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EMERGENCY DEPARTMENT UTILIZATION AMONG A COHORT OF HIV-POSITIVE INJECTING DRUG USERS IN A CANADIAN SETTING

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Abstract

Background—HIV-positive injection drug users (IDU) are known to be at risk for multiple medical problems that may necessitate emergency department (ED) use, however, the relative contribution of HIV disease versus injection-related complications have not been well described.

Objectives—We examined factors associated with ED use among a prospective cohort of HIV-positive IDU in a Canadian setting.

Methods—We enrolled HIV-positive IDU into a community-recruited prospective cohort study. We modeled factors associated with the time to first ED visit using Cox regression to determine factors independently associated with ED use. In sub-analyses, we examined ED diagnoses and subsequent hospital admission rates.

Results—Between December 5, 2005, and April 30, 2008, 428 HIV-positive IDU were enrolled, among whom the cumulative incidence of ED use was 63.7% (95% Confidence Interval [CI]: 59.1% – 68.3%) at 12 months after enrollment. Factors independently associated with time to first ED visit included: unstable housing (Hazard Ratio [HR] = 1.5, 95% CI: 1.1–2.0) and reporting being unable to obtain needed health care services (HR = 2.2, 95% CI: 1.2–4.1), whereas CD4 count and viral load were non-significant. Skin and soft tissue infections (SSTIs) accounted for the greatest proportion of ED visits (17%). Of the 2461 visits to the ED, 419 (17%) were admitted to hospital.

Conclusions—High rates of ED use were observed among HIV-positive IDU, a behavior that was predicted by unstable housing and limited access to primary care. Factors other than HIV infection appear to be driving ED use among this population in the post-HAART era.

Keywords

Emergency Service; Injection Drug Use; HIV; Canada

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INTRODUCTION

Illicit injection drug use is associated with an array of health-related harms and health care expenditures, including emergency department (ED) use.[1-2] Injection drug users (IDU) often have poor health status attributable to drug abuse and infectious diseases such as HIV and hepatitis C (HCV).[3-5] Skin and soft tissue infections (SSTIs) are also common injection-related complications that bring IDU to the ED.[1-2, 6-7] Socio-demographic factors such as homelessness have also been linked to elevated ED and hospital use among IDU and barriers such as lack of access to primary care services have been described in several settings.[2, 8-9]

Though remarkable advances to HIV/AIDS treatment and care have been made over the past two decades since the advent of highly active antiretroviral therapy (HAART), there is evidence that HIV-positive IDU continue to have unmet health needs with respect to HIV and related care.[10-11] IDU have been shown to be more likely to have poorly managed HIV infection due to decreased uptake of HAART and there is some evidence to suggest that HIV-positive IDU continue to have increased use of EDs and more frequent hospitalizations in the post-HAART era compared with other IDU. [2, 12-15]

Given the dual susceptibilities of HIV-positive IDU to the complications of poorly managed HIV infection and injection drug use, and potential barriers to health care this population may experience, understanding factors associated with acute care service utilization is essential to better serve seropositive IDU in the ED. We therefore examined the prevalence and correlates of ED use, as well as primary ED diagnoses and hospital admission rates, among a community-recruited cohort of HIV-positive IDU.

METHODS

Data for these analyses were derived from a community-recruited open prospective cohort study of HIV-positive IDU, which has been described in detail previously.[16-17] The study instrument was developed from validated United States (US) instruments.[18-19] The study was created to examine issues related to access to HIV/AIDS care among IDU.[20] In brief, recruitment for the AIDS Care Cohort to Evaluate Exposure to Survival Services (ACCESS) occurred through extensive street-based outreach and word of mouth. Beginning in May 1996, participants were recruited through self-referral and street outreach from Vancouver's Downtown Eastside (DTES), a neighborhood that ranks below the city average in almost all social and economic indicators. There is a large open-drug scene with an estimated 4,700 IDU residing in an area of approximately ten city blocks.[21] The ACCESS office is situated in the hub of the city's Downtown Eastside where the majority of injection drug use is concentrated. Study participants are seen on a semi-annual basis at which time they answer a standardized interviewer administered questionnaire and provide a blood sample for research purposes. The study has five full-time staff conducting interviews, many of whom have worked in the community for several years. All variables, with the exception of ED contact and CD4 cell count and viral load determinations, were based on responses to the questionnaire. The location and longevity of both the study site and interview staff aids follow-up and may improve reliability of self-reported stigmatizing behaviors.

Participants were eligible for the study if they were 18 years of age or older, resided in the greater Vancouver region, tested HIV-positive upon entry, had injected an illegal drug during the previous month, and provided informed consent. HIV infection was detected using ELISA and positive test results were confirmed using western blot. At baseline and semi-annual follow-up, participants completed a lengthy interviewer-administered questionnaire that elicits information regarding sociodemographic characteristics, drug use

patterns, sexual behaviors, and other relevant exposures. At baseline and semi-annually, all HIV-positive participants provide blood samples to monitor disease progression and complete an interviewer-administered questionnaire. The questionnaire elicits demographic data as well as information about participants' drug use, including information about type of drug, frequency of drug use, involvement in drug treatment and periods of abstinence. All participants provide informed consent and are remunerated $20 CDN for each study visit. The study is approved on an annual basis by the University of British Columbia/Providence Healthcare Research Ethics Board at its St. Paul's Hospital site.

The primary endpoint of interest in the present analysis was time to first ED visit among cohort participants and we were particularly interested in the potential role of clinical characteristics and unstable housing on ED use. Health record linkages were accessed via the electronic health records department at St. Paul's hospital (SPH), the local tertiary care centre that provides the majority of health care to local IDU, to determine the time to first ED use.[1-2, 8] Since we were interested in the role of HIV/AIDS disease progression on ED use, individuals were further eligible if baseline CD4 count and viral load measures were available within one year of recruitment to allow ascertainment of progression of HIV disease at baseline. We considered Aboriginal ethnicity due to the large representation of Aboriginal persons in the Downtown Eastside and the significantly elevated burden of HIV infection in this population.[22] Based on a sample size of 428 participants and a known event rate of 73.6% from past research among local IDU, formal sample size calculations were deemed unnecessary.[23]

Kaplan-Meier methods and Cox regression was used to determine factors associated with time to first ED visit during the study period. The primary explanatory variables were age; gender (male vs. female); Aboriginal ethnicity (yes vs. no); Downtown Eastside neighbourhood residence (yes vs. no); unstable housing; daily crack cocaine smoking (≥ daily vs. less); daily heroin injection (≥ daily vs. less); daily cocaine injection (≥ daily vs. less); sex trade involvement (yes vs. no); history of physical assault (yes vs. no); inability to access health services (yes vs. no); current participation in methadone maintenance therapy (MMT) (yes vs. no); baseline CD4 cell count (per 100 cells/mm^3) and baseline plasma HIV-1 RNA viral load (per log10). All variable definitions were identical to earlier reports.[24-25] Aboriginal ethnicity was defined by self-report as First Nations, Inuit, Metis, or Aboriginal. In Canada, First Nations is typically defined as indigenous peoples of North America, Inuit refers to indigenous peoples inhabiting Arctic regions, Metis refers to people of mixed First Nations and European descent, and Aboriginal can refer to any of the above. Unstable housing was defined as previously as living in a single room occupancy hotel, shelter, recovery or transition house, jail, on the street, or having no fixed address.[26-27] The variable for ability to access health services was based on responses to the question: "reporting inability to obtain needed health services (including hospital, nurse, doctor or clinic care [yes vs. no]." Unless otherwise noted, all variables refer to the six-month period prior to the interview and the multivariate model treated all behavioural variables as time-updated based on each semi-annual follow-up visit. Specifically, if during follow-up a participant changed from stable to unstable housing, the statistical model considered this within individual variation. The same was done for other behavioral variables.

The final multivariate model included all variables that were statistically significant at $p<=0.05$ level in the univariate analysis, and baseline CD4 count and baseline viral load that were forced into the model. All continuous variables met the assumption of linearity. Examinations showed no sign of non-linearity in CD4 count and using dichotomized CD4 count (≥200 vs. <200) gave similar results. The proportional hazards assumption for time-independent variables was assessed to be valid. When time-updated variables were used in

the Cox regression model it was no longer a proportional hazards model. The VIF (variance inflation factor) test showed no evidence of collinearity.

In sub-analyses, we identified the primary ICD-9 diagnosis code for each hospital admission, and examined the number of hospital admissions. The ICD-9 Diseases/Injuries Tabular Index has been used in previous studies to analyze the characteristics of ED and hospital discharge diagnoses in HIV-positive patients.[28-29] All statistical analyses were performed using SAS 9.1 (SAS, Cary, NC). All *p*-values are two-sided.

RESULTS

Between 5 December 2005, and 30 April 2008, 437 HIV-positive IDU were recruited for this study. Nine individuals were excluded for lack of baseline CD4 count or baseline viral load data. Among 428 eligible participants, the cumulative incidence of ED use was 63.7% (95% Confidence Interval [CI]: 59.1% – 68.3%) at 12 months after enrollment. The median duration of follow-up was 6.5 months (IQ range: 1.8 – 18.3) and among the entire sample of 428 individuals that were seen at the start of the study period, 152 (35%) had at least two study visits. Baseline characteristics are presented in Table 1.

Unstable Housing (Kaplan-Meier Analyses)

As shown in Figure 1, at 12 months after recruitment, the Kaplan-Meier cumulative incidence rate of ED use was 69.2% (63.9%-74.4%) among those who had unstable housing at baseline and 50.5% (42.1%-59.5%) among those who did not have unstable housing at baseline (log-rank $p = 0.004$).

Predictors of Time to First ED visit (Cox Regression Analyses)

Table 2 shows the unadjusted and adjusted relative hazards (RH) for factors associated with time to first ED visit. In the univariate analysis, DTES residence (Hazard Ratio [RH] = 1.37; 95% Confidence Interval [CI]: 1.08 – 1.73; $p = 0.009$), unstable housing (RH = 1.54 [95% CI: 1.21–1.96]; $p < 0.001$), inability to access needed health services (RH = 2.14 [95% CI: 1.17–3.91]; $p < 0.014$), and history of physical assault (RH = 1.30 [95% CI: 1.00–1.69]; $p = 0.05$) were each significantly associated with less time to first ED visit. In the multivariate analysis, participants in unstable housing (RH = 1.47 [95% CI: 1.11–1.96]; $p = 0.007$) and self-reported inability to access needed health services (RH= 2.24 [95% CI: 1.22–4.12]; $p = 0.01$) were significantly associated with less time to first ED visit.

ED Diagnoses & Hospital Admissions

The most common ED diagnoses are presented in Table 3. Of the 2461 visits to the ED, 2242 (91.1%) had diagnosis code data. SSTI such as abscesses and cellulitis accounted for the greatest number of ED visits (17.6%), followed by medical refills and aftercare (17.5%). Substance misuse and overdoses accounted for 6.0% per cent of ED visits.

Discharge data were obtained for 2381 (96.7%) of the 2461 ED visits. The majority 1778 (74.7%) were discharged from the ED with advice, 419 (17.6%) were admitted to hospital, 93 (3.9%) left the ED without being seen, and 91 (3.8%) were discharged from the ED against medical advice.

DISCUSSION

Our study demonstrates high rates of ED use among a cohort of HIV-positive IDU. Interestingly, living in unstable housing and being unable to obtain needed health care services were both independently associated with time to first ED visit during the study

period, whereas baseline CD4 cell count and viral load did not predict ED use. SSTI, including abscesses and cellulitis (17.6%), and medication refills and aftercare (17.5%) accounted for the greatest proportion of ED visits. Of the 2461 visits to the ED, 419 (17.6%) were admitted to hospital.

A key finding of the present study is the independent association between residing in unstable housing environments and shorter time to first visiting the ED. The challenges associated with living in unstable housing may act as a barrier for IDU to access primary care services, as the immediate sustenance needs implicit in being homeless (e.g., daily acquisition of food and shelter) must compete with health care needs.[30] Delays in seeking treatment may result in more frequent and lengthy hospital admissions.[12, 23, 31] Further, previous studies have clearly demonstrated that unstable housing among IDU is associated with hazardous and unhygienic injecting practices that may also predispose individuals to infection. Unsafe injection practices associated with rushed injections in public places include the use of unclean water sources, decreased sanitization of the skin with alcohol prior to injecting, and the preparation of drugs directly in the barrel of the syringe by adding water and “shaking” without cooking or filtering.[32] In our local setting, unstable housing was found to be independently associated with SSTI among IDU who used Vancouver's supervised injection facility.[33] This may also help to account for the observation in the present study that SSTI, a common injection-related complication, was the most common ED diagnoses.

The link between ED use and unstable housing is particularly concerning here in Vancouver, Canada, where the number of homeless persons rose by 106% from 2002 to 2005.[34] Additionally, there have been recent losses of low-income housing and an increase in homelessness as a result of urban renewal for the 2010 Olympic Winter Games.[35] Increased property speculation and increasing property values in the Downtown Eastside neighborhood led to reductions in available low-income housing and a predicted homeless population in excess of 3000 by the start of the 2010 Olympics.[34] The high cumulative incidence of ED visits among local IDU and the association with unstable housing indicates a pressing need for affordable housing, especially given the increasing shortage in our setting. Stable living environments can facilitate an individual's ability to stay connected with primary care services and seek care earlier on in disease progression and reduce hospital ED and inpatient service use.[36-38] In the ED, case management for unstably housed HIV-positive individuals has also been found to be a successful method in improving adherence to HAART and biological outcomes.[39]

It is noteworthy that clinical markers of HIV/AIDS disease at baseline, such as CD4 cell count and HIV-1 RNA plasma viral load, were not significantly associated with ED use in the present study. Since baseline CD4 and viral load serves as a significant prognostic indicator of treatment outcome and response to HAART therapy,[40-41] recent expansion of HAART coverage and initiation of HAART therapy at higher CD4 counts in our setting may explain somewhat the strong associations with socio-demographic characteristics and injection-related complications as the primary reason for ED use.[42-43] This contrasts with ED use patterns in the pre-HAART era when ED presentations frequently related to the acute complications of HIV/AIDS disease, including opportunistic infections.[44-45]

Inability to access needed health services was also independently associated with time to ED use in multivariate analyses. Though there have been conflicting findings in our setting on the relationship between access to primary care and hospital-based service use, our findings provide support for an association between ED use and a perceived barrier to accessing other needed health care services.[1-2, 8] Primary care services that implement an integrated model of care, including harm reduction and drug treatment, may be viewed as less

stigmatizing of drug use and prove to be more effective in reducing perceived barriers to health care access.[46] One example is supervised injection facilities (SIFs) that integrate harm reduction strategies, including preventative education on sterile injection, with primary care and addiction counseling.[46-47] Indeed, integrating wound management care into existing harm reduction services, such as needle exchange programs and SIF, in community settings has been found to be feasible, cost-effective and beneficial for preventing and treating SSTI, the most common presenting ED complaint in our study.[46-48] Additionally, previous research has found decreased ED use with methadone maintenance and other drug treatment programs with health care access.[49-52] Screening for substance misuse in the ED and referral to harm reduction and drug treatment programs that provide primary care services may therefore prove to be beneficial in this population.

LIMITATIONS

This study has several limitations. First, we may have underestimated the level of ED use as participants may have sought care at other facilities in the city. However, we did consider the hospital ED that is used by the vast majority of people living in this community.[1] Second, the current study relies on self-report of drug use and other stigmatized behaviors (e.g. sexual behaviors) and may be susceptible to socially desirable reporting. In this regard, it is noteworthy that CD4 and viral load information were not susceptible to this concern. Third, although ED usage was ascertained through a linkage to an external database, migration away from the city or other reasons for loss of participants to follow-up may nevertheless introduce some degree of bias into the study results. Fourth, although our cohort includes an estimated 20 per cent of all IDU living in the Downtown Eastside, our sample may not be representative of all IDU in the area. Finally, our study was unable to access follow-up information on health care use after discharge from the ED. Future studies should assess the impact of interventions for this population in the ED on subsequent health care utilization patterns including return to the ED.

CONCLUSIONS

In summary, our study documents a high incidence of ED use among HIV-positive IDU. Individuals more likely to visit the ED represented those most severely disadvantaged in terms of housing and access to primary care services, and the most common ED diagnoses were due to preventable injection-related infections. This study indicates that socio-demographic factors and injection-related complications play a major role in ED visits among HIV-positive IDU in the post-HAART era. While expanding use of HAART among IDU is an urgent concern,[53-54] the clinical markers of HIV disease status at baseline did not appear to play a role in predicting ED use in this setting.

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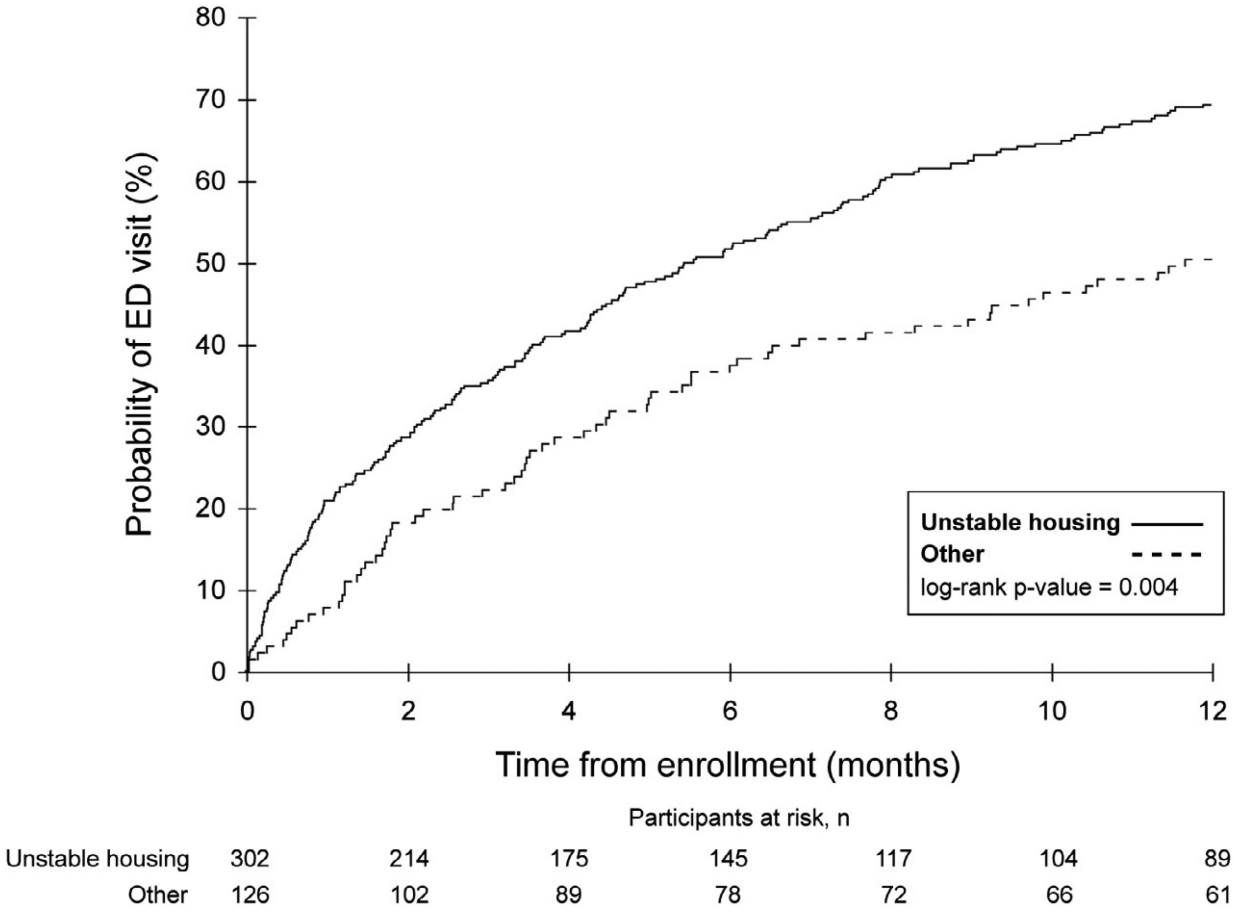

Figure 1.
Time to first emergency department (ED) use among a prospective cohort of HIV-positive injection drug users, stratified by unstable housing at baseline.

Table 1

Baseline characteristics of the 428 ACCESS participants in Vancouver, Canada

Characteristic	median	Interquartile (IQ) range	n(%)
Age (years)	41	36 - 47	
Female Gender			170 (39.72)
Aboriginal Ethnicity			178 (41.59)
DTES Residence *			291 (68.00)
Viral Load (Copies/mL) †	3,845	49 – 45,150	
CD4 Count (Copies/mL) †	290	170-460	

*Behaviours refer to activities in the last six months.

†Indicates baseline value.

Table 2

Univariate and multivariate Cox proportional hazard analyses of time to first emergency department visit among 428 HIV-positive injection drug users.

	Unadjusted Relative Hazard (RH)			Adjusted** Relative Hazard (RH)		
Variable	**RH**	**(95% CI)**	**p-value**	**RH**	**(95% CI)**	**p-value**
Age						
(Per year old)	0.99	(0.98–1.01)	0.250			
Gender						
(Female vs. male)	1.10	(0.89–1.37)	0.376			
Ethnicity						
(Aboriginal vs. other)	0.94	(0.76–1.17)	0.573			
DTES Residence*						
(Yes vs. no)	1.37	(1.08 – 1.73)	0.009	1.12	(0.85 – 1.47)	0.431
Unable to access services*						
(Yes vs. no)	2.14	(1.17 – 3.91)	0.014	2.24	(1.22 – 4.12)	0.010
Unstable Housing*						
(Yes vs. no)	1.54	(1.21 – 1.96)	<0.001	1.47	(1.11 – 1.96)	0.007
Sex Trade Involvement*						
(Yes vs. no)	1.28	(0.94 – 1.73)	0.118			
Daily Crack Cocaine Smoking*						
(Yes vs. no)	1.22	(0.98 – 1.52)	0.075			
Daily Heroin Injection*						
(Yes vs. no)	1.17	(0.90 – 1.54)	0.247			
Daily Cocaine Injection*						
(Yes vs. no)	1.22	(0.85 – 1.75)	0.273			
History of Assault*						
(Yes vs. no)	1.30	(1.00 – 1.69)	0.050	1.28	(0.98 – 1.66)	0.067
Viral load (copies/mL) †						
(per log 10)	0.99	(0.91 – 1.07)	0.807			

	Unadjusted Relative Hazard (RH)			Adjusted** Relative Hazard (RH)		
Variable	**RH**	**(95% CI)**	**p-value**	**RH**	**(95% CI)**	**p-value**
CD4+ count (cells/mm^3) †						
(Per 100 cells)	1.01	(0.97 – 1.06)	0.634			
Methadone Use*						
(Yes vs. no)	0.84	(0.68 – 1.05)	0.126			

*Behaviours refer to activities in the last six months.

†Indicates baseline value.

**Model was fitted adjusting for all variables significant in unadjusted analyses.

Table 3

Most frequent reasons for ED visits among IDU

	(N = 2242)	
Reason	**n**	**%**
Skin and soft tissue infections eg. Abscesses, cellulitis	394	(17.6%)
Medication refills and aftercare *	392	(17.5%)
Respiratory infections and disorders	264	(11.8%)
Wounds, lacerations & contusions	252	(11.2%)
Gastrointestinal & urological disorders	203	(9.1%)
Miscellaneous bacterial and viral infections	191	(8.5%)
Cardiac and circulatory system diseases	147	(6.6%)
Substance misuse and overdose	134	(6.0%)
Neurological disorders or seizures	125	(5.6%)
Psychiatric disorders	69	(3.1%)
Fractures and dislocations	44	(2.0%)
Other	27	(1.2%)

* Aftercare includes wound care & IV antibiotic administration.