Erectile Dysfunction Drug Receipt, Risky Sexual Behavior and Sexually Transmitted Diseases in HIV-infected and HIV-uninfected Men

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BACKGROUND: Health care providers may be concerned that prescribing erectile dysfunction drugs (EDD) will contribute to risky sexual behavior.

OBJECTIVES: To identify characteristics of men who received EDD prescriptions, determine whether EDD receipt is associated with risky sexual behavior and sexually transmitted diseases (STDs), and determine whether these relationships vary for certain sub-groups.

DESIGN: Cross-sectional study.

PARTICIPANTS: Two thousand seven hundred and eighty-seven sexually-active, HIV-infected and HIV-uninfected men recruited from eight Veterans Health Affairs outpatient clinics. Data were obtained from participant surveys, electronic medical records, and administrative pharmacy data.

MEASURES: EDD receipt was defined as two or more prescriptions for an EDD, risky sex as having unprotected sex with a partner of serodiscordant or unknown HIV status, and STDs, according to self-report.

RESULTS: Overall, 28% of men received EDD in the previous year. Eleven percent of men reported unprotected sex with a serodiscordant/unknown partner in the past year (HIV-infected 15%, HIV-uninfected 6%, $P < 0.001$). Compared to men who did not receive EDD, men who received EDD were equally likely to report risky sexual behavior (11% vs. 10%, $p = 0.9$) and STDs (7% vs 7%, $p = 0.7$). In multivariate analyses, EDD receipt was not significantly associated with risky sexual behavior or STDs in the entire sample or in subgroups of substance users or men who had sex with men.

CONCLUSION: EDD receipt was common but not associated with risky sexual behavior or STDs in this

sample of HIV-infected and uninfected men. However, risky sexual behaviors persist in a minority of HIV-infected men, indicating ongoing need for prevention interventions.

KEY WORDS: HIV infection; risky sexual behavior; STDs; men; phosphodiesterase inhibitors.

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INTRODUCTION

Phosphodiesterase-5 enzyme inhibitors (sildenafil citrate, tadalafil, and vardenafil HCL) are approved pharmacotherapies to treat erectile dysfunction in men.¹ These erectile dysfunction drugs (EDDs) are commonly used in the United States,² marketed broadly, often requested by patients, and associated with improved quality of life.³ EDDs have also been linked to high-risk sexual behavior in some groups of men at increased risk for HIV transmission, in particular men who have sex with men (MSM), men who use recreational or illicit drugs, and HIV-infected men.⁴⁻¹⁶ Because of their association with risky behavior, some have argued that EDD medications should be classified as controlled substances.^{5,17}

The source for obtaining EDD is an important issue to consider. Men may obtain EDD via prescription from a health care provider or from other sources, such as the Internet, friends, or the black market.^{5,9,10,12} Health care providers must consider whether a prescription of an EDD could have adverse public health effects. Nearly all of the existing literature regarding EDD and risky sexual behavior has come from non-clinical samples of high-risk populations, in which prescribed EDD was rarely differentiated from EDD obtained from other sources. Thus, it is less clear whether prescribing EDD for erectile dysfunction in the context of routine health care is associated with risky sexual behavior or sexually transmitted disease (STD) transmission.

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Health care providers caring for HIV-infected men must also consider whether an EDD prescription could facilitate sexual encounters that result in additional HIV transmission. The number of older, HIV-infected men has increased significantly in recent years, largely due to improved treatment but also due to new infections in this age group.¹⁸ As the HIV-infected population ages, the demand for EDDs may increase in this group due to additional chronic diseases that are associated with erectile dysfunction. Thus, it is important to determine whether EDD obtained through routine healthcare is associated with risky sexual behavior in HIV-infected and HIV-uninfected men.

This study's objectives were to identify characteristics of men who received prescriptions for EDD through a network of Veterans Health Affairs (VHA) clinics throughout the United States, to determine whether EDD receipt was associated with risky sexual behavior and sexually transmitted diseases (STDs), and to determine whether these relationships varied based on HIV status, substance abuse, or having sex with men.

METHODS

The Veterans Aging Cohort Study (VACS) is an ongoing prospective cohort study involving HIV-infected and HIV-uninfected veterans receiving care at VHA clinics throughout the United States. The overarching aim of VACS is to study the role of alcohol consumption and comorbid medical and psychiatric disease on clinical outcomes in HIV infection.¹⁹ VACS participants were recruited from infectious disease (HIV-infected) and general medicine (HIV-uninfected) clinics at eight sites (Atlanta, GA; Baltimore, MD; Bronx, NY; Houston, TX; Los Angeles, CA; New York City, NY; Pittsburgh, PA and Washington, DC).¹⁹ Overall, 58% of HIV-infected men at the eight sites were enrolled, with only 9% of those approached refusing to participate.¹⁹ HIV uninfected controls were targeted to match the demographics of the HIV-infected participants on 5-year age blocks, race and gender. Subjects completed a comprehensive baseline survey at enrollment and then at one year follow-up intervals. Further descriptions of the VACS sample and methodology are available online (www.vacohort.org).

The study sample for these analyses includes the subset of male VACS participants who completed a follow-up survey between September 2005 and January 2007 and who reported any sexual activity in the past year ($n=2,787$). Data were obtained from three linked sources: participant surveys, electronic medical records, and pharmacy data that are collected nationally through the Pharmacy Benefits Management (PBM) program (Hines, IL). The PBM program includes all outpatient prescriptions funded through the VHA healthcare system and are likely to be representative of the use of prescribed EDD in this population.

Measures. *EDD use* was defined as two or more prescriptions for sildenafil citrate, tadalafil, or vardenafil HCL, documented in the PBM database in the year prior to and up to the follow-up survey date. Thus, men who had received only one EDD prescription were not considered to be EDD users, because such men may have never used the medication, or simply tried it once. Although men were not asked about non-prescribed use of EDD at this assessment, a previous assessment in the

same cohort demonstrated substantial agreement between self-reported EDD use and the PMB database, with fewer than 5% of men reporting EDD use exclusively from non-VA sources (unpublished data).

Risky sexual behavior was defined as "unprotected sex with a partner of serodiscordant or unknown HIV status". Specifically, men were asked, "During the past 12 months, did you ever, even once, have unprotected vaginal or anal sex (sex without a condom) with any of the following types of partners? Any partner who was HIV positive; Any partner who was HIV negative; Any partner whose HIV status was unknown." The following were the response options: Yes (unprotected sex at least once); or No (always used a condom). Those who reported unprotected sex with anyone of serodiscordant or unknown HIV status were classified as having risky sexual behavior.

STDs were identified by self report. Participants were asked, "In the past 12 months, have you been diagnosed with any of the following sexually transmitted diseases?" Persons were classified as having had a self-reported STD if they reported having genital warts, chlamydia, gonorrhea, syphilis, trichomonas, chancroid, or herpes.

Participant demographic characteristics, including gender, race/ethnicity, and marital status/living with partner were measured by self-report on the VACS baseline survey. Measures of alcohol and drug use and depression were included on the VACS follow-up surveys. Hazardous drinking (drinking associated with possible harm) was defined as a score of eight or more on the Alcohol Use Disorders Identification Test (AUDIT).²⁰ Participants were asked to report the frequency of use of marijuana, cocaine, stimulants, and heroin; current use for these drugs was defined as "at least monthly." Non-prescribed use of pain medications, defined as use of pain medications that were not prescribed, was based on self-reported use in the past year from a list of 20 specific narcotic pain medications. Depression, measured by the Patient Health Questionnaire (PHQ-9) at each follow-up assessment, was classified as present if the PHQ-9 score was 10 or more.²¹ Comorbid medical conditions, including diagnoses of hypertension, diabetes, and coronary artery disease (CAD), were determined using International Classification of Diseases, Ninth Revision (ICD-9) codes from the electronic medical record. Persons were considered to have a comorbid diagnosis if at least one inpatient or two outpatient ICD-9 code diagnoses were recorded between one-year prior to and six months after the survey date. Persons were classified as having sex with men if they reported having "sex with males" or "sex with males and females" in the past year. Further details on variables and surveys can be found at www.vacohort.org.

Analysis

Demographic and behavioral characteristics were described and compared by HIV status using chi-square tests and t-tests, as appropriate. We used chi-square tests to determine whether EDD receipt varied by demographic and descriptive variables and to determine the bivariate associations of EDD receipt to risky sex and STDs.

Multivariable logistic regression models were used to identify independent factors associated with EDD receipt, risky sexual behavior, and STDs. Logistic regression models predicting EDD receipt were adjusted for demographic variables (age, race/ethnicity, married/living with partner, sex with

males in past 12 months), alcohol and drug use, and comorbidities identified as potential confounders (depression, diabetes, hypertension, and coronary artery disease). The logistic regression models predicting risky sexual behavior and STD included the same variables plus EDD receipt. There was significant collinearity between the sex with males and HIV status variables; therefore, we ran multivariate models stratified by HIV status. For each set of models, we first ran the multivariate logistic regression models including the variables described above. We then reran the models excluding variables with $p > 0.2$ in both HIV-infected and uninfected models, and we present these models in the results. We also examined the relationship of EDD to risky sexual behavior or STDs in the following subgroups: those with hazardous drinking, cocaine use, and sex with men. All analyses were conducted using Stata 10.0 (College Station, TX).

Multiple imputation was used to address missing data.^{22–24} For each of the following covariates, 1% or less were missing a response: married or living with partner, had sex with males, hazardous alcohol use, and depression. Pain medication use information was missing for 2%, and marijuana and cocaine use information was missing for 4%. Multiple imputation was conducted using the Stata v10.0 (Stata Corporation, College

Station, Texas) ice command.^{22–24} The imputation model included EDD receipt, risky sexual behavior, and all covariates included in the initial models (listed above), undertook ten switching procedures, and generated five datasets. The Stata v10.0 mim command was used to combine the results of the analyses from the multiply imputed data sets.²³ Analyses were also conducted on the complete case dataset (using categories to define missing data). Results from analyses of imputed data did not differ substantively from those using complete cases; therefore, the results from the imputation models are included here.

RESULTS

The study sample consists of 2,787 sexually-active men, of whom 1,469 (53%) were HIV-infected. Demographic and behavioral characteristics in both HIV-infected and HIV-uninfected men are shown in Table 1. Over 60% of the men were over age 50, over two-thirds were black, and one-third were married or living with a long-term partner. Many had comorbid health conditions, and substance use behavior was common; 18% reported hazardous alcohol consumption, and over 10%

Table 1. Demographics and Main Outcomes Among 2,787 Sexually Active Men Participating in VACS, 2005–2007, Overall and by HIV Serostatus

	ALL	HIV-infected	HIV-uninfected	P-Value
N	2,787	1,469	1,318	
Mean age (SD)	52.0 (8.9)	51 (8.5)	53 (9.1)	<0.001
Age in years, N (%)				
<40	215 (8)	133 (9)	82 (6)	<0.001
40–49	874 (31)	494 (34)	380 (29)	
50+	1,698 (61)	842 (57)	856 (65)	
Race/Ethnicity, N (%)				0.3
White	513 (18)	254 (17)	259 (20)	
Black	1926 (69)	1036 (71)	890 (68)	
Hispanic	241 (9)	126 (9)	115 (9)	
Other/Unknown	107 (4)	53 (4)	54 (4)	
Married or living with partner, N (%) ^a	915 (33)	376 (26)	539 (41)	<0.001
Sex with men in past year, N (%) ^a	636 (23)	611 (42)	25 (2)	<0.001
Alcohol and drug use, N (%) ^a				
Hazardous alcohol consumption ^b	500 (18)	240 (17)	260 (20)	0.019
Non-prescribed pain medication ^c	374 (14)	216 (15)	158 (12)	0.04
Marijuana (monthly)	358 (13)	234 (17)	124 (10)	<0.001
Cocaine (monthly)	312 (12)	176 (13)	136 (11)	0.2
Stimulants (monthly)	40 (2)	34 (2)	6 (0.5)	<0.001
Heroin (monthly)	91 (3)	44 (3)	47 (4)	0.4
Comorbid health conditions, N (%)				
Depression ^d	566 (20)	257 (18)	309 (24)	<0.001
Hypertension ^e	1154 (41)	409 (28)	745 (57)	<0.001
Diabetes ^e	468 (17)	172 (12)	296 (22)	<0.001
Coronary artery disease ^e	196 (7)	58 (4)	138 (10)	<0.001
Peripheral vascular disease ^e	72 (3)	22 (2)	50 (4)	<0.001
EDD receipt in past year, N (%)	788 (28)	380 (26)	408 (31)	0.03
Risky sexual behavior (past year), N (%) ^f	284 (11)	214 (15)	70 (6)	<0.001
Sexually transmitted diseases (past year), N (%) ^a	200 (7)	145 (10)	55 (4)	<0.001
Genital herpes	92 (3)	57 (4)	35 (3)	0.07
Genital warts	47 (2)	31 (2)	16 (1)	0.07
Chlamydia	55 (2)	29 (2)	26 (2)	0.99
Gonorrhea	60 (2)	37 (3)	23 (2)	0.16
Syphilis	66 (2)	45 (3)	21 (2)	0.01
Chancroid	27 (1)	10 (1)	17 (1)	0.1
Trichomonas	32 (1)	13 (1)	19 (1)	0.17

P-value: comparison of HIV-infected vs. HIV-uninfected. ^aBased on self-report; ^bHazardous Alcohol Consumption: Alcohol Use Disorders Identification Test (AUDIT) score of ≥ 8 ; ^cNon-prescribed pain medications defined as any use in past year from list of 20 narcotic pain medications; ^dScore of 10 or more on the Patient Health Questionnaire (PHQ-9) (21); ^eBased on ICD-9 diagnosis; ^fdefined as unprotected intercourse with a partner of serodiscordant or unknown HIV serostatus

reported marijuana, cocaine, or the non-prescribed use of pain medications. Compared to HIV-uninfected men, HIV-infected men were more likely to have reported having had sex with men, and the use of marijuana, non-prescribed pain medications, and stimulants (Table 1). HIV-uninfected men were more likely to be married or living with a partner, have hazardous alcohol consumption, and have other medical comorbidities.

Overall, 28% of these sexually active men received two or more prescriptions for EDD in the previous year (Table 1). HIV-infected men were slightly less likely to be prescribed EDD (26% vs. 31%, $p=0.003$). Regarding risky sexual behavior, 11% reported unprotected sex with a non-main partner in the past year. HIV-infected men were significantly more likely than HIV-uninfected men to engage in risky sexual behavior (15% vs. 6%, $p<0.001$). STDs were reported by 7% of the sample. HIV-infected men were significantly more likely to report a STD diagnosis in the previous year (10% vs. 4% $p<0.001$).

Individual Characteristics Associated with EDD Prescription

One-third of men age 50 years and over received two or more prescriptions for EDD in the previous year. Table 2 shows the relationship of demographic, behavioral, and clinical characteristics with EDD use overall, and among HIV-infected and HIV-uninfected men. Overall, EDD receipt was more common in older men, nonwhite men, non-MSM men, those with non-

prescribed use of pain medications, and those with depression, hypertension, or diabetes (Table 2). Among HIV-infected men, EDD receipt was more common in older men, men who don't have sex with men, those with non-prescribed use of pain medications, and those with diabetes (Table 2). Among HIV-uninfected men, EDD receipt was more common in older men, nonwhite men, those not married or living with partner, and those with non-prescribed use of pain medications, cocaine use, depression, or hypertension (Table 2).

In both the HIV-infected and HIV-uninfected multivariate models, increasing age and use of unprescribed pain medications were associated with an increased likelihood of EDD receipt (Table 3). In the HIV-infected model, having sex with men was associated with a decreased likelihood of EDD receipt. In the HIV-uninfected model, non-white race/ethnicity and depression were associated with an increased likelihood of EDD receipt, while married/ living with partner was associated with a decreased likelihood of EDD receipt (Table 3).

Association of EDD Receipt with Risky Sexual Behavior and STDs

The percent of reported risky sexual behavior was similar between those who did and did not receive EDD (11% vs. 10%, $p=0.6$). This was true when the analysis was restricted to the HIV-infected men (16% vs. 15%, $p=0.4$) or the HIV-uninfected men (6% vs. 5%, $p=0.6$).

Table 2. Factors Associated with EDD Receipt Among Sexually Active Men Participating in VACS, 2005–2007, Overall and in HIV-infected and HIV-uninfected Men

Patient characteristic		Proportion of persons who received EDD in past year, N (%)		
		ALL (n=2,787)	HIV-infected (n=1,469)	HIV-uninfected (n=1,318)
Age in years	<40	14 (7)	9 (7)	5 (6)
	40–49	210 (24)	114 (23)	96 (25)
	50+	564 (33) ^g	257 (31) ^g	307 (36) ^g
Race/ethnicity	White	108 (21)	61 (24)	47 (18)
	Black	583 (30)	270 (26)	313 (35)
	Hispanic	65 (27)	34 (27)	31 (27)
	Other/Unknown	32 (30) ^g	15 (28)	17 (31) ^g
Married or living with partner ^a	Yes	242 (26)	106 (28)	136 (25)
	No	538 (29)	267 (25)	271 (35) ^g
Sex with men in past year ^a	Yes	116 (18)	112 (18)	4 (16)
	No	668 (31) ^g	265 (32) ^g	403 (31)
Hazardous alcohol consumption ^b	Yes	144 (29)	61 (25)	83 (32)
	No	631 (28)	313 (26)	318 (31)
Non-prescribed pain medication ^c	Yes	148 (40)	74 (34)	74 (47)
	No	616 (26) ^g	297 (24) ^g	319 (28) ^g
Marijuana use ^a	Yes	93 (26)	53 (23)	40 (32)
	No	654 (28)	311 (26)	343 (30)
Cocaine use ^a	Yes	96 (31)	43 (24)	53 (39)
	No	650 (28)	320 (26)	330 (30) ^f
Stimulants use ^a	Yes	7 (18)	5 (15)	2 (33)
	No	727 (28)	353 (26)	374 (30)
Depression ^d	Yes	189 (33)	77 (30)	112 (36)
	No	591 (27) ^g	299 (25)	292 (29) ^f
Hypertension ^e	Yes	379 (33)	126 (31)	253 (34)
	No	409 (25) ^g	254 (24) ^g	155 (27) ^g
Diabetes ^e	Yes	162 (35)	58 (34)	104 (35)
	No	626 (27) ^f	322 (25) ^f	304 (30)
Coronary artery disease ^e	Yes	51 (26)	16 (28)	35 (25)
	No	737 (28)	364 (26)	373 (32)

^aBased on self-report; ^bHazardous Alcohol Consumption: Alcohol Use Disorders Identification Test (AUDIT) score of ≥ 8 ; ^cNon-prescribed pain medications defined as any use in past year from list of 20 narcotic pain medications; ^dScore of 10 or more on the Patient Health Questionnaire (PHQ-9) (21); ^eBased on ICD-9 diagnosis ^f $p<0.05$; ^g $p<0.01$; p -values from chi-square tests for differences in percentage of persons who received EDD in each of the patient characteristic categories

Table 3. Factors Associated with EDD Receipt Among Sexually Active Men Participating in VACS, 2005–2007: Multivariate Analysis

	HIV-infected (n=1,469)			HIV-uninfected (n=1,318)		
	OR	95% CI	P	OR	95% CI	P
Age						
<40 years	–			–		
40–49	3.4	1.6–6.9	0.001	4.3	1.7–11.0	0.003
50+	4.3	2.1–8.7	<0.001	7.8	3.1–19.8	<0.001
Non-white (ref=white)	0.8	0.6–1.2	0.3	2.1	1.5–3.0	<0.001
Married/living with partner ^a	1.1	0.8–1.4	0.6	0.6	0.5–0.8	0.001
Sex with men in past year ^a (ref=no sex with men in past year)	0.6	0.4–0.8	<0.001	0.5	0.2–1.4	0.2
Non-prescribed pain medication in past year ^b (ref=none)	1.4	1.0–1.9	0.03	2.0	1.4–2.9	<0.001
Depression ^c (ref=none)	1.2	0.9–1.7	0.2	1.4	1.0–1.8	0.02
Hypertension ^d (ref=none)	1.2	0.9–1.6	0.1	1.3	1.0–1.7	0.07
Coronary artery disease ^d (ref=none)	0.8	0.4–1.5	0.5	0.7	0.4–1.0	0.06

^aBased on self-report; ^bNon-prescribed pain medications defined as any use in past year from list of 20 narcotic pain medications; ^cScore of 10 or more on the Patient Health Questionnaire (PHQ-9) (21); ^dBased on ICD-9 diagnosis

In both the HIV-infected and HIV-uninfected models, being married/living with partner were associated with decreased likelihood of risky sex, whereas sex with males, hazardous alcohol consumption, and cocaine use were associated with increased likelihood of risky sex (Table 4). In the HIV-infected model only, unprescribed pain medication and marijuana use was associated with an increased likelihood of risky sex. For both HIV-infected and uninfected models, EDD receipt was not statistically significantly associated with risky sex (Table 4).

Overall, the percentage of reported STDs was similar between those who did not receive EDD (7% vs. 7%, $p=0.7$). This finding was similar among HIV-infected men (9% vs. 10%, $p=0.5$); although among HIV-uninfected men, those who received EDD were more likely to report an STD in bivariate analyses (6% vs. 3%, $p=0.02$). For both HIV-infected and uninfected models, EDD receipt was not statistically significantly associated with STDs (Table 5). In both the HIV-infected and HIV-uninfected multivariate models of STDs, unprescribed pain medication was associated with an increased likelihood of STDs. In the HIV-infected model, younger age and sex with men was associated with an increased likelihood of STDs.

There were no statistically significant relationships between EDD receipt and risky sexual behaviors or STDs in models limited to those with hazardous drinking, cocaine use, or men who reported having sex with men (data not shown).

DISCUSSION

In this sample of over 2,500 men attending VHA outpatient clinics, EDD receipt was not associated with risky sexual behavior or STDs, overall or within subgroups of HIV-infected men, substance users, or MSM. Thus, for men who obtain EDD via prescription from a healthcare provider, EDD appears to be prescribed responsibly and used responsibly. These findings differ from the majority of previous studies on this topic. One of the most plausible reasons for the varying conclusions is that the focus of our study is on men who received EDD as part of clinical practice, whereas nearly all of the previous reports linking EDD to risky sexual behavior were conducted in non-clinical samples in high risk groups, including MSM^{4–12,16,25}, substance abusers^{11,26}, and HIV-infected men outside of clinical settings.^{13–15} In nearly all of these studies, the association of EDD and risky sexual behavior was consistently the strongest in men who also used stimulant drugs such as methamphetamines, ecstasy, or gamma-hydroxybutyrate (GHB), which were rare in our study sample.

The source of EDD may also influence its relationship with risky sexual behavior. In samples of younger MSMs, 40% or more report obtaining EDD without a prescription (e.g. via the internet or off the street).^{5,9,10,12} Men obtaining EDD without a prescription appear to report higher-risk behaviors than those

Table 4. Factors Associated with Risky Sexual Behavior in Sexually Active Men Participating in VACS, 2005–2007: Multivariate Analysis

	HIV-infected (n=1,469)			HIV-uninfected (n=1,318)		
	OR	95% CI	P	OR	95% CI	P
EDD receipt	1.2	0.9–1.8	0.2	1.0	0.6–1.7	0.9
Non-white (ref=White)	1.0	0.6–1.5	0.9	1.7	0.8–3.7	0.2
Married/living w/ partner ^a	0.6	0.4–0.9	0.03	0.4	0.2–0.7	0.004
Sex with men in past year ^a (ref=no sex with men in past year)	2.0	1.4–2.8	<0.001	4.0	1.3–11.7	0.01
Hazardous alcohol consumption ^b (ref=none)	1.7	1.1–2.5	0.008	2.2	1.3–3.8	0.004
Non-prescribed pain medication ^c (ref=none)	1.6	1.1–2.4	0.02	0.5	0.2–1.1	0.09
Marijuana use ^a (ref=none)	1.5	1.0–2.1	0.04	1.8	0.9–3.6	0.08
Cocaine use ^a (ref=none)	1.8	1.2–2.7	0.01	2.4	1.3–4.5	0.005
Depression ^d (ref=none)	1.1	0.7–1.6	0.7	1.5	0.9–2.5	0.2

Risky sexual behavior defined as unprotected intercourse with a partner of serodiscordant or unknown HIV serostatus^aBased on self-report; ^bHazardous Alcohol Consumption: Alcohol Use Disorders Identification Test (AUDIT) score of ≥ 8 ; ^cNon-prescribed pain medications defined as any use in past year from list of 20 narcotic pain medications; ^dScore of 10 or more on the Patient Health Questionnaire (PHQ-9) (21)

Table 5. Factors Associated with Self-Reported Sexually Transmitted Diseases (STDs) in Sexually Active Men Participating in VACS, 2005–2007: Multivariate Analysis

	HIV-infected (n=1,469)			HIV-uninfected (n=1,318)		
	OR	95% CI	P	OR	95% CI	P
EDD receipt	0.99	0.6-1.5	0.9	1.7	0.9-2.9	0.09
Age						
<40	–			–		
40-49	0.5	0.3-0.8	0.006	0.8	0.2-3.0	0.8
50+	0.6	0.3-1.0	0.038	1.2	0.3-4.3	0.8
Non-White (ref=White)	1.5	0.9-2.6	0.1	1.8	0.7-4.4	0.2
Sex with men in past year ^a (ref=no sex w/ men in past year)	1.5	1.0-2.3	0.04	2.1	0.4-10.0	0.4
Hazardous alcohol consumption ^b (ref=none)	1.5	0.9-2.3	0.1	1.7	0.9-3.1	0.08
Non-prescribed pain medication ^c (ref=none)	1.9	1.2-3.0	0.004	2.0	1.0-3.8	0.04
Marijuana use ^a (ref=none)	1.2	0.8-1.9	0.4	1.8	0.9-3.8	0.1
Depression ^d (ref=none)	1.4	0.9-2.2	0.1	1.4	0.8-2.5	0.3
Hypertension ^c (ref=none)	0.7	0.4-1.1	0.1	0.7	0.4-1.2	0.2
Diabetes ^c (ref=none)	0.5	0.3-1.1	0.1	0.7	0.3-1.5	0.3

^aBased on self-report; ^bHazardous Alcohol Consumption: Alcohol Use Disorders Identification Test (AUDIT) score of ≥ 8 ; ^cNon-prescribed pain medications defined as any use in past year from list of 20 narcotic pain medications; ^dScore of 10 or more on the Patient Health Questionnaire (PHQ-9) (21); ^eBased on ICD-9 diagnosis

obtaining it by prescription.⁹ A study of EDD use in heterosexual drug users found that many men used the medications to “enhance sexual experience,” rather than to treat erectile dysfunction, but 30% of that sample had obtained these medications without a prescription.¹¹ The current study only considered EDD that had been obtained by prescription, a source that is most relevant and under the control of the prescribing clinician.

In this study, the proportion of sexually active men who received prescriptions for EDD use was fairly high; one-third of men over age 50 received two or more prescriptions in the previous year, with receipt being equally likely among men aged 50 to 60 as in those aged 60 and above. EDD receipt was less common among MSM in this sample, which could reflect either less erectile dysfunction, or decreased use of physicians as a source of EDDs, or a reluctance by physicians to prescribe EDD to these patients. The association of EDD receipt with non-prescribed use of pain medications had not been reported previously. Possible explanations include an association of chronic pain with erectile dysfunction, side effects of the specific medications, or other characteristics of men that are more likely to use pain medications without a prescription. Similarly, the finding linking depression with EDD receipt could reflect either depression as a cause of erectile dysfunction, erectile dysfunction as a cause of depression, or side effects of medications used to treat depression.^{27,28} Other studies have also found an association of depression with EDD use in HIV-infected men.²⁹

The proportion of sexually active men who engaged in risky sex or reported STDs was fairly high, especially among HIV-infected men. This is consistent with a previous analysis in VACS in which men were more likely to engage in risky sex if they were younger, reported hazardous alcohol or drug use, were not married, or were MSM.³⁰ Persons with these risk factors may benefit from additional attention regarding HIV/STD prevention counseling regardless of their EDD use; an opportune time to address sexual health risks would be when an EDD is being prescribed.

Several potential study limitations should be noted. As in any cross-sectional analysis, the cause-and-effect relationship

between EDD receipt and risky sexual behaviors can be difficult to assess, especially when the associations are compared at general levels rather than event-specific analyses. Men attending VHA clinics may have sociodemographic or behavioral characteristics that are different from men recruited from non-VHA clinical settings, although veterans have not been the focus of prior research on this topic. Our definition of EDD receipt does not include EDD that was obtained from a non-VHA pharmacy, provided as a sample medication, or obtained without a prescription. However, the focus of this analysis is on EDD obtained from a healthcare provider. It is also possible that providers systematically declined to provide EDD to men that they knew or suspected were engaging in risky sexual behavior, but this was not measured in the current study. Finally, measures of risky sexual behavior and self-reported STDs have limitations and are likely to underestimate the true prevalence of these behaviors and infections. However, we have no reason to suspect that reporting of these conditions would vary according to EDD receipt.

In conclusion, the findings from this study provide some reassurance to healthcare providers who prescribe EDD, including those who provide care to HIV-infected men. Although it is clear that some men who receive EDD engage in risky sexual behavior, we found that HIV-infected and HIV-uninfected men who received EDD were no more likely to engage in risky sexual behavior or to report new STDs than men who did not receive EDD. Physicians should continue to counsel their patients about HIV/STD prevention at opportune moments such as discussion of EDD, general checkups, or when identifying other risk factors associated with risky sexual behavior.

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