Multicenter Study of Outcomes Among Persons With HIV Who Presented to US Emergency Departments With Suspected SARS-CoV-2

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Background: There is a need to characterize patients with HIV with suspected severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

Setting: Multicenter registry of patients from 116 emergency departments in 27 US states.

Methods: Planned secondary analysis of patients with suspected SARS-CoV-2, with (n = 415) and without (n = 25,306) HIV. Descriptive statistics were used to compare patient information and clinical characteristics by SARS-CoV-2 and HIV status. Unadjusted and multivariable models were used to explore factors associated with death, intubation, and hospital length of stay. Kaplan–Meier curves were used to estimate survival by SARS-CoV-2 and HIV infection status.

Results: Patients with both SARS-CoV-2 and HIV and patients with SARS-CoV-2 but without HIV had similar admission rates (62.7% versus 58.6%, $P = 0.24$), hospitalization characteristics [eg, rates of admission to the intensive care unit from the emergency department (5.0% versus 6.3%, $P = 0.45$) and intubation (10% versus 13.3%, $P = 0.17$)], and rates of death (13.9% versus 15.1%, $P = 0.65$). They also had a similar cumulative risk of death (log-rank $P = 0.72$). However, patients with both HIV and SARS-CoV-2 infections compared with patients with HIV but without SAR-CoV-2 had worsened outcomes, including increased mortality (13.9% versus 5.1%, $P < 0.01$, log-rank $P < 0.0001$) and their deaths occurred sooner (median 11.5 versus 34 days, $P < 0.01$).

Conclusions: Among emergency department patients with HIV, clinical outcomes associated with SARS-CoV-2 infection are not worse when compared with patients without HIV, but SARS-CoV-2 infection increased the risk of death in patients with HIV.

Key Words: HIV, emergency department, SARS-CoV-2, clinical outcomes

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INTRODUCTION

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a leading cause of death in the United States.[1] Despite extensive attempts to characterize SARS-CoV-2 infections and the concurrent pandemic in the broader medical literature,[2,3] less is known about SARS-CoV-2 in patients infected with HIV—either the characteristics of those who become infected with SARS-CoV-2 or the clinical outcomes that stem from concurrent HIV and SARS-CoV-2 infection.[4–10]

This is despite a population of over 1 million individuals in the United States infected with HIV and a clear public health need for more information on the topic.[11,12] HIV can be treated with antiretroviral medication; the introduction of such therapies has increased life expectancy for patients with HIV. However, patients with HIV suffer from excess morbidity (eg, higher rates of diabetes, hypertension, chronic kidney disease, and cerebrovascular accidents compared with individuals without HIV infection).[13] This morbidity could portend that those with HIV and concurrent SARS-CoV-2 infection may have worse outcomes than individuals without HIV.[4,14] Depending on treatment effectiveness, persons with HIV infection can have a wide range of immunocompetency and therefore vulnerability to severity of viral infection.[4,13,14]

Thus, there is an urgent need to characterize the clinical features and outcomes of a large and heterogenous sample of patients with HIV and SARS-CoV-2 infections. This multicenter

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study helps address the current need for clinical information on SARS-CoV-2 in patients with HIV. We use a national registry of hospitals to assess a population of patients with and without HIV presenting to US emergency departments (EDs) with suspected SARS-CoV-2 infections.[15,16] Our first objective was to present and compare clinical characteristics and outcomes of a population of patients (stratified by the presence or absence of HIV and presence or absence of SARS-CoV-2 infection) presenting to US EDs with a suspected SARS-CoV-2 infection. Our second objective was to explore factors associated with both primary (death) and secondary (intubation and hospital length of stay) outcomes among the subpopulation with HIV. Our third objective was to compare survival estimates stratified by HIV and SARS-CoV-2 infection status.

METHODS

This study was a planned secondary analysis of a multicenter registry of patients from 45 medical centers, with 116 EDs in 27 US states, the REgistry of suspected COVID-19 in EmeRgency care (RECOVER) Network.[15,16] Our December 2020 data cut of the registry included 25,721 unique patients with a qualifying emergency department (ED) visit at participating medical centers for suspected SARS-CoV-2 infection and an accompanying polymerase chain reaction based test for SARS-CoV-2. Patients with ED visits lacking a reasonable probability of being related to SARS-CoV-2 (eg, trauma, alcohol or drug intoxication, or testing performed purely for admission policy) were excluded from enrollment in the registry; all entries in the registry had a minimum of 30-day follow-up information.[15,16]

The registry used a REDCap platform (http://www.projectredcap.org) with 204 questions among 7 domains (visit information, demographics, symptoms and risk factors, vital signs, medical history, current medications, test results, and outcomes). As described previously, the platform used programming to force data entry for critical fields, perform error checking, and ensure sensible alpha-numeric content and ranges for numeric data.[15,16] Data were obtained by abstractors using the local electronic health record at each study site and supported by an administrative core and a steering committee. Training of data abstractors was conducted through teleconference with the principal investigator and supplemented by a program manager and extensive guidance documentation; this included guidance document embedded in the REDCap.[15,16]

The protocol for the RECOVER Network was reviewed by the institutional review board at all participating sites. Detailed methodology (including study design, setting, registry development, patient selection, and other characteristics) for the RECOVER Network has been described elsewhere.[15,16] The population of interest for this study was patients in the registry with a documented HIV infection or AIDS. Patient data were stratified by SARS-CoV-2 and HIV test results—positive and negative.

Values were summarized and presented with descriptive statistics including medians with interquartile range and proportions. We used χ^2 tests and unpaired Student t tests to compare clinical characteristics and outcomes between the stratified groups and to compare patients with HIV stratified by SARS-CoV-2 status. To explore factors associated with our primary and secondary outcomes, which include death, intubation, and hospital length of stay, we first calculated unadjusted odds ratios (ORs) and corresponding 95% confidence intervals (CIs) to determine whether the odds of experiencing the outcomes varied by factor; factors explored included age, sex, race, smoking status, obesity (defined by a body mass index greater than 35 kg/m^2), insured status/type, and presence of a do not resuscitate order. Factors were selected based on previous studies and clinical judgment.[15–18] We then constructed multivariable logistic regression models to further identify associations between the aforementioned factors and outcomes. Given that death was our primary outcome of interest, we also constructed Kaplan–Meier curves comparing survival probabilities for patients with HIV (stratified by SARS-CoV-2–positive and SARS-CoV-2–negative status) and survival probabilities for patients with SARS-CoV-2 (stratified by HIV-positive and HIV-negative status). Log-rank tests were used to compare survival distributions. Per our a priori protocol, categorical data that were not charted were considered absent and not imputed.[15,16] Missing ($>$0.1%) continuous data (ie, age, vital signs, and body mass index) were analyzed for monotonicity and replaced using multiple imputation.[15,16] Furthermore, we tested for collinearity but did not identify any variables that were colinear; we did not test for interaction. We were unable to include information about HIV treatment status and CD4 count in our analysis or modeling given a high degree of missingness (46% were missing); these data were not imputed. An α level of <0.01 was considered significant, and all analyses were completed using SAS software (SAS Institute Inc., Cary, NC).[19]

RESULTS

Patient Characteristics

We identified 415 patients from the RECOVER registry with HIV (1.6% of our data cut of the registry); 201 patients (48%) with HIV were found to have a polymerase chain reaction–confirmed SARS-CoV-2 infection. Characteristics of these patients stratified by SARS-CoV-2 and HIV infection status are presented in Table 1. Patients with both SARS-CoV-2 and HIV (compared with those with SARS-CoV-2 but without HIV) were more often male (76.1% versus 52.4%), more often identified as Black or African American (59.7% versus 34.8%), more often insured through either Medicaid or Medicare (70.1% versus 57.0%), and more often undomiciled (4.0% versus 1.1%). With some exceptions, such as cancer (13.4% versus 6.8%) and some types of substance use [eg, tobacco (20.9% versus 7.1%), marijuana (5.5% versus 1.6%), or methamphetamine (3.0% versus 0.3%)], the medical and substance use histories of the 2 populations were similar.

Patients who were SARS-CoV-2 negative but HIV-positive (compared with patients with neither SARS-CoV-2 nor HIV infections) were more often male (74.3% versus 45.5%), more often identified as Black or African American (44.9% versus 22.3%), more often insured through either Medicaid or Medicare (59.3% versus 48.7%), and more often undomiciled (15.0% versus 4.2%). Again, with some exceptions, such as some types of substance use [eg, tobacco

TABLE 1. Characteristics of Patients in the RECOVER Network Stratified by SARS-CoV-2 and HIV Status

	SARS-CoV-2 Positive		SARS-CoV-2 Negative	
	HIV-Positive n = 201	HIV-Negative n = 13,236	HIV-Positive n = 214	HIV-Negative n = 12,070
	n (%)	n (%)	n (%)	n (%)
Demographics				
Age in yr, median (IQR)	57 (48–63)	59 (43–71)	50 (39–58)	53 (36–66)
Female sex	48 (23.9)	6294 (47.6)	55 (25.7)	6579 (54.5)
Race				
American Indian or Alaska Native	0 (0)	59 (0.4)	1 (0.5)	82 (0.7)
Asian	0 (0)	410 (3.1)	4 (1.9)	361 (3.0)
Black or African American	120 (59.7)	4610 (34.8)	96 (44.9)	2695 (22.3)
Native Hawaiian or other Pacific Islander	1 (0.5)	35 (0.3)	2 (0.9)	59 (0.5)
White	28 (13.9)	3826 (28.9)	83 (38.8)	7399 (61.3)
Other	52 (25.9)	4298 (32.5)	28 (13.1)	1495 (12.4)
Ethnicity				
Hispanic or Latino	45 (22.4)	3689 (27.9)	33 (15.4)	1343 (11.1)
Insurance				
Private	54 (26.9)	4129 (31.2)	69 (32.2)	4885 (40.5)
Medicaid or Medicare	141 (70.1)	7541 (57.0)	127 (59.3)	5879 (48.7)
Uninsured	3 (1.5)	1091 (8.2)	14 (6.5)	879 (7.3)
Undomiciled	8 (4.0)	146 (1.1)	32 (15.0)	503 (4.2)
Medical history				
Atrial fibrillation	12 (6.0)	835 (6.3)	10 (4.7)	1123 (9.3)
Cancer (either active or inactive)	27 (13.4)	896 (6.8)	31 (14.5)	1840 (15.2)
Chronic obstructive pulmonary disease	18 (9.0)	672 (5.1)	25 (11.7)	1591 (13.2)
Current tobacco smoker	42 (20.9)	944 (7.1)	92 (43.0)	2807 (23.3)
Diabetes mellitus	55 (27.4)	3219 (24.3)	44 (20.6)	2718 (22.5)
Heart failure	13 (6.5)	897 (6.8)	21 (9.8)	1458 (12.1)
Hyperlipidemia	39 (19.4)	3062 (23.1)	65 (30.4)	3527 (29.2)
Hypertension	86 (42.8)	5254 (39.7)	74 (34.6)	5246 (43.5)
Previous ischemic heart disease	9 (4.5)	647 (4.9)	17 (7.9)	1377 (11.4)
BMI, median (IQR)	27.3 (23.7–31.6)	30 (25.7–35.4)	25.6 (21.5–31.2)	28.1 (23.6–33.8)
Previous organ transplant	8 (4.0)	162 (1.22)	1 (0.5)	264 (2.19)
Other substance use				
Cocaine use	3 (1.5)	64 (0.5)	16 (7.5)	281 (2.3)
Daily alcohol	4 (2.0)	350 (2.6)	25 (11.7)	1054 (8.7)
Injection drug use	1 (0.5)	17 (0.1)	6 (2.8)	152 (1.3)
Marijuana	11 (5.5)	214 (1.6)	39 (18.2)	873 (7.2)
Methamphetamine use	6 (3.0)	38 (0.3)	28 (13.1)	267 (2.2)
Opioid dependency	2 (1.0)	27 (0.2)	14 (6.5)	254 (2.1)

BMI, body mass index; IQR, interquartile range.

(43.0% versus 23.3%), cocaine use (7.5% versus 2.3%), and marijuana (18.2% versus 7.2%)], the medical and substance use histories of the 2 populations were similar (Table 1).

Risk Factors and Presenting Symptoms

Patient's self-reported risk factors for infection, presenting symptoms, and days since symptom onset (stratified by SARS-CoV-2 and HIV infection status) are presented in Table 2. With a few exceptions [eg, patients with both SARS-CoV-2 and HIV infections, compared with patients with SARS-CoV-2 but without HIV infection, less often had exposure to SARS-CoV-2 from nursing homes (1.5% versus 8%) but were more likely to report abdominal pain (44.8% versus 35.1%) or chest pain (53.2% versus 42.4%)], self-reported risk factors and presenting symptoms were similar across the strata. Furthermore, days since symptom onset were similar across the strata (a median of 4 days of symptoms for both HIV-positive and HIV-negative patients with SARS-CoV-2 infections and a median of 3 days of symptoms for both HIV-positive and HIV-negative patients without SARS-CoV-2 infections, Table 2d.

Clinical Outcomes

Clinical characteristics of patients on arrival to the ED along with hospitalization characteristics (if admitted) are presented in Table 3 stratified by SARS-CoV-2 and HIV status. Patients with both SARS-CoV-2 and HIV (compared with patients with SARS-CoV-2 but without HIV) had similar ED

TABLE 2. Self-Reported Risk Factors for Infection and Presenting Symptoms Stratified by SARS-CoV-2 and HIV Infection Status

	SARS-CoV-2 Positive		SARS-CoV-2 Negative	
	HIV-Positive n = 201	HIV-Negative n = 13,236	HIV-Positive n = 214	HIV-Negative n = 12,070
	n (%)	n (%)	n (%)	n (%)
Self-reported risk factors				
None	24 (11.9)	1562 (11.8)	77 (36.0)	4130 (34.2)
Travel to the United States from a country with known endemic disease	0 (0)	99 (0.7)	4 (1.9)	205 (1.7)
Sick contacts without confirmed SARS-CoV-2	9 (4.5)	957 (7.2)	12 (5.6)	934 (7.7)
Unemployed or retired and social contact with friends, family, and/or general public	52 (25.9)	3460 (26.1)	54 (25.2)	2422 (20.1)
Employment				
Nonhealth care worker and contact with family, friends, and/or general public	94 (46.8)	4662 (35.2)	22 (10.3)	2193 (18.2)
Health care worker with patient contact	2 (1.0)	418 (3.2)	4 (1.9)	763 (6.3)
Close contact with a person with known/suspected SARS-CoV-2	10 (5.0)	1147 (8.7)	7 (3.3)	370 (3.1)
Institutional exposure				
Hospital	2 (1.0)	251 (1.9)	7 (3.3)	588 (4.9)
Nursing home	3 (1.5)	1064 (8.0)	3 (1.4)	476 (3.9)
Assisted living facility	0 (0)	172 (1.3)	1 (0.5)	216 (1.8)
Prison, jail, or correctional facility	0 (0)	39 (0.3)	1 (0.5)	71 (0.6)
Other	16 (8.0)	881 (6.7)	16 (7.5)	836 (6.9)
Presenting symptoms				
Abdominal pain	90 (44.8)	4650 (35.1)	26 (12.1)	1527 (12.7)
Chest pain	107 (53.2)	5606 (42.4)	45 (21.0)	2628 (21.8)
Cough				
Dry	129 (64.2)	8614 (65.1)	96 (44.9)	5235 (43.4)
Wet	12 (6.0)	893 (6.7)	35 (16.4)	1566 (13.0)
Diarrhea	82 (40.8)	4834 (36.5)	36 (16.8)	1615 (13.4)
Fatigue/malaise	56 (27.9)	3736 (28.2)	36 (16.8)	2667 (22.1)
Fever	131 (65.2)	9034 (68.3)	102 (47.7)	4718 (39.1)
Headache	82 (40.8)	4990 (37.7)	28 (13.1)	1759 (14.6)
Joint pain	14 (7.0)	1364 (10.3)	9 (4.2)	308 (2.6)
Muscle aches	59 (29.4)	4213 (31.8)	49 (22.9)	2188 (18.1)
Nausea/vomiting	96 (47.8)	5606 (42.4)	40 (18.7)	2565 (21.3)
Olfactory/taste disturbance	4 (2.0)	694 (5.2)	3 (1.4)	149 (1.2)
Rash	46 (22.9)	2785 (21.0)	3 (1.4)	126 (1.0)
Rhinorrhea	48 (23.9)	2897 (21.9)	21 (9.8)	1240 (10.3)
Shortness of breath	137 (68.2)	291 (2.2)	112 (52.3)	313 (2.6)
Sore throat	63 (31.3)	3625 (27.4)	26 (12.1)	1927 (16.0)
Wheezing	22 (10.9)	1490 (11.3)	8 (3.7)	606 (5.0)
Days since symptom onset, median (IQR)	4 (2–7)	4 (2–7)	3 (1.5–7)	3 (1–7)

IQR, interquartile range.

triage vitals (eg, median oxygen saturations on arrival of 96% and 93%, $P = 0.48$) and admission rates (62.7% versus 58.6%, $P = 0.24$); those who were admitted also had similar hospitalization characteristics [eg, 5.0% versus 6.3% ($P = 0.45$) were admitted to the intensive care unit from the ED and 10% versus 13.3% ($P = 0.17$) required respiratory support with intubation] and rates of death (13.9% versus 15.1%, $P = 0.65$). Furthermore, among the subgroups of patients with SARS-CoV-2 who died, those who died did so at similar times [death occurred a median number of 11.5 days (HIV-positive) versus 8 days (HIV-negative) from the initial ED visit, $P = 0.57$]. Patients without SARS-CoV-2 but with HIV (compared with patients without either SARS-CoV-2 or HIV) had similar ED triage vitals and, for the subpopulation admitted, similar hospitalization characteristics and outcomes (Table 3).

Comparison of Patients With HIV Stratified by SARS-CoV-2 Infection Status

Information specific to the subpopulation of patients with HIV (both with and without SARS-CoV-2 infections) is presented in the Supplemental Table, Supplemental Digital

TABLE 3. Patient Clinical Characteristics and Outcomes Stratified by SARS-CoV-2 and HIV Status

	SARS-CoV-2 Positive		SARS-CoV-2 Negative	
	HIV-Positive n = 201	HIV-Negative n = 13,236	HIV-Positive n = 214	HIV-Negative n = 12,070
	n (%)	n (%)	n (%)	n (%)
ED triage vitals				
Oxygen saturation, median (IQR)	96 (94–98)	93 (83–96)	98 (96–99)	95 (92–97)
Temperature (°C), median (IQR)	37 (36.7–37.7)	37.1 (36.7–37.8)	36.9 (36.6–37.2)	36.8 (36.6–37.2)
Systolic blood pressure, median (IQR)	128 (115–147)	131 (118–146)	129 (117–145)	135 (120–151)
Diastolic blood pressure, median (IQR)	77 (69–86)	77 (68–86)	80 (69–90.8)	81 (70–90)
Heart rate, median (IQR)	98 (84–111)	95 (82–108)	97 (82–110)	91 (79–105)
Respiratory rate, median (IQR)	19 (17–22)	19 (18–21)	18 (17–20)	18 (17–20)
Hypotension in ED	23 (11.4)	1233 (9.3)	30 (14.0)	1546 (12.8)
Lowest oxygen saturation (%) in ED, median (IQR)	94 (90–97)	93 (83–96)	96 (94–97.8)	95 (92–97)
Arrived with cardiac arrest	2 (1.0)	90 (0.7)	0 (0)	64 (0.5)
Admitted to hospital	126 (62.7)	7758 (58.6)	105 (49.1)	5671 (47.0)
Hospitalization characteristics				
Admitted to intensive care unit from ED	10 (5.0)	832 (6.3)	14 (6.5)	804 (6.7)
Transferred to ICU during admission	19 (9.5)	1248 (9.4)	9 (4.2)	314 (2.6)
Circulatory support				
Vasopressors	19 (9.5)	1651 (12.5)	14 (6.5)	601 (5.0)
Extracorporeal membrane oxygenation	3 (1.5)	110 (0.8)	6 (2.8)	161 (1.3)
Ventilatory support				
Supplemental oxygen	78 (38.8)	5025 (38.0)	58 (27.1)	2851 (23.6)
High flow oxygen	6 (3.0)	907 (6.9)	4 (1.9)	420 (3.5)
Noninvasive positive pressure ventilation	12 (6.0)	836 (6.3)	5 (2.3)	346 (2.9)
Intubation	20 (10.0)	1756 (13.3)	7 (3.3)	550 (4.6)
Hospital length of stay in days, median (IQR)	7 (4–14)	7 (4–13)	4 (2–6.8)	4 (2–7)
Died	28 (13.9)	1995 (15.1)	11 (5.1)	670 (5.6)
If patient died, the number of days from the ED visit, median (IQR)	11.5 (5–15.5)	8 (4–15)	34 (7–55)	12 (4–34)

ICU, intensive care unit; IQR, interquartile range.

Content, http://links.lww.com/QAI/B720. Patients with both HIV and SARS-CoV-2 infections (compared with patients with HIV but without SAR-CoV-2) were older (median ages of 57 versus 50 years, $P < 0.001$), more often identified as Black or African American (59.7% versus 44.9%, $P < 0.01$) but were less often undomiciled (4% versus 15%, $P < 0.001$). Furthermore, these patients were more often admitted to the hospital (62.7% versus 49.1%, $P < 0.01$), required respiratory support with intubation (10% versus 3.3%, $P < 0.01$), had longer hospital length of stays (median of 7 days versus 4 days, $P < 0.01$), and more frequently died (13.9% versus 5.1%, $P < 0.01$), and among the subpopulation that died, they died more quickly (death occurred in a median number of 11.5 days versus 34 days from the initial ED visit, $P < 0.01$).

Factors Associated With Death, Intubation, and Hospital Length of Stay Among Patients With HIV

In unadjusted analyses of factors associated with the outcomes of death, intubation, and hospital length of stay, among the subpopulation of patients with HIV and SARS-CoV2, we found that identifying as White was associated with an increased odds of death [OR 3.06 (95% CI: 1.19 to 7.86)] and intubation [OR 4.10 (1.47–11.44)] and identifying as Black was associated with a decreased odds of respiratory support through intubation [OR 0.25 (0.09–0.69)]. In multivariable analyses of the subpopulation of patients with HIV and SARS-CoV-2, we found that identifying as Black was associated with decreased odds of death [OR 0.24 (95% CI: 0.08 to 0.70)] and respiratory support through intubation [OR 0.17 (95% CI: 0.05 to 0.60)].

Survival Analysis

Kaplan–Meier Survival estimates for the population of patients with SARS-CoV-2 (stratified by HIV-positive and HIV-negative status) are shown in Figure 1; patients with HIV and SARS-CoV-2 infections had a similar probability of death at any given point compared with patients without HIV but with SARS-CoV-2 infection (log-rank $P = 0.72$). Survival estimates for the population of patients with HIV (stratified by SARS-CoV-2–positive and SARS-CoV-2–negative status) are shown in Figure 2; patients with both HIV and SARS-CoV-2 infections had a higher probability of death compared with patients with HIV but without SARS-CoV-2 at any point (log-rank $P < 0.0001$).

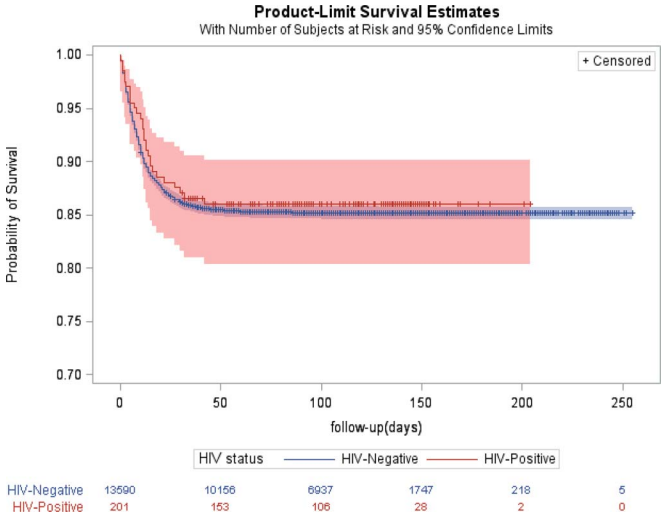

FIGURE 1. Kaplan–Meier survival estimates for patients with SARS-CoV-2 infections stratified by HIV-positive (red) and HIV-negative (blue) status. full color online

DISCUSSION

We found a population of 415 patients with HIV within the RECOVER Network. Nearly half of those with HIV were SARS-CoV-2 positive. With some exceptions, the groups had similar characteristics and similar (median) duration of symptoms before presenting to US EDs for care. Expectedly, patients with SARS-CoV-2 (both HIV-positive and HIV-negative) died at higher rates, were more often intubated, and had longer hospital length of stays, compared with those without SARS-CoV-2. However, patients with HIV and SARS-CoV-2 did not seem to have markedly worse outcomes (death, intubation, and hospital length of stay) compared with patients without HIV but with SARS-CoV-2.

Our study is not the first to demonstrate that outcomes associated with SARS-CoV-2 are not worse among patients with an HIV infection (compared with those without an HIV infection).[20–24] A US multicenter study that included 404 patients with HIV found no differences in outcomes through propensity-matched analysis.[20] Of note, most (70%) patients in this study had a history of antiretroviral therapy (ART).[20] These findings are congruent with a Zambian study of 443 hospitalized patients with HIV[21]; HIV was not found to be independently associated with poor outcomes (caveat being that those with severe HIV disease were more likely to develop severe SARS-CoV-2 or die of SARS-CoV-2).[21] A third study that did not identify worse outcomes also represented a population of patients with controlled HIV infections (eg, 94% had viral load <20 copies/mL).[22]

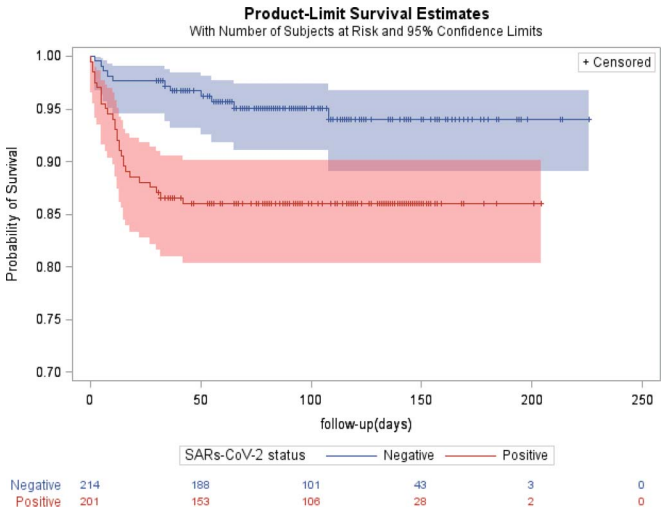

FIGURE 2. Kaplan–Meier survival estimates for patients with HIV stratified by SARS-CoV-2–positive (red) and SARS-CoV-2–negative (blue) status. full color online

However, reports have differed.[4,25] One recent US study (2988 persons living with HIV concurrently infected with SARS-CoV-2) demonstrated that hospitalization rates were higher among those without viral suppression and among those with lower CD4 counts.[4] This is in the context of recent work from the World Health Organization that reported HIV infection (among individuals with concurrent SARS-CoV-2 infections) was independently associated with a higher risk of death.[25] Of note, much like our current work, this World Health Organization study was limited given that ART information was absent for a majority (60%) of patients.

Although the overall impressions of these works seem conflicting, 1 potential underlying explanation is that SARS-CoV-2–associated clinical outcomes may be more related to the severity of an HIV infection (eg, high viral low, low CD4 count, and absence of ART) and not necessarily just the presence (or absence) of an HIV infection. Given this, it is possible that our similar outcomes among patients with SARS-CoV-2 and an HIV infection (compared with those without an HIV infection) may stem from a population of patients with controlled or less severe HIV infections. Unfortunately, given the high degree of missingness on HIV treatment status and CD4 count in our secondary analysis, we are unable to confirm this or offer a more thorough explanation. Future work remains necessary.

We further found that the population with both HIV and SARS-CoV-2 disproportionately identified as Black or African American. HIV disproportionately affects those who identify as Black or African American[12]; these findings likely stem from the disproportionate burden of SARS-CoV-2 (both population prevalence and overall mortality) seen within Black and African American communities across the United States.[26,27] These are the same Black communities that suffer from clearly demonstrated, longstanding, inequities in both health risks and outcomes that existed well before the start of the current pandemic.[26,27]

Interestingly, and counter to our a priori beliefs, patients with SARS-CoV-2 infections were less often smokers. Recent work suggests that smoking is an independent risk factor for both hospital admission and death from SARS-CoV-2.[28,29] However, there is limited evidence to support this phenomenon, and contradictory thoughts on the association of tobacco use and SARS-CoV-2 infection do exist.[28–30] We are uncertain as to the implications of this current finding in our HIV-positive population (a finding that was also noted among the larger, primary, analysis). Unfortunately, an

explanation is beyond the limited scope of this current work. Further study is required and is currently being completed in the larger RECOVER Network.

Limitations

There are several limitations to this work, the first and most notable of which is missing information on both HIV treatment status and CD4 count and our inability to account for these in our study. This is a limitation shared by other work on the topic.[25] Our work was a planned secondary analysis of a larger, national, registry. The primary study was focused on characterizing patients who presented to US EDs with suspected SARS-CoV-2 infections. Despite each site and investigator attempting to obtain this information, in many situations the information was not present in the electronic health record. Given the possibility that SARS-CoV-2–related outcomes may be dependent on severity of HIV infection, it would have been of interest to explore whether patients not on ART or with deranged CD4 cell count and HIV viral load had similar outcomes.[4,21]

However, independent of either treatment status or CD4 count, there is still a clear need for our work (and works like our current study) that explores outcomes (including mortality) associated with SARS-CoV-2 infections in patients with HIV and how these findings compare with individuals without HIV. Our findings add to the literature base and will be useful given the ongoing global pandemic and conversation around risk stratification and vaccine prioritization for patients with HIV.[4,11]

A second limitation of this work stems from the site-to-site variability and potential concerns for generalizability inherent to any national, multicenter registry (eg, hospital-specific intensive care unit admission practices or policies on invasive oxygen techniques); a limitation likely more compounded given that SARS-CoV-2 prevalence and hospital resources were likely not equal across sites (eg, hospitals in regions with higher SARS-CoV-2 prevalence may have had limited ability to offer invasive respiratory support).[15,16] We are unable to account for the possible contributions of site-specific differences given the sample size presented here, the period of study for this population, and the changing epicenters of SARS-CoV-2 infections across the United States.

Despite these limitations, to the best of our knowledge, our work is the first such report that focuses on patients with HIV who presented to US EDs with suspected SARS-CoV-2 infections and also includes information on both hospitalization characteristics and patient mortality. Our work is also one of the few studies not limited to a single center or region[5–7,9] but instead reflects a national, multicenter registry.[4,8,10]

CONCLUSIONS

We present findings from a national registry of hospital EDs on patients with (and without) HIV who presented to US EDs with a suspected SARS-CoV-2 infection. We expectedly find that patients with SARS-CoV-2 fare worse than those without SARS-CoV-2. However, we do not find worse outcomes for patients with both SARS-CoV-2 and HIV compared with those with SARS-CoV-2 but without HIV.

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