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Long-term Retention in Office Based Opioid Treatment with Buprenorphine

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Abstract

Background—Guidelines recommend long-term treatment for opioid use disorder with buprenorphine; however, little is known about patients in long-term treatment. The aim of this study is to examine the prevalence and patient characteristics of long-term treatment retention (1 year) in an Office Based Opioid Treatment (OBOT) program with buprenorphine.

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Methods—This is a retrospective cohort study of adults on buprenorphine from January 2002 to February 2014 in a large urban safety-net primary care OBOT program. The primary outcome was retention in OBOT for at least one continuous year. Potential predictors included age, race, psychiatric diagnoses, hepatitis C, employment, prior buprenorphine, ever heroin use, current cocaine, benzodiazepine and alcohol use on enrollment. Factors associated with 1 year OBOT retention were identified using generalized estimating equation logistic regression models. Patients who re-enrolled in the program contributed repeated observations.

Results—There were 1605 OBOT treatment periods among 1237 patients in this study. Almost half, 45% (717/1605), of all treatment periods were 1 year and a majority, 53.7% (664/1237), of patients had at least one 1 year period. In adjusted analyses, female gender (Adjusted Odds Ratio [AOR] 1.55, 95% CI [1.20, 2.00]) psychiatric diagnosis (AOR 1.75 [1.35, 2.27]) and age (AOR 1.19 per 10 year increase [1.05, 1.34]) were associated with greater odds of 1 year retention. Unemployment (AOR 0.72 [0.56, 0.92]), Hepatitis C (AOR 0.59 [0.45, 0.76]), black race/ethnicity (AOR 0.53 [0.36, 0.78]) and Hispanic race/ethnicity (AOR 0.66 [0.48, 0.92]) were associated with lower odds of 1 year retention.

Conclusions—Over half of patients who presented to Office Based Opioid Treatment with buprenorphine were ultimately successfully retained for 1 year. However, significant disparities in one-year treatment retention were observed, including poorer retention for patients who were younger, black, Hispanic, unemployed, or with hepatitis C.

Keywords

buprenorphine; Office Based Opioid Treatment (OBOT); substance users; patient dropout; health disparities

1.0 Introduction

Buprenorphine is an effective treatment for opioid use disorder (OUD) but short-term medication alone is not sufficient for long-term recovery.(Kraus et al., 2011; Weiss et al., 2015) According to the American Society of Addiction Medicine the standard of care for patients with OUD is “long-term or even lifetime medication use.”(Kraus et al., 2011) However, in most studies less than two-thirds of patients who enroll in Office Based Opioid Treatment (OBOT) with buprenorphine stay in treatment for greater than six months.(Alford et al., 2011; Gryczynski et al., 2014; Kakko, Svanborg, Kreek, & Heilig, 2003)

Previous research delineated patient-specific factors associated with early (six months) disengagement from OBOT, including a patient’s inability to adhere to clinic structure (Gryczynski et al., 2014; Tkacz, Severt, Cacciola, & Ruetsch, 2012) and continued substance use.(Fareed et al., 2014; Ferri, Finlayson, Wang, & Martin, 2014; Hser et al., 2014) Illicit buprenorphine use at OBOT enrollment is associated with increased short-term retention in buprenorphine treatment.(Alford et al., 2011; Cunningham, Roose, Starrels, Giovanniello, & Sohler, 2013) Once enrolled in OBOT, illicit benzodiazepine(Ferri et al., 2014) and illicit opioid (Fiellin et al., 2008; Stein, Patricia Cioe, & Friedmann, 2005) use early in treatment are both predictive of short-term disengagement. Cocaine use has also been associated with short-term disengagement (Gryczynski et al., 2014; Sullivan et al.,

2010) although not consistently.(Schottenfeld RS, Pakes JR, Oliveto A, Ziedonis D, & Kosten TR, 1997)

However, little is known about those who leave treatment after more than a year. Patients in long-term (1 year) treatment may be distinct from those retained short-term. For example, in one such small study of buprenorphine patients (n=53) in treatment for over 2 years, 91% of urine samples had no evidence of illicit opioid use.(Fiellin et al., 2008) Such data suggests that long-term OBOT patients may be at reduced risk for opioid relapse. Despite possible differences between long-term and new patients, guidelines do not differ for managing patients based on program tenure.(Kraus et al., 2011; Substance Abuse and Mental Health Services Administration, 2005) As buprenorphine treatment is growing, from 48,000 prescriptions in 2003(Mark, Kassed, Vandivort-Warren, Levit, & Kranzler, 2009) to 9.3 million prescriptions in 2012,(Office of Diversion Control, Drug & Chemical Evaluation Section, Drug Enforcement Administration, 2013) understanding long-term treatment retention and risk factors for disengagement will facilitate more effective OUD treatment. To pursue this objective, we examined a large cohort of patients treated with buprenorphine within a twelve-year period.

2.0 Materials and methods

This retrospective cohort study (DROP [Disenrollment and Re-engagement in an OBOT Program]) examines patients treated with buprenorphine at Boston Medical Center's OBOT Program from January 1, 2002 to February 28, 2014. The primary study aim was to describe patient characteristics associated with OBOT treatment retention for at least one year. In additional exploratory analyses, we describe reasons for disengagement.

2.1 Study setting

This OBOT program, established in 2002 at a large urban safety-net hospital, uses a nurse care manager to promote collaborative care.(Alford et al., 2011) a model which has been disseminated to community health centers and is known as the Massachusetts Model. (Substance Abuse and Mental Health Services Administration, 2014; LaBelle, Han, Bergeron, & Samet, 2016) Patients enrolled in the OBOT program receive primary care and buprenorphine treatment integrated within the Primary Care Clinic. Patients are typically seen weekly by a nurse care manager for the first month and every 3 months by their buprenorphine prescriber, with intervals based on clinical stability. Weekly substance use counseling is required, but the majority of patients receive counseling outside of Boston Medical Center. Patients in the OBOT program during some of the study period (years 2012 to 2014) did have enhanced access to psychiatry services within the primary care clinic, however this was a limited resource, and the majority of patients received psychiatric care elsewhere. Utilization and location of behavioral health services was not consistently documented and so these variables were not examined in this study.

2.2 Study population

This study included all men and women age 18 or older who entered treatment in the OBOT clinic prior to February 28, 2013, allowing at least one year follow up for all participants.

This clinic does not include pregnant patients. All patients completed the standard clinical intake process and successfully completed buprenorphine induction.(Alford et al., 2011)

2.3 Data sources and collection

Data, included basic demographics, medical diagnoses and laboratory tests, were initially abstracted from the Electronic Medical Record (EMR) at with the assistance of the hospital's Clinical Data Warehouse.(S. Murphy, 2009) Race/ethnicity was categorized as white, black, Hispanic or other, during patient registration based on patient self-report in pre-specified categories as required by state law.(Jorgensen, Thorlby, Weinick, & Ayanian, 2010) When data were incomplete or lacked sufficient detail, two trained reviewers (D.H. and H.K.) and a physician (Z.W.) manually reviewed de-identified clinic notes. Manual chart review was required to obtain more complete details regarding substance use history, prior OUD treatment, and reasons for disengaging from OBOT.

2.4 Outcome

The primary outcome was at least one year of continuous OBOT with buprenorphine. Patients were allowed to have multiple engagement periods with the OBOT program. The start of the treatment period was the date of completion of buprenorphine induction as documented by receipt of the first buprenorphine prescription. Disengagement was designated as when the patient 1) had no active buprenorphine prescription for 60 days and 2) did not make any clinic contact for 60 consecutive days. The disengagement date was the last day of an active prescription or clinic contact, whichever was later.

One continuous year of treatment was defined as a period in which the individual was in treatment for at least 365 days, as long as any gap in care was less than 60 days. A new treatment period began with a new buprenorphine induction prescription. Treatment periods of at least one continuous year were designated “ 1 year retention” and patients with such retention were designated “OBOT veterans”.

Additional exploratory analyses were performed looking at factors associated with a 2 year treatment period. For the 2 year treatment period analyses we further restricted our inclusion criteria to only include patients who entered treatment in the OBOT clinic prior to February 28, 2012 to allow for at least 2 years of follow-up.

2.5 Reasons for disengagement

After the disengagement date was identified, the research associates (H.K., D.H.) and primary investigator (Z.W.) reviewed the three de-identified OBOT or Primary Care clinic notes immediately prior to the disengagement date and the three de-identified notes immediately after the disengagement date, if available, to elucidate the reason treatment ended. Reasons for disengagement were coded into at least one of the eleven possible categories, with multiple reasons allowed for a single treatment period. The final eleven categories were iteratively refined by the research team. Reasons were coded based on content analysis, using existing theory from prior work,(Alford et al., 2011; Fingerhoo, King, Brooner, & Rastegar, 2014; Gryczynski et al., 2014) clinical knowledge of the research team and reasons listed for termination of treatment traditionally reported to the

state Department of Public Health's Bureau of Substance Abuse Services.(Bureau of Substance Abuse Services, 2012) (Table 3)

2.6 Statistical Analyses

2.6.1 Descriptive Statistics—Descriptive statistics were obtained of patient characteristics using proportions for categorical variables and means (standard deviation) or medians (interquartile range) for continuous variables, as appropriate. Proportions and 95% confidence intervals were calculated for the primary outcome of interest (1 year of continuous treatment) and the proportion of patients with each stated reason for leaving treatment. The potential predictors, all assessed at initial enrollment, included the following: age, gender, race/ethnicity (white, black, Hispanic and other), completion of high school level of education, employment, Hepatitis C (HCV) antibody status, presence of psychiatric diagnoses on the problem list, history of heroin use, history of prior buprenorphine treatment and current use of any cocaine, alcohol or illicit benzodiazepines based on self-report on admission to the clinic. Descriptive bivariate comparisons of patient characteristics at enrollment for OBOT veterans (ever achieved 1 year of treatment) versus those who were not were conducted in preliminary analyses using chi-square tests, t-tests and Wilcoxon-tests.

2.6.2 Multivariable Regression Models—Unadjusted and adjusted generalized estimating equations (GEE) logistic regression models were used to identify factors associated with the outcome of “one year or more treatment retention”. As some patients contributed more than one treatment period, the GEE was used to account for the correlation due to the repeated measurements. The GEE models were fit using an independence working correlation matrix and results are reported using the empirical variance estimator. Prior to regression analyses, Spearman correlation coefficients were calculated between independent variables and no pair of variables had a correlation >0.40. Potential predictors that were significant in bivariate analyses (p<0.10) were then included in a final multivariable model along with age (known from the literature to be associated with short-term treatment retention) and the potential confounders calendar year and the number of treatment periods the patient had experienced up to and including the current observation (ranging from 1st to 4th). Calendar year (categorized as: 2003 to 2007 to 2008 to 2010 and 2011 to 2014) was included in multivariable models given to account for possible secular trends and changes in the clinic. All available data was included in the repeated measures analyses. An additional sensitivity analysis was performed using only the first OBOT treatment period for each patient. The above model was also fit for the exploratory outcome of “two years or more of continuous treatment” for any given engagement.

2.6.3 Reasons for Disengagement—The reasons for disengagement were described for both the treatment periods of 1 year and those less than a year and compared using unadjusted GEE logistic regression models to account for the correlated data. Due to the exploratory nature of these analyses, no adjustments were made for multiple comparisons.

All analyses were completed using SAS 9.3 software (Cary, NC). The Boston University Institutional Review Board approved this study.

3.0 Results

3.1 Sample characteristics

During the 12-year study period, 1237 patients entered the OBOT program. The majority of patients were male (61.4%), of white race/ethnicity (68.2%), unemployed (64.2%), and had completed high school (64.3%). In terms of medical characteristics, 66.0% had any psychiatric diagnosis and 58.7% had positive Hepatitis C (HCV) antibody. The mean buprenorphine dose was 16mg per day, mean age of first opioid use was 22 years and age of first OBOT enrollment was 38 years. (Table 1) The median number of unique engagement periods with OBOT was 1 (range 1-5) and the median length of each patient's longest engagement period was 413 days (Interquartile Range 145, 1189).

Of the 1237 patients who entered OBOT, 53.7% (664/1237) ever remained in OBOT at any point for a continuous year or more and were classified as "OBOT veterans." Among those with sufficient follow-up time, 40.6% (469/1156) of patients ever remained in OBOT for a continuous two year period or longer, 23.6% (155/652) of patients for 5 years or more and 5.2% (3/58) of patients for a continuous 10 year period. (Table 1)

3.2 Primary Outcome: Treatment Retention 1 Year

Among the 1237 patients, 1605 OBOT treatment periods occurred. About half, (45.7% [717/1605]) of all treatment periods resulted in 1 year retention in OBOT. In adjusted GEE analyses based on 1345 complete observations, older age (AOR 1.19 per 10 year increase [1.05, 1.34]), female gender (Adjusted Odds Ratio [AOR] 1.55, 95% CI [1.20, 2.00]) and psychiatric diagnosis (AOR 1.75 [1.35, 2.27]) were associated with greater odds of 1 year retention.

Black (AOR 0.53 [0.36, 0.78]) and Hispanic (AOR 0.66 [0.48, 0.92]) race/ethnicity, compared to white, unemployment (AOR 0.72 [0.56, 0.92]), HCV positive (AOR 0.59 [0.45, 0.76]) were associated with lower odds of 1 year retention. Any alcohol use (AOR 0.88 [0.63, 1.23]), cocaine use (AOR 0.86 [0.61, 1.22]) and history of heroin use (AOR 0.90 [0.61, 1.32]) did not appear to be associated with retention. In terms of the covariates in the model, treatment periods starting in the year 2011 or later (AOR 0.62 [0.42, 0.90]) and the patient's second (AOR 0.39 [0.28, 0.53]) or third (AOR 0.34 [0.18, 0.64]) treatment period with OBOT were less likely to be greater than one year. The results were similar in the sensitivity analysis using only the first OBOT treatment period for each patient. (Table 2)

3.3 Retention for 2 Years

In adjusted GEE analyses, the factors associated with 2-year treatment retention were similar to those for 1-year treatment retention (female gender, psychiatric diagnoses and older age). Similarly, factors associated with decreased odds of any given treatment period lasting 2 years were similar to 1-year findings (unemployment, HCV positive and Hispanic race/ethnicity). (Table 2)

3.4 Reasons for disengagement

The most common reason for disengagement among all treatment periods was Relapse (32.6%), although Relapse appeared to be less common among treatment periods ≥ 1 year compared to the <1 year periods (23.3% vs. 40.1%, $p<0.0001$). The ≥ 1 year treatment periods appeared less likely to end due to Legal Issues (2.8% vs. 4.7%, $p=0.04$) or Clinic Problems (7.3% vs. 11.7%, $p=0.003$). No patients disengaged due to Death, according to the medical record. (Table 3)

4.0 Discussion

In this 12-year study of patients on buprenorphine in a single well-established OBOT program, over half of the patients remained in treatment for at least one continuous year. Achieving OBOT veteran status is important as there are significant benefits associated with remaining on buprenorphine for at least one year, including decreased opioid use.(Hser et al., 2016) as well as decreased hospitalizations and emergency department visits.(Lo-Ciganic et al., 2016) Additionally, patients in recovery from heroin use for at least one year report improved quality of life.(Best et al., 2012)

Black and Hispanic race/ethnicity were each associated with poorer treatment retention in this study compared to white race, consistent with past findings that minorities are less likely to engage in substance use care(Bernstein et al., 2005) and less likely to be retained in substance use treatment of any kind.(McCaul, Svikis, & Moore, 2001) including buprenorphine treatment.(Hser et al., 2014) Understanding and addressing this disparity in outcomes for minority patients who are affected by the opioid epidemic must become an addiction treatment priority.

Prior work has found that female patients are less likely to engage in substance use treatment and also face unique barriers to entry, including lack of childcare, concerns about losing custody of their children and difficulty accessing care while pregnant.(Greenfield et al., 2007; Tuchman, 2010) Despite these barriers, in this study, female patients had increased long-term treatment retention. As others have suggested, female patients may both gain more benefit from and more easily accommodate to the structure of a substance use clinic. (Öhlin, Fridell, & Nyhlén, 2015) This finding about female advantage for OBOT >1 year retention is consistent with work on short-term treatment retention.(Burns et al., 2015; Öhlin et al., 2015) While women may have better retention than men in OBOT, much remains to be done to overcome the particular stigma and barriers for women to engage in care in the first place.

As in previous studies, older age was associated with longer treatment engagement(Gryczynski et al., 2014; Hser et al., 2014) as was being employed,(McCaul et al., 2001; Stein et al., 2005) likely a marker of socioeconomic stability. Future interventions to assist with treatment retention may include employment assistance to help patients engage in work in an effort to maintain recovery.

Additionally, our finding of an increased odds of ≥ 1 year treatment retention for patients with a psychiatric diagnosis warrants additional exploration. Traditionally it has been viewed

that psychiatric co-morbidities, especially those that are poorly controlled, lead to worse opioid use disorder treatment outcomes.(Dausey & Desai, 2003; Kessler et al., 1994; Kraus et al., 2011; Savant et al., 2013) However some newer work, focused specifically on response to buprenorphine, has begun to challenge this idea. Research on 12-week buprenorphine treatment outcomes has shown positive associations between a lifetime diagnosis of depression and decreased opioid use; (Dreifuss et al., 2013) another study showed that the presence of any psychiatric diagnosis was associated with a significantly increased odds of achieving abstinence from opioids at 12 weeks, even independent of receiving treatment for the psychiatric condition.(Griffin et al., 2014)

Buprenorphine may have some antidepressant properties which could explain this relationship between psychiatric co-morbidities and improved buprenorphine treatment outcomes.(Bodkin, Zornberg, Lukas, & Cole, 1995; Dreifuss et al., 2013) Additionally patients with more severe psychiatric co-morbidities may be more highly motivated to obtain medical treatment in general and benefit more from the structure and support of the OBOT setting(Gelkopf, Weizman, Melamed, Adelson, & Bleich, 2006; Griffin et al., 2014; Rounsaville BJ & Kleber HD, 1985) even independent of receiving specific psychiatric care. (Saunders et al., 2015) One study found that among patients with depression and substance use disorder, simply the referral to substance use treatment significantly improved depression symptoms.(Chan, Huang, Bradley, & Unützer, 2014) Additionally, as patients are seen monthly in OBOT, there is ample opportunity to identify psychiatric comorbidities and link patients to psychiatric care.

Although the presence of psychiatric comorbidities was associated with increased odds of long-term treatment retention, this finding was not generalizable to all medical comorbidities. In this study patients who were HCV antibody positive were less likely to be retained for a year or more. This is consistent with the findings of a study on short-term buprenorphine treatment, showing that HCV antibody positive patients were less likely to be opioid abstinent.(S. M. Murphy, Dweik, McPherson, & Roll, 2015)

In this study, patient use of buprenorphine prior to OBOT was not significantly associated with increased odds of a year-long retention, in contrast to some prior work.(Alford et al., 2011; Cunningham et al., 2013) Thus while prior exposure to buprenorphine may aid short-term retention, this may not be as important a factor on long-term retention. Additionally, patients appeared to have lower odds of a treatment period of 1 year on their second or third engagement, likely signaling that patients who struggled to remain in OBOT on their first attempt continued to struggle on subsequent enrollments.

To better understand patients' treatment trajectory we attempted to capture the reasons for disengagement to the extent possible in a retrospective chart review. It was notable that relapse appeared to be a less common reason for disengagement among 1 year treatment periods compared to those shorter periods. Similar to previous studies approximately a third (30.6%) of treatment periods ended for unknown reasons.(Fiellin et al., 2008; Hser et al., 2014)

4.1 Strengths and Limitations

This study has several limitations. It is a single site retrospective study which has potential to limit generalizability, although the nurse care manager Massachusetts Model (LaBelle et al., 2016; Substance Abuse and Mental Health Services Administration, 2014) is a leading model of buprenorphine OBOT delivery. Some variables, especially reasons for disengagement, had missing data. Additionally, while none of the patients had death documented in the medical record, this was not verified by searching any additional databases. Nonetheless, the large number of patients, long follow-up time and wide range of variables offer a unique perspective on long-term buprenorphine treatment outcomes.

5.0 Conclusions

Although over half of all patient presentations initiating buprenorphine to address an opioid use disorder were able to establish and maintain long-term (1 year) treatment in OBOT, specific characteristics can help identify patients who will become “OBOT veterans,” thus making this determination is not simply a flip of a coin. Black and Hispanic race/ethnicity, younger age, hepatitis C antibody positive status and lack of employment were all associated with lower odds of long-term retention. Additional research and interventions are needed to address potentially modifiable factors identified in this study, to increase long-term engagement in this lifesaving treatment. Possible future interventions include ensuring culturally sensitive care, treating hepatitis C, and employment assistance to facilitate long-term continuous care for all patients.

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Highlights

- Long-term (1 year) retention in office-based buprenorphine treatment is common
- Significant disparities exist in buprenorphine treatment retention
- Lower retention among Black, Hispanic, unemployed or hepatitis C positive patients
- Higher retention among patients who were female, older or had a psychiatric diagnosis

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Table 1

Bivariate Analyses of Baseline Characteristics of OBOT Patients over a Twelve-Year Study Period (N= 1237)

Demographics	Total (N =1237) N (%) or mean (SD)	Patients With 1 Year Retention (N=664) N (%) or mean (SD)	Patients With <1 Year Retention (N=573) N (%) or mean (SD)	p-value
Age at Enrollment, years (N =1222)	38 (11)	38 (11)	38 (11)	0.76
Female (N =1222)	472 (38.6%)	295 (44.4%)	177 (31.7%)	<.0001
Race/Ethnicity (N = 1203)				<.0001
White	821 (68.2%)	486 (74.0%)	335 (61.4%)	
Black	179 (14.9%)	75 (11.4%)	104 (19.0%)	
Hispanic	187 (15.5%)	86 (13.1%)	101 (18.5%)	
Other	16 (1.3 %)	10 (1.5%)	6 (1.1%)	
High school/GED or Higher (N = 986)	634 (64.3 %)	391 (65.9%)	243 (61.8%)	0.50
Unemployed (N = 1177)	752 (60.8%)	389 (59.8%)	363 (69.7%)	<.0001
Any Psychiatric Diagnoses (N = 1224)	808 (66.0%)	482 (72.9%)	326 (57.9%)	<.0001
HIV Positive (N = 469)	23 (4.9%)	10 (3.7%)	13 (6.5%)	0.16
HCV Antibody Positive (N = 1084)	636 (58.7%)	306 (52.2%)	330 (66.3%)	<.0001
Alcohol Use at Enrollment (N =1237)	213 (17.2%)	96 (14.5%)	117 (20.4%)	0.006
Cocaine Use at Enrollment (N = 1237)	164 (13.3%)	67 (10.1%)	97 (16.9%)	0.0004
Illicit Benzodiazepine Use at Enrollment (N =1237)	108 (8.7 %)	51 (7.7%)	57 (9.9%)	0.16
History of ever heroin use (N = 1237)	1063 (85.9%)	547 (82.4%)	516 (90.1%)	0.0001
Prior Buprenorphine Treatment (N = 1237)	404 (32.7%)	241 (36.3%)	163 (28.4%)	0.003
Age at first Opioid Use (N=1164)	22 (8)	22 (8)	22 (8)	0.71

Legend: High school/GED or Higher – completed high school or passed the General Education Development test or more advanced degree; HCV Antibody Positive- Hepatitis C Antibody Positive; Prior Buprenorphine Treatment – patient self-report of prior buprenorphine treatment with any buprenorphine provider on initial intake; History of Heroin- reported use of heroin, with or without opioid pills, as compared to use of opioid pills only

Table 2

Associations Between Patient Characteristics and the Outcomes 1 Year Treatment Retention and 2 Years Treatment Retention

Independent Variables	Primary Outcome: 1 year retention Unadjusted OR (95% CI)	Primary Outcome: 1 year retention Adjusted OR (95% CI)	Exploratory Outcome: 2 years retention Adjusted OR (95% CI)
Age at Enrollment	0.99 (0.89, 1.09)	1.19 (1.05, 1.34) *	1.27 (1.11, 1.45) *
Gender			
Male	Reference	Reference	Reference
Female	1.62 (1.31, 2.01) *	1.55 (1.20, 2.00) *	1.44 (1.09, 1.91) *
Race/Ethnicity			
White	Reference	Reference	Reference
Black	0.52 (0.38, 0.71) *	0.53 (0.36, 0.78) *	0.70 (0.46, 1.08)
Hispanic	0.56 (0.42, 0.74) *	0.66 (0.48, 0.92) *	0.64 (0.43, 0.94) *
Other	1.59 (0.62, 4.05)	2.03 (0.57, 7.17)	0.91 (0.23, 3.59)
Unemployment	0.65 (0.52, 0.81) *	0.72 (0.56, 0.92) *	0.69 (0.53, 0.91) *
High school/GED or Higher	1.09 (0.86, 1.39)	^^^	^^^
Any Psychiatric Diagnoses	1.68 (1.35, 2.08) *	1.75 (1.35, 2.27) *	1.97 (1.48, 2.62) *
HCV Antibody Positive	0.55 (0.44, 0.68) *	0.59 (0.45, 0.76) *	0.61 (0.47, 0.80) *
Prior Buprenorphine Treatment	1.42 (1.13, 1.77) *	1.14 (0.88, 1.48)	1.29 (0.96, 1.72)
History of Ever Heroin Use	0.57 (0.41, 0.78) *	0.90 (0.61, 1.32)	0.72 (0.48, 1.09)
Alcohol Use at Enrollment	0.78 (0.59, 1.04)	0.88 (0.63, 1.23)	0.76 (0.53, 1.11)
Cocaine Use at Enrollment	0.60 (0.44, 0.80) *	0.86 (0.61, 1.22)	0.79 (0.53, 1.17)
Benzodiazepine Use (Illicit) at Enrollment	0.90 (0.63, 1.29)	^^^	^^^
Calendar Year			
2003-2007	Reference	Reference	Reference
2008-2010	1.07 (0.86, 1.34)	0.91 (0.70, 1.18)	0.98 (0.74, 1.31)
2011-2014	0.91 (0.66, 1.27)	0.62 (0.42, 0.90) *	0.89 (0.55, 1.45)
Number OBOT Period			
1 st (N=958)	Reference	Reference	Reference
2 nd (N= 209)	0.45 (0.34, 0.59) *	0.39 (0.28, 0.53) *	0.52 (0.35, 0.76) *
3 rd (N=54)	0.39 (0.22, 0.66) *	0.34 (0.18, 0.64) *	0.78 (0.37, 1.65)
4 th (N=16)	0.48 (0.18, 1.25)	0.45 (0.16, 1.32)	0.41 (0.04, 3.96)

Legend: Age OR represents odds for every 10-year increase in age; Primary outcome of 1 year retention is based on an analytic sample with N = 1345 observations; Exploratory outcome of 2 year retention is based on an analytic sample with N = 1186 observations; High school/GED or Higher – completed high school or passed the General Education Development test or more advanced degree; HCV Antibody Positive- Hepatitis C Antibody Positive; Prior Buprenorphine Treatment – patient self-report of prior buprenorphine treatment with any buprenorphine provider on initial intake; History of Heroin- reported use of heroin, with or without opioid pills, as compared to use of opioid pills only; Number OBOT Period–the number of treatment periods the patient had experienced up to and including the current observation

^^ not included in final model

* p-value < 0.05

Table 3

Reasons for disengagement from OBOT for All Treatment Periods, Treatment Periods 1 year and <1 year

Reason	All (N=1605) N (%)	1 year-long (N=717) N (%)	< 1 year (N=888) N (%)	p-value
Clinic Problems	156 (9.7%)	52 (7.3%)	104 (11.7%)	0.003
Important Life Events	68 (4.2%)	28 (3.9%)	40 (4.5%)	0.56
Health Contraindications	45 (2.8%)	15 (2.1%)	30 (3.4%)	0.11
Relapse	523 (32.6%)	167 (23.3%)	356 (40.1%)	<0.0001
Taper	53 (3.3%)	33 (4.6%)	20 (2.3%)	0.01
Legal Issues	62 (3.9%)	20 (2.8%)	42 (4.7%)	0.04
Transfer	86 (5.4%)	40 (5.6%)	46 (5.2%)	0.73
Insurance issues	7 (0.4%)	6 (0.8%)	1 (0.1%)	0.06
Death	0 (0%)	0 (0%)	0 (0%)	0.99
Unknown	492 (30.6%)	162 (22.6%)	330 (37.2%)	<0.001
Did Not Disengage	298 (18.6%)	260 (36.3%)	38 (4.3%)	<0.0001

Legend: 1) Clinic Problems (e.g. administrative discharge for non-compliance clinic rules or conflict in the patient-provider relationship); 2) Important Life Events (including change in housing, change in social support such as the loss of loved one); 3) Health Contraindications (including medication side effects, significant surgery or pain) 4) Addiction Relapse (with opioids or continued use of other illicit substances, often resulting in the clinic recommending transfer to methadone or detoxification) 5) Taper Off Buprenorphine 6) Transfer (to another buprenorphine or naltrexone clinic) 7) Legal Issues (including incarceration and concern about future incarceration) 8) Insurance or Payment Issues 9) Death- as documented in the medical record 10) Unknown (no reliable or clear documentation of a reason) and 11) Did Not Disengage (still engaged in care at the end of the study period)

p-value based on unadjusted GEE logistic regression models