

The association between symptoms of generalized anxiety disorder and appointment adherence, overnight hospitalization, and emergency department/urgent care visits among adults living with HIV enrolled in care

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Abstract This study examined the association between generalized anxiety disorder (GAD) symptoms and healthcare utilization (HCU) among 801 people living with HIV (PLWH). Participants recruited from community health centers in Florida completed questionnaires assessing demographics, substance use, symptoms of GAD and depression, and HCU. Adjusted binary and multinomial logistic regressions assessed the association between moderate-severe GAD symptoms and past 6-month missed HIV-care appointments, overnight hospitalization, and emergency department (ED)/urgent care visits. Participants reporting moderate-severe GAD symptoms had a greater odds of missing an HIV-care appointment (AOR 2.03, 95% CI 1.28–3.24, $p = 0.003$), spending 2 (AOR 4.35, 95% CI 2.18–8.69, $p < 0.001$) or 3+ (AOR 2.79, 95% CI 1.20–6.45, $p = 0.016$) nights in the hospital, and visiting an

ED/urgent care facility 2 (AOR 2.63, 95% CI 1.39–4.96, $p = 0.003$) or 3+ (AOR 2.59, 95% CI 1.27–5.26 $p = 0.008$) times compared to participants reporting none-mild anxiety. Depression was associated with fewer ED/urgent care visits and overnight hospitalizations, while no association was found with missed primary care appointments. The role of anxiety in illness management remains understudied among PLWH. Anxiety identification and the development of interventions for anxiety among PLWH may have important consequences for healthcare cost saving, patient retention in care, and HIV-disease management.

Keywords HIV/AIDS · Anxiety · Appointment adherence · Overnight hospitalizations · Emergency department visits

Introduction

Despite previous findings suggesting significant relationships between anxiety and the misuse of healthcare services, the literature examining the relationship between symptoms of generalized anxiety disorder (GAD) and healthcare utilization (HCU) among people living with HIV (PLWH) is sparse (O’Cleirigh et al., 2009; Traeger et al., 2012). Clinically significant symptoms of anxiety are prevalent in up to 82% of PLWH (Chaudhury et al., 2016). More specifically, GAD is one of the most prevalent mental health conditions among PLWH, as previous studies have indicated that approximately 6.5–20% of adults living with HIV meet diagnostic criteria (Chaudhury et al., 2016). GAD is characterized by persistent worries or fears that cause significant distress, impair occupational and social functioning, and alter physical functioning in the form of fatigue, poor concentration, headaches, muscle tension,

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shortness of breath, upset stomach, and sleep disturbance (American Psychiatric Association, 2013). GAD can be debilitating and interfere with chronic illness management via impaired concentration and low self-efficacy to complete illness self-management tasks (Beck & Clark, 1997; Nel & Ashraf, 2011). Though the advent of antiretroviral therapy (ART) has yielded nearly equivalent life expectancies among PLWH compared to the general population, anxiety has been associated with suboptimal ART adherence and negative adherence-related health outcomes such as hastened HIV disease progression and increased mortality (Campos et al., 2010; Willie et al., 2016).

One of the most efficient ways to effectively manage and monitor a patient's medication adherence is through the use of regularly scheduled appointments, as previous findings have shown that regularly attending scheduled HIV clinic visits reinforces consistent ART adherence (Gardner et al., 2008). However, approximately 40% of PLWH miss at least one HIV care appointment every 4 months, resulting in increased risk of HIV disease progression due to physician inability to monitor a patient's ART regimen (Mugavero et al., 2009a, b; Park et al., 2007). Consistent appointments also increase the likelihood that patients receive appropriate screenings, intervention, and referrals for anxiety and depression, conditions associated with suboptimal treatment adherence in PLWH (Traeger et al., 2012).

In addition to missed HIV care appointments, PLWH have an increased propensity to seek healthcare services through the ED (McCusker et al., 2010). Prior to the implementation of the Affordable Care Act (ACA), PLWH frequented the ED approximately 3 times more often than the general medical population, resulting in an estimated annual cost to the health care system of \$100 million (Bozzette et al., 1998). Though the number of insured PLWH has increased since the passing of the ACA, adults living with HIV continue to frequent the ED more often than their HIV-negative counterparts (Mohareb et al., 2013; Ng et al., 2016). ED and inpatient hospitalizations may reflect suboptimal HIV and chronic illness management in the outpatient setting (Aidala et al., 2016). Psychological distress (e.g., substance misuse and depression) has also been identified as a risk factor for more frequent ED visits among PLWH (Choi et al., 2015; Mohareb et al., 2013; Ng et al., 2016; Venkat et al., 2008).

In addition to high rates of anxiety, an estimated 20–30% of PLWH report depression, and 7–16% meet criteria for a substance use disorder; these disorders have been specifically linked to missed primary care appointments and higher ED utilization among PLWH (Choi et al., 2015; Traeger et al., 2012). Despite high comorbidity of depression and substance use with anxiety (up to 62% of PLWH with depression report clinically significant anxiety, and anxiety

is linked to higher rates of alcohol and injection drug use), previous studies have not elucidated the unique relationship between anxiety and HCU (Garey et al., 2015; Gaynes et al., 2015; Staton-Tindall et al., 2015).

Examination of the effect of anxiety on the health behaviors of PLWH is important to optimize health outcomes for individuals in this population. No study to date has examined the association of GAD symptoms and HCU among PLWH, despite the high prevalence of anxiety and adjustment difficulties in this population. Thus, this study aimed to (1) assess the 6-month prevalence of missed HIV-healthcare appointments, overnight hospital visits, ED/urgent care visits and (2) examine the association between symptoms of GAD and the aforementioned healthcare services in a demographically heterogeneous sample of adults living with HIV within the state of Florida. We hypothesized that individuals experiencing moderate-severe GAD symptoms would demonstrate a greater likelihood of missing a scheduled HIV-care appointment, as well as utilizing an ED/urgent care facility and hospital overnight compared to adults reporting none-mild symptoms.

Methods

Participants and procedure

The sample ($N = 801$) included participants recruited from 2014 to 2017 for the Florida Cohort Study, an ongoing National Institute on Alcohol Abuse and Alcoholism (NIAAA) funded study that aims to understand the determinants of health outcomes of adults living with HIV receiving care within the state of Florida. The Florida Cohort Study uses a convenience-sampling method of data collection across multiple county health departments and community setting clinics throughout Florida (Gainesville, Ft. Lauderdale, Lake City, Miami, Orlando, Sanford, & Tampa). PLWH receiving care or services at the aforementioned sites were referred by a clinic staff member or self-referred in response to brochures available in the clinic and informed about the study. Upon expressing initial interest, participants were provided with additional information and administered a prescreening questionnaire to assess for literacy skills. All adults (i.e., 18 and older) living with HIV were eligible to participate. Informed consent was obtained from all individual participants included in the study. Following participant-provided written informed consent, participants completed a self-administered 45-min questionnaire on paper or via laptop using Research Electronic Data Capture, a secure data collection software program. Information regarding demographics, substance use, and symptoms of anxiety and depression was collected. Survey information was then

linked to Enhanced HIV/AIDS Reporting System (eHARS) maintained by the Florida Department of Health and the electronic medical record maintained by the study clinics. Participants received \$25.00 after completion of the study. The Institutional Review Boards of the University of Florida, Florida International University, and Florida Department of Health approved this study.

Measures

Dependent variable, Healthcare Utilization (HCU): The Florida Cohort Study assessed HCU via three self-report categorical measures referring to the previous 6 months: (1) “Did you stay at a hospital for at least one night?”, (2) “Did you go to an emergency room or urgent care center to receive medical treatment?” and (3) “Have you missed any scheduled HIV health care appointments in the past 6 months?” Respondents selected 0, 1, 2, or 3+ healthcare uses during the past 6 months. They provided a dichotomous, yes or no response pertaining to whether they had missed a scheduled HIV healthcare appointment.

Primary independent variable, symptoms of Generalized Anxiety Disorder: The Generalized Anxiety Disorder 7-item Assessment (GAD-7) measured participant GAD symptoms over the past 2 weeks. The measure utilizes seven Likert scale items to assess for GAD symptom severity, each ranging from “0” (not at all) to “3” (nearly every day). Scores on the GAD-7 were dichotomized into no/mild symptoms of anxiety (score 0–9) and moderate/severe symptoms (score ≥ 10); this cut-off has demonstrated good sensitivity (89%) and adequate specificity (82%) (Shacham et al., 2012; Spitzer et al., 2006). The GAD-7 has been used previously in measuring anxiety among PLWH, and it has shown to be a valid and effective tool to screen for GAD (Shacham et al., 2012; Spitzer et al., 2006).

Depressive Symptoms: The Patient Health Questionnaire (PHQ-8) assessed self-reported depressive symptoms over the past 2 weeks. Depression was defined by a PHQ-8 algorithm diagnosis of major depression requiring participants to endorse the presence of either depressed mood or anhedonia and at least the presence of 5 of the 8 symptoms “more than half the days” over the past 2 weeks. Individuals reporting 2–4 symptoms, including depressed mood or anhedonia “more than half the days” over the past 2 weeks were categorized as “other depression” (Kroenke et al., 2009). The PHQ-8 has demonstrated high internal and external reliability, and has been implemented in previous studies measuring depressive symptomatology among PLWH (Do et al., 2014; Kroenke et al., 2009). Depression has been linked to lower ART adherence and retention in care (Uthman et al., 2014; Zuniga et al., 2016).

Substance use: Participants self-reported substance use in the past 12 months, including alcohol, marijuana, and

other illicit drugs (i.e., crack/cocaine, ecstasy, opioids, sedatives, and injection drugs). Hazardous drinking was defined as consuming more than 14 drinks per week or ≥ 5 drinks per occasion at least monthly in the past 12 months for men, and more than 7 drinks per week or ≥ 4 drinks per occasion at least monthly for women, which has been shown to place PLWH at increased risk for adverse health events (US Preventative Task Force, 2004; Vagenas et al., 2015). Reported cigarette use, marijuana use, and other illicit drug use within the past 12 months were dichotomized as yes or no. Hazardous drinking and illicit substance use have previously been associated with ART and HIV appointment non-adherence in adults living with HIV (Bulsara et al., 2018).

Durable Viral Suppression: HIV viral load values were obtained from Enhanced HIV/AIDS Reporting System. Durable viral suppression was defined as all viral load suppressed (HIV-1 RNA test value ≤ 200 copies/ml) in the past 12 months. Higher viral load can contribute to poorer health status (e.g., cardiovascular and respiratory problems) due to systemic immune activation, and may subsequently lead to increased utilization of the ED (The Antiretroviral Cohort Collaboration, 2010; Perno et al., 2002; Tashima et al., 2001).

Sociodemographics: Age, race/ethnicity, sex, employment status, level of education, marital status, and insurance status were collected via self-report. For the purpose of our analyses, participants were categorized into four age groups: 18–34, 35–44, 45–54, and ≥ 55 . Race/ethnicity was categorized into hispanic, non-hispanic white, non-hispanic black, and non-hispanic others. Sex was a dichotomous variable based on participant’s sex at birth. Employment was classified into two groups; currently employed or not employed. Level of education was classified into three groups; less than high school, high school, and more than high school. Marital status was dichotomized into reporting currently being in a long-term relationship (married or living with a long-term partner) or not. Insurance status was dichotomized based on whether or not participants reported currently having health insurance. Younger age, female sex, lack of health insurance, minority race/ethnicity, marital status, and viral load have been associated with HIV primary care appointment nonadherence (Jones et al., 2013; Traeger et al., 2012; Waldrop-Valverde, 2014).

Statistical analyses

All analyses were performed in IBM SPSS Version 24 (SPSS, Version 24; IBM, Armonk, NY). Univariate descriptive statistics were calculated for sample sociodemographics, substance use, symptoms of anxiety and depression, and HCU. The sample was subsequently stratified based on GAD-7 cutoff score for none/mild and

moderate/severe GAD symptoms. Bivariate analyses were conducted using Chi Square tests to assess for potential differences in sociodemographics, depressive symptoms, durable viral suppression, substance use, and HCU based on GAD symptom severity. To further assess the relationship between anxiety and HCU outcomes, a binary logistic regression was conducted to test the association between anxiety and missing a scheduled HIV-care appointment. Multinomial logistic regression analyses examined the association between anxiety and the four level (i.e., 0, 1, 2, 3+ visits) overnight hospitalization and ED/urgent care variables, with participants denying use of a healthcare service (i.e., 0 visits) serving as the designated referent group. Since SPSS multinomial analyses defaults comparisons to the highest coded group, independent variables were reverse coded to allow for comparison to the lowest numbered group. All analyses controlled for potential confounding variables (i.e., hazardous drinking, marijuana use and other illicit drug use) that were significantly associated with anxiety in bivariate analysis ($p < 0.05$), as well as pertinent sociodemographic variables (i.e., age, race/ethnicity, sex, education, employment), insurance status, marital status, and durable viral suppression, all factors associated with HCU supported by the literature. We presented adjusted odds ratios with 95% confidence limits. Analyses utilized participants who reported none-mild anxiety as the designated referent group.

Results

Sociodemographics, substance use, and symptoms of anxiety

The sample ($N = 801$) had a mean age of 47.48 years ($SD = 10.70$). The racial/ethnic breakdown was as follows: hispanic (18.9%), non-hispanic black (56.4%), non-hispanic white (21.3%), and non-hispanic others (3.4%). The majority of participants were male (64.5%). A similar percentage of the sample obtained less than high school degree (35.0%), high school diploma (29.3%) and post-secondary education (35.7%). Nearly a quarter of participants reported current employment (24.2%). The majority of participants (80.9%) reported being currently single, widowed, divorced, or separated. In regards to health-related variables, 94.8% reported health insurance coverage, and approximately 40.8% were not virally suppressed over the past year. Over 1/3 (35.0%) of participants reported hazardous drinking, 37.8% reported marijuana use in the past 12 months, and 36.3% reported using a drug other than marijuana. Approximately 15% endorsed symptom criteria

for major depression or other depression, while 31.1% reported moderate to severe symptoms of GAD.

Participants reporting moderate/severe symptoms of GAD were significantly younger ($X^2 = 12.92$, $p = 0.005$), reported fewer years of education ($X^2 = 6.72$, $p = 0.35$), and had a higher prevalence of unemployment ($X^2 = 20.27$, $p < 0.001$). Additionally, PLWH with moderate/severe GAD symptoms were more likely to report hazardous drinking ($X^2 = 8.52$, $p = 0.003$), marijuana use ($X^2 = 5.25$, $p = 0.022$) and drug use other than marijuana ($X^2 = 12.16$, $p < 0.001$). Participants reporting moderate-severe symptoms of anxiety were also significantly more likely to report depression ($X^2 = 160.73$, $p < 0.0001$) and have at least one detectable viral load in the past 12 months ($X^2 = 6.62$, $p = 0.010$) (Table 1).

The association between moderate to severe symptoms of GAD and HCU

In regards to HCU, 24.9% of participants reported missing a regularly scheduled HIV health care appointment in the past 6 months. Over 30% of participants reported an overnight hospital stay on at least one occasion during the past 6 months, with 6.8% reporting spending 3 or more nights in the hospital. Nearly half (49.5%) reported going to the ED or visiting an urgent care facility and 9.8% reported 3 or more visits. Bivariate analyses indicated that participants reporting moderate-severe GAD symptoms were significantly more likely to miss a regularly scheduled HIV care appointment ($X^2 = 24.20$, $p < 0.001$), have an overnight hospitalization ($X^2 = 27.03$, $p < 0.001$), and report more visits to the ED or urgent care facility ($X^2 = 25.62$, $p < 0.001$) compared to participants who reported none-mild anxiety (Table 2).

All multivariable analyses adjusted for age, race/ethnicity, sex, education, employment, marital status, depressive symptoms, insurance status, hazardous drinking, marijuana use, other drug use, and durable viral suppression. Binary logistic regression analysis assessed the association between GAD symptoms and missing a scheduled HIV-care appointment. Moderate to severe symptoms of GAD was associated with missing a scheduled HIV-care appointment in the past 6 months (OR 2.28, 95% CI 1.63–3.19 $p < 0.001$). After controlling for covariates, PLWH with moderate-severe symptoms of GAD had greater odds of missing a scheduled HIV health care appointment in the past 6 months (AOR 2.03, 95% CI 1.28–3.24, $p = 0.003$) compared with adults reporting none-mild anxiety (Table 3).

Multinomial logistic regression assessed the relationship between anxiety and the four level (i.e., 0, 1, 2, 3+ visits) overnight hospitalization and ED/urgent care variables. While anxiety was not significantly associated with

Table 1 Demographics, substance use, depressive symptoms, and durable viral suppression differences between individuals reporting none-mild symptoms versus moderate-severe symptoms of GAD (N = 801)

Variable	Category	None-mild symptoms of GAD (n = 553)	Moderate-severe symptoms of GAD (n = 248)	Total (N = 801)	p Value
Sociodemographics					
Age	18–34	68 (12.3)	46 (18.5)	114 (14.2)	0.005
	35–44	105 (19.0)	53 (21.4)	158 (19.7)	
	45–54	221 (40.0)	104 (41.9)	325 (40.6)	
	≥ 55	159 (28.8)	45 (18.1)	204 (25.5)	
Sex	Male	360 (65.1)	157 (63.3)	517 (64.5)	0.624
	Female	193 (34.9)	91 (36.7)	284 (35.5)	
Race/ethnicity	Hispanic	104 (18.8)	47 (19.0)	151 (18.9)	0.799
	Non-hispanic, white	118 (21.3)	53 (21.4)	171 (21.3)	
	Non-hispanic, black	310 (56.1)	142 (57.3)	452 (56.4)	
	Non-hispanic, other	21 (3.8)	6 (2.4)	27 (3.4)	
Education	<High school	177 (32.1)	103 (41.5)	280 (35.0)	0.035
	High school diploma or equivalent	170 (31.9)	64 (25.8)	234 (29.3)	
	>High school	204 (37.0)	81 (32.7)	285 (35.7)	
Employment	Unemployed	386 (71.2)	206 (86.2)	592 (75.8)	< 0.0001
	Employed	156 (28.8)	33 (13.8)	189 (24.2)	
Marital status	Single/divorced/widowed/separated	440 (79.9)	248 (83.1)	646 (80.9)	0.286
	Married/living with a long-term partner	111 (20.1)	42 (16.9)	153 (19.1)	
Insurance status	No	24 (4.5)	16 (6.8)	40 (5.2)	0.180
	Yes	514 (95.5)	220 (93.2)	734 (94.8)	
Substance use					
Hazardous drinking	No	356 (68.5)	137 (57.6)	493 (65.0)	0.003
	Yes	164 (31.5)	101 (42.4)	265 (35.0)	
Marijuana use	No	316 (65.0)	122 (56.0)	438 (62.2)	0.022
	Yes	170 (35.0)	96 (44.0)	266 (37.8)	
Other drug use	No	348 (67.8)	126 (54.5)	474 (63.7)	< 0.001
	Yes	165 (32.2)	105 (45.5)	270 (36.3)	
Mental health					
Depression	No	499 (95.2)	149 (61.8)	648 (84.7)	< 0.0001
	Other depression	23 (4.4)	34 (14.1)	57 (7.5)	
	Major depression	2 (0.4)	58 (24.1)	60 (7.8)	
Health status					
Durable viral suppression	≤ 200	203 (37.7)	115 (47.7)	318 (40.8)	0.010
	> 200	335 (62.3)	127 (52.3)	462 (59.2)	

Bold values indicate significance at $p < 0.05$

^aN may vary according to missing data

spending 1 night in the hospital (OR 1.43, CI 0.93–2.18, $p = 0.100$), participants were more likely to spend 2 (OR 3.31, CI 1.99–5.49, $p < 0.001$) or 3+ nights (OR 2.06, CI 1.16–3.66, $p = 0.013$) than no nights in the hospital if they reported moderate-severe symptoms of GAD. The effect of anxiety on overnight hospitalization remained significant after controlling for covariates; participants were more likely to spend 2 (AOR 4.35, 95% CI 2.18–8.69, $p < 0.001$) or 3+ nights (AOR 2.79, 95% CI 1.20–6.45,

$p = 0.016$) than no nights in the hospital if they reported moderate-severe GAD symptoms. Please refer to Table 4 for additional information related to covariates and overnight hospitalization variables.

Similarly, participants were more likely to report 2 (OR 2.61, CI 1.67–4.10, $p < 0.001$) or 3+ visits (OR 2.44, CI 1.48–4.02, $p < 0.001$) than no visits to the ED or urgent care facility if they reported moderate-severe GAD symptoms, while anxiety was not significantly associated with 1

Table 2 Bivariate associations between GAD symptom severity and HCU (N = 801)

Category	None-mild anxiety (n = 553)	Moderate-severe anxiety (n = 248)	Total (N = 801)	<i>p</i> Value
<i>Variable</i>				
Emergency department or urgent care facility visits				
0	300 (54.8)	100 (40.6)	400 (50.5)	< 0.0001
1	149 (27.3)	63 (25.7)	212 (26.7)	
2	55 (10.0)	48 (19.5)	103 (13.0)	
3+	43 (7.9)	35 (14.2)	78 (9.8)	
Overnight hospital stays				
0	407 (74.2)	146 (59.1)	553 (69.6)	< 0.0001
1	78 (14.3)	40 (16.2)	118 (14.8)	
2	32 (5.8)	38 (15.4)	70 (8.8)	
3+	31 (5.7)	23 (9.3)	54 (6.8)	
Missed HIV-care appointments				
No	440 (80.1)	157 (63.8)	597 (75.1)	< 0.0001
Yes	109 (19.9)	89 (36.2)	198 (24.9)	

Bold values indicate significance at $p < 0.05$

^aN may vary according to missing data

visit (OR 1.26, CI 0.87–1.83, $p = 0.210$). The effect of anxiety on ED/urgent care visits remained significant after controlling for covariates as participants were more likely to report frequenting an ED or urgent care facility 2 (AOR 2.63, 95% CI 1.39–4.96, $p = 0.003$) or 3+ (AOR 2.59, 95% CI 1.27–5.26 $p = 0.008$) times compared to no visits if they reported moderate-severe GAD symptoms. Please refer to Table 5 for additional information related to covariates and ED/urgent care visits.

Discussion

Study findings supported our hypotheses that PLWH reporting moderate-to-severe symptoms of GAD had greater odds of missing a scheduled HIV-care appointment, as well as reporting an overnight hospitalization and visiting an ED/urgent care facility.

The deleterious effect of anxiety on routine HIV appointment attendance observed in this study reinforces the well-supported link between anxiety and medication non-adherence among PLWH. This finding contrasts with the association between anxiety and more frequent primary care utilization that has been observed among general primary care samples (Kroenke et al., 2007; Ruiz et al., 2011). In addition, in the general chronic illness literature, some studies have found associations between anxiety and greater adherence to self-management tasks, prompted by motivation to avoid feared negative health outcomes (Dowson et al., 2004). However, unique aspects of HIV

may elicit anxiety and care avoidance. Among PLWH, anxiety related to health and stigma may promote avoidance of situations where these factors must be confronted, such as HIV care appointments (Yehia et al., 2015). In addition, PLWH with greater anxiety may display cognitive biases of anticipating more threatening outcomes from care provider interactions (Bar-Haim, et al., 2007). While depression has previously been associated with lower appointment attendance among PLWH, perhaps due to hopelessness and decreased motivation to remain in care, it is notable that anxiety was associated with missed care appointments in this sample, after controlling for depressive symptoms (Joyce et al., 2005; Zuniga et al., 2016).

With regard to the association between GAD symptoms and ED/urgent care visits in this sample, it is possible that anxiety and avoidant tendencies may deter HIV care visits until a threshold of symptom acuity is reached, prompting presentation to the ED/urgent care center. While prior studies have found that depressive symptoms are associated with missed primary care visits and more frequent ED/inpatient visits, these studies have not examined the unique influence of depressive symptoms while accounting for comorbid anxiety symptoms (Joyce et al., 2005; O’Cleirigh et al., 2009; Zuniga et al., 2016). In the current study, depression was associated with fewer ED/urgent care visits and overnight hospitalizations, while no association was found with missed primary care appointments. Despite high diagnostic overlap between depression and anxiety, recent efforts have attempted to characterize the unique cognitive, emotional, and motivational processes associ-

Table 3 Logistic regression analyses examining the relationship between GAD symptom severity and missed HIV-care appointments in the past 6 months (N = 801)

Variable	Missed appointments AOR ^a , CI	<i>p</i>
GAD		
None-mild symptoms of anxiety (referent)		
Moderate-severe symptoms of anxiety	2.03 (1.28–3.24)	0.003
Age		
18–34 (referent)		
35–44	0.88 (0.47–1.62)	0.683
45–54	0.59 (0.33–1.06)	0.078
≥ 55	0.49 (0.25–0.99)	0.048
Sex		
Male (referent)		
Female	0.80 (0.50–1.26)	0.336
Race/ethnicity		
Non-hispanic, white (referent)		
Non-hispanic, black	0.83 (0.43–1.58)	0.572
Hispanic	1.10 (0.63–1.92)	0.722
Non-hispanic, other	1.28 (0.40–4.03)	0.668
Education		
< High school (referent)		
High school	0.69 (0.41–1.17)	0.173
> High school	0.86 (0.51–1.44)	0.578
Employment		
No (referent)		
Yes	1.53 (0.95–2.45)	0.076
Marital status		
Single (referent)		
Married/long-term partner	1.08 (0.64–1.82)	0.762
Depression		
No (referent)		
Other depression	0.95 (0.45–2.03)	0.913
Major depression	0.69 (0.30–1.56)	0.382
Insurance		
No (referent)		
Yes	1.73 (0.67–4.42)	0.250
Hazardous drinking		
No (referent)		
Yes	1.20 (0.78–1.85)	0.389
Marijuana use		
No (referent)		
Yes	1.31 (0.86–1.99)	0.194
Other drug use		
No (referent)		
Yes	1.51 (0.98–2.31)	0.057
Durable viral suppression		
≤ 200 (referent)		
> 200	2.39 (1.58–3.62)	< 0.001

Bold values indicate significance at $p < 0.05$

^aControlled for age, race/ethnicity, sex, education, employment, marital status, depressive symptoms, insurance status, hazardous drinking, marijuana use, other drug use, and durable viral suppression

Table 4 Multinomial logistic regression analyses examining the relationship between GAD symptom severity and overnight hospital stays in the past 6 months (N = 801)

Number of HCU visits	1 versus 0 AOR ^a CI	<i>p</i>	2 versus 0 AOR ^a CI	<i>p</i>	3+ versus 0 AOR ^a CI	<i>p</i>
<i>Variables</i>						
GAD						
None-mild symptoms of anxiety (referent)						
Moderate-severe symptoms of anxiety	1.48 (0.80–2.72)	0.203	4.35 (2.18–8.69)	< 0.001	2.79 (1.20–6.45)	0.016
Age						
18–34 (referent)						
35–44	2.26 (0.91–5.60)	0.078	1.17 (0.34–3.97)	0.797	1.67 (0.46–6.04)	0.434
45–54	1.55 (0.67–3.62)	0.303	2.07 (0.75–5.70)	0.159	1.06 (0.32–4.48)	0.912
≥55	1.94 (0.80–4.68)	0.139	1.40 (0.44–4.42)	0.558	0.95 (0.25–3.56)	0.942
Sex						
Male (referent)						
Female	0.49 (0.27–0.87)	0.016	0.58 (0.29–1.17)	0.134	0.59 (0.24–1.40)	0.235
Race/ethnicity						
Non-hispanic white (Referent)						
Non-hispanic black	3.75 (1.01–13.86)	0.047	0.77 (0.07–7.70)	0.824	2.27 (0.20–25.69)	0.507
Hispanic	1.66 (0.81–3.39)	0.163	1.24 (0.52–2.96)	0.615	2.14 (0.65–7.01)	0.205
Non-hispanic other	0.55 (0.22–1.34)	0.190	0.25 (0.07–0.91)	0.036	1.33 (0.35–5.05)	0.670
Education						
< High school (referent)						
High school	0.50 (0.26–0.94)	0.034	0.31 (0.13–0.73)	0.007	0.36 (0.12–1.00)	0.051
> High school	0.66 (0.35–1.22)	0.188	0.58 (0.27–1.24)	0.161	0.87 (0.35–2.16)	0.776
Employment						
No (referent)						
Yes	0.48 (0.25–0.93)	0.031	0.29 (0.09–0.87)	0.028	0.74 (0.27–1.97)	0.549
Marital status						
Single (referent)						
Married/long-term partner	0.54 (0.30–0.99)	0.047	1.26 (0.48–3.28)	0.633	0.81 (0.30–2.14)	0.647
Depression						
No (referent)						
Other depression	0.32 (0.09–1.07)	0.064	0.20 (0.05–0.71)	0.013	0.34 (0.06–1.77)	0.203
Major depression	0.47 (0.15–1.48)	0.203	0.49 (0.14–1.66)	0.256	1.70 (0.56–5.16)	0.347
Insurance						
No (referent)						
Yes	1.64 (0.43–6.15)	0.464	1.09 (0.22–5.37)	0.913	0.34 (0.10–1.18)	0.091
Hazardous drinking						
No (referent)						
Yes	1.32 (0.77–2.26)	0.308	1.23 (0.63–2.41)	0.535	0.79 (0.35–1.78)	0.569
Marijuana use						
No (referent)						
Yes	1.02 (0.60–1.72)	0.933	0.75 (0.38–1.48)	0.417	0.65 (0.28–1.49)	0.314
Other drug use						
No (referent)						
Yes	1.03 (0.60–1.75)	0.901	1.02 (0.53–1.97)	0.944	1.99 (0.91–4.34)	0.083
Durable viral suppression						
≤ 200(referent)						
> 200	1.23 (0.73–2.08)	0.423	1.54 (0.90–2.95)	0.194	1.24 (0.56–2.71)	0.592

Bold values indicate significance at $p < 0.05$

^aControlled for age, race/ethnicity, sex, education, employment, marital status, depressive symptoms, insurance status, hazardous drinking, marijuana use, other drug use, and durable viral suppression

Table 5 Multinomial logistic regression analyses examining the relationship between GAD symptom severity and ED/urgent care visits in the past 6 months (N = 801)

Number of HCU visits	1 versus 0 AOR ^a CI	<i>p</i>	2 versus 0 AOR ^a CI	<i>p</i>	3+ versus 0 AOR ^a CI	<i>p</i>
<i>Variables</i>						
GAD						
None-mild symptoms of anxiety (referent)						
Moderate-severe symptoms of anxiety	1.45 (0.88–2.40)	0.141	2.63 (1.39–4.96)	0.003	2.59 (1.27–5.26)	0.008
Age						
18–34 (referent)						
35–44	1.43 (0.69–2.94)	0.325	1.35 (0.52–3.47)	0.529	0.74 (0.26–2.13)	0.583
45–54	1.65 (0.86–3.16)	0.128	1.31 (0.57–3.05)	0.517	0.78 (0.31–1.95)	0.606
≥ 55	1.64 (0.82–3.29)	0.159	1.52 (0.61–3.74)	0.361	0.60 (0.20–1.73)	0.346
Sex						
Male (referent)						
Female	0.76 (0.48–1.18)	0.225	0.52 (0.28–0.99)	0.048	1.25 (0.64–2.44)	0.513
Race/ethnicity						
Non-hispanic white (referent)						
Non-hispanic black	2.42 (0.77–7.54)	0.126	0.80 (0.37–1.72)	0.584	2.30 (0.45–11.77)	0.316
Hispanic	1.41 (0.79–2.49)	0.237	1.79 (0.83–3.86)	0.132	1.13 (0.47–2.72)	0.773
Non-hispanic other	0.94 (0.49–1.77)	0.850	0.81 (0.32–1.99)	0.647	0.83 (0.30–2.30)	0.724
Education						
< High school (referent)						
High school	0.60 (0.36–1.01)	0.055	0.69 (0.34–1.40)	0.306	0.37 (0.16–0.84)	0.018
> High school	1.05 (0.63–1.76)	0.838	1.14 (0.57–2.27)	0.691	0.64 (0.29–1.39)	0.264
Employment						
No (referent)						
Yes	1.03 (0.64–1.65)	0.885	0.93 (0.47–1.82)	0.834	0.78 (0.34–1.79)	0.566
Marital status						
Single (referent)						
Married/long-term partner	0.89 (0.53–1.49)	0.671	0.58 (0.29–1.13)	0.112	0.97 (0.43–2.20)	0.952
Depression						
No (referent)						
Other depression	0.35 (0.12–0.97)	0.045	1.07 (0.42–2.74)	0.880	0.46 (0.31–1.65)	0.237
Major depression	0.54 (0.23–1.26)	0.159	0.57 (0.19–1.70)	0.321	1.28 (0.47–3.46)	0.616
Insurance						
No (referent)						
Yes	1.24 (0.50–3.06)	0.636	2.58 (0.54–12.25)	0.230	0.75 (0.22–2.53)	0.645
Hazardous drinking						
No (referent)						
Yes	1.10 (0.71–1.71)	0.643	1.15 (0.64–2.07)	0.623	0.87 (0.44–1.71)	0.692
Marijuana use						
No (referent)						
Yes	0.95 (0.62–1.45)	0.823	1.19 (0.67–2.08)	0.545	0.60 (0.30–1.20)	0.152
Other drug use						
No (referent)						
Yes	0.87 (0.56–1.36)	0.557	1.72 (0.98–3.02)	0.056	1.81 (0.94–3.47)	0.072
Durable viral suppression						
≤ 200 (referent)						
> 200	1.24 (0.81–1.89)	0.304	1.80 (1.02–3.18)	0.042	1.32 (0.69–2.53)	0.390

Bold values indicate significance at $p < 0.05$

^aControlled for age, race/ethnicity, sex, education, employment, marital status, depressive symptoms, insurance status, hazardous drinking, marijuana use, other drug use, and durable viral suppression

ated with anxiety. Individuals with GAD report greater physical symptoms (e.g., gastrointestinal distress) and higher emotional intensity than depressed individuals in medically-healthy samples (Aldoa et al., 2010; MacDonald et al., 2015). General medicine primary care patients with anxiety have reported poorer perceived health status, and perceived symptom severity is a strong predictor of HCU, particularly ED visits (Khan et al., 2011; Ruiz et al., 2011).

Models of stress and coping may also help account for the association between anxiety, missed HIV care appointments, and ED/urgent care utilization in this sample. Among PLWH, disease self-management includes tasks such as filling prescriptions, scheduling and attending appointments, and managing comorbid conditions. These tasks occur alongside the patient's other family, social, and occupational responsibilities. PLWH in particular may experience limited physical, emotional, cognitive, social and financial resources to meet these demands (Brandt et al., 2017; Zullig et al., 2016). Participants reporting greater anxious symptomatology in this sample may possess fewer coping resources to manage stressors and/or overly rely on avoidance-oriented coping strategies (e.g., substance use), which in turn may lead to inadequate health management (Weaver et al., 2005). In this sample, moderate-severe GAD symptoms was associated with hazardous drinking and illicit drug use.

Nearly 25% of the sample reported missing an HIV care appointment in the past 6 months. Missed appointments can aggregate contributing to loss to follow-up, leading to failure to attain or maintain HIV virologic suppression with subsequent risk for HIV transmission. This is a particular concern within the state of Florida, which has seen an increasing incidence of HIV since 2013 (Florida Department of Health, 2017). Specifically, Sheehan and colleagues (2017) found that 33% of 65,735 PLWH in the state of Florida from 2000 to 2014 were not retained in care, and 40.1% were not virally suppressed. In addition, the high rates of self-reported hospitalization and ED utilization in this study are consistent with recently reported figures among PLWH (Berry et al., 2012; Lazar et al., 2017; Ng et al., 2016). Prior investigations have revealed that non-AIDS-defining infections are a leading cause of ED visits and hospitalizations among PLWH, even among PLWH enrolled in outpatient care (Berry et al., 2012; Lazar et al., 2017; Ng et al., 2016). Because adherence to ART lowers infection and hospitalization risk, ED visits and hospitalizations are potential indicators of suboptimal outpatient HIV and comorbidity management (Lazar et al., 2017; McCusker et al., 2010).

Given the potentially reciprocal relationship between HIV/AIDS disease status and anxiety found in this study, identification and intervention of anxiety and distress may have important consequences for effective disease man-

agement in PLWH (Sheehan et al., 2017). Our findings support previous calls for the importance of screening and treating anxiety as an essential component of HIV care (Shacham et al., 2012). Thorough screens, brief interventions, and mental health referrals by HIV and/or primary care providers, as well as integration of mental health care providers into HIV and community health clinics may help decrease stigma, facilitate positive relationships with patients, and promote patient-friendly clinic services, all of which are documented contributors to care retention (Yehia et al., 2015).

Our study has several limitations and notable strengths. We were unable to assess a continuous number of overnight hospital stays and visits to an ED/urgent care facility, as the administered survey utilized a categorical variable assessing 0–3+ visits. Along these lines, GAD and HCU measures relied on participant self-report data instead of hospital/medical record information, limiting our ability to assess a precise reason for admittance. Secondly, our study utilized a cross-sectional design; thus, we cannot determine the temporality of the observed relationships. Additionally, all participants were PLWH enrolled in care within the state of Florida and thus our findings may not generalize to all adults living with HIV. Despite these limitations, this study highlights the importance of assessing, and intervening on symptoms of anxiety among PLWH. Notably, our study assessed for three unique HCU outcomes, all of which have important implications for healthcare cost saving, patient retention in care, and effective HIV-disease management. Additionally, over 90% of study participants reported having insurance, thus providing insight into factors associated with HCU beyond insurance status. Race/ethnicity was not associated with GAD symptoms and most of the Florida Cohort HCU outcomes after accounting for covariates. Though access to healthcare services has improved among minorities (i.e., African Americans, Latinos) since the passing of the ACA, there is a robust literature examining health disparities associated with healthcare access and subsequent utilization among minority populations (Chen et al., 2016; Derose et al., 2011). Future studies would benefit from examining racial/ethnic differences in the relationship between to GAD symptoms and HCU to ascertain a more nuanced examination of the effect of racial/ethnic group status on these constructs. Future studies should also determine whether management of anxiety positively influences healthcare utilization behaviors in this population, and in turn, improves HIV-related health outcomes.

To the author's knowledge, this is the first study highlighting the robust influence of symptoms of GAD on HCU behaviors among PLWH. In our Florida Cohort Population, significant symptoms of GAD were associated with greater odds of missing a scheduled HIV-health care appointment,

utilizing the ED/urgent care facility, and staying in the hospital overnight. Identifying patients with GAD symptoms and providing appropriate treatment will likely yield substantive physical and mental health benefits for PLWH.

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Compliance with ethical standards

Conflict of interest Zachary L. Mannes, Lauren E. Hearn, Zhi Zhou, Jennifer W. Janelle, Robert L. Cook and Nicole Ennis declare that they have no conflict of interest.

Human and animal rights and Informed consent All procedures were in accordance with the ethical standards of the institutional research committees and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

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