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Full Length Research Paper

Factors associated with utilization of HAART amongst hard-to-reach HIV-infected individuals in Atlanta, Georgia

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The study is aimed at identifying clinical, demographic and behavioral factors, including participation in HIV care, associated with the utilization of antiretroviral therapy (ART), among hard-to-reach HIV-positive individuals in Atlanta, GA. The study included 184 HIV-positive participants of the Infectious Disease Program (IDP) of the Grady Health System between February 1999 to March 2001. Individuals were categorized as regular attendees (those who consistently kept their outpatient appointments, n = 65), irregular (those who inconsistently kept their appointments, n = 60) or non-attendees (those who failed routinely to keep their appointments, n = 59). Univariate and multivariate analyses using log-binomial regression modeling were done. HIV-infected individuals who consistently kept their appointments at the IDP received ART at a frequency (86%) that is twice that of those who missed some appointments (42%) and four times that of those who routinely failed to keep appointments (20%). In multivariate analysis, category of clinic attendance (regular, irregular or non-attendee) was the only risk factor independently associated with utilization of ART: Regular attendees (RR = 3.59, 95% CI 2.12 to 6.08) and irregular attendees (RR = 2.26, 95% CI 1.28 to 4.01) compared to non-attendees. The positive association between routine clinic attendance and use of antiretroviral therapy observed in this study should encourage the development of strategies to retain patients in outpatient HIV care.

Key words: Antiretroviral therapy (ART), HIV-infected individuals, Georgia.

INTRODUCTION

Highly active antiretroviral therapy (HAART) has proven to be extremely effective in the treatment of human immunodeficiency virus (HIV) infected individuals and has had a positive impact on clinical outcomes. Through the proper use of HAART, this otherwise deadly disease can be turned into a manageable chronic condition (Siegel and Lekas, 2002). Combination antiretroviral therapy regimens are able to suppress the viral load to below the limits of detection allowing for recovery of CD4 cell counts that permit most individuals to prevent the development of opportunistic infections and AIDS-associated malignancies (Palella et al., 1998).

While significant progress has been made in developing new drugs with less taxing requirements and fewer side effects, challenges still remain in bringing these medications to all HIV-infected persons that require them. All HIV infected individuals should receive HAART according to specific clinical criteria established by the U.S Department of Health and Human Services (Panel on Antiretroviral Guidelines for Adults and Adolescents, 2010). However, throughout the United States, some individuals who meet clinical criteria remain without therapy. Several studies suggest that individuals who do

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not initiate antiretroviral therapy or discontinue, it continue to have higher morbidity and mortality (Lucas et al., 2003). Thus, understanding the factors that prevent patients from starting or remaining on HAART is of critical importance to designing new policies and interventions.

An important component of effective HIV therapy is the prevention of drug resistance. Data from the post-HAART era indicates a direct correlation between adherence and the likelihood of developing antiretroviral drug resistance (Friedland and Williams, 1999). Once a patient's virus becomes resistant to therapy, there is an almost inevitable rise in viral loads accompanied by an eventual decline in immunologic counts (Friedland and Williams, 1999; Bangsberg et al., 2004). The implications of this emerging drug resistance go beyond the self-interest of the afflicted individual. As these resistant strains are transmitted to others, HAART therapy will become less effective (Bangsberg et al., 2004; Wainberg and Friedland, 1998). It is therefore clear that for HAART to succeed on an individual and global level requires an exacting degree of commitment from all parties within the health care system. Understanding predictors of adherence is thus a priority in creating HIV control policies.

Atlanta is a metropolitan city of over five million people with approximately 21,354 individuals living with HIV at the end of 2007 (US Centers for Disease Control and Prevention, 2007). Studying the HIV epidemic in this urban setting offer important insight into the challenges of diagnosing HIV-infected individuals, initiating them on HAART therapy when indicated and ensuring that they remain on therapy once started. Currently, comprehensive HIV-care for hard-to-reach patients in Atlanta is delivered at two primary locations: The Infectious Disease Clinic on Ponce (IDP) and the Fulton County Department of Health and Wellness. Access to care in these clinics including antiretroviral therapy is provided mostly at no cost or at a nominal cost. Despite this fact, many eligible individuals are unable to be successfully linked into care, fail to be initiated on antiretroviral therapy after enrollment, or have difficulties remaining on antiretroviral therapy once initiated. The most recent estimates from 2007 indicate that an alarming 56% of HIV-infected individuals were not receiving HIV primary medical care (US Centers for Disease Control and Prevention, 2007; Georgia Division of Public Health, HIV/AIDS Epidemiology Reporting System, 2011) The situation in Atlanta is representative of urban populations across the country in this regard.

Many studies of ART have focused on adherence, and the beliefs and attitudes of individuals infected with HIV/AIDS in urban settings. Most of these studies were done from the perspective of the health professionals administering HAART (Giordano et al., 2005; Mugavero et al., 2007; Wallace, 2003). In this investigation, rather, we focus on the initiation of HAART by clinicians, and the patient-specific factors that may influence the initiation of care among hard to reach HIV-positive individuals in Atlanta, GA.

METHODS

Study design, definitions and patient selection

HIV-infected persons were enrolled in the study between February 1999 and March of 2001 in Atlanta, GA. The study was structured as a routine clinic review, that is, a retrospective case-control study involving three groups: Regular attendees, irregular attendees, or non-attendees at the HIV clinic. Regular attendees were defined as individuals who were established clients of the Infectious Disease Program (IDP) of the Grady Health System and whose record of attendance (> 75%) during the past two years was marked by no gap of greater than 6 months. Irregular attendees were defined as individuals associated with the IDP for two years or more, but whose attendance had gaps of greater than 6 months. Non-attendees were defined as individuals with no record of having attended IDP, but who had been seen in the emergency room or had been hospitalized at Grady Memorial Hospital. Based on the presence or absence of taking of antiretroviral drugs (ARTs) (including Protease Inhibitors, Nucleoside Reverse Transcriptase Inhibitors (NRTIs), and Non-nucleoside Reverse Transcriptase Inhibitors [NNRTIs]) determined by chart review (see below), patients were classified as either being currently on or off ARTs (without reference to the adequacy of or compliance with the current regimen). "Currently on ARTs" was defined by a note by the clinician at the most recent visit, or a prescription of ARTs that had been filled within 30 days of that visit.

Patients were accessed using the clinic logs for the morning of each work day assessed (we attempted to enroll during 1 to 2 days each week, varying the actual day of the week). All attendees were deemed eligible for this study. Attending clinicians were asked for permission to offer patients enrollment in the study. If the clinician agreed, he/she referred the patient to a research associate after the visit. Patients who agreed to participate were asked to undergo an interview and to give permission for a chart review. The true refusal rate is a mix of clinicians' refusal to offer enrollment, patients' refusal of the clinicians' offer, and patients' refusal to participate after enrollment was discussed. The first two are not known, but the third was under 5%. The chart review, conducted contemporaneously with recruitment, permitted categorization of patients as regular or irregular attendees. Non-attendees were recruited from Grady Hospital as well as from several community venues that provide services to HIV positive persons, using a procedure similar to that used in the clinic: permission from the attending clinician and enrollment of the participant.

Data collection

After informed consent was obtained, we collected for each individual, baseline information using a one-time face-to-face interview that requested demographic information, past medical history, behavioral and risk-taking factors, and psychosocial concomitants. We used clinic or hospital records to determine current clinical status, and receipt of ART's was assessed by documentation in the clinic record or through the computerized on-site pharmacy records that a regimen was dispensed at least once; medications obtained through research and other non-Grady HIV-care facilities were recorded as well.

In addition to evaluation of clinical, behavioral, psychosocial features for each group, we assessed CD4 count and viral load. Given that regular attendees undergo routine laboratory testing as part of their clinic visits, no further laboratory testing was needed. Irregular attendees underwent testing for CD4+ count and HIV viral

load at interview time; if the individual had been to the clinic, then these values were obtained from chart data. Non-attendees underwent laboratory testing in the field as part of the interview process. HIV Viral load was done using the standard and ultrasensitive versions of the Amplicor HIV-1 Monitor test (Roche Molecular Systems, Branchburg, NJ). The standard version of the assay ranges from 400 to 750,000 copies/ml of plasma, while the ultrasensitive method detects between 50 and 75,000 copies/ml of plasma.

The calculated sample size of 60 patients in each of three groups permitted detection of a difference between groups of 25 to 30% in the proportion on ARTs with a power of 80% or above. Actual enrollment was 65, 60 and 59 individuals recruited in regular, irregular attendees, and non-attendees, respectively (a total of 184 HIV-positive individuals)

The study was approved by the Emory Institutional Review Board and the Grady Research Oversight Committee.

Data analysis

Data were entered into a Microsoft Access 2000 database (Microsoft Corp., Redmond, WA) and statistical analyses were performed using SAS software, version 9.1 (SAS Institute Inc., Cary, NC). A P value of ≤ 0.05 was defined as statistically significant.

The chi-square test or Fisher's exact test were used to identify differences in baseline characteristics of three attendance category groups. Means of continuous variables were compared among attendance groups using one-way ANOVA.

Analysis of factors associated with ART utilization was done in univariate and multivariate analysis. Risk ratios with 95% confidence intervals, and p-values for the effect of each variable on utilization of ART were estimated with log-binomial regression models. Variables included in initial multivariate log-binomial regression model were chosen based on statistical criteria as well as epidemiological and biological plausibility criteria. Confounding and interaction were assessed. Backward selection was used to arrive to final model.

RESULTS

A total of 184 HIV-infected patients were enrolled in the study. Mean age was 41 years, with the majority being male (75%) and African Americans (93%).

Sociodemographic, clinical, and behavioral characteristics of the study population according to their level of clinic attendance are shown in Table 1. Certain characteristics significantly differed among regular attendees, irregular and non-attendees. The mean age was 43, 41 and 30 years for regular, irregular and non-attendees, respectively ($p < 0.001$). At the time of interview, only 6 (9%) of 65 regular attendees reported currently being homeless, as compared to 28 (47%) of 60 irregular attendees and 19 (32%) of 59 non-attendees ($p < 0.001$). Among regular attendees 18 (28%) had been incarcerated in the six months prior to the time of interview, when compared to 39 (65%) of irregular, and 38 (64%) of non-attendees ($p < 0.001$). Ownership of an automobile was reported by 51% of regular attendees, and only 15% of irregular and 6% of non-attendees ($p < 0.001$).

In terms of utilization of healthcare services, 56 (86%) of regular attendees were on antiretroviral therapy at the time of the interview compared to 25 (42%) of irregular attendees and 12 (20%) of non-attendees ($p < 0.001$). A greater percentage of regular attendees (28%) have been hospitalized due to HIV related complications, as opposed to irregular (8%) and non-attendees (10%) ($p = 0.006$).

All of the regular attendees reported knowing someone with HIV/AIDS, while 3 and 12% of irregular and non-attendee, respectively, did not know other HIV positive individuals ($p = 0.003$). Sexual orientation did not significantly differ among the three groups. Exchanging sex for drugs was highest amongst irregular attendees (17%) when compared to 1% of regular and 5% of non-attendees, respectively ($p = 0.004$).

The overall use of ART in the study population was 51% (93 of 184 patients). Results of univariate analysis of factors associated with ART utilization are shown in Table 2. Patients that were on ART were significantly more likely to be regular attendees (RR = 4.24, 95% CI 2.53 to 7.08) or irregular attendees (RR = 2.05, 95% CI 1.14 to 3.68), compared to patients that were not receiving ART. Individuals on ART compared to those not on ART were significantly more likely to be older than 40 years of age (RR 1.48, 95% CI 1.10 to 2.00), to own a personal vehicle (RR = 1.82, 95% CI 1.40 to 2.37), and to have HIV-related hospitalizations (RR = 1.46, 95% CI 1.09 to 1.97). Patients in ART were also significantly less likely to currently be homeless (RR = 0.48, 95% CI 0.30 to 0.75), to have been incarcerated in the 6 months prior to the interview (RR = 0.71, 95% CI 0.53 to 0.95), and to exchange sex for drugs (RR = 0.13, 95% CI 0.02 to 0.88). Table 3 demonstrates respondent's drug use in ART and no ART groups. Patients in ART group were significantly more likely to have a lifetime use of amphetamines (RR = 1.40, 95% CI 1.95 to 1.86), and significantly less likely to have a lifetime use of alcohol (RR = 0.61, 95% CI 0.43 to 0.86), use of crack in the last 6 months (RR = 0.49, 95% CI 0.33 to 0.73), and use of alcohol in the last 6 months (RR = 0.57, 95% CI 0.42 to 0.76), and lifetime use of alcohol (RR = 0.61, 95% CI 0.43 to 0.86), compared to no ART group.

In multivariate analysis, category of clinic attendance was the only factor significantly associated with utilization of ART: Regular attendees (RR = 3.59, 95% CI 2.12 to 6.08) and irregular attendees (RR = 2.26, 95% CI 128 to 4.01) had significantly higher rates of receiving ART compared to non-attendees, controlling for being currently homeless, using alcohol and exchanging sex for drugs (Table 4).

DISCUSSION

Our study demonstrated that among a wide array of demographic, social, clinical, and behavioral patients' characteristics assessed, the primary factor associated with HAART utilization was participation in HIV care. Furthermore, those who were fully engaged in outpatient care and rarely missed appointments were the group

Table 1. Sociodemographic, clinical and behavioral characteristics of study population based on category of clinic attendance (n = 184)

Characteristic	No. (%) of patients based on clinic attendance			P value
	Regular attendees (n = 65)	Irregular attendees (n = 60)	Non- attendees (n = 59)	
Sociodemographic characteristics				
Male gender	48(74)	45(75)	45 (76)	0.95
Age, mean ± SD (range)	43±7(27-62)	41±7 (27 - 58)	39±6(25-59)	< 0.001†
Age > 40 years	42(65)	31(52)	22 (37)	0.01
Black race (n = 65/58/59)	57(88)	57(97)	55 (95)	0.14¥
Homelessness				
Current	6(9)	28(47)	19 (32)	< 0.001
Last 6 months	5(8)	10(17)	13 (22)	0.07¥
Single marital status	63(97)	58(97)	57 (97)	1.00¥
Have children < 18 years of age	2(3)	2(3)	3 (5)	0.82¥
Imprisonment in last 6 months	18(28)	39(65)	38 (64)	< 0.001
Employment status				
Employed	4(6)	4(7)	7 (12)	Referent
Unemployed	26(41)	26(44)	24 (41)	0.63¥
Other	34(43)	29(49)	28 (47)	0.54¥
Automobile use (n = 61/55/55)	31(51)	8 (15)	3 (6)	< 0.001¥
Access to transportation(n = 61/55/55)	27(49)	30(55)	28 (51)	0.56¥
Utilization of healthcare services				
ART utilization				
ART	56(86)	25(42)	12 (20)	< 0.001
No ART	9 (14)	35(58)	47 (80)	Referent
HIV related hospitalization	18(28)	5(8)	6 (10)	0.006¥
Received outpatient care	22(34)	28(47)	20 (34)	0.25
Behavioral characteristics				
Disclosure of HIV status	5(8)	7 (12)	11 (19)	0.17¥
Knows others with HIV	65 (100)	58(97)	52 (88)	0.003¥
Belief in ART efficacy	51(78)	50(83)	37 (63)	0.09¥
HIV related change in sexual behavior	55(85)	46(77)	46 (78)	0.49
Sexual preference (n = 64/60/58)				
MSM	26(40)	22(37)	18 (31)	0.42
Lesbian	1(2)	2(3)	0	0.24¥
Heterosexual	33(52)	1(2)	38 (66)	Referent
Other	4(6)	35(58)	2 (3)	0.34¥
Exchange sex for money	4(6)	7 (12)	4 (7)	0.50¥
Exchange sex for drugs	1(1)	10(17)	3 (5)	0.004¥
Presence of STD's (n = 65/59/59)	4(6)	6 (10)	5 (8)	0.75¥
Lab values				
CD4 count, mean ± SD (range) (n = 44/47/46)	274 ± 191 (6-652)	231±231 (7-860)	305±272 (6-980)	0.66†
CD4 %, mean ± SD (range) (n = 47/48/35)	17 ± 12 (0.4-58)	13±11 (0.01-39)	18±13 (0.03-42)	0.66†
Viral load, mean ± SD (range) (n = 46/43/32)	63,751 ± 160,261 (50 - 750,000)	266,070±1175518 (0-7,750,00)	63,2442±106,339 (50-445,150)	0.87†

† F-test, analyzing difference among means. ¥ Fisher's Exact Test two-sided p-value.

Table 2. Univariate analysis of ART use and baseline characteristics of the study population (N=184).

Characteristic	ART (n = 93) n (%)	No ART (n = 91) n (%)	Risk ratio (95% CI)	P-value
Sociodemographic characteristics				
Male gender	74 (53.6)	64(46.4)	1.30 (0.89 - 1.89)	0.18
Age >40 years	57 (60.0)	38(40.0)	1.48 (1.10 - 2.00)	0.01
Black race	85 (91.4)	84(94.4)	0.82 (0.52 - 1.29)	0.39
Homeless				
Currently	15 (16.1)	38(41.8)	0.48 (0.30 - 0.75)	0.001
Last 6 months	12 (12.9)	16(17.6)	0.83 (0.52 - 1.30)	0.41
Single marital status	89 (95.7)	89(98.8)	0.75 (0.42 - 1.35)	0.33†
Has children <18 years	4 (4.3)	3(3.3)	1.14 (0.59 - 2.19)	0.70†
Imprisonment last 6 months	40 (43)	55(60.4)	0.71 (0.53 - 0.95)	0.02
Unemployed (n=92/90)	33 (35.8)	43(47.8)	0.78 (0.57 - 1.06)	0.13
Automobile use (n = 86/85)	32 (37)	10 (12)	1.82 (1.40 - 2.37)	<0.001
Access to transportation (n = 86/85)	43 (50)	4 (49)	1.01 (0.75 - 1.36)	0.94
Utilization of healthcare services				
Category				
Regular attendee	56 (60.2)	9(9.9)	4.24 (2.53 - 7.08)	<0.001
Irregular attendee	25 (26.9)	35(38.5)	2.05 (1.14 - 3.68)	0.02
Non-attendee	12 (12.9)	47(51.7)	Referent	
HIV related hospitalization	20 (22)	9 (10)	1.46 (1.09 - 1.97)	0.01
Received outpatient care	38 (41)	32 (35)	1.13 (0.84 - 1.50)	0.42
Behavioral characteristics				
Disclosure of HIV status	92 (99)	83 (91)	4.73 (0.74 - 30.19)	0.10†
Preoccupation with HIV status	10 (11)	13 (14)	0.84 (0.52 - 1.38)	0.50
HIV related change in sexual behavior	78 (84)	69 (76)	1.31 (0.86-1.99)	0.21
Sexual preference (n = 92/90)				
MSM	37 (40.2)	29(32.2)	1.19 (0.88-1.59)	0.25†
Lesbian	2 (2.2)	1(1.1)	1.41 (0.62-3.23)	0.41†
Heterosexual	50 (54.3)	56(62.2)	referent	-
Other	3 (3.3)	4(4.4)	0.91 (0.38-2.19)	0.84†
Exchange sex for money	3 (3)	12 (14)	0.38 (0.14 - 1.04)	0.06†
Exchange sex for drugs	1 (1)	13 (14)	0.13 (0.02 - 0.88)	0.04†
Presence of STD's (n = 93/90)	7 (8)	8(9)	0.91 (0.52 - 1.60)	0.75
Lab values				
CD4 count, mean ± SD (range) (n = 61/62)	247 ± 212 (6 - 886)	284±246 (6-980)	1.00 (0.99 - 1.00)	0.38
CD4 %, mean ± SD (range) (n = 66/64)	15 ± 12 (0.01 - 58)	17±13 (0.02-41)	1.01 (0.99 - 1.02)	0.45
Viral load, mean ± SD (range) (n = 63/58)	188,590 ± 977,052 (50 - 7,750,000)	77,864±140382 (0- 750,000)	1.00 (1.00-1.00)	0.39

† Fisher's Exact test two-sided p-value.

Table 3. Respondent's drug use by utilization of ART (N = 184).

Drug	ART (n = 93) n (%)	No ART (n = 91) n (%)	Risk Ratio (95% CI)	P-value
Marijuana				
Ever	81 (87)	83 (91)	0.82 (0.56 - 1.22)	0.33
Last 6 months	23 (25)	23 (24)	0.96 (0.69 - 1.34)	0.80
Heroin				
Ever	21 (23)	18 (20)	1.08 (0.78 - 1.51)	0.63
Last 6 months	0 (0)	2 (2)	Undefined	-
Cocaine				
Ever	55 (59)	58 (64)	0.91 (0.68 - 1.21)	0.52
Last 6 months	4 (4)	8 (9)	0.64 (0.28 - 1.45)	0.29†
Crack				
Ever	68 (73)	75 (82)	0.78 (0.58 - 1.05)	0.10
Last 6 months	21 (23)	47 (52)	0.49 (0.33 - 0.73)	< 0.001
Amphetamines				
Ever	26 (28)	14 (20)	1.40 (1.05 - 1.86)	0.02
Last 6 months	0 (0)	0 (0)	Undefined	-
Alcohol				
Ever	85 (91)	89 (98)	0.61 (0.43 - 0.86)	0.005†
Last 6 months	37 (40)	62 (68)	0.57 (0.42 - 0.76)	< 0.001

† Fisher's exact test two-sided p-value.

Table 4. Multivariate analysis of the factors associated with receiving ART.

Variable	RR	95% CI	P value
Category			
Regular attendee	3.59	2.12 - 6.08	< 0.001
Irregular attendee	2.26	1.28 - 4.01	0.005
Non-attendee	1.00		
Currently homeless	0.71	0.48 - 1.05	0.09
Alcohol	0.88	0.71 - 1.10	0.25
Sex for drugs	0.19	0.03 - 1.28	0.09

most likely to be on HAART. In this study, HIV-infected individuals enrolled in regular care received ART at the Infectious Disease Clinic in Atlanta at a frequency that is twice that of irregular and four times that of those not in regular clinic-based HIV care (86 versus 42 and 20%, respectively). In the multivariate analysis, regular involvement in HIV care emerged as the only independent predictor of being on antiretroviral therapy while controlling for being currently homeless, using alcohol and exchanging sex for drugs. Notably, substance abuse, homelessness, imprisonment, sources of income, gender and race were not independently associated with ART utilization.

We should note that those we called "non-attendees" were persons not seen at our HIV clinic, the largest and most active in Atlanta at the time. That 20% of them had received ARTs at some time may be attributable to the fact that they had been seen at approximately 15 other venues, many of them at multiple sites, but none as regular patients (data not shown). It maybe difficult to

sort out non-prescribing from non-acceptance of routine care, and the psychosocial reasons for the health care behavior may play an important role that was not capture by this study. Nonetheless, the unwillingness of clinicians to place irregular and non-attendees on ARTs is very much in evidence.

In various other studies, individuals of lower socio-economic status, racial/ethnic minorities, those involved in drug use and women have been less likely to receive treatment (Pappas et al., 1993; Shapiro et al., 1999; Wood et al., 2003). These barriers may represent an unwillingness of health care providers to start therapy in these 'at risk' populations for fear of non-adherence. The fact that these risk factors were not independently associated with ART utilization in our study is revealing. Our results lead to the supposition that such factors as drug or alcohol abuse should not influence the decision to initiate HAART, provided that the patient has demonstrated sustained and regular engagement with the HIV clinic. These results are not unprecedented. In the EuroSIDA study intravenous drug users were less likely to initiate ART. However among those who did, their response to therapy was similar to other groups (Celentano et al., 2001). Our results add to the growing body of evidence that provider hesitancy in the initiation of therapy may be misguided. From this perspective, no one should be denied antiretroviral therapy based on behavioral or social characteristics. The recently proposed approach to fighting the spread of HIV in the United States and the world called "test and treat" is based on getting patients tested with HIV into care for education and treatment (Dodd et al., 2010; Granich et al., 2009). Clearly, for this strategy to be successful, programs should be developed for those individuals at risk for poor clinic attendance by emphasizing targeted interventions to achieve stability and manageability of their daily lives. Drug and alcohol use, mental illness, and homelessness, require referrals to substance abuse treatment, psychiatrists, and social workers.

Hospitalizations for HIV-related complications were significantly higher among those on ART in our study. This seemingly paradoxical finding has been shown in several studies on HIV therapy. Mortality appears to be highest during the first year after initiation of ART (Lohse et al., 2007; Moore and Chaisson, 1999). Several theories have been postulated to try to explain these observations. It is likely that many individuals are being initiated on therapy at late stages of infection. Mortality from opportunistic infections at low CD4 counts despite intervention may account for some of these results. Additionally, those that are started after AIDS diagnoses may be prone to experience Immune Reconstitution Syndrome, which could result in higher rates of hospitalizations. Medication side effects also likely contribute to the phenomenon of higher hospitalization in the first year after starting ART.

The overall use of ART in our study population was less frequent than that reported in previous studies; this finding was not unexpected given that our study included individuals not engaged in ongoing HIV care (Palella et al., 1998; Shapiro et al., 1999; Bassetti et al., 1999; Sackoff et al., 2000). This again emphasizes the notion that active, regular participation in HIV care is essential for ART utilization. Given the benefits of antiretroviral therapy, this study's findings suggest that HIV control strategies Atlanta should be directed at enhancing linkage and retention in HIV care.

Given the findings that regular attendance at the IDP was singularly important to ART utilization, this study also sought to elucidate the factors associated with regular, irregular attendance, and nonattendance in HIV care. Understanding these factors is crucial for future interventions. Our study showed that irregular and non-attendees display considerable social stress as evidenced by higher rates of homelessness, imprisonment and general drug use. The summation of these disruptive lifestyles may represent an ongoing barrier to entering routine medical care, and difficulty in accessing treatment (Carrieri et al., 2003; Celentano et al., 1998). Hence, while these factors may not directly affect ART utilization, they had significant influence on becoming a regular attendee in HIV care. An alarming finding was the overall high use of alcohol and crack in the study population. This continued substance abuse appears to represent a persistent major barrier to accessing routine medical care. As a result, these HIV-infected individuals are unable to initiate needed therapy even when indicated.

This analysis rejects the overall null hypothesis as there are differences in ART utilization associated with degree in outpatient care, demographic, clinical and behavioral characteristics. Though these results cannot be generalized to other HIV-infected populations, the results emphasize that studies limited to patients with HIV who are already enrolled in care do not necessarily provide a complete understanding of HIV/AIDS among hard to reach individuals in inner cities. Finally the results gathered in this study support the development of strategies or models to support HIV-infected individuals as they attempt to enter and remain successfully in care. Given the established benefits of HAART for HIV-infected individuals, serious effort needs to be directed at strategies aimed at initiating and sustaining vulnerable patients in medical care.

Our study is subject to several limitations. Some groups of HIV-infected individuals may be underrepresented, particularly the very ill as they were not easily accessible or were often too debilitated to participate (possibility for non-response bias). Another population that was likely not represented adequately is those distrustful of the physicians and the medical establishment. Also because the majority of the data was collected by self-report, it is subject to reporting bias. The stigma that can be associated with behavioral patterns or life choices can cause individuals to omit some important epidemiologic

information. Some of these shortcomings are reflected in our inability to calculate the true refusal rate, which would include refusals at each step of the recruitment process.

In the ten years since this assessment was performed, some improvement has occurred, but our clinic system still retains a substantial number of persons who are irregular in their attendance and who would benefit from ARTs. The problems of homelessness and drug use, which interact in important ways with the inability or unwillingness to use ARTs, persist and have been intensified by recent economic events. While great strides have been made in the US, the next phase in reducing the morbidity and mortality of HIV will require the comprehensive identification of factors which have allowed HIV to persist in vulnerable populations (that is, based on race, economic, cultural, sociological and behavioral factors). If these factors are not appropriately identified and addressed, medications currently used in HAART regimens will be rendered ineffective with dramatic consequences (Georgia Division of Public Health, HIV/AIDS Epidemiology Reporting System, 2011; Giordano et al., 2005)

Conclusion

The overall use of ART among this hard-to-reach patient population was less frequent than that reported in previous studies likely due to our inclusion of individuals not engaged in ongoing HIV care. This finding emphasizes that studies limited to patients with HIV who are already enrolled in care may not provide a complete understanding of HIV/AIDS among hard-to-reach individuals in inner cities. Independent association between routine clinic attendance and use of antiretroviral therapy observed in this study should encourage the development of strategies to retain patients in outpatient HIV care.

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