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Improving Adherence to HIV Quality of Care Indicators in Persons With Opioid Dependence: The Role of Buprenorphine

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Abstract

Background—Opioid-dependent HIV-infected patients are less likely to receive HIV quality of care indicators (QIs) compared with nondependent patients. Buprenorphine/naloxone maintenance therapy (bup/nx) could affect the quality of HIV care for opioid-dependent patients.

Methods—We abstracted 16 QIs from medical records at nine HIV clinics 12 months before and after initiation of bup/nx versus other treatment for opioid dependence. Summary quality scores

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BHIVES Collaborative members are listed in Appendix 1.

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(number of QIs received/number eligible × 100) were calculated. We compared change in QIs and summary quality scores in patients receiving bup/nx versus other participants.

Results—One hundred ninety-four of 268 participants (72%) received bup/nx and 74 (28%) received other treatment. Mean summary quality scores increased over 12 months for participants receiving bup/nx (45.6% to 51.6%, $P < 0.001$) but not other treatment (48.6% to 47.8%, $P = 0.788$). Bup/nx participants experienced improvements in six of 16 HIV QIs versus three of 16 QIs in other participants. Improvements were mostly in preventive and monitoring care domains. In multivariable analysis, bup/nx was associated with improved summary quality score (β 8.55; 95% confidence interval, 2.06–15.0).

Conclusions—In this observational cohort study, HIV-infected patients with opioid dependence received approximately half of HIV QIs at baseline. Buprenorphine treatment was associated with improvement in HIV QIs at 12 months. Integration of bup/nx into HIV clinics may increase receipt of high-quality HIV care. Further research is required to assess the effect of improved quality of HIV care on clinical outcomes.

Keywords

quality of health care; HIV; quality indicators; health care; buprenorphine; opioid-related disorders; heroin dependence

INTRODUCTION

When prescribed and taken appropriately, antiretroviral treatment results in improved survival among HIV-infected patients. This has transformed treatment of HIV disease into management of a chronic illness.[1,2] As with other chronic illnesses (eg, diabetes and heart failure), national guidelines have been developed to provide an evidence basis for treatment. In 2004, the Institute of Medicine issued guidelines intended to improve the quality of care for HIV-infected individuals based on an extensive review of the literature and expert opinion.[3] These guidelines are being used increasingly as performance measures when applied to the clinical care rendered by HIV providers. They do not, however, address HIV quality indicators specific for drug-using populations.

Unlike other HIV-infected individuals, patients with coexisting substance use disorders have not benefited equally from recent improvements in HIV management. Individuals using illicit drugs, for example, are less likely to receive antiretroviral treatment[4,5] and have more HIV-related symptoms[6] and higher hospitalization rates.[7] Substance abuse treatment in HIV-infected individuals is associated with improved antiretroviral treatment adherence,[8] decreased emergency department visits and hospitalizations,[9] and increased receipt of primary care[10] but is often underused.[11–14]

The Food and Drug Administration's approval of buprenorphine/naloxone (Suboxone®, Reckitt Benckiser Pharmaceuticals, Inc., Richmond, VA) creates an opportunity for primary care physicians to offer opioid dependence treatment directly,[15] including HIV-infected patients.16 Office-based buprenorphine treatment is feasible and effective in reducing illicit opioid use,17,18 safe for use in HIV clinical settings,[19] and associated with high patient satisfaction ratings.[20] It may also engage more previously untreated opioid-dependent patients compared with methadone maintenance.[21]

The Health Resources and Services Administration HIV/AIDS Bureau Special Projects of National Significance sponsored an initiative to integrate treatment within HIV primary care settings.[22] The objective of the current study was to examine the impact of buprenorphine/naloxone (bup/nx) treatment on quality of HIV care in a multisite cohort of patients with

coexisting opioid dependence and HIV infection. This study hypothesized that integration of HIV and drug addiction treatment services would enhance the quality of HIV care.

METHODS

Setting

As described more fully in this supplement,[22,23] from 2004 to 2009, the HIV/AIDS Bureau of the Health Resources and Services Administration funded, through its Special Projects of National Significance, the development of demonstration programs that integrated HIV care and bup/nx treatment for opioid dependence at 10 HIV clinic sites across the United States. The Health Resources and Services Administration also funded an Evaluation and Technical Assistance Center to coordinate the multisite evaluation, provide clinical and evaluation support and technical assistance, and promote dissemination of findings. Nine of the 10 sites agreed to participate in an observational substudy examining the effect of bup/nx integration on the quality of HIV care. Each site and the Center obtained Institutional Review Board approval for conducting this evaluation.

Participants

Potential study participants were identified through provider referral, word of mouth, and community outreach and enrolled from 2005 through 2007. Eligible participants were HIV-infected, at least 18 years old, met *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* criteria for opioid dependence, and spoke English or Spanish. Potential participants were excluded if they had aspartate aminotransferase or alanine transaminase levels greater than five times normal, were pregnant, or had unstable alcohol or benzodiazepine dependence or other severe medical or psychiatric conditions that jeopardized safe bup/nx prescribing guidelines[24] or capacity for informed consent. All participants completed written informed consent before enrollment.

Data Collection

Study participants completed baseline assessments that recorded demographic, social, substance use, and quality of care measures; research personnel conducted medical record abstraction to confirm substance abuse and medical treatment at baseline, 3, 6, 9, and 12 months follow-up. Data were entered electronically at participating sites and uploaded to the Center for collation and analysis.[23]

Measures

Opioid Dependence Treatment—The primary independent variable for this analysis was receipt of at least one bup/nx prescription during the first 45 days after enrollment. After bup/nx induction in the HIV clinic, maintenance doses ranged from 2 mg to 24 mg per day according to site dosing protocols. A bup/nx clinical coordinator facilitated bup/nx treatment in HIV clinics. Those who did not receive bup/nx either chose or were assigned off-site methadone maintenance therapy or other treatment (eg, methadone maintenance or detoxification) based on local site protocols.

Quality of HIV Care—The primary dependent variable was a summary score for quality of HIV care. This score was adapted from a comprehensive assessment of the quality of healthcare in the United States.[25] The summary score was generated by dividing number of instances in which recommended care was delivered (“pass” criteria) by the number of times participants were eligible to receive recommended care (eligibility criteria) multiplied by 100 and expressed as a percentage. For example, if a person was eligible to receive 10 HIV quality of care indicators over the 12-month follow-up period yet received only eight, the

summary quality score for that person was 80% (8/10 × 100). For the current study, participants were potentially eligible for a maximum of 16 HIV quality of care indicators (Table 1).

Secondary dependent variables were the 16 specific HIV quality of care indicators included in the summary score, representing therapeutic, monitoring, screening, prevention, and counseling quality domains (Table 1). These HIV quality of care indicators were previously developed according to modified Delphi methods for use in the HIV Cost and Utilization Study and RAND,[26] applied in the Veterans Administration HIV Quality Enhancement Research Initiative,[27,28] the Infectious Disease Society of America,[26,29] and the HIVQUAL project of New York State,[30] and reviewed in an Institute of Medicine Report.[3]

Covariates—Covariates included gender (male, female), race/ethnicity (white, black, Latino, other), age in years, education level (less than high school, high school graduate, at least some college), and housing status (homeless versus not). We used a previously validated HIV Symptom Index (20 items)31 to adjust for HIV severity, and Addiction Severity Index (ASI)–Lite drug and alcohol composite scores to assess addiction severity.[32,33] Patient opioid of choice at baseline was defined as heroin if the number of days of heroin use during the last 30 days exceeded the number of days of nonprescription opioid analgesic use as measured by ASI-Lite responses. Opioid of choice was nonprescription opioid analgesics if the reverse was true. Concomitant stimulant use at baseline was defined as any cocaine or amphetamine use in the prior 30 days. Injection drug use was defined as intravenous route of administration for any substance use reported in the ASI-Lite.32 Depression was assessed using the Center for Epidemiologic Studies–Depression instrument (scale 1–4).34

Analysis

We used descriptive statistics to examine patient characteristics and the frequency of HIV quality of care indicators received at baseline and 12-month follow-up. We assessed differences in baseline patient characteristics by opioid dependence treatment status (bup/nx versus referral for other treatment) using *t* tests for continuous variables and chi-square tests for categorical data. We assessed change in HIV quality of care indicators from baseline to 12 months using McNemar test and used paired *t* tests for quality summary scores. Bivariate associations between patient characteristics and summary quality scores at baseline and 12 months were assessed using *t* tests for continuous variables and chi-square tests for categorical data. We estimated the influence of receipt of bup/nx on our primary outcome, change in summary quality score from baseline to 12-month follow-up, using multivariable generalized estimating equations linear regression models to adjust for potential confounding variables as well as clustering by site. We considered variables for inclusion in multivariable analysis if they were associated with change in summary quality score at $P < 0.20$ in bivariate analysis. A variable with P value of < 0.05 was considered significant and kept in the final model. Patient age, race, and gender were retained in the model regardless of statistical significance because they have been associated with variations in key quality of care indicators in past studies[35] and were potential confounding variables. Stata/IC version 10.0 (StataCorp, College Station, TX) was used to complete all statistical analyses.

RESULTS

There were 373 subjects enrolled at participating sites, of which 268 (72%) had quality of care chart abstractions completed at baseline and 12 months. At baseline, 194 (72%) were treated for opioid dependence using bup/nx and 74 (28%) were referred for other treatments. Of the 194 participants receiving bup/nx at baseline, 78.4% remained on bup/nx at 3 months,

72.7% at 6 months, 62.9% at 9 months, and 53.1% at 12 months follow-up. The analytic sample was representative of the overall population in female gender (35% versus 32%, $P = 0.446$), black race–ethnicity (52% versus 56%, $P = 0.097$), less than high school education (41% versus 44%, $P = 0.444$), mean age (45 versus 45 years, $P = 0.835$), ASI alcohol score (0.074 versus 0.075, $P = 0.129$), and ASI drug score (0.313 versus 0.321, $P = 0.329$). On average, 30 participants were enrolled per site (range, 4–92).

Table 2 summarizes participant characteristics at baseline. Participants were predominantly male (65%) and nonwhite (52% black, 17% Latino). ASI drug severity scores were high, reflecting participants seeking treatment for opioid dependence. ASI alcohol severity scores were also elevated, suggesting significant concomitant abuse of alcohol. Participants receiving bup/nx were 2.5 years younger on average, more likely to report concomitant stimulant use, and primarily used heroin over opioid analgesics as their opioid of choice. Otherwise, participant characteristics were similar, including addiction and HIV symptom severity.

The mean summary score for quality of HIV care increased 6.0%, from 45.6% to 51.6% ($P < 0.001$) for those receiving bup/nx but did not change for those receiving other treatments (48.6% versus 47.8%, $P = 0.788$) at 12 months from baseline (Table 3). Participants receiving bup/nx experienced improvements in six of 16 HIV quality of care indicators during this timeframe, including hepatitis A and pneumococcal vaccination, CD4 and viral load monitoring, injection drug use risk reduction counseling, and HIV clinic visits. Provision of *Pneumocystis carinii* pneumonia prophylaxis and screening for tuberculosis and syphilis, however, declined. Participants receiving other treatments for opioid dependence experienced improvements in three of 16 HIV quality of care indicators, including pneumococcal vaccination and injection drug use and sexual risk reduction counseling. Screening for tuberculosis and hyperlipidemia and CD4 monitoring all declined.

Table 4 reports summary quality scores at baseline and 12 months by patient characteristics. Summary quality scores were lower among those who primarily used heroin compared with those who primarily used opioid analgesics at both baseline and 12 months. Summary quality scores varied little by other participant characteristics. There was a trend toward lower summary quality scores for participants receiving bup/nx compared with those receiving other treatment at baseline that reversed at 12 months.

In multivariable analysis (Table 5), only bup/nx treatment was associated with improvement in quality of HIV care (mean difference in change in summary score [β coefficient] 8.55; 95% confidence interval, 1.06–15.0) compared with non-bup/nx treatment. Covariates of age, race/ethnicity, gender, opiate of choice, and stimulant use were not associated with changes in quality of care summary score.

DISCUSSION

In this observational study, HIV-infected persons with opioid dependence received only half of HIV quality of care indicators but experienced improved quality of HIV care when treated with bup/nx compared with referral for other treatment. Integration of bup/nx treatment into HIV practices represents an opportunity for increasing engagement in and receipt of HIV care processes associated with higher quality HIV care. Improvements in quality of care were the result of improvements over a broad spectrum of HIV quality of care indicators, including those from the monitoring, prevention, and counseling domains of quality.

This study’s main finding that patients receiving bup/nx experienced greater improvements in quality of HIV care than those referred for other treatment is consistent with HIV

providers' experience managing multiple chronic conditions. HIV primary care providers are accustomed to managing patients with chronic relapsing conditions such as opioid dependence and well positioned to engage patients in treatment,[36] improve linkages between addiction and medical services,[37] and facilitate relapse prevention.[38,39] In previous studies, office-based buprenorphine treatment was associated with high patient satisfaction rating[20] and engagement of previously untreated opioid-dependent patients compared with methadone maintenance.[21] Office-based buprenorphine may be a tool for increasing patient activation among HIV-infected patients with coexisting substance use, leading to improved HIV self management.[40] Alternatively, it is possible that opioid-dependent patients directly engaging in office-based bup/nx treatment empower their HIV providers to deliver more comprehensive care. Additional studies are required to elucidate patients' reasons for increased activation and patient satisfaction with office-based bup/nx treatment.

Despite improved care associated with bup/nx treatment, HIV-infected participants with opioid dependence received only half of the indicated HIV care items. This low percentage of HIV quality of care indicators achieved, however, is comparable to summary scores of overall healthcare quality in the US population. In a random sample of people living in 12 communities throughout the United States, participants received only 54.9% of recommended care. Although the quality of care for specific chronic conditions varied widely, care for HIV infection was not assessed.[25,35] Individual HIV quality of care indicator levels in our study, however, were lower than those reported in HIV-infected populations in Ryan White-funded settings,[41] Veterans Administration HIV clinics, or a national probability sample of HIV-infected Americans.[5] These differences are likely explained by the fact that the current study enrolled HIV-infected patients with substance use disorders, representing a potentially more challenging population to engage.

This study demonstrates the feasibility of using a summary quality of care score to assess the quality of HIV care. This approach, validated in other medical conditions and populations, has the advantage of providing an overall benchmark of quality of HIV care that accounts for differences in eligibility criteria for individual quality indicators. Absolute improvements in quality of care, however, were small. Further studies are required to validate this approach more broadly in other HIV-infected populations and assess correlations with clinical outcomes.

In contrast to studies of healthcare quality in the general population,[35] no associations among age, gender, and race/ethnicity and quality summary scores were identified. We hypothesize that potential variations in quality of care by demographic characteristics may be outweighed by the effect of active opioid dependence on HIV care. Systemic interventions to improve engagement in treatment of opioid dependence such as bup/nx may have a greater effect on receipt of recommended HIV care than interventions tailored to nonmodifiable patient characteristics.

The current findings should be interpreted in light of several potential limitations. First, the observational and nonrandomized nature of this study allows for the introduction of potential unmeasured confounders and biases. For example, the majority of participants received bup/nx versus referral for other treatment. Patients may have differed in their predisposition to pursue HIV care. There was, however, a non-significant trend toward greater HIV clinic visits and quality summary scores at baseline among participants referred for non-bup/nx treatment, suggesting that potential selection bias may be biasing our results toward the null rather than overestimating the effect of bup/nx. Also, the small number of participants receiving "other" treatment may have resulted in insufficient power to detect difference in measured confounders. Still, this is the largest assembled evaluation of HIV-infected, opioid-dependent patients to date, and inclusion of known confounders (age, opiate

of choice, and stimulant use) was accounted for in multivariable models. Second, HIV clinical sites varied in their development of models for bup/nx integration.[23] Bup/nx was, however, typically administered by providers using standard bup/nx treatment guidelines24 in real-world HIV treatment settings. Third, participating HIV clinic providers and staff received substantial training and expert support in implementation of office-based bup/nx, and patients benefited from a grant-supported bup/nx clinical coordinator. Observed improvements in quality of HIV care among patients engaged in office-based bup/nx may not be generalizable to HIV practice settings lacking such support. Finally, we were only able to assess a limited number of HIV quality of care indicators for 12 months of follow-up in the current study, making it possible that inclusion of a greater number of care indicators might attenuate the observed effects of bup/nx treatment on quality of HIV care. Still, the number of HIV quality of care indicators observed in this study exceeds those reported in prior studies5,41 and represents consensus recommendations from multiple agencies.

In summary, HIV-infected patients with opioid dependence who received bup/nx treatment experienced improved receipt of recommended HIV care over 12 months follow-up. Participants, however, received only approximately half of recommended HIV care, indicating that broadly targeted interventions are required to improve the quality of care for this particularly vulnerable population. Integration of office-based bup/nx into HIV practices represents one innovation for closing this gap in the quality of HIV care by increasing engagement in and receipt of recommended HIV care.

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APPENDIX I: THE BHIVES COLLABORATIVE

The CORE Center (Chicago, IL), El Rio Santa Cruz Neighborhood Health Center (Tucson, AZ), Johns Hopkins University (Baltimore, MD), Miriam Hospital (Providence, RI), Montefiore Medical Center (Bronx, NY), OASIS (Oakland, CA), Oregon Health & Science University (Portland, OR), University of California San Francisco Positive Health Program at San Francisco General Hospital (San Francisco, CA), University of Miami Medical School (Miami, FL), Yale University School of Medicine (New Haven, CT), and The New York Academy of Medicine (New York, NY).

TABLE 1

HIV Quality of Care Indicator Definitions

Quality Indicator	"Pass" Criteria	Eligibility Criteria
Medications		
ART	Receipt of ART in past 12 months	CD4 nadir ≤ 350 cells/mL^3, ever
PCP prophylaxis	Receipt of dapsone, tmp/smx, atovaquone, pentamidine in past 12 months	CD4 count ≤ 200 cells/mL^3 in past 12 months
MAC prophylaxis	Receipt of clarithromycin, azithromycin, or rifabutin in past 12 months	CD4 count ≤ 50 cells/mL^3
Screening		
Hyperlipidemia	Lipid test in past 12 months	On ART
Syphilis	RPR in past 12 months	All
Tuberculosis	PPD in past 12 months	All previously PPD-negative or unknown status
Cervical cancer	Pap smear in past 12 months	Biologic females
Prevention		
Hepatitis A vaccine	Hepatitis A vaccine series, ever	All with negative hepatitis A serology
Hepatitis B vaccine	Hepatitis B vaccine series, ever	All with negative hepatitis B serology
Pneumovax	Pneumococcal vaccine, ever	All
Influenza	Influenza vaccine in past 12 months	All
Monitoring		
CD4	≥ 2 CD4 counts performed in past 12 months	All
Viral load	≥ 2 HIV viral loads performed in past 12 months	All
HIV visits	≥ 4 HIV clinic visits in 12 months	All
Counseling		
IDU risk reduction	IDU risk reduction counseling during at least 1 visit in past 12 months	All
Sex risk reduction	Sexual risk reduction counseling during at least 1 visit in past 12 months	All

ART, antiretroviral treatment; PCP, *Pneumocystis carinii*pneumonia; IDU, injection drug use; MAC, Mycobacterium avium Complex; tmp/smx, Trimethoprim-sulfamethoxazole; RPR, rapid plasma reagin; PPD, Purified Protein Derivative.

TABLE 2

Participant Characteristics at Baseline, Overall, and by Opioid Treatment Status (n = 268)

	Overall (n = 268)	Buprenorphine (n = 194)	Non-Buprenorphine (n = 74)	*P*[*]
Mean age (SD)	45.5 (8.16)	44.8 (8.35)	47.3 (7.40)	0.027
Female gender (%)	93 (34.7)	71 (36.6)	22 (29.7)	0.291
Race/ethnicity (%)				
White	73 (27)	52 (27)	21 (28)	0.339
Black	138 (52)	95 (50)	43 (58)	
Latino	45 (17)	37 (19)	8 (11)	
Other	10 (4)	8 (4)	2 (3)	
Education (%)				
Less than high school	111 (42)	80 (41)	24 (39)	0.964
High school	99 (37)	70 (37)	24 (39)	
College	57 (21)	43 (22)	13 (221)	
Homeless (%)	74 (28)	52 (27)	22 (30)	0.632
Mean HIV symptom index (SD)	2.60 (0.79)	2.65 (0.77)	2.47 (0.81)	0.106
Mean depression score (SD)	2.48 (0.73)	2.51 (0.74)	2.40 (0.70)	0.271
Mean ASI–drug (SD)	0.313 (0.128)	0.317 (0.126)	0.302 (0.133)	0.383
Mean ASI–alcohol (SD)	0.074 (0.110)	0.078 (0.115)	6.26 (0.094)	0.306
Opioid of choice (%)				
Opioid analgesics	115 (43)	66 (34)	49 (66)	<0.001
Heroin	153 (57)	128 (66)	25 (34)	
Stimulant use (%)	139 (52)	110 (57)	29 (40)	0.012
Injection drug use (%)	171 (64)	118 (61)	53 (72)	0.100
Mean HIV visits (SD)[†]	6.88 (7.03)	6.49 (6.42)	7.89 (8.39)	0.198

[*] *t*-test *P*-value for continuous variables; chi-square *P*-value for categorical variables.

[†] Number of HIV clinic visits during the 12 months before baseline enrollment.

SD, standard deviation; ASI, Addiction Severity Index.

TABLE 3

HIV Quality of Care Indicators and Summary Score at Baseline and 12 Months by Treatment Status (n = 268)

	Buprenorphine (n = 194)					Non-Buprenorphine (n = 74)				
	Baseline		12 Months			Baseline		12 Months		
	No. Eligible	Percent Received	No. Eligible	Percent Received	*P*	No. Eligible	Percent Received	No. Eligible	Percent Received	*P*
Mean summary score (SD)	194	45.6 (21.2)	194	51.6 (20.1)	<0.001	74	48.6 (20.2)	74	47.8 (23.2)	0.788
HAART	141	65	150	67	0.434	56	63	61	74	0.081
PCP prophylaxis	59	66	45	51	0.042	18	44	17	65	0.198
MAC prophylaxis	7	57	9	22	0.101	4	75	1	100	N/A
Screening										
Lipids	116	33	131	40	0.219	41	46	49	27	0.046
Syphilis	194	60	194	51	0.036	74	58	74	47	0.206
Tuberculosis	168	37	161	25	0.013	66	41	64	23	0.019
Cervical cancer	71	38	71	31	0.353	21	43	21	71	0.083
Prevention										
Hepatitis A vaccine	118	27	118	35	0.003	31	23	31	26	0.317
Hepatitis B vaccine	81	30	81	35	0.157	35	29	35	31	1.00
Pneumovax	194	58	194	70	<0.001	74	51	74	61	0.008
Influenza	194	42	194	40	0.666	74	46	74	38	0.317
Monitoring										
CD4	194	54	194	79	<0.001	74	77	74	62	0.028
Viral load	194	55	194	78	<0.001	74	70	74	57	0.068
≥ 4 HIV visits	194	60	194	76	<0.001	74	66	74	64	0.706
Counseling										
IDU risk reduction	194	27	194	36	0.033	74	24	74	47	0.002
Sex risk reduction	194	24	194	30	0.179	74	19	71	36	0.009

SD, standard deviation; HAART, highly active antiretroviral treatment; PCP, *Pneumocystis carinii* pneumonia; IDU, injection drug use; MAC, Mycobacterium avium Complex; N/A, not applicable.

TABLE 4

Summary Quality Score at Baseline and 12 Months by Characteristic (n = 68)

	Baseline Summary Score	*P* Value for Variable	12-Month Summary Score	*P* Value for Variable
Opioid treatment				
Non-Buprenophine	48.6	0.609	47.8	0.128
Buprenorphine	45.6		51.6	
Age in years				
20–39	47.2	0.189	45.9	0.133
40–49	46.1		53.1	
≥ 50	46.3		50.2	
Gender				
Male	46.3	0.193	49.8	0.066
Female	46.7		50.6	
Race/ethnicity				
White	44.3	0.956	48.7	0.311
Black	46.4		50.4	
Latino	48.6		53.8	
Other	49.4		51.2	
Education				
Less than high school	44.1	0.261	50.1	0.488
High school	48.2		50.0	
College	48.5		54.5	
Homeless				
No	46.5	0.379	51.7	0.375
Yes	45.7		47.8	
HIV symptom index				
Lowest tertile	47.2	0.428	49.3	0.518
Middle tertile	44.4		46.8	
Highest tertile	47.6		55.8	
Depression score				
Lowest tertile	48.9	0.379	50.2	0.754
Middle tertile	45.3		49.8	
Highest tertile	44.9		52.0	
ASI–drug score				
Lowest tertile	47.1	0.513	50.7	0.989
Middle tertile	44.0		51.3	
Highest tertile	48.2		50.1	
ASI–alcohol score				
Lowest tertile	45.6	0.701	50.9	0.262
Middle tertile	47.8		49.1	
Highest tertile	46.6		51.2	
Opioid of choice				

	Baseline Summary Score	*P* Value for Variable	12-Month Summary Score	*P* Value for Variable
Opioid analgesics	49.2	0.060	53.9	0.024
Heroin	44.3		48.1	
Stimulant use				
No	46.4	0.860	50.7	0.983
Yes	46.8		50.7	
Injection drug use				
No	46.7	0.877	51.6	0.551
Yes	46.3		50.0	

ASI, Addiction Severity Index.

TABLE 5

Multivariable Associations With Change in HIV Quality of Care Summary Score (n = 268)*

	β Coefficient (95% CI)
Bup/nx treatment	8.55 (2.06 to 15.0)
Age (1 year)	0.28 (−0.10 to 0.66)
Female gender	1.69 (−4.38 to 7.76)
Race/ethnicity	
White	Referent
Black	−0.52 (−6.66 to 5.62)
Latino	0.66 (−7.98 to 9.31)
Other	−0.83 (−16.6 to 14.9)
Opioid of choice Heroin	−2.00 (−8.83 to 4.83)
Stimulant use	−0.37 (−6.82 to 6.08)

* β Coefficients indicate absolute difference in change in summary score compared with referent category. For example, β coefficient of 8.55 for bup/nx treatment means there was an 8.55% greater improvement in quality of care score in the bup/nx group compared with other treatment.

CI, confidence interval; bup/nx, buprenorphine/naloxone.