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The Effect of the COVID-19 Pandemic on Prescribing Medications for Opioid Use Disorder in the Mid-Michigan Region

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Abstract

Background: The increasing prevalence of opioid use coupled with the emergence of the Coronavirus Disease-19 (COVID-19) pandemic impacted opioid overdoses and death rates. People with opioid use disorder (OUD) are particularly vulnerable to the pandemic's consequences. Although Medications for Opioid Use Disorder (MOUD) are the most well supported treatment for OUD, they remain underutilized by clinicians, particularly in the primary care setting, emphasizing the importance of examining factors that impact prescribing.

Objective: To assess clinicians' prescribing practices for MOUD and assess the pandemic's effect on MOUD prescription. To determine whether there is an association between patient-specific factors, such as mental health diagnoses and substance use disorder (SUD), and MOUD prescription practices prior to and during the COVID-19 pandemic.

Methods: A retrospective chart review assessed 500 patient charts with a diagnosis of OUD to assess demographics, MOUD prescribing, substance use, and co-morbid mental health conditions.

Results: 312 charts met inclusion criteria. There was no significant difference in the percentage of new MOUD prescriptions among the selected cohort between the 2 selected timeframes, nor was there a significant difference in the prescriber/setting of new prescriptions. Cumulative analysis revealed that greater than 2/3 of the selected patients had concurrent mental health diagnoses. Greater than 50% of patients reported active non-opioid substance use. The odds of having a co-occurring SUD were significantly higher among patients treated in the emergency department and various treatment settings—including urgent care and non-primary care clinics—as compared to the primary care outpatient setting.

Conclusions: Strong evidence supports the efficacy of using MOUD in primary care, yet it is underutilized in the mid-Michigan region. Overall prevalence of mental health diagnoses, SUD, MOUD prescriber practices were similar prior to and during the COVID-19 pandemic. There was a high occurrence of co-occurring SUD especially among patients treated outside of the primary care setting. Future initiatives to increase clinician education around MOUD and address patient barriers to treatment are warranted.

Keywords

opioid use disorder, medication-assisted treatment (MAT), medications for opioid use disorder (MOUD), coronavirus disease 2019 (COVID-19), substance use

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Highlights

Medications for opioid use disorder (MOUD) remain underutilized during COVID-19 pandemic despite increase in opioid-related overdoses during this time. Patient-specific factors such as socioeconomic barriers and social isolation during the pandemic pose a challenge to increasing patient access to MOUD and other forms of OUD treatment.

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Introduction

The Center for Disease Control (CDC) noted the first "wave" of the opioid epidemic beginning in 1990 with the rise of prescription opioid use and subsequent prescription opioid overdose-related deaths. In the early 2010s, there was a shift resulting in rising deaths due to heroin and synthetic opioid overdose (eg, fentanyl).[1] Between 2020 and 2021, there was an approximate 15% increase in drug overdose deaths, ultimately resulting in 80,000 opioid-related overdose deaths (OODs) in 2021.[2] This spike in OODs and escalation of the opioid epidemic mirrored the beginning of a pandemic that drastically changed lives globally and healthcare as a whole.

Beginning in 2020, the world saw the emergence of the Coronavirus Disesae-19 (COVID-19 pandemic). By March, there were more than 118,000 cases of COVID-19 across 114 countries.[3] The rapid spread and severity of the illness from COVID-19 put a significant strain on the US healthcare system.[4] Among those at particularly high risk of the adverse outcomes from the pandemic are individuals with substance use disorder (SUD) and opioid use disorder (OUD).[5] The increased demand on healthcare professionals and resources in combination with strict distancing mandates further limited the access of treatment for patients with SUD, particularly for those taking methadone for OUD, which entails closely-monitored treatment regimens.[4] Patients with SUD—including OUD, alcohol use, tobacco use, and cannabis use disorders—have also been shown to have significantly higher rates of COVID-19 infection and complications related to COVID-19 compared to individuals without any form of SUD.[5]

Individuals with OUD are also at increased risk of opioid overdose deaths (OODs). Experts correctly predicted that the implementation of social distancing and other COVID infection mitigation measures would increase OODs. These deaths were due in large part to quarantine-related factors, including social isolation, leading to an increase in individuals using substances alone and reduced access to recovery support services placed individuals using opioids at higher risk of OODs.[6] This was further compounded by individuals' reduced access to preferred illicit opioids as a result of social distancing, and a subsequent increase in the use of other illicit substances as well as increased potency of the illegal drug supply.[6,7]

Minimizing adverse outcomes of OUD requires understanding the root of the issue and targeting the factors that place individuals at an increased risk of OUD. Prior studies have examined patient factors and characteristics that contribute to increased risk of OUD and overdose from opioid use. Individuals with mental health conditions have been shown to be at higher risk for opioid use.[8,9] One study conducted in 2017 found that the 16% of Americans who have mental health disorders receive over half of all opioids prescribed in the US.[8] In particular, individuals with mood disorders were shown not only to be more likely to initiate prescription opioid therapy, but to sustain long-term use of opioids. Notably, these individuals were using prescription opioids rather than synthetic opioids or heroin. As duration of prescription opioid therapy increases, so does the risk of developing OUD.[10] Studies have found that individuals diagnosed with common mental health conditions—namely major depression, dysthymia, generalized anxiety disorder, and panic disorder—were significantly more likely to use opioids than individuals without these diagnoses. Many studies have sought to assess the relationship between co-occurring mental health conditions and OUD treatment outcomes, although there still remains disagreement on this association. While some studies report that individuals with mental health conditions have poorer adherence to MOUDs and greater risk of relapse,[11] other reports state the opposite; notably, Zhu et al[12] found in their study that having a diagnosis of major depressive disorder (MDD) was associated with increased engagement in OUD pharmacotherapy. A general consensus regarding the relationship between mental health conditions and access as well as adherence to MOUD is necessary to better understand the role that co-occurring mental health conditions may play in treatment for OUD.

In addition to mental health conditions, one factor associated with increased risk for opioid use is alcohol or other substance use.[9] Prescribed opioid use is also significantly more likely in individuals with substance use disorder.[9] Prior studies focused on the association between these patient variables and prescription drug use, however, as the opioid (and polysubstance) epidemic continues to progress, concern shifts towards synthetic opioids like fentanyl, with significantly higher overdose mortality rates.[13] Polysubstance use remains a patient-dependent factor that likely contributes to overdose-related deaths and therefore highlights an increased risk for patients with polysubstance use disorder: if rates of opioid use are higher in individuals polysubstance use disorder and the opioid of choice favors potent, illicit synthetic opioids rather than prescription opioids, risk for OODs in this population rises.

Another key component in tackling the opioid epidemic is optimizing patient access to the appropriate resources and treatments available. Traditionally, medication-assisted treatment (MAT) is the use of medication, combined with psychosocial and behavioral support to treat OUD. Substance Abuse and Mental Health Services Administration (SAMHSA) has traditionally used the term MAT, though recent recommendations have advocated for the use of medications for opioid use disorder (MOUD).[14,15] There are 3 drugs approved by the Federal Drug Administration (FDA) for MOUD: naltrexone, methadone, and buprenorphine. MOUD consistently shows efficacy in treatment of OUD and reduction of overdose deaths.[16-19] MOUD using

buprenorphine/naloxone is typically offered in an office-based opioid treatment model of care by primary care clinicians or in addiction recovery programs. Methadone, however, is subject to strict prescriber regulations including specially certified prescribers that have to dispense methadone at specific facilities called Opioid Treatment Programs (OTPs). Additionally, for the first 90 days of treatment patients were required to go to the clinic every day until take-home methadone was available to them. During and since the pandemic, some of these strict regulations were loosened by SAMHSA for established patients; however, most of the regulations stood firm for new MOUD patients.[20] A central aspect of approaching MOUD in clinical practice is by using a harm reduction strategy to avert death and dying from opioid overdoses. Despite this, it is estimated that only 18% of patients with OUD receive medications for OUD[21] and therefore, it is important to examine the factors that influence prescribing practices. While there has been progress made in the availability of MOUD treatment in large part due to an increase in prescriptions coming from the primary care setting, it seems that primary care prescribers, specifically within rural areas, cannot keep up with this advancement.[22,23] This discrepancy raises concern for patients with OUD living in rural areas with regard to their potentially worse treatment outcomes.

In addition to implementing MOUD, other forms of in-person interactions are often necessary when treating and monitoring patients during treatment of OUD.[4] While telehealth has been able to mitigate some of the barriers posed by the COVID-19 pandemic, the ability to monitor dosing for certain medications and placement of patients in rehabilitation facilities has been affected.[4,24] Identifying barriers to treatment and continuity of care for patients with OUD is paramount in taking steps towards addressing the opioid epidemic and improving patient outcomes.

The objective of this study was to examine clinician prescribing patterns for MOUD and assess the pandemic's effect on prescribing among a cohort of patients within the Mid-Michigan region. A second objective of this research was to determine whether there is an association between patient-specific factors, such as mental health diagnoses and SUD, and MOUD prescriber practices both prior to and during the COVID-19 pandemic. To determine the potential effect that the pandemic had on prescribing, patient charts were reviewed from designated "pre-pandemic" and "peri-pandemic" periods for comparison.

Methods

A retrospective electronic medical record (EMR) review was done using data collected from EPIC—an EMR database—of 1 health system (including multiple medical centers) in the Mid-Michigan region between two (2) 12-month timeframes: First, from March 1, 2019 to February 29, 2020 and second, from March 1, 2020 and February 29, 2021. While the Department of Health and Human Services (HHS) did declare COVID-19 a public emergency in January 2020,[25] it had not yet been declared a "pandemic" until March 11th, 2020 by the World Health Organization (WHO).[24,26] Therefore, the year prior to March 2020 was labeled as the "pre-pandemic" period and the year from March 2020 to the end of February 2021 as the "peri-pandemic" period. In each timeframe, 250 charts were used for data collection. Inclusion criteria was as follows: patients >18 years of age with a recorded diagnosis of opioid use disorder that were evaluated in an emergency department or other outpatient setting. Medical records were selected using The International Statistical Classification of Diseases and Related Health Problems (ICD-10) diagnosis codes relevant to opioid use disorder, denoted: opioid use disorders (F11.XXX). *Note: "X" indicates that there are more specific diagnoses within the larger diagnostic category.*

Data Elements

The project met the requirements of the local Institutional Review Board (IRB), as required by regulatory statutes. Electronic patient charts were reviewed independently, and de-identified data were compiled for analysis. Basic demographic information was collected including age, sex, and ethnicity. Patients were grouped by the type of clinical care setting of their visit, either the emergency department (ED) or outpatient clinic. History of non-opioid substance use—including nicotine, alcohol, marijuana, cocaine, heroin, methamphetamines, and prescription medications—was collected. Frequency of use and route of administration were also collected. Mental health diagnoses including depression, anxiety, schizophrenia, bipolar disorders were abstracted based on ICD-10 codes included in patients' charts as well as confirmed with self-report. Suicidal ideations were determined by patient responses to PHQ-9 questionnaires and chart review.

MOUD or addiction management for OUD was determined to be utilized if the patient had a prescription for buprenorphine-naloxone, injectable buprenorphine-extended release, buprenorphine hydrochloride, injectable naltrexone, a referral to a methadone clinic, a referral for outpatient counseling, reported abstinence, "other," or not available. "Other" referred to only 2 included cases of either naltrexone monotherapy (but non-injectable) and 1 case in which a patient was on prior buprenorphine who re-initiated treatment but not receiving a new prescription. MOUD prescriptions were considered "new" prescriptions based on the clinical documentation indicating whether there was a history of MOUD or explicitly stating it was a new prescription. A history of prior MOUD prescription was not used as exclusion criteria in this study, and those with prior history of MOUD prescription were included (though their

continuation of a prior medication was not categorized as a "new" prescription). The prevalence of MOUD prescribing was compared between the 2 patient cohorts (pre-pandemic versus peri-pandemic). Patients found to have co-occurring mental health and OUD diagnoses receiving MOUD were compared as well as those receiving medication-assisted treatment for non-opioid related substance use disorder.

Statistical Analysis

Statistical analysis was conducted using SAS software, version 9.4 (SAS Institute Inc., Cary, NC). A kappa statistical calculation was used to ascertain the level of agreement between chart reviewers to ensure high consistency of data abstractors. Descriptive statistics included mean and standard deviation for age and were calculated with percentages for categorical variables. A 2-sample *t*-test was used to test for the difference in average age between pre-pandemic and peri-pandemic periods. Chi-square test examined the difference in proportions for variables between both periods. The Fisher's exact test was the alternative to test for the difference in proportion when the assumption of Chi-square test was violated. Univariate and multivariable logistic regression were performed to test for association between variables. Specifically, 1 multivariable logistic regression was used to examine the association between explanatory variables, including biological sex, body mass index (BMI), race, insurance type, treatment setting, and smoking status, and dependent variable of MOUD prescribed (Buprenorphine vs Methadone). A second multivariable logistic regression was used to examine the association between explanatory variables, including biological sex, body mass index (BMI), race, insurance type, treatment setting, and smoking status and prescription type (Buprenorphine vs Methadone), and dependent variable of MH conditions for patient who were MOUD prescribed. The last multivariable logistic regression was used to examine the association between explanatory variables, including biological sex, body mass index (BMI), race, insurance type, treatment setting, and smoking status and prescription type (Buprenorphine vs Methadone), and dependent variable of co-occurring SUD for patient who were MOUD prescribed. The *P*-values of Hosmer and Lemeshow Goodness-of-Fit test for all 3 multivariate logistic regression were all greater than .05 indicating the models were good fits to the data. All of the analytical results were considered to be significant when *P*-values were less than or equal to .05.

Results

A roster of 500 charts were initially audited; 283 charts met inclusion criteria and were included in the final analysis. 217 charts were excluded primarily due to 2 main reasons: (1) Charts were pulled with ICD diagnosis F11.20 (opioid dependence, uncomplicated, or related diagnoses) where patients were on long term prescription opioids without evidence of OUD, and (2) Charts were identified as having an F11.XX diagnosis within the time criteria, but the electronic health record had no documentable information/notes available to extract data from. For the cohort pertaining to pre-pandemic period, 140 charts were reviewed and analyzed; of the 110 pre-pandemic charts excluded, 42.7% were excluded due to not having enough documentation available, and 45.4% were excluded due to no evidence of OUD. 143 charts were used in analysis of the peri-pandemic period; of the 107 charts peri-pandemic charts excluded, 48.5% were excluded due to not having enough documentation available, and 50.5% were excluded due to no evidence of OUD. Although some patients had health encounters recorded both before and during the pandemic, patients were assigned to either the pre-pandemic or peri-pandemic group, and corresponding data was collected from only 1 of these timeframes according to their grouping. Results of kappa analysis demonstrated substantial agreement (kappa = .720).

Characteristics of Individuals with OUD

In the pre-pandemic timeframe, 62.50% of the charts were reviewed from patients who reported being biologically female, while 37.50% were reviewed of individuals who reported being biologically male. In the peri-pandemic period, the percent of patients who reported being biologically female and male was 58.04% and 41.96%, respectively. These numbers did not significantly differ between the pre- and peri-pandemic periods. Most patients in both timeframes were identified as white, with approximately 87% of patients in the pre- and peri-pandemic timeframes reporting white as ethnicity. The remaining 13% included Black, Hispanic, Asian, and other race. Due to the small sample size of non-white, Hispanic, Asian, and patients of other races, they were collectively categorized as "Other." Patients in both the pre- and peri-pandemic period were noted to be receiving state-sponsored Medicaid insurance (78.29% and 72.44%, respectively). There was no significant difference in gender, ethnicity, or insurance status between patients included in the chart review between the pre-pandemic and peri-pandemic timeframes.

The average age across all reviewed charts included in the analysis was 35.87 years in the pre-pandemic cohort and 38.83 years in the peri-pandemic cohort. The mean age of patients in the peri-pandemic period was significantly greater than the mean age of patients in the pre-pandemic period (Table 1).

Type of MOUD and Setting of MOUD Prescriptions

There was a slight decrease in the proportion of patients receiving new MOUD prescriptions between the pre-pandemic 68 (48.57%) and the peri-pandemic period 66

Table 1. Demographics Among Individuals with Opioid Use Disorder (OUD) in Pre- and Peri-pandemic period.

Variable	Pre-pandemic *N* = 140	Peri-pandemic *N* = 143	Test statistics (*P*-value)
Age	35.87 (10.80)	38.83 (12.17)	−2.15 (.033)*
Gender			0.5783[a] (.447)
Female	85 (62.50%)	83 (58.04%)	
Male	51 (37.50%)	60 (41.96%)	
Ethnicity			0.1584[a] (.691)
White	120 (86.96%)	122 (85.31%)	
Black	10 (7.25%)	16 (11.19%)	
Other	8 (5.80%)	5 (3.50%)	
Insurance			2.272[a] (.686)
Employer	4 (2.92%)	5 (3.52%)	
State-sponsored	107 (78.10%)	101 (71.13%)	
Medicare	15 (10.95%)	18 (12.68%)	
Other	6 (4.38%)	11 (7.75%)	
None	5 (3.65%)	7 (4.93%)	

Expressed as mean (standard deviation), or count (percentage) of individuals.
[a]Chi-square test statistics.
*P-value less than or equal to .05.

(46.48%). However, this finding was not statistically significant. Over 50% of patients were not prescribed MOUD (Table 2). In both periods, the most common prescribers of MOUD were opioid treatment programs (OTPs), followed by outpatient clinics, and finally, emergency departments (EDs); there was no significant difference in prescriber types between periods. Buprenorphine/naloxone and methadone remained the predominate medication types prescribed in both time periods. There was no significant difference in the type of MOUD prescribed between the pre- and peri-pandemic periods.

Effect of Covariates on the Odds of Having a MH Diagnosis Among Patients on MOUD

Among patients prescribed MOUD, the odds of having a MH condition were significantly lower for black patients as compared to white patients (OR 0.04, 95% CI <0.01, 0.31). Patients on MOUD who were received treatment in the ED (OR 6.53, 95% CI 2.23, 22.69) and in various treatment settings (OR 17.49, 95% CI 5.19, 71.03) were significantly more likely to also have a non-opioid substance use as compared to patients receiving treatment in an outpatient clinic setting (Table 3).

Assessment of the odd of patients actively being treated with MOUD for patients with a co-occurring MH diagnosis or a co-occurring SUD did not differ significantly based on insurance type, biological sex, type of MOUD, smoking status, BMI, or period of assessment (ie, pre- versus peri-pandemic).

Co-Occurring Mental Health Diagnoses Among Individuals with OUD

Co-occurring MH diagnoses were assessed in the pre-pandemic and peri-pandemic timeframes. Charts reviewed from the pre-pandemic timeframe demonstrated 98 (70%) of patients had a MH diagnosis; 54 (38.57%) of this cohort had more than 1 MH diagnosis. In the peri-pandemic period, 97 (67.83%) of patients had a MH diagnosis, with 58 (40.56%) of these patients having greater than 1 diagnosis. Depression and anxiety were the most common MH diagnoses among patients in both periods; approximately 20% of the total patient population in both periods had a diagnosis of anxiety and/or depression. There was no significant difference in the prevalence of co-occurring MH diagnoses between the 2 periods (Supplemental Table 1).

MOUD Prescriptions for Individuals with OUD and Non-Opioid Substance Use

Of the 140 patient charts reviewed in the pre-pandemic period, 73 charts had documented active non-opioid substance use. In the peri-pandemic period, 81 charts of the 143 reviewed had documented active non-opioid substance use. Among patients with documentation of active substance use in the pre-pandemic period, 34 of the 73 patients were prescribed MOUD (46.58%). By comparison, 34 of the 81 patients with active substance use in the peri-pandemic period were prescribed MOUD (50.52%) (Supplemental Table 2).

MOUD Prescriptions for Individuals with OUD and MH Diagnosis

Both in the pre- and peri-pandemic timeframes, 98 and 97 patients had documentation of a co-occurring MH diagnosis, respectively. Of these 98 patients in each group, 47 patients in the pre-pandemic period were prescribed MOUD while 49 patients in the peri-pandemic period were prescribed MOUD. There was no significant difference in the prevalence of MOUD prescription among patients with a co-occurring mental illness in the pre-pandemic period as compared to the peri-pandemic period (Supplemental Table 3).

Non-Opioid Substance Use Among Individuals with OUD

Co-occurring substance data use was recorded from patient charts; 52.15% of patients reported any active non-opioid substance use in the pre-pandemic period, and 56.64% reported active use in the peri-pandemic period. There was

Table 2. Medications for Opioid Use Disorder [MOUD] Prescriptions in the Pre- Versus Peri-pandemic Period.

MOUD variable	Pre-pandemic *N* = 140 (%)	Peri-pandemic *N* = 143 (%)	Test statistics (*P*-value)
New MOUD Rx			
Yes	68 (48.57)	66 (46.48)	0.124[a] (.725)
No	72 (51.43)	76 (53.52)	
MOUD prescriber/setting			
Outpatient clinic	20 (22.73)	16 (18.60)	1.749[a] (.626)
ED	9 (10.23)	14 (16.28)	
OTP	39 (44.32)	35 (40.70)	
Unknown	20 (22.73)	21 (24.42)	
Type of MOUD (New Rx)			
Buprenorphine/naloxone	26 (38.24)	30 (45.45)	0.718[a] (.397)
Buprenorphine	3 (4.41)	3 (4.55)	(1.000)[b]
Naltrexone Injection	2 (1.82)	0 (0.00)	(.530)[b]
Methadone	37 (54.41)	31 (46.97)	0.742[a] (.389)
Other	0 (0.00)	2 (3.03)	(.241)[b]
Type of MOUD (Prior + New)			
Buprenorphine/naloxone	38 (27.14)	36 (25.17)	0.142[a] (.706)
Buprenorphine	5 (3.57)	3 (2.10)	(.498)[b]
Naltrexone injection	2 (1.42)	0 (0.00)	(.244)[b]
Methadone	46 (32.86)	41 (28.67)	0.582[a] (.445)
Other	0 (0.00)	6 (4.20)	(.030*)[b]
None	14 (10.00)	19 (13.29)	0.742[a] (.389)
Abstinence	5 (4.96)	6 (4.20)	0.074[a] (.786)

Abbreviations: ED, emergency department; MOUD, medications for opioid use disorder; OTP, opioid treatment program.
[a]Chi-square test statistics.
[b]Fisher's Exact test
**P*-value less or equal to .05.

no significant difference in the overall number of participants reporting active substance use between the pre- and peri-pandemic periods (Supplemental Table 3).

Discussion

Despite the evidence for the efficacy of using MOUD, this study revealed that it continues to be underutilized in Mid-Michigan primary care settings. Although there has been an increase in number of opioid-related deaths during the years of the pandemic,[6] prescriber practices have not significantly changed and MOUD prescription rates have not increased during the pandemic, specifically in the Mid-Michigan region.

Lack of access to regularly monitored physician care places individuals at increased risk for poorer adherence to treatment regimens and limits the ability of patients to have effective OUD treatment.[4] Clark et al[27] outlined the barriers to starting buprenorphine treatment when patients were required to come in for an initial visit. They discuss how patients from lower income statuses, rural areas, and those with significant familial or work obligations have limited access to MOUD programs. A recent report analyzing the prescription trends for patients with OUD and AUD within rural areas also noted that MOUD appeared to be greatly underutilized within their cohort[23]; the results of the present studies noted a similar trend of less than optimal prescription frequency in the primary care setting within the rural, mid-Michigan region from with the patient cohort was selected. Decreased access to care for patients within rural areas was exacerbated during the pandemic. Due to stay-at-home orders and reduced clinic availability during COVID-19, on March 31st, 2020, the Drug Enforcement Administration (DEA) waived the requirement for an in-person appointment for initial buprenorphine prescriptions.[28] Nonetheless, this study revealed no change in MOUD prescribing in pre- versus peri-pandemic times, emphasizing the need to evaluate the underutilization of MOUD prescription despite loosened restrictions. The increase in opioid overdose deaths during the pandemic begs the question: would overdose deaths have been lower if patients had increased access to MOUD?

The findings of this study support the notion that OUD is often associated with concurrent non-opioid substance use, with greater than 50% of the patient cohort in either time period reporting active substance use. Prior studies have

Table 3. Multivariable Logistic Regression Analyzing the Odds of Mental Health Diagnoses (MH diagnoses) Or Co-occurring Substance Use Disorder (SUD) Being Present Among Patients Prescribed Medications for the Treatment of Opioid Use Disorder (MOUD), Using Buprenorphine as a Reference Group.

	MOUD prescribed (ref = buprenorphine)		MH condition (ref = no)		Co-occurring SUD (ref = no)	
Variables (reference group)	Adjusted OR 95% CI	Unadjusted OR 95% CI	Adjusted OR 95% CI	Unadjusted OR 95% CI	Adjusted OR 95% CI	Unadjusted OR 95% CI
Period (ref = pre-pandemic)						
Peri-pandemic	0.84 (0.42, 1.70)	0.76 (0.41, 1.42)	1.50 (0.66, 3.49)	1.20 (0.59, 2.46)	2.09 (0.95, 4.78)	1.13 (0.60, 2.11)
Sex (ref = female)						
Male	1.20 (0.57, 2.57)	0.79 (0.41, 1.53)	0.53 (0.22, 1.28)	0.50 (0.24, 1.04)	1.42 (0.63, 3.20)	1.79 (0.92, 3.47)
BMI	1.03 (0.97, 1.09)	1.01 (0.96, 1.06)	1.03 (0.96, 1.11)	1.02 (0.97, 1.09)	0.95 (0.89, 1.01)	0.93 (0.88, 0.98)*
Ethnicity (ref = White)						
Black	0.24 (0.03, 1.40)	0.60 (0.11, 2.79)	0.04 (<0.01, 0.31)*	0.13 (0.02, 0.62)*	0.76 (0.11, 5.04)	1.83 (0.39, 9.55)
Other	0.69 (0.09, 4.52)	0.53 (0.07, 3.28)	2.25 (0.26, 52.90)	1.27 (0.18, 25.32)	2.27 (0.34, 18.87)	2.06 (0.33, 15.96)
Insurance (ref = employee-sponsored)						
State- sponsored	5.08 (0.60, 107.13)	4.21 (0.52, 86.42)	0.90 (0.04, 9.47)	0.87 (0.04, 7.08)	0.14 (0.01, 1.92)	0.26 (0.01, 2.11)
Other	2.58 (0.27, 57.79)	2.29 (0.26, 49.37)	2.04 (0.08, 25.95)	1.33 (0.06, 12.77)	0.11 (<0.01, 1.66)	0.19 (0.01, 1.72)
Smoker (ref = active)						
None	0.41 (0.13, 1.18)	0.56 (0.21, 1.47)	0.41 (0.12, 1.36)	0.56 (0.21, 1.61)	1.71 (0.48, 6.30)	0.73 (0.26, 1.94)
MOUD setting (ref = outpatient)						
ED	0.60 (0.25, 1.39)	0.65 (0.30, 1.37)	0.60 (0.21, 1.64)	0.46 (0.18, 1.06)	6.53 (2.23, 22.69)*	6.33 (2.53, 18.29)*
Various	1.43 (0.52, 3.94)	1.64 (0.68, 4.04)	2.85 (0.75, 12.36)	1.50 (0.49, 4.90)	17.49 (5.19, 71.03)*	10.98 (3.98, 34.60)*
MOUD prescribed (ref = buprenorphine)						
Methadone/Naltrexone			1.28 (0.56, 2.93)	1.81 (0.89, 3.75)	0.57 (0.26, 1.21)	0.68 (0.36, 1.27)

*P-value less than or equal to .05.

demonstrated an association between mental health conditions—such as anxiety and depression—and substance use disorder (specifically, prescription opioid drug use).[9] In this study, the rates of co-occurring mental health diagnoses in the selected patient cohort were analyzed in order to determine if mental health conditions might be a barrier to patient access to MOUD. Moreover, this population represents a group of individuals who are at increased risk of SUD and OUD based on prior research. This study also analyzed how prescriptions differed for patients with OUD and co-occurring mental health diagnoses as compared to patients with OUD and no co-occurring mental health diagnosis; notably, no significant difference was found in prescription rates between these 2 groups. While there still may exist a barrier to OUD care for patients with mental health conditions, the findings of this present study determined that there was no difference in MOUD prescription based on whether patients had a mental health diagnosis within the selected cohort. Further investigation examining the relationship between opioid use and the increased risk of other substance use and/or mental health diagnoses would be beneficial, particularly because prior studies have been conducted decades prior to this current study, and thus updated data is not represented. The results also demonstrate that among this patient cohort, the odds of co-occurring MH diagnoses were less among black patients on MOUD versus white patients. This brings into question whether there are protective factors that minimize patient risk for MH conditions, or if there is an issue of underdiagnosing mental health conditions in black patients compared to white patients.

Conclusion

The findings in this study suggest a need for identifying ways to increase MOUD access, particularly in those with limited access to healthcare (ie, those in rural settings and those who are uninsured). Clinicians working with patients with OUD should be aware of the factors that place their patients at higher risk of morbidity and mortality from opioid use. The results of this research substantiate prior findings that the risk of co-occurring mental illness and other non-opioid substance use disorders is increased among patients with OUD.[8,9] Pandemic-specific factors, such as social isolation and increased barriers to healthcare, should be examined as well in order to preemptively develop measures to mitigate these limitations should the world face future health crises.

Limitations

One limitation of this study was the sample size. Only 283 of 500 reviewed charts met inclusion criteria and were analyzed. While the overall kappa value showed substantial agreement among variables included in the analysis (kappa = .720), there were notably patient charts that did not include complete information regarding all variables, further limiting the sample size. A significant number of the unanalyzable charts were found to be patients that were opioid-dependent on long-term opioid therapy for chronic pain without evidence of opioid use disorder. While these patients were appropriately coded under the ICD-10 F11.XX classification (eg, F11.20 for "uncomplicated opioid dependence"), there were also a significant number of patients with evidence of OUD included in the study that were coded under F11.20—such as those who were on long term methadone treatment and coded as (F11.20 for "methadone dependence"). This ambiguity fails to distinguish between true opioid use disorder and appropriate long-term opioid therapy for chronic pain, highlighting the need for the separation of opioid use disorder and opioid dependence in future iterations of the ICD diagnostic classification system.

When assessing for co-variates such as MH diagnoses and non-opioid substance use, it is difficult to capture the multitude of possible diagnoses and sub-diagnoses; diagnoses were limited to depression, anxiety, bipolar disorder, PTSD, and "other" as a general category and without specifying subtypes within these categories (eg, major depressive disorder was noted, but without documenting severity, recurrence, or with any psychotic features). Assessment of non-opioid substance use involved documentation of broad categories of several substances (alcohol, tobacco, marijuana), but not all patient's specified the type of substance used or the frequency of non-opioid substance use, which are notably important factors to consider when trying to assess the effect of this variable on MOUD prescribing. Additionally, the medical records available for review from the cohort in the mid-Michigan region may not be generalizable to other communities, which may be more isolated than the mid-Michigan area with varying levels of healthcare access. Urban cities face issues regarding socioeconomic barriers to healthcare that may not be as well represented by the cohort analyzed in this study.

Future Directions

This study's data did not reflect any increase in MOUD prescription frequency during the pandemic, possibly reflecting clinician hesitancy in initiating MOUD. Research into clinician beliefs regarding MOUD prescription and their apprehension towards using telehealth platforms to monitor patients with OUD throughout their treatment is essential to help addressing other barriers to MOUD treatment. While there are limitations on the generalizability of this data to the United States as a whole, this finding highlights an additional area of possible research. During the pandemic, OODs drastically increased, as did the prevalence of anxiety and depression.[29] National opioid use

increased during the pandemic, and it is possible that the increase in OODs reflects the lack of reciprocal increase in MOUD prescriptions. Ongoing research into ways to increase use of MOUD, particularly among patients with co-occurring MH diagnoses and those who may have limited healthcare access is indicated to promote better outcomes for patients with OUD.

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Supplemental Material

Supplemental material for this article is available online.

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