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Emergency Department Utilization Among HIV-infected Patients in a Multisite Multistate Study

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Abstract

Objective—The aim of this study was to examine Emergency Department (ED) utilization and clinical and sociodemographic correlates of ED use among HIV-infected patients.

Methods—During 2003, 951 patients participated in face-to-face interviews at 14 HIV clinics in the HIV Research Network. Respondents reported the number of ED visits in the preceding 6 months. Using logistic regression, we identified factors associated with visiting the ED in the last 6 months and admission to the hospital from the ED.

Results—Thirty-two per cent of respondents reported at least one ED visit in the last 6 months. In multivariate analysis, any ED use was associated with Medicaid insurance, high levels of pain (the third or fourth quartile), more than seven primary care visits in the last 6 months, current or former illicit drug use, social alcohol use and female gender.

Of those who used ED services, 39% reported at least one admission to the hospital. Patients with pain in the highest quartile reported increased admission rates from the ED as did those who made six or seven primary care visits, or more than seven primary care visits vs. three or fewer.

Conclusions—The likelihood of visiting the ED has not diminished since the advent of highly active antiretroviraltherapy (HAART). More ED visits are to treat illnesses not related to HIV or injuries than to treat direct sequelae of HIV infection. With the growing prevalence of people living with HIV infection,the numbers of HIV-infected patients visiting the ED may increase, and ED providers need to understand potential complications produced by HIV disease.

Keywords

Emergency Department; HIV; utilization; HIV Research Network

Introduction

HIV-infected patients are more intensive users of the healthcare system than the general population.(1,2) Studies early in the HIV epidemic demonstrated that this population had a

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higher than average rate of Emergency Department (ED) use compared to the general United States population. (3) HIV-infected patients who present to the ED also have high rates of admission to the hospital. (4) In contrast to ED utilization in the general population, socio-demographic characteristics and drug use contributed little to the probability of ED visits in a cohort of HIV-infected persons receiving care in 1991–1992; ED was primarily driven by disease severity.(5)

Inpatient utilization has declined and outpatient utilization increased with the advent of HAART, but rates of ED utilization have not been reported in the current era of highly active antiretroviral therapy (HAART). (6–10) Emergency Department care is expensive and may be potentially avoidable. Identifying factors associated with ED visits is an important step in improving health care delivery to HIV-infected patients and reducing health care costs. Since HIV-infected patients are now living longer and healthier lives, (11–14) we hypothesized that ED utilization and inpatient admissions would be more strongly associated with sociodemographic and substance use characteristics, compared to factors related to the clinical aspects of HIV disease.(15–19)

The objective of this study was to assess utilization rates, reasons for ED utilization, and patient characteristics associated with ED utilization in the HAART era among patients who have a primary source of HIV care. We evaluated the characteristics associated with one or more ED visits, including demographic factors, frequency of primary care visits, pain, CD4 count and HIV-1 RNA. We also examined factors associated with being admitted to the hospital from the ED.

Methods

Study Design

This study is a cross-sectional survey, based on in-person interviews with patients recruited from HIV clinics. Patients were not recruited directly from Emergency Departments.

Study Setting

The HIV Research Network (HIVRN) is a consortium of outpatient clinics that provide primary and subspecialty care to HIV-infected adult and pediatric patients. Clinics abstract specified data elements from patients' medical records; abstracted data are assembled into a uniform database and submitted to a Data Coordinating Center (2,20). Patients are identified only by a coded ID number in the medical record database. Fourteen out of the 15 clinics that treated adult patients participated in conducting interviews with patients. Six are located in the Eastern United States, three in the Midwest, two in the South and three in the West. Seven clinics have academic affiliations; seven are community-based.

Subject Recruitment

Initially, Data Coordinating Center staff drew a random sample from each participating clinic using the coded IDs in the medical record database. The sampling frame consisted of active patients in 2002 at these sites. Sampled IDs were then sent to the clinics to be linked with personal identifiers by clinic staff. Due to confidentiality restrictions, each sampled patient had to be first approached by a clinic staff member to solicit participation in the interview. Clinic staff mailed letters of invitation to potential study patients at their last known address. We encountered a large proportion of incorrect addresses and a high rate of non-response to the mailed letter of invitation. Resources did not permit multiple follow-ups of sampled patients, nor could it be documented whether nonresponse was due to incorrect addresses or to implicit refusal. Of 5,363 letters of invitation sent, we successfully conducted interviews with 717 patients (13%). To increase the sample size, in all but three

clinics patients were recruited while awaiting treatment in the HIV clinic. This yielded interviews with another 234 patients. Time constraints on clinic staff precluded keeping detailed records of numbers of refusals, either to the letter or to the in-person recruitment. A total of 951 patients were interviewed. The median sample size per clinic was 59 patients (range: 38 to 172 patients). The low response rate to the mailed invitation, and the non-random selection of patients as they waited in clinics, implies that this should be considered a convenience sample. However, gender, race/ethnicity, the reported means of HIV acquisition, first CD4 count in 2003, and proportion with undetectable HIV-1 RNA were similar in the interviewed sample and in the larger population of patients at these clinics. (Table 1) The near-zero values of Cramer's V statistic indicate very little association between data source and each variable.

Face-to-face interviews were conducted between December 1, 2002 and December 31, 2003 by professional interviewers trained and supervised by Battelle Corporation (Columbus, Ohio, USA). The interviews assessed a wide range of HIV-related topics. For comparability, interview questions were taken from the interview developed for the HIV Cost and Services Utilization Study (HCSUS).(1,2) All patients in this study were receiving primary outpatient care, defined by having at least one CD4 test and one outpatient visit during 2003.

Institutional Review Board approval/exemption of the project, including the interview, was obtained by the data coordinating center and each clinic. Additionally, written informed consent was obtained from each participant before the start of the interview. Participants were reimbursed $30 for the approximately one-hour interview. A Spanish language version of the interview was available.

Measurement of Variables

Interview Data—The interview assessed the frequency of ED utilization in the prior 6 months, the number of ED visits that led to admission to the hospital, and whether the patient went to the ED on their own or on the advice of a healthcare provider. Patients were asked the reason for the most recent ED visit, with response options of: an illness you thought related to HIV infection, an accident or injury, pregnancy-related care, an alcohol or drug-related condition, an illness that was not related to HIV infection. We also examined HIVRN medical record data to determine the one year ED utilization rate among all adult patients enrolled in these HIVRN sites.

From the patient interview we collected data on gender, age, racial/ethnic group, years of school completed, employment status, insurance coverage, and HIV risk factor. (Table 1) We categorized age as 18–49 and 50 or older, based on the CDC guidelines for defining "elderly" HIV-infected individuals. For employment, respondents could self-identify as "disabled"; this does not imply that their disability status had been officially adjudicated. Respondents reported the number of primary care visits in the six months prior to the interview, excluding ED visits and excluding primary care visits solely for mental or substance abuse treatment. The number of visits was categorized into quartiles. Alcohol use was ascertained, as in HCSUS (22), from questions asking (1) how many days in the past four weeks the respondent drank alcohol, (2) how many drinks the person consumed on a typical day when drinking, and (3) the number of days the person consumed more than five drinks. We defined hazardous drinking as greater than 14 drinks per week for men and greater than 7 drinks per week for women, according to National Institute on Alcohol Abuse and Alcoholism (NIAAA) guidelines.(23) Binge drinking was defined as 5 or more drinks on at least 1 day in the past 4 weeks. We combined hazardous and binge drinkers into one category, with the reference group being non-drinkers. "Social" drinkers were those who consumed alcohol, but not to excess.

To assess illicit drug use, we asked about use of sedatives, sleeping pills, tranquilizers, amphetamines, analgesics, marijuana, cocaine, inhalants, LSD, and heroin. Current substance use was defined as using any illicit drug within 6 months of the interview. Former substance use was defined as using illicit drugs more than 6 months prior to the interview, but not within 6 months of the interview.

Pain was measured by combining responses to the two items comprising the pain subscale of the Medical Outcome Study Short Form 36. Scoring was based on the RAND modifications to the SF-36. A score of zero represented no pain while a score of 100 represented the most intense pain.(24) For analyses, we classified this variable into quartiles.

Medical Record Data—CD4 count and HIV-1 RNA were extracted from medical records, using the first value obtained in calendar year 2003. CD4 count was categorized as 0–49, 50–199, 200–499 and greater than 499 cells/mm^3. HIV-1 RNA was categorized as ≤400 copies, > 400 copies per/mL or as missing. HIV risk factor was also obtained from medical records; the IDU category comprised patients with multiple risk factors including IDU.

Highly active antiretroviral therapy (HAART) was defined as use of: (1) three or more nucleosides; or (2) a protease inhibitor [PI], a non-nucleoside reverse transcriptase inhibitor [RTI], or a fusion inhibitor, in combination with at least two other antiretrovirals. Patients were considered to be on HAART if they received any of these combinations during the calendar year. This definition includes triple nucleoside regimens, which were still standard of care in 2003. We opted to be as inclusive as possible in our definition of HAART in order to maximize the sensitivity of the analysis; this definition is unlikely to exclude any preferred drug combinations.

To compare the 6-month utilization rate with national statistics on ED use, we confirmed that the annual rate was twice the 6-month rate. We used HIVRN medical record data for all adult patients to determine ED visit rates for the first 6 months of 2003, the second six months of 2003, and the full year. Because ED use at providers outside the HIVRN may not be recorded in medial records, the ED visit rate obtained from medical record data may understate the true rate. However, there is no reason to believe that any potential undercount would vary differentially over time, and thus the medical record data can speak to relative rates for different time periods.

Data Analysis

We used chi-square tests to examine the association between individual socio-demographic variables and any ED use. Logistic regression was performed to analyze factors associated with having at least one visit to the ED, and with being admitted to the hospital from the ED. The multivariate model included variables presumed a priori to influence ED utilization. The Andersen-Aday model of the determinants of healthcare utilization provided the basis for our a priori assumptions. The model considers three sets of variables; predisposing characteristics, such as demographics, enabling factors, such as health insurance, and need factors, such as severity of current disease.(25,26) Multivariate analyses of any ED visit were conducted on 913 persons having complete data for all variables. The analyses of factors associated with hospital admission were conducted only among those who visited the ED and had no missing data. (N=280) Analyses were conducted using STATA 9.0, (College Station, Texas, USA). In all regressions, adjustment was made for site of care, to account for variations in practice patterns and demographic differences across clinics. This was done by adding an indicator variable for each clinic (except one reference clinic) to each model. All models were checked using likelihood ratio tests and the Hosmer-Lemeshow goodness of fit

test.(27) For variables with multiple categories, we report as a "group test," the Wald test for joint significance of all levels of the variable.

Results

The majority of the participants were male (68%) and of minority ethnicity (52% Black and 14% Hispanic) (Table 2). The median age was 45 years (range 20–85). HIV risk factors included men who have sex with men (MSM) (34%), heterosexual transmission (30%) and injection drug use (IDU) (27%). The majority (69%) were on HAART. As of the first test available for the patient in 2003, the median CD4 count was 376 cells/mm^3 (range 0–2040 cells/mm^3) and the median HIV-1 RNA was 461 copies/ml (range 0–750,000 copies/ml), with 37% being undetectable.

ED Visits

The 6-month ED visit rate was 62.8 per 100 persons. Nearly one third (32%) reported at least one ED visit in the six months preceding the interview. Of those visiting the ED, the median was 1 visit per person (range 1–12). Of those with an ED visit, forty six percent made more than one visit in six months.

Per patient report, reasons for the most recent ED visit were to treat (1) an HIV-related illness (30%), (2) a non-HIV illness (45%), (3) an accident (14%), (4) drug or alcohol-related reasons (3%), and (5) pregnancy (0.3%), with 8% missing. For the most recent ED visit, over three quarters (77%) were self-referrals, and only 22% of visits were due to provider referral. For the most recent ED visit, twenty-six percent of those seeking emergency care for HIV-related illness were referred to the ED by the provider, and 22% of those seeking care for non-HIV-related illness were referred by the provider, a non-significant difference.

Table 3 presents results of a logistic regression analysis of factors associated with any ED visit, conducted on 913 patients with complete data. High levels of pain (third or fourth quartile), having more than seven primary care visits in the last six months, current or former illicit drug use, Medicaid insurance, and female gender remained associated with ED utilization when other variables were controlled. Clinical variables -- such as CD4 count, HIV-1 RNA, or HAART usage – were not significantly associated with any ED utilization.

Hospital Admission from the ED

Thirty nine percent of patients who visited the ED (n=121) were subsequently admitted to the hospital from the ED on at least one occasion. The probability of having an admission from the ED was associated with the number of ED visits, rising from 32% of those with one ED visit, to 41% of those with 2 ED visits, to 67% of those with 3 or more visits (results not shown).

Table 4 reports results of a multivariate logistic regression of any inpatient admission from the ED (n= 280). The odds of admission to the hospital from the ED were greater for patients who made six or more primary care visits, versus 3 or fewer. Patients with CD4 counts less than 200 cells/mm^3 were more likely to be admitted than those with CD4 counts above 500 cells/mm^3. Patients reporting the highest level of pain also reported relatively high odds of admission from the ED, although the set of variables representing pain quartiles was not jointly significant. Patients who were retired had higher odds of being admitted from the ED than patients who were employed, but the overall effect of employment status on inpatient admissions was not significant.

Discussion

ED utilization was high in this multiclinic, multistate sample of HIV-infected patients. In this study, 32% visited the ED once or more within six months, and the 6-month ED attendance rate was 62.8 per 100 persons. Inspection of HIVRN medical record data showed that the 1-year visit rate was approximately twice the 6-month rate. Extrapolation of the 6-month interview data leads to an estimated one-year ED visit rate of 125.6 per 100 persons. Nationwide United States estimates for the general population in 2003 show an overall ED visit rate of 38.9 visits per 100 persons, suggesting higher utilization among HIV-infected patients than in the general population. (3)

Our finding that nearly one-third of patients used the ED within a six-month interval is consistent with previous data from the pre-HAART and early HAART eras. In the pre-HAART era, 23%– 43% of HIV-infected persons reported utilizing the ED at least once in a six month period.(5,28–30) Other pre-HAART and early HAART estimates of ED utilization varied from 16 to 71% of patients studied over periods of three months to two years.(31–33) This suggests that the benefits of HAART have not resulted in decreased use of ED services.

A substantial proportion of patients (62%) reported that their most recent ED visit was due to non-HIV-related illnesses, injuries, or substance abuse. Future studies will need to examine provider-reported reasons for visitation, which may be different from patient self-report. Comparison of reason-for-visit data from patients and primary care providers may help to identify potentially avoidable ED visits. Nevertheless, if reasons for the most recent visit are representative of reasons for all visits, HIV infection may be incidental in a significant proportion of ED visits by people with HIV disease.

It is noteworthy that clinical variables, such as CD4 cell counts, HIV-1 RNA suppression, and receipt of HAART were not significantly associated with any ED use. This is in contrast to data from earlier in the HIV epidemic, showing that patients with AIDS were more likely to use the ED than those with less advanced HIV disease.(5) This finding is consistent with our hypothesis that ED use in the current HAART era will be less strongly related to clinical aspects of the disease, compared with the pre-HAART era.

Patients with more visits to the primary care physician were had higher odds of visiting the ED. Mauskopf et al., who found that patients with fewer than four visits had half the odds of making an ED visit, noted this association early in the epidemic.(34) One interpretation is that those with the most primary care visits are the most likely to use the ED because they are among the sickest patients. If true, illness burden may be related to comorbid conditions, given the lack of association between ED use and HIV-specific clinical variables. (The association between number of primary care visits and reason for the most recent ED visit was not significant.)

All subjects in this study were engaged with a source of regular HIV care. A previous study suggested that lacking a dominant HIV provider may increase the odds of using the ED (34), and thus our results may underestimate ED use by HIV-infected patients lacking a regular source of care. However, it is notable that ED use was relatively common in this sample, despite the presence of established links with primary care providers.

As hypothesized, ED utilization was associated with the same sociodemographic and substance use characteristics that are associated with increased ED use in the general population(35,36). Women, those with Medicaid insurance, and those who described themselves as disabled were more likely to use the ED than their counterparts. Many studies have demonstrated increased health care utilization in HIV-infected women compared to

men.(2,29,37) Our findings are consistent with those of the HCSUS, which showed that women had more use of the ED than men. (29) While other studies have shown no differences in ED utilization between HIV-infected men and women, they generally examined subgroups of HIV-infected persons, particularly the homeless (30,38) or drug users (30,39) or used data from early in the HIV epidemic. HCSUS showed higher odds of ED use among persons with public insurance, racial/ethnic minorities, persons with IDU HIV exposure, and those under 35 years of age, whereas the current study did not find significant effects for age, HIV risk factor, or minority status. (29)

Like Solomon and Palepu, we found that both current and former drug users had higher odds of using the ED than those who never used drugs.(30,33) This could be because current drug users may have medical complications of injection drug use, such as abscesses, osteomyeletitis, endocarditis, and overdoses requiring emergency evaluation. Former drug users may have increased need for emergency services due to long-term sequelae of former drug use such as complications of infectious hepatitis. Although Palacio et al. did not find that IDU was associated with ED use among Women's Interagency Health Study (WIHS) participants, our definition of illicit drug use was more inclusive than IDU/non-IDU, as we included patients who were using any illicit drug, independent of injection status. (31)

Consistent with past literature, (5,40) we found that higher levels of pain were associated with increased likelihood of ED utilization. The effect of pain was notable, given that it is possible that some ED visits could have occurred prior to the period (past four weeks) captured in the pain questions. The pain questions may be reflecting chronic pain that persists over periods longer than four weeks.

Thirty-nine percent of ED users had at least one inpatient hospitalization following ED visitation. This is consistent with several other serious chronic diseases and demonstrates significant severity of illness among HIV infected patients. Therefore, utilization of the ED utilization may therefore be appropriate in many instances.

Limitations

Results of this study should be interpreted in light of several limitations. First, we were limited by self-reported measures of ED utilization in this analysis. It is possible that some respondents forgot to include some ED visits in the total, while others may have reported visits that occurred outside the six-month reference period. However, reliance on self-reported data greatly increases the feasibility of studies of ED use, as medical records from one provider may not capture all ED use by a patient.

A large proportion of patients had missing CD4 cell count and HIV-1 RNA data. For 80 patients, data were missing because one site left the HIVRN after interviews were conducted and no medical record data were available for 2003. For others, a match with medial record data could not be established. Although patients with missing clinical data were included in analyses, the rate of missing data is a limitation.

In addition, the convenience sample of interviewees may introduce bias into the estimates of ED use, as respondents and non-respondents may differ in service use. Patients who were approached in the waiting room to participate may have differed from those who responded to the mailed invitation. This may also introduce bias concerning the number of visits to the HIV clinic. We compared all patients enrolled in the HIVRN during 2003 to those who participated in the interview and found no differences in gender, race, or HIV risk factor; however, there may still be other differences between those patients who chose to participate in the study and the overall population of patients using HIVRN clinics. The high percentage of interviewees who were unemployed, disabled, or retired may also have led to the

introduction of bias, as these patients had more potential free time to attend an interview. Finally, the HIVRN is not a national probability sample. Though its population is similar to that of a 1996 nationally representative sample of persons in care for HIV infection (1), we are cautious about generalizing our findings to the entire U.S. HIV-infected population.

Conclusions

In summary, HIV-infected individuals make frequent visits to the Emergency Department and are often admitted from there to the hospital. The proportion of patients making one or more ED visits has apparently not declined since the introduction of HAART. The increased prevalence of patients with HIV infection due to improved survival with HAART, the aging of the population and the development of comorbid disease in HIV infected patients suggest that overall numbers of persons with HIV infection using ED services may be increasing over time. Although some ED visits are due to injuries, the majority are due to significant HIV or non-HIV related illnesses and the presence of HIV infection may complicate care delivery. ED providers need to be aware of the side effects of treatments and the management of comorbidities in HIV-infected patients. If pain management and substance abuse complications are associated with increased likelihood of ED visits, additional services to provide patients with adequate outpatient pain management and substance abuse treatment may reduce ED utilization. Our results are important not only for HIV-infected patients and providers but also for those who pay for this care.

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APPENDIX

Participating Sites

Alameda County Medical Center, Oakland, California (Howard Edelstein, MD, Silver Sisneros, D.O.)

Children’s Hospital of Philadelphia, Philadelphia, Pennsylvania (Richard Rutstein, M.D.)

Community Health Network, Rochester, New York (Steven Fine, M.D., Roberto Corales, D.O.)

Community Medical Alliance, Boston, Massachusetts (James Hellinger, M.D.)

Drexel University, Philadelphia, Pennsylvania (Peter Sklar, M.D., Sara Allen, C.R.N.P.)

Henry Ford Hospital Detroit, Michigan (John Jovanovich, M.D., Norman Markowitz, M.D.)

Johns Hopkins University, Baltimore, Maryland (Kelly Gebo, M.D., Richard Moore, M.D., George Siberry MD, Allison Agwu MD)

Montefiore Medical Group, Bronx, New York (Robert Beil, M.D.)

Montefiore Medical Center, Bronx, New York (Lawrence Hanau, M.D.)

Nemechek Health Renewal, Kansas City, Missouri (Patrick Nemechek, M.D.)

Oregon Health and Science University, Portland, Oregon (P. Todd Korthuis, M.D.)

Parkland Health and Hospital System, Dallas, Texas (Philip Keiser, M.D.)

St. Jude's Children's Hospital and University of Tennessee, Memphis, Tennessee (Patricia Flynn, M.D., Aditya Gaur, M.D.)

St. Luke's Roosevelt Hospital Center, New York, New York (Victoria Sharp, M.D.)

Tampa General Health Care, Tampa, Florida (Jeffrey Nadler, M.D., Chararut Somboonwit, M.D.)

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Wayne State University, Detroit, Michigan (Lawrence Crane, M.D., Jonathan Cohn, M.D.)

Sponsoring Agencies

Agency for Healthcare Research and Quality, Rockville, Maryland (Fred Hellinger, Ph.D., John Fleishman, Ph.D., Irene Fraser, Ph.D.)

Health Resources and Services Administration, Rockville, Maryland (Richard Conviser, Ph.D., Alice Kroliczak, Ph.D., Robert Mills, Ph.D.)

Substance Abuse and Mental Health Services Administration, Rockville, Maryland (Joan Dilonardo, Ph.D., Laura House, Ph.D., Pat Roth)

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Table 1

Comparison of Interviewed Patients (N=871) and Full HIVRN Medical Record Data (n= 13,029)

	Overall Dataset Adult Patients Enrolled in 13 HIV Research Network Sites	Interview Dataset	Cramer's V Statistic
Male Sex	70%	67%	−0.016
Race			
White	29%	28%	
Black	49%	56%	0.048
Hispanic	20%	13%	
Other/Unknown	2.0%	3.0%	
Transmission Method*			
IDU	25%	28%	
MSM	36%	34%	0.023
HET	33%	30%	
First CD4 cell count			
>50	8%	6%	
50–199	18%	16%	
200–499	43%	45%	0.018
≥500	31%	33%	
HIV-1 RNA			
<400	56%	51%	
≥400	44%	49%	0.026

* IDU-Injection drug use, MSM- Men who have sex with men, HET- heterosexuals. For comparability, analyses exclude interview data from one site that did not provide medical record data in 2003. Missing data also excluded for comparability. Cramer's V statistic measures strength of association and ranges from −1 to +1, with 0 indicating no association.

Table 2

Demographic and Clinical Characteristics

	Study Population N=951 (%)	Patients with any ED visits N=308 (%)	Patients admitted from ED N=121 (%)
Age (years)			
18–49	677 (71)	222 (72)	87 (72)
>50	267 (28)	83 (27)	33 (27)
Missing	7 (1)	3 (1)	1 (1)
Race			
White	294 (31)	77 (25)	25 (21)
Black	491 (52)	177 (57)	76 (62)
Hispanic	130 (14)	39 (13)	14 (12)
Other/missing	36 (4)	15 (5)	6 (5)
Sex			
Male	648 (68)	176 (57)	69 (57)
Female	303 (32)	132 (43)	52 (43)
HIV Risk Factor*			
IDU	256 (27)	110 (36)	44 (36)
MSM	319 (34)	73 (24)	25 (21)
HET	282 (30)	96 (31)	35 (29)
Other/Missing	94 (10)	29 (9)	17 (14)
First CD4 Count of 2003 (cells/mm^3)			
<50	45 (5)	18 (6)	11 (9)
50–199	114 (12)	35 (11)	18 (15)
200–499	319 (34)	99 (32)	36 (30)
>499	234 (25)	70 (23)	21 (17)
Missing	239 (25)	86 (28)	35 (29)
HIV-1 RNA(copies/ml)			
<400	349 (37)	123 (34)	52 (42)
≥ 400	360 (38)	100 (39)	36 (36)
Missing	242 (25)	85 (35)	33 (39)
HAART			
No	292 (31)	100 (32)	42 (35)
Yes	659 (69)	208 (68)	79 (65)
Bodily Pain			
1^{st} Quartile	206 (22)	40 (13)	10 (8)
2^{nd} Quartile	241 (25)	66 (22)	21 (17)
3^{rd} Quartile	208 (22)	77 (25)	28 (23)

	Study Population N=951 (%)	Patients with any ED visits N=308 (%)	Patients admitted from ED N=121 (%)
4th Quartile	291 (31)	122 (40)	60 (50)
Missing	5 (1)	3 (1)	2 (2)
Illicit drug use			
Current	344 (36)	122 (40)	48 (40)
Former	336 (35)	121 (40)	48 (40)
Never	267 (28)	62 (22)	24 (20)
Missing	4 (0)	3 (1)	1 (1)
Alcohol use			
Hazardous binge drinking	101 (10)	20 (7)	6 (5)
Social Alcohol Usage	275 (29)	81 (27)	25 (21)
No Alcohol	573 (60)	204 (67)	89 (74)
Missing	2 (1)	1 (0)	1 (1)
Education			
< High school degree	244 (26)	92 (30)	39 (32)
High school grad/junior college	569 (61)	186 (61)	72 (59)
College/ post-college	127 (14)	27(9)	9 (7)
Missing	11 (1)	3 (1)	1 (1)
Employment			
Working	225 (24)	48 (16)	10 (8)
Retired	151 (16)	54 (17)	25 (21)
Disabled	475 (50)	178 (58)	77 (64)
Unemployed	91 (10)	26 (9)	9 (7)
Missing	9 (1)	2 (1)	0 (0)
Insurance			
Private	215 (23)	51 (17)	17 (14)
Medicaid	357 (38)	147 (48)	58 (48)
Medicare	92 (10)	28 (9)	15 (12)
Medicare/Medicaid	181 (19)	61 (20)	25 (21)
None	94 (10)	16 (5)	5 (4)
Missing	12 (1)	5 (2)	1 (1)
Primary Care Visits			
≤3	375 (40)	95 (31)	24 (20)
4, 5	117 (12)	33 (11)	9 (7)
6, 7	227 (24)	78 (26)	39 (32)
≥8	232 (24)	99 (32)	47 (40)
Number of ED Visits			
0	642 (68)		----

	Study Population N=951 (%)	Patients with any ED visits N=308 (%)	Patients admitted from ED N=121 (%)
1	162 (17)		52 (43)
2	74 (8)		29 (24)
3 or more	65 (7)		40 (33)
Missing	8 (1)		----

* IDU-Injection drug use, MSM- Men who have sex with men, , HET- heterosexual transmission.

Note: Percentages may not sum to 100 due to rounding.

Table 3

Factors Associated with making any ED Visit within the past 6 months

	Bivariate OR (95% CI) Associated with an ED Visit	Multivariate OR (95% CI) Associated with any ED Visit
Age (years)		
18–49	1.0 (Ref)	1.0 (Ref)
≥50	0.94 (0.69–1.28)	0.95 (0.66–1.37)
Race		
White	1.0 (Ref)	1.0 (Ref)
Black	1.45 (0.98–2.13)	1.27 (0.82–1.98)
Hispanic	1.00 (0.60–1.67)	0.94 (0.53–1.65)
Other	1.72 (0.79–3.73)	1.38 (0.59–3.23)
Group Test (P-Value)	5.63 (0.13)	2.21 (0.53)
Sex		
Male	1.0 (Ref)	1.0 (Ref)
Female	1.98 (1.46–2.69)*	1.95 (1.33–2.86)*
HIV Risk Factor		
IDU	1.0 (Ref)	1.0 (Ref)
MSM	0.45 (0.31–0.66)*	0.82 (0.52–1.29)
HET	0.72 (0.50–1.04)	0.67 (0.44–1.02)
Other/missing	0.54 (0.31–0.91)*	0.51 (0.28–0.92)* 6.40 (0.09)
CD4 in 2003 (cells/mm^3)		
<50	1.72 (0.87–3.44)	1.41 (0.64–3.10)
50–199	1.06 (0.64–1.74)	0.92 (0.52–1.60)
200–499	1.07 (0.74–1.57)	0.99 (0.65–1.52)
>499	1.0 (Ref)	1.0(Ref)
Missing	1.21 (0.74–1.98)	2.65 (0.58–12.11)
Group Test (P-Value)	2.66 (0.61)	2.64 (0.62)
HIV-1 RNA (copies/ml)		
<400	1.0 (Ref)	1.0 (Ref)
≥400	0.85 (0.61 −1.17)	1.05 (0.71 −1.55)
Missing	0.97 (0.61 – 1.54)	0.44 (0.10– 1.98)
Group Test (P-Value)	1.05 (0.59)	1.27 (0.53)
Receipt of HAART		
No	1.0 (Ref)	1.0 (Ref)
Yes	0.87 (0.64–1.17)	0.99 (0.70–1.39)
Bodily Pain		
1st Quartile	1.0 (Ref)	1.0 (Ref)

	Bivariate OR (95% CI) Associated with an ED Visit	Multivariate OR (95% CI) Associated with any ED Visit
2nd Quartile	1.56 (0.99–2.50)	1.36 (0.83–2.23)
3rd Quartile	2.30 (1.45–3.63)*	2.10 (1.28–3.44)*
4th Quartile	3.04 (1.98–4.68)*	2.36 (1.47–3.81)*
Group Test (P-Value)	29.36 (0.00)	15.79 (0.001)
Illicit drug use		
Current	1.90 (1.30–2.77)*	1.85 (1.20–2.86)*
Former	1.82 (1.25–2.66)*	1.59 (1.04–2.41)*
Never	1.0 (Ref)	1.0 (Ref)
Group Test (P-Value)	12.85 (0.00)	8.12 (0.02)
Alcohol use		
Hazardous/Binge drinking	1.0 (Ref)	1.0 (Ref)
Social EtOH	1.61 (0.93–2.81)	1.76 (0.98–3.14)
No EtOH	1.95 (1.16–3.28)*	1.94 (1.06–3.57)*
Group Test (P-Value)	6.81 (0.03)	4.72 (0.09)
Education		
< High School	1.0 (Ref)	1.0 (Ref)
H.S. or Junior College	0.86 (0.62 −1.19)	1.07 (0.74–1.54)
College or More	0.53 (0.31 −0.89)	0.85 (0.46–1.56)
Group Test (P-Value)	6.13 (0.05)	0.80 (0.67)
Employment		
Working	1.0 (Ref)	1.0 (Ref)
Retired	1.80 (1.10–2.96)*	1.24 (0.71–2.19)
Disabled	2.20 (1.50–3.22)*	1.27 (0.80–2.04)
Unemployed	1.31 (0.73–2.34)	0.92 (0.48–1.77)
Group Test (P-Value)	18.03 (0.00)	1.87 (0.60)
Insurance		
Private	1.0 (Ref)	1.0 (Ref)
Medicaid	2.89 (1.78–4.70)*	2.09 (1.20–3.65)*
Medicare	1.15 (0.64–2.09)	0.97 (0.51–1.87)
Medicaid/Medicare	1.97 (1.18–3.29)*	1.44 (0.81–2.57)
None	0.76 (0.39–1.49)	0.86 (0.41–1.80)
Group Test (P-Value)	29.54 (0.00)	11.30 (0.02)
Primary Care Visits past 6 months		
≤3	1.0 (Ref)	1.0 (Ref)
4, 5	1.09 (0.67–1.77)	0.95 (0.56–1.61)
6, 7	1.65 (1.11–2.45)*	1.38 (0.90–2.13)
≥8	2.63 (1.79–3.87)*	2.13 (1.38–3.27)*

	Bivariate OR (95% CI) Associated with an ED Visit	Multivariate OR (95% CI) Associated with any ED Visit
Group Test (P-Value)	26.44 (0.00)	14.28 (0.002)

Note: Group test is a chi-square test of the joint significance of all category indicators for a variable. Analyses included indicators for each HIVRN site (not shown).

Table 4

Factors Associated with Admission to the Hospital from the ED (n=280)

Variable Name	Bivariate Odds Ratio 95% (CI)	Multivariate Odds Ratio 95% (CI)
Age		
18–49	1.0 (Ref)	1.0 (Ref)
≥50	0.95 (0.55–1.65)	0.93 (0.45–1.91)
Race		
White	1.0 (Ref)	1.0 (Ref)
Black	1.71 (0.84–3.48)	2.64 (1.00–6.95)*
Hispanic	1.14 (0.44–2.98)	1.14 (0.34–3.78)
Other	1.26 (0.35–4.57)	1.48 (0.28–7.77)
Group Test (P-Value)	2.67 (0.44)	5.28 (0.15)
Sex		
Male	1.0 (Ref)	1.0 (Ref)
Female	0.98 (0.59–1.62)	1.10 (0.52–2.32)
HIV Risk Factor		
IDU	1.0 (Ref)	1.0 (Ref)
MSM	0.78 (0.42–1.48)	1.02 (0.41–2.54)
HET	0.92 (0.51–1.66)	0.54 (0.25–1.20)
Other/missing	1.88 (0.79–4.51)	2.10 (0.68–6.50)
Group test (P-Value)	3.58 (0.31)	5.46 (0.14)
CD4 in 2003 (cells/mm^3)		
<50	3.60 (1.17–11.1)*	5.74(1.29–25.52)*
50–199	2.13 (0.90–5.07)	2.91 (1.00–8.46)*
200–499	1.34 (0.67–2.66)	1.46 (0.62–3.46)
>499	1.0 (Ref)	1.0 (Ref)
Missing	2.20 (0.95–5.09)	10.58 (0.99–112.06)*
Group Test (P-Value)	7.95 (0.09)	9.78 (0.04)
HIV-1 RNA (copies/ml)		
<400	1.0 (Ref)	1.0 (Ref)
≥400	0.69 (0.39–1.21)	0.79 (0.36–1.71)
Missing	0.81 (0.45–1.47)	0.14 (0.01–1.41)
Group Test (P-Value)	1.72 (0.42)	2.91 (0.23)
Receipt of HAART		
No	1.0 (Ref)	1.0 (Ref)
Yes	0.88 (0.53–1.46)	1.28 (0.64–2.53)
Bodily Pain		
1st Quartile	1.0 (Ref)	1.0 (Ref)

Variable Name	Bivariate Odds Ratio 95% (CI)	Multivariate Odds Ratio 95% (CI)
2nd Quartile	1.42 (0.57–3.52)	1.34 (0.43–4.18)
3rd Quartile	2.13 (0.88–5.17)	1.80 (0.62–5.23)
4th Quartile	3.07 (1.34–7.00)*	2.45 (0.88–6.82)
Group Test (P-Value)	17.04 (0.00)	3.62 (0.31)
Illicit drug use		
Current	1.11 (0.56–2.20)	0.80 (0.31 – 2.04)
Former	1.00 (0.50–2.00)	0.71 (0.28 – 1.75)
Never	1.0 (Ref)	1.0 (Ref)
Group Test (P-Value)	0.18 (0.95)	0.57 (0.75)
Alcohol use		
Hazardous/Binge drinking	1.0 (Ref)	1.0 (Ref)
Social EtOH	1.29 (0.43–3.83)	3.15 (0.83–11.94)
No EtOH	2.03 (0.73–5.65)	1.86 (0.47–7.35)
Group Test (P-Value)	3.58 (0.16)	3.70 (0.16)
Education		
< High School	1.26 (0.48–3.31)	1.06 (0.53–2.12)
H.S. or Junior College	1.24 (0.51–3.05)	0.77 (0.23–2.61)
College or More	1.0 (Ref)	1.0 (Ref)
Group Test (P-Value)	0.24 (0.88)	0.33 (0.85)
Employment		
Working	1.0 (Ref)	1.0 (Ref)
Retired	2.89 (1.13–7.34)*	4.27 (1.34–13.60)*
Disabled	2.80 (1.28–6.11)*	2.33 (0.85–6.41)
Unemployed	2.00 (0.66–6.05)	2.20 (0.54–8.97)
Group Test (P-Value)	7.16 (0.07)	6.04 (0.11)
Primary Care Visits past 6 months		
<3	1.0 (Ref)	1.0 (Ref)
4, 5	1.38 (0.54–3.55)	1.17 (0.35 – 3.93)
6, 7	4.21 (2.02–8.78)*	3.82 (1.61 −9.08)*
>8	3.27 (1.64–6.49)*	3.16 (1.39 – 7.19)*
Group Test (P-Value)	17.88 (0.00)	11.50 (0.009)
Insurance		
Private	1.0 (Ref)	1.0 (Ref)
Medicaid	1.53 (0.61–3.85)	0.56 (0.17 −1.87)
Medicare	2.52 (0.88–7.21)	1.32 (0.36 −4.85)
Medicare/Medicaid	1.63 (0.63–4.20)	0.72 (0.21 – 2.42)
None	1.11 (0.31–4.07)	0.83 (0.14– 4.83)

Variable Name	Bivariate Odds Ratio 95% (CI)	Multivariate Odds Ratio 95% (CI)
Group Test (P-Value)	3.33 (0.50)	2.16 (0.71)

Note: Group test is a chi-square test of the joint significance of all category indicators for a variable. Analyses included indicators for each HIVRN site (not shown).