



Comparing telemedicine to in-person buprenorphine treatment in U.S. veterans with opioid use disorder

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ABSTRACT

Background: Telemedicine-delivered buprenorphine (tele-buprenorphine) can potentially increase access to buprenorphine for patients with opioid use disorder (OUD), especially during the COVID-19 pandemic, but we know little about use in clinical care.

Methods: This study was a retrospective national cohort study of veterans diagnosed with opioid use disorder (OUD) receiving buprenorphine treatment from the Veterans Health Administration (VHA) in fiscal years 2012–2019. The study examined trends in use of tele-buprenorphine and compared demographic and clinical characteristics in patients who received tele-buprenorphine versus those who received in-person treatment only.

Results: Utilization of tele-buprenorphine increased from 2.29% of buprenorphine patients in FY2012 ($n = 187$) to 7.96% ($n = 1352$) in FY2019 in VHA veterans nationally. Compared to patients receiving only in-person care, tele-buprenorphine patients were less likely to be male (AOR = 0.85, 95% CI: 0.73–0.98) or Black (AOR = 0.54, 95% CI: 0.45–0.65). Tele-buprenorphine patients were more likely to be treated in community-based outpatient clinics rather than large medical centers (AOR = 2.91, 95% CI: 2.67–3.17) and to live in rural areas (AOR = 2.12, 95% CI: 1.92–2.35). The median days supplied of buprenorphine treatment was 722 (interquartile range: 322–1459) among the tele-buprenorphine patients compared to 295 (interquartile range: 67–854) among patients who received treatment in-person.

Conclusions: Use of telemedicine to deliver buprenorphine treatment in VHA increased 3.5-fold between 2012 and 2019, though overall use remained low prior to COVID-19. Tele-buprenorphine is a promising modality especially when treatment access is limited. However, we must continue to understand how practitioners and patient are using telemedicine and how these patients' outcomes compare to those using in-person care.

1. Introduction

Opioid use disorder (OUD) is a debilitating illness associated with serious harms, including overdose and suicide (Bohnert et al., 2012; Igen et al., 2010; Larney et al., 2015; Park et al., 2016; Wilcox, Conner, & Caine, 2004). The most effective treatment for OUD is pharmacotherapy with the medications buprenorphine and methadone (Mattick, Breen, Kimber, & Davoli, 2014; Nielsen, Larance, & Lintzeris, 2017). Unlike methadone, buprenorphine can be prescribed by DEA-waivered

clinicians in an office-based setting and thus has been a focus of recent expansion efforts (Collins, Koroshetz, & Volkow, 2018; Wyse et al., 2018). Overall, pharmacotherapy remains greatly underused with less than a third of patients diagnosed with OUD receiving treatment in recent years (Lembke & Chen, 2016; Morgan, Schackman, Leff, Linas, & Walley, 2017; Saloner & Karthikeyan, 2015). Telemedicine, defined as synchronous videoconferencing between providers and patients in separate locations, is a treatment modality that can increase access and accessibility of treatment for chronic illnesses (Hill et al., 2010), but has

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been particularly underused (Grubbs, Fortney, Dean, Williams, & Godleski, 2015) and understudied in substance use disorder treatment (Lin et al., 2019). With the recent COVID-19 pandemic, there has been an unprecedented shift to telemedicine-delivered treatment across health care systems, with specific policy changes, including lifting restrictions under the Ryan Haight Online Pharmacy Consumer Protection Act of 2008, which has removed barriers to telemedicine-delivered buprenorphine (tele-buprenorphine; Lin, Fernandez, & Bonar, 2020). Given this shift in care, it is even more important for those in the field to understand potential impacts of tele-buprenorphine on patient utilization and outcomes.

We know little about tele-buprenorphine treatment, including the types of patients who are more likely to receive telemedicine-delivered versus in-person care and how treatment modality impacts treatment utilization and patient outcomes. A few studies have examined tele-buprenorphine care within a single clinic (Weintraub, Greenblatt, Chang, Himelhoch, & Welsh, 2018; Zheng et al., 2017) or through a series of cases (Brunet, Moore, Lendvai Wischik, Mattocks, & Rosen, 2020) and found similar substance-related outcomes in tele-buprenorphine patients compared to in-person (Zheng et al., 2017). The largest study to date examined telemedicine-delivered OUD treatment from providers located in large clinics to patients located in rural clinics in Ontario, Canada (Eibl et al., 2017). That study found greater retention among patients receiving telemedicine-delivered pharmacotherapy, though many of the patients were receiving tele-methadone treatment. No prior data, to our knowledge, describe the clinical characteristics of patients who received tele-buprenorphine and how tele-buprenorphine patients compared with patients who received in-person care with respect to both patients' characteristics and treatment utilization.

To understand recent trends in the use of this new delivery modality and compare patients who received tele-buprenorphine versus patients who received buprenorphine through usual in-person visits, we examined demographic and clinical characteristics of these two groups using data from fiscal years (FY) 2012 through 2019 of patients with OUD treated in the U.S. Veterans Health Administration (VHA). VHA is the largest addiction treatment provider in the United States (Wyse et al., 2018). Specifically, the aims of the study were to: 1) examine trends in utilization of tele-buprenorphine over time, 2) compare characteristics of patients who received tele-buprenorphine versus traditional in-person treatment, and 3) compare treatment utilization including length of buprenorphine treatment and utilization of adjunctive psychosocial treatments in patients who received tele-buprenorphine versus in-person treatment.

2. Methods

2.1. Study design and data source

The study obtained patient data from the VHA Corporate Data Warehouse (CDW). The VHA CDW is a national repository of electronic medical records, including diagnoses, treatment utilization, and pharmacy fills from all VHA patients across the United States. The Ann Arbor Veterans Affairs Institutional Review Board approved the study protocol.

2.2. Sample

We examined the cohort of all veterans nationally who had at least one VHA inpatient or outpatient encounter at any VHA facility with a diagnosis of OUD in fiscal year (FY) 2012 through FY 2018 (i.e., October 1, 2011, through September 30, 2018). The study included patients only if they had filled at least one buprenorphine prescription after OUD diagnosis. We examined treatment utilization for the one year period after, ending in September 30, 2019. The study assessed diagnoses of OUD using the International Classification of Disease (ICD-9 and ICD-

10) diagnosis codes (Appendix Table 1).

2.3. Measures

Receipt of buprenorphine was defined as any VHA pharmacy fill of oral buprenorphine medication. We calculated the total days supply of buprenorphine by summing across buprenorphine prescriptions for each patient and counted nonoverlapping days of buprenorphine fills from FY2012 to FY2019. Similar to prior studies (<https://pubmed.ncbi.nlm.nih.gov/32428386/>; Manhapra, Petrakis, & Rosenheck, 2017; Oliva, Harris, Trafton, & Gordon, 2012), we examined clinic "stop codes" in CDW data, which indicate the clinical setting or type of services received during a specific encounter with VHA providers, to determine receipt of psychotherapy visits for OUD treatment.

We defined tele-buprenorphine for OUD by first including veterans who were diagnosed with OUD who received at least one buprenorphine fill within one year after diagnosis of OUD (covering FY 2012 through FY 2019). Among those veterans, we identified individuals who received telemedicine-delivered buprenorphine treatment, defined by: 1) an outpatient telehealth visit identified using secondary stop codes (Appendix Table 2); 2) received during a visit for treatment of OUD; and 3) the name of the buprenorphine prescriber was the same as the clinician who provided the telehealth visit and occurred on the same date. Patients with any tele-buprenorphine visits during the study period were compared with patients who received buprenorphine only via in-person visits.

2.4. Covariates

Demographic characteristics examined included patients' age, sex, race, Hispanic ethnicity, rural/urban residence, and homelessness. We determined rural/urban status using patient zip code and defined by Rural-Urban Commuting Areas (RUCAs) geographic taxonomy ("USDA ERS - Documentation. 2010 Rural-Urban Commuting Area (RUCA) Codes," n.d.). The study team determined homelessness by utilization of homeless veteran services (see Appendix Table 3).

Patients receiving the majority of their care at a VHA medical center (VAMC; typically a major facility including a range of specialty services) versus VHA community-based outpatient clinics (CBOCs) are much more likely to receive buprenorphine treatment (<https://pubmed.ncbi.nlm.nih.gov/32428386/>), so we included a variable indicating whether the patient received >50% of their care in a VA medical center versus a CBOC. The research team identified additional psychiatric and substance use disorder diagnoses via ICD codes from inpatient and outpatient clinical encounters in the 12 months prior to the patient's first OUD diagnosis. Comorbid mental health diagnoses included psychotic disorders, PTSD, other anxiety disorders, depression, bipolar disorder, alcohol use disorder, stimulant use disorder, cannabis use disorder and other substance use disorders (see Appendix Table 4). The study included number of Elixhauser Comorbid conditions (in addition to OUD) to indicate overall burden of comorbid medical conditions (van Walraven, Austin, Jennings, Quan, & Forster, 2009).

2.5. Statistical analysis

We examined trends over time in the percentage of patients who received tele-buprenorphine treatment among all patients who received buprenorphine in that fiscal year. Patients could appear in multiple years in these trend analyses. We also examined the percentage of patients who received telemedicine-delivered psychotherapy among patients who received any buprenorphine treatment in each fiscal year and examined clinic locations where tele-buprenorphine was prescribed.

We then compared the characteristics of patients who received any tele-buprenorphine across the study period with patients who only received buprenorphine in-person. Using χ^2 tests, the research team compared the groups' baseline patient demographic and clinical

characteristics. Multivariable logistic regression was then used to examine differences in the demographic and clinical characteristics in patients adjusting for all covariates and also adjusting for year of OUD diagnosis. Finally, we described both in-person and telemedicine-delivered treatment utilization in this cohort, including differences in days supplied of buprenorphine and also examined telemedicine and in-person delivered psychotherapy for OUD. We chose to focus on these treatment characteristics descriptively without adjusting for covariates. Given that use of tele-buprenorphine is quite new, at least pre-COVID-19, a substantial selection effect is likely contributing to which patients' were being selected for tele-buprenorphine treatment.

3. Results

3.1. Patients with OUD receiving tele-buprenorphine

A total of 33,616 unique veterans with a diagnosis of OUD received buprenorphine treatment in the VHA from FY2012 to FY2019. Among these patients, a total of 2718 patients with OUD received any telemedicine-delivered buprenorphine treatment compared to 30,898 patients who received only in-person delivered buprenorphine. Utilization of tele-buprenorphine increased 3.5-fold over the study period, from 2.29% of buprenorphine patients in FY 2012 ($n = 187$) to 7.96% ($n = 1352$) in FY 2019 (see Fig. 1). Concurrent to increases in tele-buprenorphine, increases also occurred in telemedicine-delivered individual psychotherapy for patients receiving tele-buprenorphine, while telemedicine-delivered group psychotherapy remained relatively flat during this time period (see Fig. 2). Clinic settings where tele-buprenorphine was used included: substance use disorder clinics

(78.0% of all tele-buprenorphine encounters), mental health and PTSD clinics (21.1%), primary care (0.3%) and other clinics (0.7%).

3.2. Patient characteristics associated with telemedicine treatment

When comparing tele-buprenorphine to in-person buprenorphine patients, the tele-buprenorphine group had a higher proportion of patients in younger age groups, higher proportion of females, and a higher proportion of patients who were White (see Table 1). Tele-buprenorphine patients were also more likely to live in rural areas and were more likely to receive their care primarily in a CBOC compared to in-person patients. Tele-buprenorphine patients also had a higher prevalence of depressive disorders and anxiety disorders but lower prevalence of psychotic disorder, alcohol use disorder, stimulant use disorder, and cannabis use disorder compared to patients seen in-person.

In analyses adjusted for all covariates in Table 1, tele-buprenorphine patients were significantly less likely than patients receiving only in-person care to be male or to be Black. Also, compared to patients who received only in-person care, tele-buprenorphine patients were more likely to be treated in a CBOC, more likely to live in a rural area, and more likely to have depressive disorder, and less likely to have stimulant use disorder and cannabis use disorder (see Table 2).

3.3. OUD treatment utilization in patients using telemedicine versus in-person treatment

Last, we examined utilization of treatments comparing patients who received tele-buprenorphine versus those who only received buprenorphine treatment in-person. Patients who received tele-buprenorphine

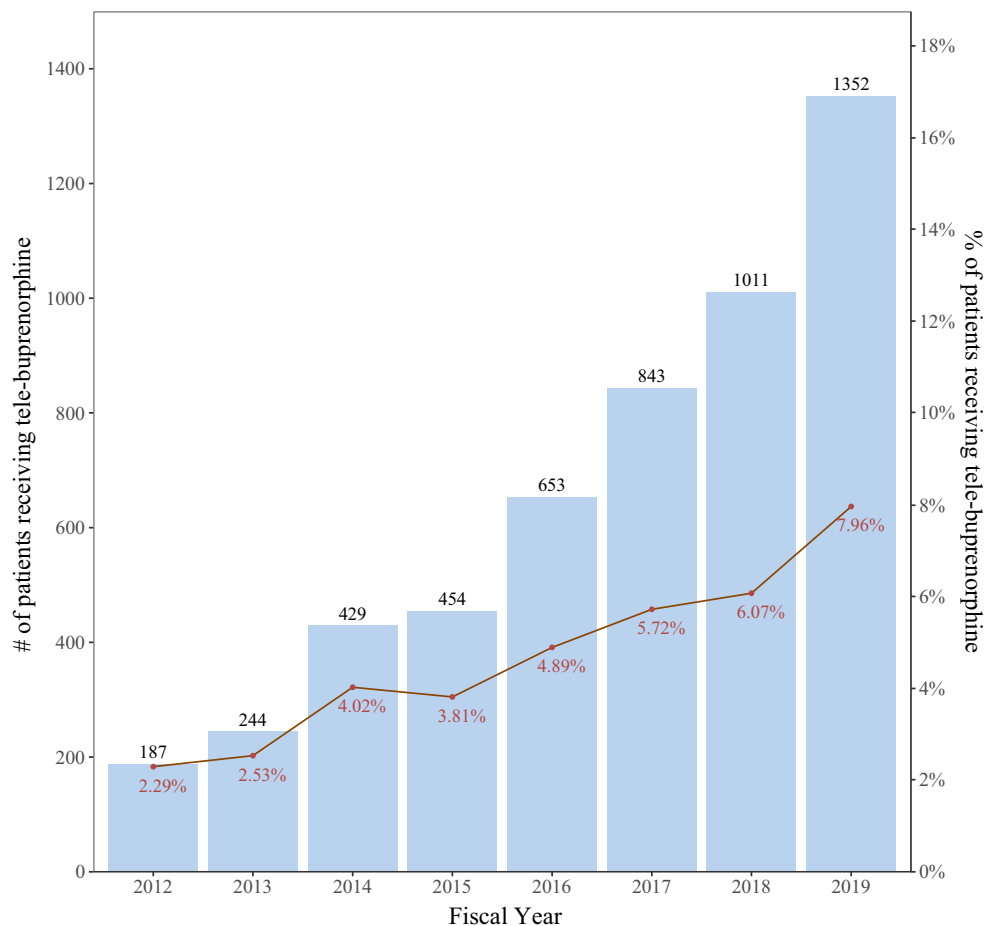


Fig. 1. Trends in patients receiving tele-buprenorphine for opioid use disorder in the VHA.

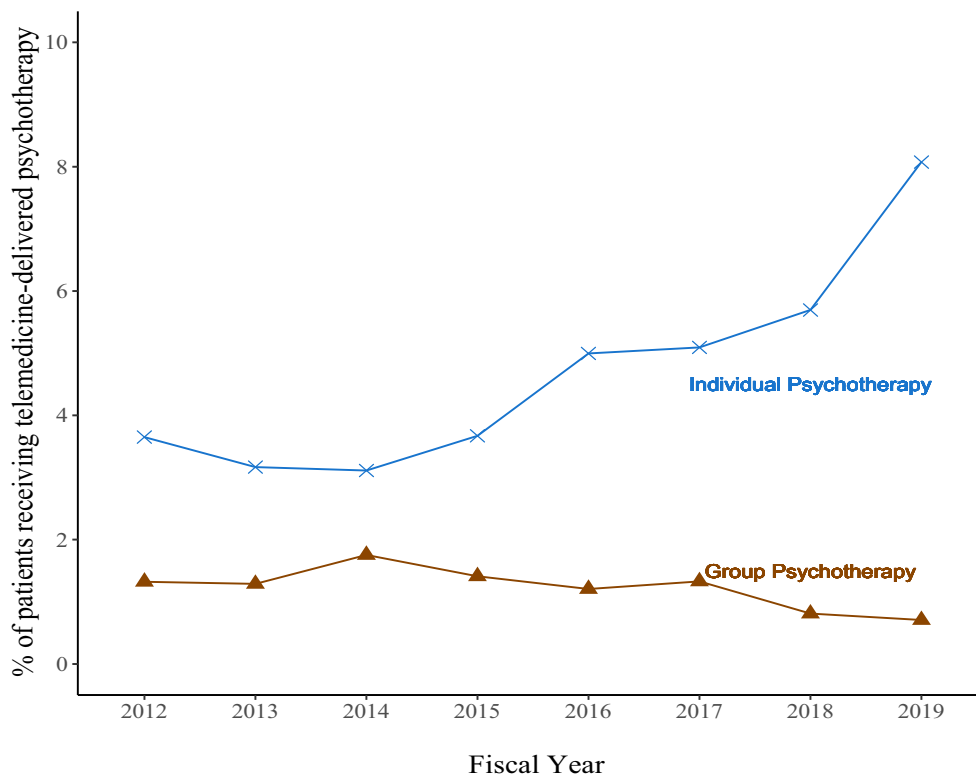


Fig. 2. Trends in percentage of patients receiving telemedicine-delivered psychotherapy among patients receiving buprenorphine in each fiscal year.

received a median of 39 (interquartile range [IQR]: 19, 70) buprenorphine treatment visits with 4 (IQR: 2, 13) of those being telemedicine visits. These frequencies are compared to a total of 20 (IQR: 6, 48) buprenorphine visits for patients who received in-person treatment. The median days supplied of buprenorphine treatment was 722 (IQR: 322, 1459) among the tele-buprenorphine patients compared to 295 (IQR: 67, 854) among patients who received only treatment in-person. Among patients who received tele-buprenorphine, the average number of psychotherapy treatment visits for OUD was 18 (IQR: 6, 40) with 1 (IQR: 0, 3) of those being telemedicine visits compared to 15 (IQR: 4, 39) psychotherapy treatment visits for those who received in-person treatment. Among patients receiving tele-buprenorphine, 2374 (87.3%) received treatment from a clinician in a VAMC while they were in a VHA clinic (Clinical Video Telehealth [CVT]) and 315 received tele-buprenorphine while they were located at home (VA Video Connect [VVC]).

4. Discussion

This study of veterans receiving OUD treatment in the VHA found substantial increases in use of tele-buprenorphine treatment from FY 2012 to FY2019, with 7.96% receiving any tele-buprenorphine visits among all patients receiving buprenorphine in FY2019. Patients who received tele-buprenorphine, as expected, were more likely to live in rural areas. However, in many other respects, patients who received tele-buprenorphine were similar to patients receiving in-person treatment with a high prevalence of comorbid physical and mental health conditions, as well as substance use disorders.

The few studies that have compared tele-buprenorphine patients to patients receiving traditional in-person care have found that retention on buprenorphine treatment was similar (Zheng et al., 2017). This current analysis adds to those prior results by showing patients receiving tele-buprenorphine are more likely to live in rural areas but the vast majority of tele-buprenorphine patients did not live in a rural area. This study also broadens the evidence-base by including multiple years of data from the largest national health care system delivering

buprenorphine care in the United States. Similar to a prior study of mostly patients receiving telemedicine-delivered methadone (Eibl et al., 2017), these results also indicate that patients receiving tele-buprenorphine stayed in treatment for longer than patients receiving in-person treatment. Retention on buprenorphine treatment is a critical outcome because longer retention is associated with numerous positive clinical outcomes including decreased mortality (Morgan et al., 2017; Norton et al., 2017; Sordo et al., 2017). Because tele-buprenorphine is a fairly new approach and relative outcomes are not well established, only more stable patients may be referred, so patients who stayed longer in treatment were more likely to receive tele-buprenorphine. However, telemedicine-delivered buprenorphine may also help patients stay in treatment longer due to increased accessibility of care. Randomized controlled trials should examine the impact of telemedicine care on treatment utilization and retention as well as substance-related outcomes. In addition, this was also the first study that examined real-world use of tele-buprenorphine in a large health care system that used different models of tele-buprenorphine; given that for many patients, telemedicine visits were a minority of total buprenorphine visits, future work should examine clinical decision-making around when telemedicine is used versus in-person, and how this affects patient retention.

These results are among the first to examine telemedicine-delivery of psychotherapy for substance use disorder treatment in real-world clinical settings throughout the United States. A few prior studies have piloted telemedicine-delivery of psychotherapy in patients receiving medications for OUD; those findings indicate patients find this modality of therapy delivery to be generally acceptable (King et al., 2009; King, Brooner, Peirce, Kolodner, & Kidorf, 2014). Here, we saw an increasing trend in telemedicine-delivered individual therapy for patients who received tele-buprenorphine along with relative stability in the lower levels of telemedicine-delivered group psychotherapy. In many ways, telemedicine-delivered psychotherapy is just as crucial for patients with substance use disorders given the lack of access to evidence-based forms of psychotherapy treatments for substance use disorders and comorbid mental health conditions in many parts of the United States. Also, the

Table 1
 Characteristics of patients receiving tele-buprenorphine compared with patients who received in-person buprenorphine (FY2012–2019).

Patient characteristics	Received tele-buprenorphine for OUD % (n)/mean (N = 2718)	In-person buprenorphine only % (n)/mean (N = 30,898)	Total % (n) (N = 33,616)	X ²	p-Value
Age				33.80	<0.0001
18–29	2.17% (59)	2.49% (769)	2.46% (828)		
30–50	54.56% (1483)	48.82% (15084)	49.28% (16567)		
51–64	26.75% (727)	29.42% (9089)	29.20% (9816)		
≥65	16.52% (449)	19.28% (5956)	19.05% (6405)		
Female	8.94% (243)	7.29% (2251)	7.42% (2494)	9.96	0.0016
Race					
White	87.05% (2366)	80.47% (24864)	81.00% (27230)	146.30	<0.0001
Black	5.41% (147)	13.02% (4024)	12.41% (4171)		
Other/multi-race	2.80% (76)	1.72% (530)	1.80% (606)		
Unknown	4.75% (129)	4.79% (1480)	4.79% (1609)		
Ethnicity					
Hispanic	4.60% (125)	5.51% (1701)	5.43% (1826)	6.11	0.047
Non-Hispanic	92.13% (2504)	91.73% (28342)	91.76% (30846)		
Other/Unknown	3.27% (89)	2.77% (855)	2.81% (944)		
Homeless	15.34% (417)	18.82% (5814)	18.54% (6231)	19.97	<0.0001
Care location					
VAMC	38.45% (1045)	66.75% (20624)	64.46% (21669)	883.85	<0.0001
CBOC	49.30% (1340)	27.48% (8491)	29.25% (9831)		
Other/Unknown	12.25% (333)	5.77% (1783)	6.29% (2116)		
Residence					
Urban	75.97% (2065)	86.84% (26833)	85.97% (28898)	310.94	<0.0001
Rural	21.60% (587)	10.42% (3219)	11.32% (3806)		
Other/Unknown	2.43% (66)	2.74% (846)	2.71% (912)		
Depressive disorder	57.58% (1565)	52.80% (16313)	53.18% (17878)	22.95	<0.0001
Bipolar disorder	10.01% (272)	9.68% (2992)	9.71% (3264)	0.29	0.5846
PTSD	34.51% (938)	33.99% (10501)	34.03% (11,439)	0.30	0.5799
Other anxiety disorder	34.18% (929)	31.31% (9673)	31.54% (10602)	9.55	0.0020
Psychotic disorder	3.90% (106)	5.33% (1648)	5.22% (1754)	10.38	0.0013
Alcohol use disorder	30.94% (841)	34.02% (10512)	33.77% (11353)	10.59	0.0011
Stimulant use disorder	15.49% (421)	22.06% (6815)	21.53% (7236)	63.78	<0.0001
Cannabis use disorder	10.56% (287)	14.20% (4389)	13.91% (4676)	27.72	<0.0001
Other substance use disorder	34.18% (929)	35.62% (11007)	35.51% (11936)	2.27	0.1315
Number of Elixhauser comorbid conditions					
0	19.5% (530)	20.25% (6258)	20.19% (6788)	8.46	0.0146
1	26.01% (707)	23.54% (7273)	23.74% (7980)		
≥2	54.49% (1481)	56.21% (17367)	56.07% (18848)		

majority of patients with OUD have additional mental health and substance use disorders (Lin, Bohnert, et al., 2020), where psychotherapy may be a key treatment option. However, psychotherapy treatment often requires frequent treatment visits, commonly weekly therapy sessions, which is particularly challenging for the this treatment populations, where transportation barriers and competing demands are common. Telemedicine-delivery of psychotherapy, especially to patients at home, may minimize the barriers (e.g., transportation) and burdens (e.g., time away from work and family responsibilities) of office-based treatment, thus increasing reach and accessibility of existing empirically based psychotherapy treatment for substance use disorders. Future research should seek to understand overall effectiveness of telemedicine-delivered psychotherapy and which patients may benefit from this modality.

This study also identified important differences between tele-buprenorphine patients and patients who received only in-person care. Tele-buprenorphine patients were significantly less likely to be Black even after controlling for other sociodemographic differences. Several recent studies examining telemedicine use broadly post-COVID-19 have also begun to find differences in race, ethnicity, and other demographic characteristics, and suggest that numerous contributors, including differences at the patient, healthcare system, and community levels, are at play (Chunara et al., 2021; Eberly et al., 2020). Specifically, research should determine whether Black veterans are more likely to be treated in facilities with a low propensity to deliver tele-buprenorphine and/or whether Black veterans are less likely to be offered and/or engage in tele-buprenorphine than White veterans treated within the same facility. It will be crucial to continue to investigate contributors to any disparities

in treatment use and to consider additional interventions to address disparities that may persist with the transition to virtual care. In addition to demographic differences, comorbid mental health disorders were highly prevalent, with comorbid depression even more prevalent in patients who received tele-buprenorphine. Unfortunately, recent data have also shown that patients with depression and comorbid substance use disorders are less likely to receive high quality depression treatment (Coughlin, Pfeiffer, Ganoczy, & Lin, 2020). Thus, it may be particularly important to consider how to address these comorbid conditions within telemedicine models, incorporating both medication and psychotherapy treatment. Telemedicine hub models, in which clinicians with different backgrounds located in a hub site who can treat patients located in distant clinics or their homes, are promising (Brunet et al., 2020). Although, ideally, clinics would be able to deliver the array of mental health and substance use disorder medication and psychotherapy treatments via telehealth, a range of delivery models likely will be needed to meet patients' needs.

Examining telemedicine delivery of treatment for vulnerable patients, including those with OUD is particularly important in the current context of the COVID-19 pandemic. Much of chronic care management has shifted dramatically from in-person care to both telemedicine and telephone-delivered treatment. For buprenorphine treatment, major changes have taken place in federal guidelines from the DEA and SAMHSA to lower barriers to tele-buprenorphine due to specific concerns about decreasing access to treatment in this patient population due to social distancing (Lin, Fernandez, & Bonar, 2020). The impact of these changes in federal guidelines not only on the uptake of tele-buprenorphine but also on retention in care and other patient

Table 2
Logistic regression examining patient characteristics associated with tele-buprenorphine compared to in-person buprenorphine treatment.

Characteristic	AOR comparing tele-buprenorphine to in-person
Age	
18–29	ref
30–50	1.18 (0.90,1.56)
51–64	1.11 (0.83,1.47)
65 & over	1.05 (0.78,1.41)
Male	0.85 (0.73,0.98)
Race	
White	ref
Black	0.54 (0.45,0.65)
Other/multi-race	1.44 (1.12,1.86)
Unknown	0.88 (0.71,1.09)
Ethnicity	
Hispanic	ref
Non-Hispanic	1.13 (0.93,1.37)
Other/Unknown	1.38 (1.01,1.86)
Homeless	
Yes	0.95 (0.85,1.07)
Care location	
VAMC	ref
CBOC	2.91 (2.67,3.17)
Other/Unknown	3.78 (3.30,4.33)
Residence	
Urban	ref
Rural	2.12 (1.92,2.35)
Other/Unknown	1.12 (0.86,1.45)
Depressive disorder	1.25 (1.12,1.39)
Bipolar disorder	1.12 (0.97,1.28)
PTSD	0.95 (0.87,1.03)
Other anxiety disorder	1.03 (0.94,1.13)
Psychotic disorder	0.83 (0.68,1.02)
Alcohol use disorder	1.00 (0.90,1.10)
Stimulant use disorder	0.81 (0.72,0.91)
Cannabis use disorder	0.75 (0.66,0.86)
Other substance use disorders	1.03 (0.94,1.13)
Number of Elixhauser comorbid conditions	
0	ref
1	1.05 (0.92,1.20)
≥2	0.99 (0.85,1.16)
OUD diagnosis year	
2011	ref
2012	1.04 (0.92,1.18)
2013	0.92 (0.80,1.06)
2014	1.03 (0.89,1.19)
2015	0.97 (0.83,1.13)
2016	0.89 (0.76,1.04)
2017	0.87 (0.74,1.03)
2018	0.97 (0.80, 1.16)

outcomes will be important to study. In addition, all prior studies to date of tele-buprenorphine examined care delivery of clinicians located at one clinic location to patients at a rural clinic, but much of the shift since COVID-19 has occurred toward tele-buprenorphine to patients at home. Data from this study are the first to include patients receiving tele-buprenorphine in an at-home setting in light of recent VHA efforts to expand telemedicine treatment to veterans at home. However, future studies should assess patients' experiences and outcomes, especially because other concurrent changes are likely, including reduced ability to obtain urine toxicology to monitor for relapse and increased psychosocial stressors for patients due to COVID-19. Findings that tele-buprenorphine is associated with improved patient outcomes would suggest the federal guidelines lowering barriers to tele-buprenorphine, currently in effect during the public health emergency, should become permanent. Alternatively, if the quality of care and outcomes of treatment are significantly worse for tele-buprenorphine compared to in-person care, identifying novel strategies to overcome the differences in care (e.g., remote monitoring tools) would be a critical next step.

This study had several important limitations. The study used VHA

administrative data focusing on veterans with OUD. Although this is an important population with similar prevalence of OUD compared to the non-veteran population in the United States (Rhee & Rosenheck, 2019), some veterans obtain medications and other treatments outside of the VHA, which these data did not capture. Some of this care outside the VHA may include receipt of tele-buprenorphine, but this is likely to be infrequent given the progress the VHA has made on telehealth in general and low uptake of telemedicine-delivered OUD care in the community (Huskamp et al., 2018). As noted, patients who are offered tele-buprenorphine may differ in important clinical ways from those offered in-person buprenorphine treatment, and that may affect their ongoing engagement in care. Ideally, clinical trials in which OUD patients are randomly assigned to telemedicine versus in-person care only would allow for comparison of treatment engagement and outcomes without these potential confounds. Finally, the population of veterans with OUD is predominantly male, which may limit generalizability of these findings.

Especially with the recent, rapid implementation of telemedicine services in response to the COVID-19 pandemic, a pressing need exists to understand how telemedicine can be utilized to deliver buprenorphine treatment for the vulnerable population of patients with OUD and also how this form of care delivery impacts patients' outcomes. Although efficacy of telemedicine is generally compared to in-person care, ongoing access barriers to in-person treatment—particularly in the era of the COVID-19 pandemic—may mean that telemedicine actually increases engagement and utilization of buprenorphine, a life-saving treatment. Tremendous interest exists in understanding what telemedicine delivery of treatment looks like for this patient population, especially related to possible treatment disparities and unintended consequences with respect to retention in care. This large, multiple-year study from the pre-COVID-19 era provides some reassurance about delivery of buprenorphine treatment via telemedicine and can serve as an important comparison of utilization prior to loosening telemedicine barriers since COVID-19. However, a tremendous need remains for additional studies to understand variation in different tele-buprenorphine models and barriers and facilitators to implementing these models, and approaches to complex patients with OUD.

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CRediT authorship contribution statement

LAL: Funding acquisition, Data curation, Project administration, Writing – original draft, Writing – review & editing; JF: Conceptualization, Writing – review & editing ASB: Funding acquisition, Writing – review & editing LNC: Writing – review & editing, LZ: Formal analysis, Methodology, Writing – review & editing JDP: Conceptualization, Writing – review & editing.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jsat.2021.108492>.

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