

Risk Factors for Hospitalization in People With HIV and COVID-19

To the Editors:

BACKGROUND

The first cluster of a novel respiratory illness, now known as coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, was reported by Chinese authorities on December 31, 2019.¹ The World Health Organization declared a global pandemic on March 11, 2020,² and more than 4 million deaths have been attributed to COVID-19 worldwide to date.³

There remains debate about the clinical interaction between HIV and COVID-19. Some studies have shown similar or better COVID-19 outcomes among people with HIV (PWH) compared with individuals without HIV.⁴⁻⁸ Other studies have found that lower CD4 lymphocyte counts and untreated HIV have been associated with worse outcomes,⁹⁻¹² and in at least one study, worse outcomes among PWH were driven exclusively by patients with suppressed viral load.¹³ Reviews have concluded that individuals with well-controlled HIV are not at risk of worse COVID-19 outcomes but have suggested that more evidence is needed regarding the role of HIV control on COVID-19

outcomes.¹⁴⁻¹⁶ In many studies, numbers of patients evaluated have been relatively small and risk of hospitalization has not been well studied, but current guidelines state that PWH seem to be at increased risk of severe outcomes with COVID-19 compared with people without HIV.¹⁷

In this study, we describe a cohort of PWH with COVID-19 and assess predictors for hospitalization and hospital length of stay.

METHODS

We retrospectively reviewed 206 cases of individuals with HIV and SARS-CoV-2 at the 2 largest HIV care centers in Colorado: UCHHealth, the academic health care system of the University of Colorado, and Denver Health and Hospital Authority, an integrated, public safety net institution serving the City and County of Denver.

Individuals aged 18 years and older were included in the study cohort if they were identified as PWH who had confirmed SARS-CoV-2 infection at the participating institutions between March 2020 and February 2021. Patients who receive their HIV care at these 2 institutions but who were SARS-CoV-2–tested or admitted for COVID-19 management at other institutions were excluded. Individuals with incidental COVID-19 admitted for non-COVID-19–related reasons were also excluded.

Electronic medical records were reviewed to collect demographic variables, indicators of level of HIV control, tobacco use, underlying medical conditions (diabetes, chronic pulmonary disease, chronic kidney disease, cardiac disease, hypertension, and mental health diagnoses), and COVID-19 outcomes (hospitalization, intensive care unit admission, length of stay, and hospital disposition). Hospitalizations not related to COVID-19 were not considered a COVID-19 outcome.

Descriptive statistics were used to characterize both hospitalized and non-hospitalized cases of COVID-19. Logistic and linear regression models were used. Univariate analyses assessed for predictors of hospitalization and log-transformed hospital length of stay, measured in days. Each variable was assessed separately in univariate models, and variables found to

be significantly associated ($P < 0.05$) in the univariate models were included in multivariable regression models.

Study data were stored in REDCap (Research Electronic Data Capture, Vanderbilt University, Nashville, TN). Statistical analyses were conducted using SAS/STAT software, version 9.4 (SAS Institute Inc, Cary, NC). This study was approved by the Colorado Multiple Institutional Review Board.

RESULTS

Of the 206 cases of individuals with HIV and SARS-CoV-2 reviewed, 40 (19%) were excluded from analysis because they were incidentally positive for SARS-CoV-2 on surveillance testing. One hundred sixty-six individuals with HIV and SARS-CoV-2 infection were included in the final analyses. The mean age was 47 years (SD 13 years); most of them (83%) were cis male; 14% was cis female; 3% was non cis-gender; 37% was non-Hispanic White, 17% was non-Hispanic Black, and 32% was Hispanic/Latinx. In this cohort, 43% was insured by Medicaid and 42% commercially insured.

Most of them (90%) had suppressed HIV-RNA levels (≤ 200 copies/mL), and 10% had a CD4 lymphocyte count < 200 cells/ μ L. Approximately 97% of individuals was on antiretroviral therapy. The most common comorbidities were mental health diagnoses (43%), hypertension (30%), and chronic pulmonary disease (18%).

Of the total cohort, 44 (27%) individuals were hospitalized with a COVID-19–related admission and 10 (23% of those hospitalized) were admitted to the intensive care unit. There was one known death among this cohort, and 86% was discharged to their previous residence, whereas 14% of individuals was discharged to a long-term care facility.

In univariate analysis, older age, lower CD4 lymphocyte cell count, and increasing number of comorbidities were significantly ($P < 0.05$) associated with hospitalization (Table 1). In the multivariable logistic regression model, odds for hospitalization increased by 1.23 times for every 100 cell/ μ L decrease in CD4 lymphocyte count [95% confidence

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TABLE 1. Logistic Regression Models for Hospitalization Among 166 Individuals With HIV Diagnosed With COVID-19 Between March 2020 and February 2021

	Univariate		Multivariable	
	OR (95% CI)	P	OR (95% CI)	P
Age (per 10-year increase)	1.61 (1.21 to 2.14)	<0.01	1.28 (0.92 to 1.78)	0.15
Race/ethnicity				
Non-Hispanic White	Ref	—		
Other	1.23 (0.60 to 2.52)	0.58		
Sex				
Cis male	Ref	—		
Cis female/transgender/other	1.09 (0.44 to 2.69)	0.85		
Primary language				
English	Ref	—		
Other	1.95 (0.79 to 4.81)	0.15		
Body mass index				
Underweight/normal	Ref	—		
Overweight/obese	0.80 (0.39 to 1.64)	0.54		
CD4 count cells/mm ³ (per 100 cell decrease)	1.21 (1.06 to 1.37)	<0.01	1.23 (1.08 to 1.41)	<0.01
HIV-1 RNA				
≤200 copies/mL	Ref	—		
>200 copies/mL	2.27 (0.79 to 6.54)	0.13		
Tobacco user				
Former/never	Ref	—		
Current smoker	0.51 (0.18 to 1.42)	0.20		
Comorbidity count (per increase of 1)	1.72 (1.30 to 2.28)	<0.01	1.92 (1.33 to 2.77)	<0.01

Each variable was added separately in the univariate models, and the variables that were found to be significantly associated with hospitalization ($P < 0.05$) in the univariate models were included in the multivariable models.

interval (CI): 1.08 to 1.41, $P < 0.01$]. For every additional comorbidity, the odds of hospitalization increased 1.92 times (95% CI: 1.33 to 2.77, $P < 0.01$). Age was not significantly associated with odds of hospitalization in multivariable logistic regression (OR = 1.28, 95% CI: 0.92 to 1.78, $P = 0.15$).

Among individuals with COVID-19–related hospitalizations ($n = 44$), only older age and CD4 lymphocyte count were significantly associated with hospital length of stay. In the multivariable model, for every decrease of 100 CD4 lymphocyte cell count/ μL , length of stay increased by 12.64% (95% CI: 3.04 to 23.15, $P < 0.01$), and every increase of 10 years of age was associated with 48.39% increase in length of stay (95% CI: 15.39 to 89.85%, $P < 0.01$).

DISCUSSION

Our findings complement the existing data on HIV and SARS-CoV-2 by including a large, diverse cohort of PWH, with both inpatient and outpatient status, from 2 distinct health care systems in the same metropolitan area. As demonstrated

in other cohorts, decreased CD4 lymphocyte cell count and increased number of comorbidities were associated with increased hospitalizations, and decreased CD4 lymphocyte count and older age were associated with an increased hospital length of stay. Of importance, this analysis expanded well beyond the initial peak in COVID-19 and encompasses periods of evolving COVID-19 management options and protocols but relatively few vaccinations. Vigilance for COVID-19 among people living with HIV will continue to be critical, as will close monitoring of cases and expedited care for those with symptoms suggestive of severe disease, particularly those who are older, have lower CD4 counts, or have more comorbid conditions.

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Identifying Missed Opportunities in the Prevention of Acute HIV Infection: The Need to Provide Pre-exposure Prophylaxis Referrals to Emergency Department Patients With Increased Risk for Acquiring HIV

To the Editors:

INTRODUCTION

The Centers for Disease Control and Prevention (CDC) strongly recom-

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Y.-H.H. conceived and designed the study. N.A.I., G.G.G., J.L.J., E.P.R., M.O.S., Y.-H.H., and R.E.R. developed and supervised the emergency department-based HIV screening and linkage-to-care programs. N.W.S. and G.M.D. had primary responsibility for the data collection. N.W.S. performed data analyses. Y.-H.H., N.W.S., N.A.I., G.G.G., J.L.J., M.O.S., and R.E.R. primarily interpreted results. N.W.S. primarily drafted the manuscript. N.A.I., G.G.G., J.L.J., E.P.R., G.M.B., M.O.S., A.H.G., R.E.R., and Y.-H.H. performed critical editing of the manuscript.

mend antiretroviral pre-exposure prophylaxis (PrEP) for the prevention of HIV acquisition in individuals at increased risk through sex or injection drug use.^{1,2} However, only 8% of the approximately 1.2 million people in the United States eligible for PrEP received a prescription.³ To mitigate HIV transmission in the United States, PrEP needs to become more accessible in populations with an increased risk.⁴

Emergency departments (EDs) have historically served as a venue to access HIV prevention services because the populations at increased risk frequent these facilities.⁵ In a CDC report on HIV cases in South Carolina, EDs constituted 79% of all the health care facility visits that preceded the late diagnoses in the state.⁶ This high frequency of ED utilization before diagnosis points to the missed opportunities within EDs to provide earlier testing and, if HIV-negative, linkage for the initiation of PrEP.⁷

One approach in evaluating the magnitude of missed opportunities in EDs specifically for HIV prevention is to leverage acute HIV cases within a defined period before diagnosis. Acute infection refers to the first few weeks after exposure and is defined by a non-reactive HIV-1/HIV-2 antibody differentiation immunoassay result and a reactive HIV-1/HIV-2 nucleic acid RNA test result.⁸ This is the period during which the greatest risk of HIV transmission exists due to an extremely high viral load.⁹ In this study, we retrospectively reviewed the cases of acute HIV diagnosis from 2 urban EDs to determine the presence of ED encounters before acute infection to assess the potential benefits of PrEP referral from the ED.

METHODS

This was a retrospective study conducted at 2 urban EDs in Baltimore City beginning from the implementation of HIV fourth-generation antigen-antibody testing at each ED to March 2020 [the Johns Hopkins (JH) Hospital ED from July 2013 and the JH Bayview Medical Center from January 2015].¹⁰ Through the best-practice advisory application in the Epic electronic medical record (EMR), triage nurses offered opt-out testing to all eligible