahepatic conditions of HCV infection, correlating with the degree of liver disease during HCV infection, HCV treatment has been shown to improve mental and cognitive symptoms, significantly improving the lives of those with mental illness, especially if properly combined with treatments of comorbid psychiatric conditions.[31–33] Considered together with the high prevalence of HCV in people with mental illness, treating HCV should be a much higher priority in both physical and psychiatric disciplines in order to provide more benefit to those in more need, and health care providers should take more of a team-based, patient-centered approach to treating the whole patient, rather than just one condition in their specialty.[34]

These data are limited to services provided at CAMH or services provided by specialists that have been included in patient charts as reports to hospitalists. Information about attempts to obtain treatment elsewhere or testing for HCV requested by providers external to CAMH was not available. Testing refusal was not uniformly captured in our data, limiting our ability to determine how testing rates are impacted by declined tests. In addition, test data from prior to the study period (before 2017) were not included, so individuals who were admitted prior to the study period and remained admitted during the study period may not have all HCV screening reported in the data collected for the study, if any took place prior to 2017. However, it should be noted that testing before 2012 for individuals with mental illness was very unlikely due to significantly higher barriers to treatment. Details about processes and barriers providers may experience in testing for, and managing, HCV are also limited as staff turnover increased during the pandemic, and most staff currently working on participating units at CAMH were not working at CAMH during the study period. We used multiple imputation to address missing data, which assumes that data are missing at random. This may not be accurate, but it allows for a more complete analysis. We compared results from complete data to those with imputed values and found that results were consistent.

With the length of stay often long enough to obtain necessary test results and initiate treatment for inpatients, and the high prevalence of HCV in this population (4.9% HCV Ab positivity, 56% HCV RNA positivity), there is an opportunity for providers to ensure high screening and treatment rates. Continued efforts raise the possibility for hospitalists to eliminate HCV from this population with diligent testing and follow-up. Even when specialist help is required, the increase of virtual and e-consults during the pandemic can assist hospitalists in achieving this outcome for their patients. Progression through the cascade of care to confirmation of cure was superior when hospitalists provided treatment rather than when treatment was provided by off-site specialists. To facilitate progression from diagnosis to cure, shortening the time between steps by increasing hospitalist awareness and confidence in testing for, and managing, HCV provides a feasible strategy for reducing the burden of HCV among high needs psychiatric populations.

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Supplementary Material

Article Title: Evaluation of Hepatitis C Screening and Treatment Among Psychiatry Inpatients

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LIST OF SUPPLEMENTARY MATERIAL FOR THE ARTICLE

1. Table 1 — Logistic Regression Results to Identify Factors Associated with HCV Ab Screening of Psychiatric Inpatients Using Complete Case Analysis (N=848 Observations)

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Supplementary Table 1: Logistic Regression Results to Identify Factors Associated with HCV Ab Screening of Psychiatric Inpatients using Complete Case Analysis (N=848 observations)

		Unadjusted		Adjusted	
Characteristic	N	OR (95% CI)[1]	p-value	aOR (95% CI)[1]	p-value
Age, Years	848	0.99 (0.98 to 1.00)	0.062	0.99 (0.98 to 1.00)	0.18
Sex					
Female	222	-	-	-	-
Male	626	1.23 (0.89 to 1.68)	0.21	0.81 (0.57 to 1.16)	0.26
Ethnicity					
White	356	-	-	-	-
Asian	118	0.65 (0.42 to 0.99)	**0.044**	0.58 (0.36 to 0.92)	**0.020**
Black	202	1.22 (0.84 to 1.78)	0.29	0.84 (0.56 to 1.27)	0.41
Indigenous	16	3.70 (1.01 to 23.8)	0.087	1.92 (0.51 to 12.6)	0.40
Latin American	21	0.32 (0.13 to 0.79)	**0.015**	0.29 (0.10 to 0.77)	**0.015**
Middle Eastern	35	1.32 (0.63 to 2.96)	0.48	0.94 (0.43 to 2.22)	0.89
Other	100	0.90 (0.57 to 1.43)	0.65	0.64 (0.39 to 1.08)	0.090
Housing Status					
Unstable/Facility/Reported as Unknown	443	-	-	-	-
Stable/Non-Facility	405	0.60 (0.45 to 0.80)	**<0.001**	0.99 (0.71 to 1.38)	0.95
Forensic Unit					
No	359	-	-	-	-
Yes	489	3.83 (2.85 to 5.17)	**<0.001**	3.87 (2.74 to 5.49)	**<0.001**
Neurocognitive Disorders					
No	817	-	-	-	-
Yes	31	1.59 (0.73 to 3.83)	0.27	1.93 (0.77 to 5.30)	0.18
Neurodevelopmental Disorders					
No	786	-	-	-	-
Yes	62	0.36 (0.21 to 0.61)	**<0.001**	0.57 (0.30 to 1.06)	0.075
Schizophrenia/Schizophrenia Spectrum Disorders					
No	145	-	-	-	-
Yes	703	1.32 (0.91 to 1.90)	0.13	1.65 (0.96 to 2.82)	0.068

Bipolar and Related Disorders					
No	791	-	-	-	-
Yes	57	0.93 (0.54 to 1.65)	0.80	1.17 (0.56 to 2.48)	0.67
Substance Related and Addictive Disorders					
No	723	-	-	-	-
Yes	125	1.97 (1.28 to 3.12)	**0.003**	1.82 (1.14 to 3.00)	**0.015**
Personality Disorders					
No	798	-	-	-	-
Yes	50	1.17 (0.64 to 2.21)	0.62	0.71 (0.36 to 1.43)	0.33

1 OR = Odds Ratio, CI = Confidence Interval, aOR=Adjusted Odds Ratio

Notes: Complete case analysis was used to account for observations missing sex (n=3), ethnicity (n=40) and/or housing status (n=175). Bolded values represent significant values at a threshold of $p<0.05$.