Disparities in hospitalization among people in the HIV Outpatient Study, United States 2008-2022

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BACKGROUND:

- Hospitalization rates, an important clinical indicator to monitor treatment effectiveness, may reflect complications of antiretroviral therapy and advanced HIV disease, and provide an endpoint for morbidity among people with HIV (PWH).
- Characterizing hospitalizations may inform clinical efforts to manage comorbidities among PWH. We aimed to describe trends in hospitalization rates and to examine associated sociodemographic and clinical disparities among PWH in the HIV Outpatient Study (HOPS), a demographically diverse, multi-city cohort across the United States.

METHODS:

- We examined longitudinal medical records data for HOPS participants who had ≥ 2 clinical encounters (e.g. office visits, labs, and telemedicine) from 1/1/2008 to 12/31/2022.
- We analyzed all diagnoses that were documented as contributing to a participant's hospitalization. We then classified these hospitalizations as either HIV/AIDS-related or non-HIV/AIDS-related.
- We then evaluated sociodemographic and clinical differences in all-cause, HIV/AIDS-related, and non-HIV/AIDS-related hospitalization rates per 100 person-year (PY) over time. Factors associated with all-cause hospitalization were assessed using multivariable Poisson regression with generalized estimating equations (GEE).

RESULTS:

- Of 5,434 eligible participants, 2,502 (46.0%) were non-Hispanic (NH) White, 1917 (35.3%) NH Black, and 802 (14.8%) Hispanic persons. Most were ≤ 50 years old (73.4%) at baseline (the later of either 1/1/2008 or the first HOPS visit), privately insured (51.4%), and men who have sex with men (MSM 59.1%).
- During a median follow-up of 5.5 years, there were 5,261 hospitalizations, with a rate of 14.8 per 100 PY, largely involving only non-HIV/AIDS-related causes (87.6%).
- Multivariable factors significantly associated (P<0.05) with higher all-cause hospitalization rates included NH Black and Hispanic race/ethnicity (vs. NH White), higher HIV viral load and lower CD4 cell count prior to hospitalization, and certain comorbid conditions, including cancers, cardiovascular diseases, liver diseases, pulmonary diseases, renal diseases, hypertension, and mental health disorders; while MSM (vs. heterosexual HIV risk group), private and self-pay insurances (vs. public) were significantly associated (P<0.05) with lower rate of hospitalizations (Figure 1).

Despite the recent decline in all-cause hospitalization from 2014-2022 in HOPS, individuals who are non-Hispanic Black, Hispanic, have advanced HIV disease or public insurance are disproportionately impacted.

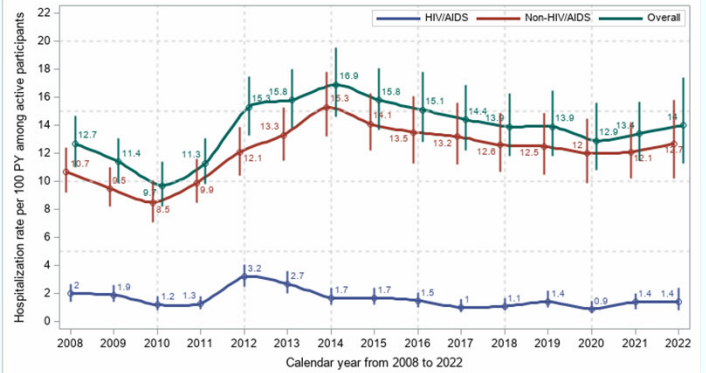
Figure 1: Hospitalization rates, and adjusted rate ratios for factors associated with all-cause hospitalization with GEE analyses, HOPS, 2008-2022.

Demographic characteristics	Univariable rate 95%CI	Univariable model rate estimate and 95%CI	Multivariable RR 95%CI	Adjusted P-value
Age at the middle of 3-year-period				
Less than 30	14.09 (11.35,17.51)		0.79 (0.61,1.03)	0.087
31-40	12.23 (10.35,14.46)		0.85 (0.66,1.10)	0.227
41-50	13.68 (12.21,15.32)		0.95 (0.76,1.19)	0.678
51-65	14.95 (13.54,16.52)		1.06 (0.87,1.29)	0.579
Over 65	22.25 (18.28,27.07)		Reference	Reference
Calendar years (period)				
2008-2010	11.85 (10.68,13.15)		1.06 (0.89,1.26)	0.541
2011-2013	15.36 (13.82,17.07)		1.28 (1.10,1.50)	0.002
2014-2016	17.18 (15.38,19.18)		1.36 (1.17,1.59)	<.0001
2017-2019	15.73 (13.98,17.70)		1.18 (1.03,1.36)	0.02
2020-2022	14.03 (12.35,15.95)		Reference	Reference
Sex				
Female	22.73 (20.19,25.59)		1.02 (0.84,1.14)	0.76
Male	12.12 (11.14,13.18)		Reference	Reference
Race/Ethnicity				
Hispanic	16.08 (13.53,19.11)		1.26 (1.04,1.53)	0.018
Others/Unknown	7.92 (5.59,11.21)		0.99 (0.71,1.37)	0.929
non-Hispanic Black	21.71 (19.63,24.01)		1.56 (1.33,1.83)	<.0001
non-Hispanic White	9.36 (8.35,10.49)		Reference	Reference
Insurance type				
Private	7.25 (6.48,8.12)		0.51 (0.04,0.59)	<.0001
Self pay	11.12 (8.62,14.34)		0.70 (0.55,0.90)	0.006
Other/Unknown	17.02 (10.74,26.96)		1.06 (0.71,1.60)	0.777
Public	24.57 (22.52,26.79)		Reference	Reference
HIV risk category				
PWID	26.52 (21.09,33.35)		0.89 (0.71,1.12)	0.336
MSM	9.05 (8.10,10.12)		0.77 (0.66,0.89)	0.001
Unknown/Other	17.52 (13.82,22.21)		1.12 (0.90,1.38)	0.307
HET	22.30 (20.11,24.73)		Reference	Reference
Most recent VL (Copies/mL)				
0 -199	11.96 (11.11,12.89)		0.21 (0.18,0.25)	<.0001
200-999	19.16 (15.02,24.45)		0.37 (0.28,0.48)	<.0001
1000-99999	23.31 (20.19,26.92)		0.43 (0.35,0.52)	<.0001
100000 and above	52.95 (44.29,63.29)		Reference	Reference
Most recent CD4+ (Cells/mm³)				
500+	10.40 (9.43,11.48)		0.60 (0.49,0.74)	<.0001
350-499	13.53 (11.79,15.52)		0.74 (0.59,0.92)	0.008
200-349	17.32 (15.13,19.84)		0.83 (0.67,1.03)	0.084
50-199	19.94 (17.07,23.29)		0.83 (0.67,1.04)	0.108
<50	23.97 (19.12,30.05)		Reference	Reference
Cancer diagnosis				
Cancer (yes)	20.60 (17.94,23.64)		1.43 (1.23,1.67)	<.0001
Cancer (no)	13.30 (12.28,14.41)		Reference	Reference
Cardiovarscular diseases				
CVD (yes)	27.38 (24.54,30.55)		2.10 (1.77,2.28)	<.0001
CVD (no)	10.30 (9.55, 11.10)		Reference	Reference
Hepatitis/liver diseases				
Hep (yes)	33.40 (25.83,43.20)		1.75 (1.34,2.29)	<.0001
Hep (no)	13.98 (13.02,15.02)		Reference	Reference
Pulmonary embolism				
PE (yes)	34.00 (29.69,38.95)		1.67 (1.43,1.94)	<.0001
PE (no)	12.02 (11.12,13.00)		Reference	Reference
Renal diseases				
Renal (yes)	24.58 (21.66,27.90)		1.75 (1.54,1.99)	<.0001
Renal (no)	11.81 (10.99,12.70)		Reference	Reference
Hypertension				
HTN (yes)	17.45 (16.06,18.97)		1.22 (1.08,1.38)	<.001
HTN (no)	10.18 (9.182,11.28)		Reference	Reference
Mental health disorder (MHD)				
MHD (yes)	18.37 (16.58,20.36)		1.26 (1.12,1.43)	<.0001
MHD (no)	12.12 (11.07,13.27)		Reference	Reference

Hospitalization rate and 95% CI per 100 person-year

Abbreviations: CI, confidence interval; CVD, cardiovascular diseases; Hep, hepatitis/liver disease; HET, heterosexual; HTN, hypertension; MHD, mental health disorder; MSM, men who have sex with men; PE, pulmonary embolism; PWID, people who inject drugs; RR, rate ratio, VL, viral load.
Notes: HIV/AIDS-related and non-HIV/AIDS-related hospitalizations were classified as mutually exclusive, with hospitalizations containing both types of diagnoses categorized as HIV/AIDS-related. All-cause hospitalizations equals the sum of HIV/AIDS and non-HIV/AIDS hospitalizations. Poisson regression with GEE approach was used to model rate of hospitalization on a per 100 person-year basis. Three-year intervals were used to aggregate count of hospitalization for longitudinal analyses. Participants' age, comorbid condition, HIV viral load, and CD4 counts were continuously updated at the beginning of each three-year period. Categories of age, HIV viral load, and CD4 counts were determined based on respective distribution. Most recent VL and CD4+ refer to the last lab results prior to hospitalization admission. For those who did not have hospitalization they refer to the last lab results at the end of every three year.

Figure 2: Longitudinal trends in hospitalization rates per 100 PY among HOPS participants with ≥1 clinical encounters from 2008-2022.



Notes: HIV/AIDS and non-HIV/AIDS hospitalizations are mutually exclusive. Overall include all-cause hospitalizations that equals the sum of HIV/AIDS-related and non-HIV/AIDS-related hospitalizations. Line/band/confidence interval slightly shifted to avoid masking with each other.

RESULTS (continued):

All-cause hospitalization rates (95% confidence interval) per 100 PY declined from 12.7 (11.0, 14.7) in 2008 to 9.7 (8.2, 11.4) in 2010, then increased to 16.9 (14.6, 19.5) in 2014 (peak), and finally levelled off and measured 14.1 (11.3, 17.4) in 2022. Non-HIV/AIDS-related hospitalization rates had a similar temporal pattern (Figure 2).

LIMITATIONS:

Medical record data for healthcare services received by participants at facilities outside HOPS sites may be incomplete or missing. Misclassifications may occur between HIV/AIDS-related and non-HIV/AIDS-related hospitalizations due to insufficient documentation or lack of detailed notes specifying reasons for hospitalization.

CONCLUSIONS:

All-cause hospitalization rates for PWH in the HOPS varied over the past 15 years, with a declining linear trend from 2014 to 2022 (P<0.05). However, hospitalizations continue to disproportionately impact individuals who are Black, Hispanic, have advanced HIV disease, or public insurance. Ensuring equitable access to prevention and management services for PWH regarding both care for HIV and for comorbidities is essential to addressing sociodemographic disparities in hospitalizations and improving health outcomes for PWH.

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