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Receipt and Predictors of Smoking Cessation Pharmacotherapy among Veterans With and Without HIV

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Abstract

Smoking is highly prevalent among people living with HIV (PLWH) and increases cardiovascular risk. Pharmacotherapies such as nicotine replacement therapy (NRT), bupropion, and varenicline help to reduce smoking, though rates of receipt among PLWH compared with HIV-uninfected persons are unknown. Among 814 PLWH and 908 uninfected patients enrolled in the Veterans Aging Cohort Study (2012–2017) who reported current smoking, we used marginal multivariable log-linear regression models to estimate adjusted relative risks (ARR) of receiving pharmacotherapy by HIV status. We also assessed patient-level factors associated with pharmacotherapy receipt within each group. In multivariable analyses, receipt of NRT was less likely among PLWH relative to uninfected participants (ARR 0.77, 95% CI 0.67, 0.89). In both populations, documented mental health disorders and contemplation to quit were associated with greater likelihood of receiving pharmacotherapy. Further research is needed to explore potential treatment disparities.

Keywords

smoking; smoking cessation; smoking cessation pharmacotherapy; HIV; Veterans

Introduction

Since HIV has become a manageable chronic disease due to effective antiretroviral therapy (ART) (1,2), people living with HIV (PLWH) are surviving albeit with an increased burden of non-infectious, non-AIDS-related illnesses, such as cardiovascular disease (CVD) (3,4). Smoking and HIV are independent risk factors for CVD, and the health consequences of CVD are compounded for PLWH who smoke (4–6). Thus, smoking cessation has emerged as a critical, modifiable component to improve the health of PLWH. The Food and Drug Administration (FDA) has approved effective pharmacologic treatments for tobacco use disorder, namely nicotine replacement therapy (NRT), bupropion, and varenicline. These medications have been shown to be effective in improving quit rates in populations with and without HIV (7–13).

PLWH and HIV-uninfected persons may have differing access to smoking cessation pharmacotherapies as a result of factors across multiple domains (e.g., factors related to comorbid conditions, smoking-related behaviors and attitudes, and issues specific to the experience of living with HIV and receiving regular care for HIV). For example, PLWH may have limited access to smoking cessation pharmacotherapy relative to uninfected populations due to their comorbid, complex care needs. Comorbid substance use and mental health disorders (e.g., unhealthy alcohol use and depression) are separately and independently associated with tobacco use among PLWH and may represent major barriers to smoking cessation (14–16). Management of these conditions in combination with HIV, may present logistical (e.g, time) or training (e.g., content expertise) barriers to addressing smoking in HIV care settings (17–19). On the other hand, PLWH may have greater health care utilization than uninfected persons as a result of receiving regular HIV care consistent with clinical guidelines to ensure immune competence and HIV viral suppression (20). As a result, PLWH may be in more frequent contact with a health care provider and have more opportunities to receive smoking cessation medications.

Despite the importance of promoting smoking cessation among PLWH, it is unclear how frequently PLWH who smoke are receiving pharmacotherapies. Therefore, in a national sample of patients receiving care in the Veterans Health Administration (VHA) recruited to the Veterans Aging Cohort Study (VACS), we determined receipt of smoking cessation pharmacotherapy among PLWH, overall and compared with a matched sample of uninfected patients. We also evaluated patient-level factors associated with receipt of pharmacotherapy among PLWH and HIV-uninfected participants separately.

Methods

Study Data Sources and Sample

VACS is a multi-site, longitudinal, prospective cohort study of PLWH and HIV-uninfected controls receiving care in nine VHA Infectious Disease (ID) and General Medicine Clinics, respectively (21). Specifically, uninfected participants are group matched by five-year blocks of age, race/ethnicity, sex, and site of care to PLWH from VHA facilities in Atlanta, Baltimore, the Bronx, Dallas, Houston, Los Angeles, Manhattan/Brooklyn, Pittsburgh, and Washington D.C. For the present study, we included the 1722 patients (814 PLWH and 908 uninfected) who were surveyed between 2012 and 2017 who reported “still smoking” or daily smoking.

VACS survey data were linked to electronic health record (EHR) data extracted from the VHA Corporate Data Warehouse (CDW), which includes clinical, administrative, pharmacy, and utilization data for all users of VHA care (22).

Primary Independent Measure

HIV status was defined as having two outpatient or one inpatient diagnostic codes from the International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM) for either AIDS (042) or HIV (V08), consistent with prior research conducted in VACS (23).

Outcomes

The primary outcome of interest was a dichotomous measure identifying receipt of any smoking cessation pharmacotherapy (NRT, bupropion, and varencline), based on outpatient prescriptions filled from VHA pharmacy data in the CDW 0–365 days following the date of completed survey. Secondary outcomes were derived to measure receipt of each specific medication 0–365 days following the date of completed survey.

Covariates

Covariate selection was guided by a conceptual model that includes factors hypothesized to impact the likelihood of receiving smoking cessation pharmacotherapy. These include sociodemographic factors, substance use and mental health comorbidity, smoking-related comorbid conditions, HIV severity, health care utilization, and smoking-related attitudes and behaviors.

Sociodemographic factors such as age at time of survey (continuous), sex (male versus female), and race/ethnicity (black, Hispanic, white, other) were asked on survey and available in administrative data sources. “Other” race included American Indian or Alaska Native, Asian, and Native Hawaiian or Pacific Islander. Education (less than high school, high school graduate or GED, some college or technical school, college graduate or graduate school), and annual income (earning less than $12,000, $12,000–24,999, $25,000 or greater) were assessed in individual survey items.

Substance use and mental health comorbidity were ascertained through both survey items and the EHR. In the survey, alcohol use was evaluated using the three-item Alcohol Use Disorders Identification Test Consumption (AUDIT-C) questionnaire, which is a brief alcohol screen validated to identify patients with unhealthy alcohol use (24). Men who scored 4 or greater and women who scored 3 or greater were identified as having unhealthy alcohol use (25). Surveyed participants were also asked to identify the frequency with which they had used cocaine or crack, amphetamines, and/or heroin in the last 12 months. We coded a dichotomous “any substance use in the last year” measure as those participants who reported “less than once per month” or more frequent use of any of these drugs compared with those reporting “no use in the last year” or “have never tried” for all drugs. Depression was assessed via survey using the Patient Health Questionnaire (PHQ-9), a 9-item screen for which a value greater than nine has an 88% sensitivity and 88% specificity for diagnosing moderate to severe depression (26). ICD-9 codes pertaining to other psychiatric conditions (bipolar disorder, major/minor depression, post-traumatic stress disorder, schizophrenia, and other psychosis) were grouped together (27), and were defined as having a recent psychiatric diagnosis if a code occurred 0–365 days prior to completing survey.

Smoking-related comorbid conditions were ascertained using diagnostic coding in the EHR, and included CVD (ICD-9 CM codes for acute myocardial infarction, coronary artery disease, congestive heart failure, hypertension, stroke, other CVD); chronic pulmonary disease (ICD-9 CM codes for COPD, obstructive lung disease, pulmonary hypertension, other pulmonary disorder); and non-AIDS malignancies (e.g., Hodgkin lymphoma and

cancers of the mouth, throat, liver, lung, and anus) (28) documented 0–365 days prior to survey date.

HIV severity was measured using the VACS Index 2.0, a composite measure of HIV severity that predicts all-cause mortality, cause-specific mortality, frailty, and other clinical outcomes in people with HIV (29) as well as in persons without HIV infection (30,31). VACS Index 2.0 includes CD4+ cell count and HIV-1 RNA in combination with other disease markers (32–34), and is generated using a combination of administrative, clinical, and laboratory data. Individual components of VACS 2.0 documented in the CDW closest to date of survey was used to calculate the continuous summary score.

Health care utilization included outpatient and inpatient visits captured using visit and stop codes documented in the CDW 0–365 days prior to survey date. The number of outpatient visits was limited to primary care encounters. These were summed and then categorized into 1–2, 3–5, and 6 visits or greater based on 1–106 visits distribution (35). Inpatient visits were summed and categorized into 0, 1, and 2 visits or greater based on a 0–16 visits distribution.

Smoking-related attitudes and behaviors were ascertained via survey questions. One survey item asked whether respondents were currently thinking about quitting. We coded a dichotomous “contemplation to quit” measure as those thinking about quitting, while grouping those who selected that they were “not sure” or “not thinking about quitting” or “not ready to quit” as not contemplating cessation. Respondents who reported at least one quit attempt were coded as having a past quit attempt. The average number of cigarettes smoked per day was also assessed on the survey and measured in our study as less than 10, 10–20, and greater than 20 cigarettes.

Analysis

We described the demographic and clinical characteristics of the sample, overall and across HIV status using chi-square tests of independence, Student’s *t*-test, and Wilcoxon Rank-Sum test as appropriate. We also described the rate of primary and secondary pharmacotherapy outcomes in the overall sample.

To assess receipt of pharmacotherapy among PLWH overall, and relative to HIV-uninfected persons, we first conducted bivariate comparisons of the prevalence of primary and secondary outcomes (across HIV status using chi-square tests). Subsequently, we fit marginal multivariable log-linear regression models with an over-dispersed Poisson working model to estimate the adjusted relative risk (ARR) and 95% confidence interval (CI) of pharmacotherapy receipt for PLWH compared with uninfected participants. Models were adjusted for all measured covariates in the domains described above. Logarithmic, rather than logistic link function, was used because the outcome was expected to be somewhat common, in which case odds ratios may overestimate the relative risks (36,37). In order to account for the multi-level nature of the data, we clustered by site of care and specified an exchangeable correlation structure. Further, we used a robust sandwich estimator to calculate standard errors and obtain a valid inference even if the correlation structure was incorrectly specified (35–39).

The same model was repeated stratified by HIV status so that we could compare which patient-level factors were associated with pharmacotherapy receipt in populations with and without HIV. All analyses were performed using Stata version 14 (Stata Corp, College Station, TX).

Results

Study Population

Among 4113 VACS participants, 1722 (42%) self-reported current smoking (n=814 of 2163 PLWH and 908 of 1950 HIV-uninfected) and were thus eligible for the present study. Participants in our sample were predominantly black (74%), male (96%), had a mean age of 56 years, and at least some college or technical school education (89%) (Table 1). Most PLWH were on ART, had well-controlled HIV with suppressed HIV viral load, and a median CD4+ count of 483 cells/m^3.

There were differences between PLWH and HIV-uninfected participants. Compared with uninfected participants, PLWH had a greater proportion of people reporting black race and earning $12,000-$24,999 annually, a lower prevalence of recent non-AIDS malignancy diagnosis, a higher median VACS Index 2.0 score, and a greater number of outpatient visits in the last year. PLWH had a lower prevalence of unhealthy alcohol use, moderate-severe depression, recent psychiatric and CVD diagnoses, and fewer inpatient visits in the last year relative to uninfected participants (Table 1). However, no differences by HIV status were observed in the proportion of participants who were contemplating smoking cessation, median number of previous quit attempts, median number of cigarettes smoked daily, or time to first cigarette indicating degree of nicotine dependence (Table 1). PLWH were more likely to use marijuana, but there were no other differences in substance use between groups.

Receipt of Smoking Cessation Pharmacotherapy by HIV Status

Overall, the prevalence of receiving any pharmacotherapy was 33% (n=1722); and the prevalence of receiving NRT, buproprion, and varenicline was 22%, 9%, and 1%, respectively. The prevalence of receiving any smoking cessation pharmacotherapy was lower among PLWH than among uninfected patients (29% vs. 36%, respectively; p=0.004) (Table 2). With regard to specific medications, the percent receiving NRT was lower among PLWH than HIV-uninfected participants (19% vs. 25%, respectively; p=0.002), no differences were observed in receipt of buproprion (8% vs. 9%; p=NS), and PLWH had a slightly higher percent of receipt of varenicline than uninfected participants (1% vs. 0.4%; p=0.03) (Table 2).

In unadjusted models, the relative risk of receiving any smoking cessation pharmacotherapy, and NRT specifically, was lower among PLWH relative to uninfected patients (RR 0.81, 95% CI 0.71, 0.94 and RR 0.75, 95% CI 0.58, 0.97, respectively). After adjustment for all covariates, no statistically significant differences in HIV status were observed in the primary outcome—receipt of any smoking cessation pharmacotherapy (Table 2). However, PLWH were less likely than uninfected persons to receive NRT after full adjustment (ARR 0.77, 95% CI 0.67, 0.89). No statistically significant difference was observed in receipt of

bupropion and, due to the small number of observations, the model assessing varenicline receipt did not converge (Table 2).

Patient-Level Factors Associated with Receipt of Pharmacotherapy among PLWH

Factors associated with increased likelihood of receiving smoking cessation pharmacotherapy among PLWH included: recently diagnosed psychiatric disorder (ARR 1.34, 95% CI 1.03, 1.73), recently diagnosed pulmonary disease (ARR 1.40, 95% CI 1.03, 1.90), and contemplation to quit (ARR 1.85, 95% CI 1.10, 3.10) (Table 3). There were no factors associated with decreased likelihood of receiving pharmacotherapy among PLWH.

Patient-Level Factors Associated with Receipt of Pharmacotherapy among HIV-uninfected

Factors associated with increased likelihood of receiving smoking cessation pharmacotherapy among uninfected participants included: black race (ARR 1.25, 95% CI 1.00, 1.57) and “other” race (ARR 1.75, 95% CI 1.24, 2.47) relative to white race, moderate to severe depression (ARR 1.33, 95% CI 1.12, 1.59), recently diagnosed psychiatric disorder (ARR 1.83, 95% CI 1.53, 2.20), contemplation to quit (ARR 1.31, 95% CI 1.14, 1.50), past quit attempt (ARR 2.27, 95% CI 1.57, 3.28), and report of smoking 10–20 cigarettes daily (ARR 1.19, 95% CI 1.06, 1.33) compared to report of smoking <10 cigarettes daily (Table 3). Earning $12,000–24,999 annually was associated with decreased likelihood of receiving smoking cessation pharmacotherapy relative to earning less than $12,000 annually (ARR 0.84, 95% CI 0.71, 0.98) (Table 3).

Discussion

To our knowledge, this is the first study to investigate receipt of effective pharmacologic treatment for tobacco use among PLWH who currently smoke, both overall and relative to a matched cohort of uninfected controls. After adjustment for covariates, PLWH were less likely to receive NRT and had comparable rates of receiving other smoking cessation pharmacotherapy with HIV-uninfected participants. Our findings suggest underutilization of pharmacotherapies generally, and disproportionate underutilization of NRT among PLWH for whom the health risks of smoking are increased.

Of note, over 70% of participants reported contemplating cessation and the median number of previous quit attempts was three in our sample. No significant differences in these characteristics were observed between those with and without HIV, suggesting high levels of readiness to stop smoking across groups. Nonetheless, a small proportion of all participants filled prescriptions for effective pharmacotherapies in the year following survey. Further work is needed to increase access to these effective pharmacotherapies, especially among highly motivated patients. Promotion of specific medications may also be necessary. Though varenicline has been demonstrated to have the greatest efficacy to promote cessation in populations with and without HIV (8,40–43), it was the least prescribed pharmacotherapy. This may relate to the fact that varenicline is still considered a second-line treatment and is strictly controlled within the VHA due to several cases specifically involving Veterans in which it potentially exacerbated underlying mental illness (44). Despite robust evidence demonstrating safety (45), clinicians should closely monitor patients who are taking

varenicline, similarly for any smoking cessation medication, as nicotine withdrawal may result in neuropsychiatric symptoms (46).

Although NRT was the most frequently received pharmacotherapy, the vast majority of participants did not receive it, and rates were lower among PLWH than uninfected persons. Prior studies have demonstrated that PLWH who report smoking have substantial interest in NRT—one conducted in a sample of 60 patients receiving care at an ID clinic in Bronx, New York found that 64% of participants were interested in NRT (47), and another conducted among 123 patients from an ID clinic in San Francisco, California found that 82% of PLWH who were currently thinking about quitting were interested in NRT (48). Whether there is high interest in NRT among PLWH receiving VHA care who report smoking is unknown, but low rates of NRT across groups and lower rates among PLWH than uninfected persons in the present study suggest room for improvement with regard to provision of smoking cessation pharmacotherapy.

Patient-level factors associated with the receipt of pharmacotherapy were both similar and different for PLWH and uninfected groups. Recently documented psychiatric disorder and contemplation to quit were associated with increased likelihood of pharmacotherapy receipt for both participants with and without HIV. However, sociodemographic characteristics (e.g., race and income) appeared to be important predictors of receiving pharmacotherapy in the uninfected population whereas they were not associated with pharmacotherapy receipt among PLWH. These findings suggest the possibility of inequitable receipt of pharmacotherapy among uninfected persons. However, given that this sample of HIV-uninfected adults was matched to PLWH based on age, sex, race, and site of care, it is unclear whether these findings are generalizable to a broader population of uninfected persons receiving VHA care. Thus, further work is needed to assess patient factors that predict receipt of smoking cessation pharmacotherapy among uninfected Veterans with current smoking in broader samples.

Overall, reasons for differences in smoking cessation pharmacotherapy receipt across HIV status and patient-level predictors identified in the present study are unclear. Factors both inside and outside of the medical encounter may have contributed to these disparities, including patient-level factors (e.g., preferences), provider-level factors (e.g., knowledge and training), and clinical setting (e.g., resources available), many of which were not available measures in our study. For instance, PLWH may be receiving care from providers with different levels of knowledge and training than uninfected patients, or a greater proportion of PLWH may prefer non-pharmacologic options. Unfortunately, we were not able to differentiate such patient and provider-level factors. Similarly in the present study, a recent diagnosis for pulmonary disease among PLWH was associated with increased likelihood of receiving pharmacotherapy. A previous study in VACS found that PLWH with a recent diagnosis for pulmonary disease had nearly five-times the odds of having made a quit attempt in the last year relative to those without such a diagnosis (28). Thus, it is possible that receiving a diagnosis for a pulmonary disease increases patient readiness to quit smoking. However, it is also possible that identification of a pulmonary condition by a provider may also increase likelihood that the provider gains knowledge about and/or becomes more willing to prescribe pharmacotherapy. Future research is needed to explore

patient treatment preferences, as well as provider- and clinic-level factors that are likely influential in patients' receipt of pharmacotherapies.

Interestingly, substance use and depression were not associated with receipt of smoking cessation pharmacotherapy in either PLWH or HIV-uninfected participants despite previous studies citing these as putative barriers to smoking cessation (49–54). Specifically among PLWH, substance use and depression have been found to be associated with current smoking status, greater nicotine dependence, and lack of motivation to quit (14,47,52–54). Moderate to severe depression was significantly associated with receipt of pharmacotherapy among the uninfected group though not among PLWH. Unhealthy alcohol use and substance use in the last year were not associated with pharmacotherapy receipt in either group. Yet, these factors associated with both smoking and HIV infection may not be translatable to provider-level practices and preferences in offering their patients smoking cessation pharmacotherapies.

Of note, recent diagnosis for CVD was not associated with receipt of smoking cessation pharmacotherapy for either group. Among the many comorbid health conditions afflicting PLWH who smoke, CVD has become of particular concern due to ART-induced metabolic changes, the high prevalence of cardiovascular risk factors in PLWH, and accelerated inflammatory processes that are believed to promote atherothrombosis (55). Smoking is a well-known and modifiable risk factor for CVD with marked reductions in CVD and coronary heart disease in PLWH who have successfully quit (5). Therefore, these diagnoses of CVD may represent missed opportunities to promote smoking cessation in this population. Promoting smoking cessation, as well as greater provision and access to pharmacotherapy is crucial among PLWH who face severe health consequences due to smoking.

In addition to limitations regarding measurement of patient-, provider-, and clinic-level factors that may influence receipt of pharmacotherapy, this study is limited in several ways. Specifically, this cohort was comprised of Veterans receiving care in the VHA and results may not be generalizable to non-Veterans, Veterans receiving VHA care who do not match the epidemiologic profile of PLWH receiving VHA care, persons not receiving health care, or patients with and without HIV receiving care in other health care systems. Additionally, NRT is available over the counter and it is possible that participants have procured smoking cessation medications in pharmacies outside the VHA. However, due to low copayments within the VHA, Veterans are not likely to obtain their medications elsewhere (56–58).

Despite these limitations, this study is among the first to assess receipt of smoking cessation pharmacotherapies among PLWH and well-matched HIV-uninfected Veterans from nine major U.S. cities. No differences in any pharmacotherapy was observed by HIV status, though PLWH were less likely than HIV-uninfected participants to receive NRT. Further work is needed to ensure access to effective pharmacologic treatments for patients who report smoking, particularly those with HIV for whom the dangers of smoking are great.

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Alphabetical list of abbreviations:

AIDS	Acquired immunodeficiency syndrome
ART	Antiretroviral therapy
ARR	Adjusted relative risk
AUDIT-C	Alcohol Use Disorders Identification Test Consumption
CDW	Corporate Data Warehouse
CI	Confidence interval
COPD	Chronic obstructive pulmonary disease
CVD	Cardiovascular disease
EHR	Electronic health record
FDA	Food and Drug Administration
GED	General education development
HIV	Human immunodeficiency virus
ICD-9-CM	International Classification of Disease, Ninth Revision, Clinical Modification
ID	Infectious disease
NRT	Nicotine replacement therapy
PHQ-9	Patient Health Questionnaire
PLWH	People living with HIV
RR	Relative risk
VACS	Veterans Aging Cohort Study
VHA	Veterans Health Administration

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Table 1:

Characteristics of Patients Reporting Current Smoking who Completed VACS Survey between 2012 and 2017, Overall and by HIV Status

	Study Population (n=1722)	HIV+ (n=814)	HIV− (n=908)	*p value*
SOCIODEMOGRAPHIC FACTORS				
Age, mean (SD)	56.2 (8.3)	56.4 (8.1)	56.1 (8.5)	NS
Male, n (%)	1646 (96)	786 (97)	860 (95)	NS
Race/ethnicity, n (%)				0.01
Black	1280 (74)	623 (77)	657 (72)	
Hispanic	93 (5)	49 (6)	44 (5)	
Other	89 (5)	42 (5)	47 (5)	
White	257 (15)	98 (12)	159 (18)	
Education, n (%)				NS
< High school	104 (6)	49 (6)	55 (6)	
High school grad, GED	647 (38)	290 (36)	357 (39)	
Some college or technical school	779 (45)	374 (46)	405 (45)	
College grad, higher education	184 (11)	97 (12)	87 (10)	
Married or living with partner, n (%)	374 (22)	169 (21)	205 (23)	NS
Annual income, n (%)				0.01
<$1200	741 (44)	330 (42)	411 (47)	
$1200–24999	485 (29)	259 (33)	226 (26)	
≥ $25000	443 (27)	200 (25)	243 (28)	
SUBSTANCE USE / MENTAL HEALTH COMORBIDITY				
Audit-C score, median (IQR)	2 (0–5)	2 (0–4)	2 (0–5)	0.05
Unhealthy alcohol use, n (%)	595 (35)	256 (31)	339 (37)	0.01
Substance use in the last year, n (%)				
Marijuana	557 (33)	288 (36)	269 (30)	0.01
Cocaine or crack	447 (26)	202 (25)	245 (27)	NS
Amphetamines	108 (6)	51 (6)	57 (6)	NS
Heroin	128 (8)	57 (7)	71 (8)	NS
Prescription opioids	331 (19)	155 (19)	176 (20)	NS
Depression severity (PHQ-9), median (IQR)	4 (1–9)	4 (1–9)	5 (1–10)	0.01
Moderate to severe depression, n (%)	407 (24)	171 (21)	236 (26)	0.02
Psychiatric disorders, n (%)	781 (48)	296 (38)	485 (57)	<0.001
SMOKING-RELATED COMORBIDITY				
Cardiovascular disease, n (%)	791 (48)	346 (44)	445 (52)	<0.001
Pulmonary disease, n (%)	185 (11)	79 (10)	106 (13)	NS
Non-AIDS malignancies, n (%)	110 (7)	64 (8)	46 (5)	0.03
HIV SEVERITY				
HIV-infected, n (%)	814 (47)			
On antiretroviral therapy, n (%)		762 (94)		
HIV severity				

	Study Population (n=1722)	HIV+ (n=814)	HIV− (n=908)	*p value*
HIV RNA Viral load, median (IQR)		40 (20–91)		
CD4+ count, median (IQR)		483 (308–691)		
VACS Index 2.0, median (IQR)	42 (33–55)	51 (41.5–63)	35 (29–44)	<0.001
HEALTH CARE UTILIZATION				
Outpatient visits in last year, median (IQR)	4 (2–6)	4 (3–7)	3 (2–5)	<0.001
Inpatient visits in last year, median (IQR)	0 (0–1)	0 (0–0)	0 (0–1)	<0.001
SMOKING-RELATED ATTITUDES / BEHAVIORS				
Contemplation to quit, n (%)	1175 (71)	554 (72)	621 (71)	NS
Past quit attempts, median (IQR)	3 (2–5)	3 (2–5)	3 (2–5)	NS
Cigarettes smoked daily, median (IQR)	9(5–12)	8(5–12)	10 (5–12)	NS
Smoke >1 pack daily, n (%)	63 (4)	27 (4)	36 (4)	NS
Time to first cigarette, n (%)				NS
After 60 minutes	493 (29)	242 (30)	251 (28)	
31–60 minutes	290 (17)	134 (17)	156 (18)	
6–30 minutes	486 (29)	225 (28)	261 (29)	
Within 5 minutes	425 (25)	206 (26)	219 (25)	

Table 2.

Associations between HIV status and Receipt of Smoking Cessation Medications among Patients Recruited to the Veterans Aging Cohort Study (N=1722): Results of Bivariate Comparisons and Adjusted Log-Linear Regression Models

	HIV+ (n=814)		HIV− (n=908)			Unadjusted relative risk		Adjusted relative risk	
	N	(%)	N	(%)	p-value	RR	(95% CI)	ARR*	(95% CI)
Receipt of Smoking Cessation Medications									
Any medication	237	(29)	323	(36)	0.004	**0.82**	**0.71, 0.94**	0.90	0.76, 1.07
Nicotine replacement therapy	154	(19)	229	(25)	0.002	**0.75**	**0.58, 0.97**	**0.77**	**0.67, 0.89**
Bupropion	69	(8)	84	(9)	NS	0.97	0.75, 1.26	1.25	0.87, 1.80
Varenicline	12	(1)	4	(0.4)	0.03	3.02	0.43, 21.00	--	--

*Relative risk of receiving medications for HIV+ relative to HIV- adjusted for age, sex, race/ethnicity, education, income, unhealthy alcohol use, substance use in last year, moderate-severe depression, recent diagnoses for psychiatric disorders, CVD, chronic pulmonary disease and non-AIDS malignancies, VACS Index 2.0, number of inpatient and outpatient visits, contemplation to quit, past quit attempt, and number of cigarettes smoked daily.

Table 3:

Relative Risk for Receipt of Any Smoking Cessation Medication Associated with Patient Characteristics Stratified by HIV Status among Patients Recruited to the Veterans Aging Cohort Study (N=1722)

	HIV+ ARR* (95% CI)	HIV− ARR* (95% CI)
SOCIODEMOGRAPHIC FACTORS		
Age	1.00 (0.98, 1.01)	0.99 (0.98, 1.00)
Male	1.46 (0.90, 2.37)	0.86 (0.53, 1.37)
Race/ethnicity		
White	Reference	Reference
Black	0.73 (0.48, 1.10)	**1.25 (1.00, 1.57)**
Hispanic	0.64 (0.36, 1.13)	1.10 (0.72, 1.68)
Other	0.97 (0.53, 1.75)	**1.75 (1.24, 2.47)**
Education		
< High school	Reference	Reference
High school grad, GED	0.68 (0.32, 1.43)	0.62 (0.35, 1.09)
Some college or technical school	0.69 (0.36, 1.32)	0.72 (0.48, 1.09)
College grad, higher education	0.96 (0.40, 2.28)	0.60 (0.23, 1.54)
Annual income		
<$1200	Reference	Reference
$1200–24999	0.92 (0.68, 1.23)	**0.84 (0.71, 0.98)**
≥ $25000	0.94 (0.68, 1.29)	0.92 (0.77, 1.09)
MENTAL HEALTH / SUBSTANCE USE		
Unhealthy alcohol use	0.99 (0.82, 1.20)	1.05 (0.85, 1.29)
Substance use in the last year	0.97 (0.78, 1.19)	0.86 (0.69, 1.07)
Moderate-severe depression	0.90 (0.76, 1.06)	**1.33 (1.12, 1.59)**
Psychiatric disorders	**1.34 (1.03, 1.73)**	**1.83 (1.53, 2.20)**
SMOKING-RELATED COMORBIDITY		
Cardiovascular disease	1.04 (0.72, 1.50)	0.98 (0.79, 1.21)
Pulmonary disease	**1.40 (1.03, 1.90)**	1.17 (0.96, 1.43)
Non-AIDS malignancies	1.26 (0.92, 1.72)	1.32 (0.88, 1.99)
HIV SEVERITY		
VACS Index 2.0	0.99 (0.98, 1.01)	1.00 (0.99, 1.00)
HEALTH CARE UTILIZATION		
Outpatient visits in last year		
1 to 2	Reference	Reference
3 to 5	1.28 (0.75, 2.20)	0.92 (0.77, 1.09)
≥6	1.63 (0.95, 2.79)	1.01 (0.87, 1.15)
Inpatient visits in last year		
0	Reference	Reference
1	1.02 (0.71, 1.45)	1.19 (0.87, 1.63)
≥2	1.12 (0.77, 1.64)	0.91 (0.70, 1.18)

	HIV+ ARR* (95% CI)	HIV− ARR* (95% CI)
SMOKING-RELATED ATTITUDES/BEHAVIOR		
Contemplation to quit	**1.85 (1.10, 3.10)**	**1.31 (1.14, 1.50)**
Past quit attempt	1.31 (0.59, 2.88)	**2.27 (1.57, 3.28)**
Cigarettes smoked daily		
<10	Reference	Reference
10–20	1.26 (0.81, 1.96)	**1.19 (1.06, 1.33)**
>20	1.51 (0.73, 3.14)	0.96 (0.76, 1.22)

*Relative risk of receiving medications adjusted for age, sex, race/ethnicity, education, income, unhealthy alcohol use, substance use in last year, moderate-severe depression, recent diagnoses for psychiatric disorders CVD, chronic pulmonary disease, and non-AIDS malignancies, VACS Index 2.0, number of outpatient and inpatient visits, contemplation to quit, past quit attempt, and number of cigarettes smoked daily.