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Research

Emergency department use by people with HIV in Ontario: a population-based cohort study

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Abstract

Background: Emergency department use may reflect poor access to primary care. Our objective was to compare rates and causes of emergency department use between adults living with and without HIV.

Methods: We conducted a population-based study involving Ontario residents living with and without HIV between Apr. 1, 2011, and Mar. 31, 2012. We frequency matched adults with HIV to 4 HIV-negative people by age, sex and census division, and used random-effects negative binomial regression to compare rates of emergency department use. We classified visits as low urgency or high urgency, and also examined visits for ambulatory care sensitive conditions. Hospital admission following an emergency department visit was a secondary outcome.

Results: We identified 14 534 people with HIV and 58 136 HIV-negative individuals. Rates of emergency department use were higher among people with HIV (67.3 v. 31.2 visits per 100 person-years; adjusted rate ratio 1.58, 95% confidence interval [CI] 1.51–1.65). Similar results were observed for low-urgency visits. With the exception of hypertension, visit rates for ambulatory care sensitive conditions were higher among people with HIV. People with HIV were also more likely than HIV-negative individuals to be admitted to hospital following an emergency department visit (adjusted odds ratio 1.55, 95% CI 1.43–1.69).

Interpretation: Compared with HIV-negative individuals, people with HIV had high rates of emergency department use, including potentially avoidable visits. These findings strongly support the need for comprehensive care for people with HIV.

Emergency department use, particularly for nonurgent conditions, is a frequently used indicator of access to primary care.[1] Understanding patterns of emergency department use is therefore necessary for optimizing resource allocation and identifying possible gaps in outpatient care. Yet, in contrast to studies examining inpatient and outpatient health care use,[2–6] comparatively few contemporary studies exist examining emergency department use among people with HIV.[7–11] Studies conducted in the years preceding the introduction of combination antiretroviral therapy demonstrated that people with HIV had rates of emergency department visits that were three- to fourfold higher than those of the general population.[12,13] Although subsequent studies found persistently heightened rates of emergency department use following the introduction of combination antiretroviral therapy, inferences were limited by samples that were small and not population-based.[7,9,10] A recent analysis of the US National Hospital Ambulatory Medical Survey demonstrated that rates of emergency department visits among people with HIV continue to exceed those of noninfected people (633 v. 438 visits per 1000 people), although by a smaller magnitude than during the preceding decade.[14]

Analogous population-based studies characterizing emergency department use among people with HIV in a Canadian setting are lacking. These data are important for several reasons. First, findings generated in the United States are of limited generalizability to the Canadian context because Canadians have access to universally insured and publicly financed health care; consequently, emergency department use should not be influenced by health insurance status. In addition, people with HIV are disproportionately disadvantaged by socioeconomic and structural factors that are associated with poor access to primary care.[15] In this context, high rates of emergency department use

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for conditions that could be potentially managed in ambulatory settings could be emblematic of poor access to primary care and highlight gaps in the community-based management of these patients. Accordingly, we compared rates and causes of emergency department use between adults living with and without HIV in Ontario, Canada. We examined the risk of hospital admission following emergency department visits as a secondary outcome. In light of previously published research, we speculated that people with HIV would have higher rates of emergency department use, including potentially avoidable visits, than HIV-negative individuals.

Methods

Setting

We conducted a population-based study comparing rates of emergency department visits between adults (age ≥ 18 yr) living with and without HIV infection in Ontario between Apr. 1, 2011 and Mar. 31, 2012. This study was approved by the Research Ethics Board of Sunnybrook Health Sciences Centre, Toronto.

Data sources

We used Ontario's administrative health databases, which were held securely in linkable files without any direct personal identifiers and analyzed at the Institute for Clinical Evaluative Sciences. We identified adults living with HIV using the Ontario HIV Database, an administrative data registry of Ontario residents with diagnosed HIV infection, which was generated using a validated case-finding algorithm.[16] The definition of 3 physician claims with an International Classification of Diseases, 9th Revision, code for HIV infection (042, 043, 044) within a 3-year period has a sensitivity of 96.2% (95% confidence intervals [CI] 95.2%–97.9%) and a specificity of 99.6% (95% CI 99.1%–99.8%) for identifying people living with HIV.[16] We obtained hospital admission and emergency department data from the Canadian Institute for Health Information's Discharge Abstract Database and National Ambulatory Care Reporting System, respectively. The National Ambulatory Care Reporting System contains detailed clinical information regarding all emergency department visits in Ontario. Recorded data elements include patient demographic variables, service dates and up to 10 diagnostic codes (International Statistical Classification of Diseases and Related Health Problems, 10th Revision [ICD-10]), one of which must be designated as the "main problem," or the most clinically significant reason for the patient's visit to the emergency department. We used the Ontario Health Insurance Plan database to identify claims for physician services, and used validated disease registries to define the presence of diabetes, hypertension, chronic obstructive pulmonary disease, congestive heart failure and asthma.[17–21] We obtained basic demographic and date-of-death data from the Registered Persons Database, a registry of all Ontario residents eligible for health insurance.

Study population

We used the Registered Persons Database to identify all adults in Ontario (age ≥ 18 yr) who were alive and eligible for health

Table 1: Baseline characteristics of people with HIV and a frequency matched sample of HIV-negative people

Characteristic	No. (%)* HIV *n* = 14 534	No. (%)* Non-HIV *n* = 58 136	Standardized difference
Age, yr			
Mean ± SD	46.4 ± 11.0	46.4 ± 11.0	0.00
18–25	355 (2.4)	1427 (2.5)	
26–35	1927 (13.3)	7703 (13.2)	
36–45	4468 (30.7)	17 933 (30.8)	
46–55	5175 (35.6)	20 609 (35.4)	
> 55	2609 (18.0)	10 464 (18.0)	
Sex			
Female	2858 (19.7)	11 432 (19.7)	0.00
Male	11 676 (80.3)	46 704 (80.3)	
Neighbourhood income quintile			
5 (highest)	2241 (15.4)	11 065 (19.0)	0.20
4	2171 (14.9)	10 012 (17.2)	
3	2348 (16.2)	10 533 (18.1)	
2	2999 (20.6)	12 391 (21.3)	
1 (lowest)	4555 (31.3)	13 606 (23.4)	
Missing	220 (1.5)	529 (0.9)	
Rural residence	628 (4.3)	2898 (5.0)	0.03
No. primary care visits in the past year			
Mean ± SD	6.0 ± 8.9	3.3 ± 5.2	0.43
Median (IQR)	4 (1–7)	2 (0–4)	
Aggregated diagnosis groups			
Mean ± SD	4.3 ± 3.1	2.7 ± 2.5	0.61
Median (IQR)	4 (2–6)	2 (1–4)	
Resource utilization band			
Nonusers	856 (5.9)	13 032 (22.4)	1.12
Healthy users	204 (1.4)	4942 (8.5)	
Low resource use	566 (3.9)	13 778 (23.7)	
Moderate resource use	8809 (60.6)	22 868 (39.3)	
High resource use	2869 (19.7)	2745 (4.7)	
Very high resource use	1230 (8.5)	771 (1.3)	
Diabetes	1500 (10.3)	6206 (10.7)	0.01
Hypertension	2685 (18.5)	12 863 (22.1)	0.09
COPD	1469 (10.1)	3624 (6.2)	0.15
Asthma	1945 (13.4)	5906 (10.2)	0.10
Congestive heart failure	327 (2.2)	677 (1.2)	0.09

Note: COPD = chronic obstructive pulmonary disease, IQR = interquartile range.
*Unless stated otherwise.

insurance as of the index date of the study, Apr. 1, 2011. From within this cohort, we identified people who had been diagnosed with HIV using the Ontario HIV Database. To create a control group that was similar with respect to characteristics that might influence emergency department use, we frequency matched a random sample of HIV-negative residents by age, sex and census division in Ontario to people with HIV in a ratio of 4:1.

Outcomes

The number of emergency department visits, person-time at risk and rates of overall emergency department use were determined for people living with and without HIV for the study period. We computed rates of emergency department use as the total number of visits occurring during the study period divided by the total person-years of follow-up in the period. For people who died or moved away from Ontario during follow-up, we used an offset to censor their observation at the date of death or migration, such that these individuals only contributed a fraction of a person-year to the rate calculation. We used the "main problem" field in each record to determine the diagnosis most responsible for the visit, and aggregated similar diagnoses into organ- or disease-based categories according to ICD-10 codes.

We defined potentially avoidable visits in 2 ways. First, we used the Canadian Triage and Acuity Scale (CTAS), a standardized measure of the immediacy with which a patient presenting to an emergency department requires care, to categorize emergency department visits as "low urgency" or "high urgency," as has been done in previous studies.[22,23] Specifically, we considered visits that were triaged as CTAS 4 (less urgent) or 5 (nonurgent) as "low urgency," or representing visits for conditions that could have been potentially managed in ambulatory settings. In contrast, we classified visits triaged as CTAS 1 (resuscitation required), 2 (emergent care required) or 3 (urgent care required) as "high urgency" and likely not preventable. Second, we calculated rates of emergency department visits for ambulatory care sensitive conditions, defined as those conditions for which emergency department use could be potentially avoided with timely and regular access to outpatient care.[24] We classified conditions as being ambulatory care sensitive using definitions from the literature and the Canadian Institute for Health Information.[24–29]

Table 2: Rates of emergency department visits and regression results for predictors of emergency department visits

Variable	No. of visits	Person-years	No. of visits per 100 person-years (95% CI)	Unadjusted rate ratio (95% CI)	Adjusted* rate ratio (95% CI)
HIV status					
Non-HIV	17 967	57 672.8	31.2 (29.9–32.5)	1.00	1.00
HIV	9670	14 370.0	67.3 (63.6–71.2)	2.19 (2.10–2.30)	1.58 (1.51–1.65)
Neighbourhood income quintile					
5 (highest)	3987	13 224.6	30.1 (28.3–32.1)	1.00	1.00
4	3933	12 101.2	32.5 (30.7–34.4)	1.05 (0.98–1.13)	1.06 (0.99–1.13)
3	4978	12 798.6	38.9 (36.3–41.7)	1.27 (1.19–1.36)	1.21 (1.14–1.29)
2	5977	15 274.5	39.1 (36.9–41.5)	1.30 (1.21–1.38)	1.23 (1.16–1.31)
1 (lowest)	8484	18 015.8	47.1 (43.5–50.9)	1.55 (1.45–1.65)	1.35 (1.27–1.43)
Residence					
Urban	25 208	68 225.9	36.9 (35.6–38.3)	1.00	1.00
Rural	2337	3504.2	66.7 (60.7–73.3)	1.49 (1.35–1.64)	1.71 (1.61–1.91)
No. primary care visits in the past year					
0	4309	18 544.3	23.2 (21.6–25)	1.00	1.00
1–2	5762	19 538.4	29.5 (27.7–31.4)	1.27 (1.20–1.35)	1.27 (1.20–1.34)
≥ 3	17 566	33 960.1	51.7 (49.4–54.1)	2.30 (2.19–2.42)	1.47 (1.40–1.55)
Aggregated diagnosis groups (prior year)					
0–5	16 263	60 123.7	27.0 (26.0–28.2)	1.00	1.00
6–9	7416	9979.9	74.3 (69.9–79.0)	2.79 (2.66–7.49)	2.29 (2.17–2.41)
≥ 10	3958	1939.2	204 (184.1–226.3)	8.22 (7.49–9.03)	6.16 (5.60–6.76)

Note: CI = confidence interval.
*Adjusted for HIV status, neighbourhood income quintile, urban versus rural residence, number of primary care visits in the past year and comorbidity burden in the past year.

In a separate analysis, we compared the risk of hospital admission following an emergency department visit between people with and without HIV. To ensure comparability in the distribution of factors that may predispose to hospital admission following an emergency department visit, we frequency matched each visit resulting in hospital admission among people with HIV to 4 such visits among non–HIV-infected individuals by patient age, sex and census division within Ontario.

Statistical analysis

We computed standardized differences to examine intergroup balance in the distribution of baseline variables. Standardized differences of less than 0.1 indicate good balance between groups for a given covariate.[30]

For the primary analysis, we compared rates of emergency department use between people with and without HIV using random-effects negative binomial regression models to account for the correlation among matched groups. To examine the association between HIV infection and hospital admission following an emergency department visit, we used generalized estimating equations with a logit link function and exchangeable correlation structure. We adjusted models for variables that could influence emergency department use and risk of subsequent hospital admission, including the number of visits to a primary care physician in the previous year, urban versus rural residence, socioeconomic status and patient comorbidity in the year preceding the index date. We determined patient socioeconomic status at the neighbourhood level using postal code information and Statistics Canada census data. We used the Johns Hopkins Adjusted Clinical Groups Case-Mix System to adjust for differences in comorbidity burden in the year preceding the index date.[31] This system uses diagnostic information from administrative databases to describe and predict use of health care resources. In this study, we used aggregated diagnosis groups, which are clusters of diagnostic codes that are similar in terms of severity and expected persistence. The number of aggregated diagnosis groups ranges from 0 to a maximum of 32, with a higher number reflecting a higher level of comorbidity. We also generated resource utilization bands, which are aggregations of age–sex diagnostic groups associated with different levels of expected resource use, ranging from 0 (lowest expected health care use) to 5 (highest expected health care use), to compare patients based on their expected use of health care resources. Because of collinearity between aggregated diagnosis groups and resource utilization bands, we adjusted models only for the former. For the hospital admission models, we also adjusted for severity of presenting symptoms according to CTAS score; whether the emergency department was located within an academic teaching hospital; and emergency department volume, classified into tertiles as low, medium or high. Because we speculated a priori that patients with HIV would be at heightened risk of admission regardless of visit severity, we examined the interaction between HIV status and CTAS score in a separate model. All analyses were conducted using SAS version 9.3.

Results

We identified 14 534 people with HIV and 58 136 matched HIV-negative individuals. The mean age was 46.4 (SD 11.0) years, and about 20% were women (Table 1). Collectively, these individuals contributed 72 043 person-years of follow-up and made 27 637 visits to the emergency department between Apr. 1, 2011, and Mar. 31, 2012, of which 9670 (35.0%) were attributable to people with HIV. Compared with HIV-negative individuals, people with HIV had a greater comorbidity burden as reflected by the number of aggregated diagnosis groups, had more physician visits in the year preceding the index date, had a higher prevalence of chronic obstructive pulmonary disease and were disproportionately represented in the

Table 3: Visits for ambulatory care sensitive conditions among people with and without HIV (per 1000 person-years)

Condition	Rate of visits (95% CI)		Rate ratio (95% CI)
	HIV	Non-HIV	
Epilepsy	3.55 (2.64–4.67)	1.08 (0.82–1.38)	3.30 (2.28–4.00)
Chronic obstructive pulmonary disease	6.05 (4.85–7.47)	1.86 (1.52–2.24)	3.26 (2.46–4.33)
Asthma	3.41 (2.52–4.51)	1.53 (1.22–1.88)	2.24 (1.57–3.17)
Heart failure	2.64 (1.87–3.63)	1.35 (1.07–1.69)	1.96 (1.33–2.88)
Diabetes	3.62 (2.70–4.75)	2.10 (1.74–2.51)	1.73 (1.25–2.39)
Dental	5.36 (4.23–6.70)	3.35 (2.89–3.85)	1.60 (1.23–2.09)
Angina	2.23 (1.52–3.14)	1.82 (1.49–2.20)	1.22 (0.82–1.82)
Gastroenteritis	1.39 (0.85–2.15)	0.26 (0.15–0.43)	5.35 (2.74–10.45)
Hypertension	1.39 (0.85–2.15)	1.72 (1.40–2.09)	0.81 (0.50–1.31)
Cellulitis	27.00 (24.38–29.83)	6.92 (6.26–7.63)	3.90 (3.39–4.49)
Ears, nose and throat (including upper respiratory infection)	14.41 (12.51–16.51)	6.95 (6.29–7.67)	2.07 (1.75–2.45)

Note: CI = confidence interval.

lowest neighbourhood income quintile (Table 1). Overall, 4065 (28.0%) people with HIV made at least 1 visit to an emergency department during the study period, compared with 10 252 (17.6%) HIV-negative individuals.

After multivariable adjustment, the rate of emergency department visits was higher among people with HIV than among HIV-negative individuals [67.3 v. 31.2 visits per 100 person-years; adjusted rate ratio 1.58, 95% CI 1.51–1.65] (Table 2). The unadjusted rates of the most common causes of emergency department visits are shown in Appendix 1, available at www.cmajopen.ca/content/4/2/E240/suppl/DC1. Compared with HIV-negative individuals, people with HIV

Table 4: Characteristics of emergency department visits by HIV status

Characteristic	No. (%)* HIV *n* = 9670	No. (%)* Non-HIV *n* = 38 670	Standardized difference
Age, yr			
Mean ± SD	45.62 ± 12.04	45.62 ± 12.03	0.01
18–25	279 (2.9)	1122 (2.9)	
26–35	1656 (17.1)	6762 (17.5)	
36–45	3034 (31.4)	12 030 (31.1)	
46–55	2921 (30.2)	11 758 (30.4)	
> 55	1780 (18.4)	6998 (18.1)	
Sex, %			
Female	2260 (23.4)	9040 (23.4)	0.00
Male	7410 (76.6)	29 630 (76.6)	
Income quintile			
5 (highest)	1222 (12.6)	5833 (15.1)	0.28
4	1126 (11.6)	6184 (16.0)	
3	1623 (16.8)	6832 (17.7)	
2	1918 (19.8)	8612 (22.3)	
1 (lowest)	3646 (37.7)	10 860 (28.1)	
Missing	135 (1.4)	349 (0.9)	
Rural residence	657 (6.8)	3269 (8.5)	0.08
No. primary care visits in the past year			
Mean ± SD	10.2 ± 13.7	6.3 ± 10.0	0.37
CTAS score			
Nonurgent	475 (4.9)	1851 (4.8)	0.09
Less urgent	2723 (28.2)	12 430 (32.1)	
Urgent	4406 (45.6)	16 816 (43.5)	
Emergent	1960 (20.3)	7235 (18.7)	
Resuscitation	78 (0.8)	250 (0.6)	
Emergency department volume			
High	7418 (76.7)	29 950 (77.5)	0.02
Low	479 (5.0)	1 837 (4.8)	
Medium	1773 (18.3)	6 883 (17.8)	
Teaching hospital	5206 (53.8)	11 220 (29.0)	0.54
Time in the emergency department, min			
Mean ± SD	367.0 ± 498.7	271.0 ± 361.7	0.24
Time of arrival in the emergency department			
Mean ± SD	13:05 ± 5.89	13:14 ± 5.86	0.01

Note: CTAS = Canadian Triage and Acuity Scale.
*Unless stated otherwise.

had high rates of emergency department visits related to infectious diseases (87.27 v. 21.55 visits per 1000 person-years; rate ratio 4.05, 95% CI 3.74–4.38) and mental health illness (62.21 v. 19.73 visits per 1000 person-years; rate ratio 3.15, 95% CI 2.89–3.44). The most frequent (n = 1069; 42.8%) infectious causes of emergency department use were skin and soft-tissue infections, with rates of 36.67 and 9.40 visits per 1000 person-years among people with and without HIV, respectively (rate ratio 3.90, 95% CI 3.46–4.40). Visits for which HIV was designated as the main problem accounted for 14.9% (n = 187) of infectious diseases–related visits among people with HIV. The most common mental health diagnoses for people with HIV were related to alcohol and substance use, with rates of 34.86 visits per 1000 person-years, compared with 7.73 visits per 1000 person-years among HIV-negative individuals (rate ratio 4.51, 95% CI 3.97–5.12).

We observed similar results when stratifying according to visit acuity. Specifically, people with HIV had higher rates of visits that were categorized as low urgency (22.3 v. 11.2 visits per 100 person-years; adjusted rate ratio 1.55, 95% CI 1.45–1.65) and high urgency (44.9 v. 19.9 visits per 100 person-years; adjusted rate ratio 1.61, 95% CI 1.53–1.69) (Appendix 2, available at www.cmajopen.ca/content/4/2/E240/suppl/DC1). In addition, people with HIV had higher rates of visits for ambula-

Table 5: Multivariable regression for hospital admission after emergency department presentation

Variable	No. hospital admissions	No. visits	% (95% CI)	Adjusted* OR (95% CI)
HIV status				
Non-HIV	3703	38 670	9.6 (9.3–9.9)	1.00
HIV	1513	9670	15.6 (14.9–16.4)	1.55 (1.43–1.69)
Income quintile				
5 (highest)	746	7055	10.6 (9.9–11.3)	1.00
4	728	7310	10.0 (9.3–10.6)	0.96 (0.85–1.08)
3	891	8455	10.5 (9.9–11.2)	0.98 (0.87–1.10)
2	1115	10 530	10.6 (10.0–11.2)	0.98 (0.88–1.09)
1 (lowest)	1681	14 506	11.6 (11.1–12.1)	1.00 (0.90–1.11)
Residence				
Urban	4906	44 352	11.1 (10.8–11.4)	1.00
Rural	306	3926	7.8 (7.0–8.6)	1.13 (0.97–1.32)
Aggregated diagnosis groups				
0–5	2717	30 728	8.8 (8.5–9.2)	1.00
6–9	1523	11 901	12.8 (12.2–13.4)	1.31 (1.22–1.41)
≥ 10	976	5711	17.1 (16.1–18.1)	1.69 (1.53–1.87)
CTAS score				
Nonurgent	23	2326	1.0 (0.6–1.4)	1.00
Less urgent	260	15 153	1.7 (1.5–1.9)	1.84 (1.25–2.70)
Urgent	2329	21 222	11.0 (10.6–11.4)	12.08 (8.31–17.57)
Emergent	2396	9195	26.1 (25.2–27.0)	34.38 (23.60–50.09)
Resuscitation	199	328	60.7 (55.4–66.0)	156.73 (101.34–236.9)
Emergency department volume				
Low	175	2316	7.6 (6.5–8.6)	1.00
Medium	753	8656	8.7 (8.1–9.3)	0.63 (0.52–0.77)
High	4288	37 368	11.5 (11.2–11.8)	0.61 (0.50–0.74)
Teaching hospital				
No	3112	31 914	9.8 (9.4–10.1)	1.00
Yes	2104	16 426	12.8 (12.3–13.3)	1.12 (1.04–1.20)

Note: CI = confidence interval, CTAS = Canadian Triage and Acuity Scale, OR = odds ratio.
*Adjusted for HIV status, neighborhood income quintile, urban versus rural residence, number of primary care visits in the past year and comorbidity burden in the past year, CTAS score, emergency department volume and teaching versus nonteaching hospital.

tory care sensitive conditions (7.9 v. 3.3. per 100 person-years; adjusted rate ratio 1.77, 95% CI 1.60–1.96). With the exception of hypertension, rates of emergency department use for individual ambulatory care sensitive conditions were higher among people with HIV (Table 3).

To compare the risk of hospital admission following an emergency department visit, we frequency matched 9670 emergency department visits made by people with HIV to 38 670 visits made by HIV-negative individuals by age, sex and geographic residence within the province. Although the distribution of visits by CTAS score was similar between the 2 groups (Table 4), the proportion of visits resulting in hospital admission was higher among people with HIV (15.6%, 95% CI 14.9%–16.4%) than among HIV-negative individuals (9.6%, 95% CI 9.3%–9.9%). After multivariable regression, people with HIV were at greater risk of being admitted to hospital than HIV-negative individuals (adjusted odds ratio [OR] 1.55, 95% CI 1.43–1.69] (Table 5). In an analysis stratified by CTAS score, people with HIV were more likely to be admitted to hospital at all levels of visit severity, with the exception of CTAS 1 (resuscitation required) (Figure 1).

Interpretation

In our population-based study, we observed higher rates of emergency department use among people with HIV relative to a matched sample of HIV-negative individuals. We found consistent results when considering emergency department use for less urgent visits. We also found higher odds of hospital admission among people with HIV, including for visits triaged as less urgent. Further research is warranted to examine whether community-based interventions that promote access to outpatient-based mental health care, substance use treatment, oral health care and timely primary care could reduce potentially preventable emergency department visits among people with HIV.

Our findings build upon those of other recently published studies. Specifically, rates of emergency department use in our study are similar to those of a US study comparing emergency department use among a nationally representative sample of people with and without HIV.[14] However, people with HIV in that study were less likely to have private insurance than HIV-negative individuals, whereas our findings, arising from a publicly funded health care system, should not be influenced by such disparities. Our results are also similar to those of a Canadian study involving 438 HIV-infected injection drug users, in that the cumulative incidence of emergency department use during the 1-year study period was 63.7%, with skin and soft-tissue infections accounting for 17.6% of visits.[11] However, our study was population-based in nature, and therefore included all individuals with HIV who entered care, including those who never injected drugs.

Several intersecting mechanisms may explain our findings. First, previous research has shown that low socioeconomic status is associated with greater use of emergency departments for conditions amenable to outpatient management.[23] Although matching on geographic residence mitigated between-group differences in socioeconomic status, our previous work has demonstrated that people with HIV are disproportionately

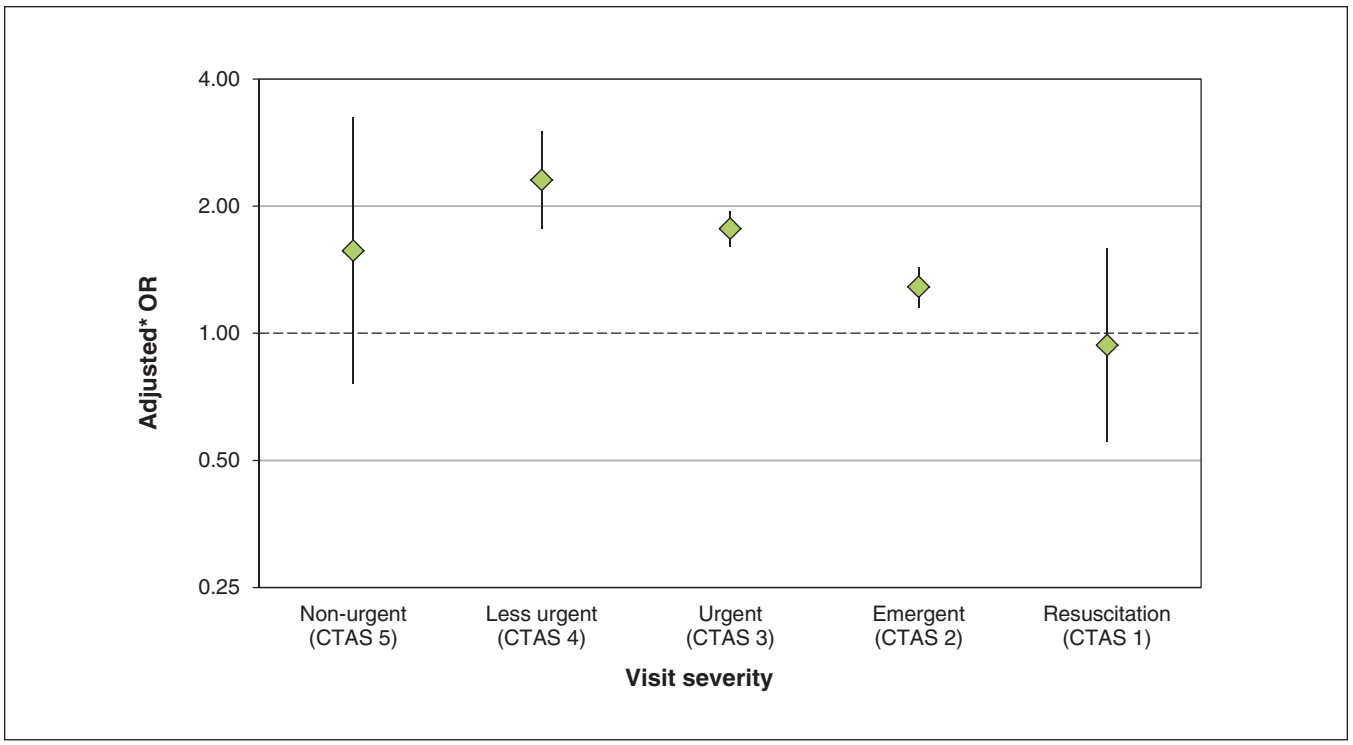

Figure 1: Hospital admission following an emergency department visit among people with HIV compared with HIV-negative individuals, stratified by visit acuity.*Adjusted for socioeconomic status, urban versus rural residence, patient comorbidity, emergency department volume and whether the emergency department was located within an academic teaching hospital. CTAS = Canadian Triage and Acuity Scale, OR = odds ratio.

represented in low-income neighbourhoods and are more socially and economically marginalized when measures of neighbourhood instability and material deprivation are examined.[32,33] In addition, ecologic measures of socioeconomic status may not wholly capture the detrimental impact of social determinants such as food and housing insecurity, stigma and unemployment on health outcomes and health services use. These challenges are faced by up to 50% of Ontario residents with HIV and have been associated with poor health outcomes and heightened rates of emergency department use in several studies.[34–38] Second, our finding of high rates of emergency department visits related to mental health and substance use could be explained by earlier work highlighting a greater relative burden of mental health–related morbidity among Ontario residents with HIV and less engagement in continuous HIV outpatient care among individuals with a history of injection drug use.[39,40] Although higher rates of infectious diseases–related visits among people with HIV are not unexpected, only a minority of visits were related to underlying HIV infection. In contrast, skin and soft-tissue infections accounted for most of these episodes in people with HIV, possibly reflecting complications of injection drug use among susceptible individuals.[11] As of 2011, injection drug use was the mode of acquisition for about 10% of people living with HIV in Ontario.[41] Finally, people with HIV had a greater burden of comorbid illness relative to the control population. In addition, some conditions may be more severe among people with HIV. For example, there is evidence that acute exacerbations of chronic obstructive pulmonary disease are almost 3 times more likely to occur among people with HIV than HIV-negative individuals.[42] Higher rates of emergency department use among people with HIV may therefore reflect appropriate referral by primary care physicians of medically complex individuals to the emergency department. Similarly, clinicians may exercise greater caution in their treatment of individuals with HIV and multiple comorbid conditions, which could account for the higher odds of hospital admission following an emergency department visit among these patients, particularly for conditions triaged as less urgent and nonurgent.

Limitations

Our findings are strengthened by the population-based nature of our data, which allowed us to examine all Ontario residents with HIV who have entered care. However, our study has some limitations. We used administrative databases and did not have access to laboratory data, including viral load and CD4 cell count, and mode of HIV acquisition. Similarly, we did not have reliable data on antiretroviral use. However, as noted earlier, there were few visits attributable to underlying HIV infection, and an earlier study did not find an association between these indices and emergency department use in people with HIV.[11] Although we adjusted for comorbidity burden and neighbourhood income quintile, residual confounding related to severity of underlying illness and socioeconomic status is possible. Misclassification or ascertainment bias is possible if a tendency exists to overcall certain diagnoses (e.g., cellulitis, pneumonia) or upgrade the CTAS category in the context of HIV. However, the distribution of CTAS score was similar between people with and without HIV, suggesting that the latter phenomenon is unlikely to have occurred. Although triage level and ambulatory care sensitive conditions are routinely used as indicators of potentially preventable emergency department visits, these definitions have not been validated and do not consider additional patient factors such as degree of comorbidity and social determinants of health. Consequently these visits may not always avoidable, even with timely access to primary care. Finally, we could not identify individuals with undiagnosed HIV and/or people with HIV who have not linked to care; we hypothesize that rates of emergency department visits would be higher in that population.

Conclusion

We found higher rates of emergency department use among people with HIV relative to the general Ontario population, including for conditions that could be potentially managed in outpatient settings. These findings have important implications for future research and the management of people with HIV. Most notably, they strongly support the focus on comprehensive care for people with HIV set out in Ontario's new provincial strategy (Jean Bacon, Director of Health Policy and Knowledge Translation and Exchange, The Ontario HIV Treatment Network, Toronto: personal communication, 2016). The strategy advocates for early treatment for HIV, clinical guidelines for HIV care that include monitoring for early signs of comorbid conditions that can be managed within primary care settings, timely access to mental health and addiction services, and community-based support programs that address the social and economic determinants of health. In addition, integration of wound care management into existing harm-reduction services may reduce visits for skin and soft-tissue infections associated with injection drug use. Because emergency department use for less urgent conditions is associated with an inability to access timely primary care, we recommend further research to understand impediments to procuring such care among people with HIV. Overall, these efforts will contribute to a more complete understanding of the reasons underlying the observed disparities in emergency department use and ultimately inform programming that optimizes engagement with primary care and management of chronic disease for people with HIV.

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