Is There a Race-Based Disparity in the Survival of Veterans with HIV?

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BACKGROUND: Disparities in survival for black patients with HIV in the United States have been reported. The VA is an equal access health care system.

OBJECTIVE: To determine whether such disparities are present in the VA health care system.

DESIGN: Retrospective cohort study using national VA administrative databases.

PATIENTS: Two thousand three hundred and four white and 3,641 black HIV-infected patients first hospitalized for HIV between October 1, 1996 and September 30, 2000.

MEASUREMENTS: Thirty-day mortality after first hospitalization with HIV, and subsequent long-term survival. Follow-up ended at death or September 30, 2002. Data were adjusted for age, sex, HIV disease severity, non-HIV-related comorbidities, primary discharge diagnosis, hepatitis C status, and facility effects.

RESULTS: The mean follow-up was 3.2 years. Overall survival was similar for black patients compared with white patients (adjusted hazard ratio 1.09, $P=.09$). Hospital mortality was 7.0% for black and 6.4% for white patients ($P=.35$). Adjusted hospital mortality for black patients was similar to that of white patients (odds ratio 1.20, $P=.10$). Long-term survival after hospitalization did not significantly differ by race (adjusted hazard ratio 1.07, $P=.21$, for black patients compared with white patients).

CONCLUSIONS: Survival during and after first hospitalization with HIV in the VA did not significantly differ for white and black patients, possibly indicating similar effectiveness of care for HIV. Further research is needed to understand the reasons for the lack of disparities for VA patients with HIV and whether the VA's results could be replicated.

KEY WORDS: HIV/AIDS; race; survival; veterans affairs; health disparities; cohort study.

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HIV infection and HIV-related mortality disproportionately affect black persons in the United States compared with white persons. Of the over 1 million people in the United States living with HIV infection, 50% are black, despite constituting only 12% of the U.S. population. Of the 40,000 new infections each year in the United States, 54% occur in black persons.¹ National Centers for Disease Control and Prevention (CDC) data show that mortality for black patients after an AIDS diagnosis is higher than for white patients in the era of highly active antiretroviral therapy, or HAART.^{2,3} The causes of this disparity in mortality are not entirely known. Barriers to care

may be important, as some studies have shown that black patients are less likely to receive HAART or receive it later in their disease course.^{4,5}

We sought to examine survival of patients with HIV who were cared for in a setting with relatively few barriers to HIV care, namely the Veterans Affairs health system, in order to determine whether there are race-based disparities in survival in that setting. The VA is the largest single provider of HIV care in the United States⁶ and provides care throughout the United States. As such, it affords a rare opportunity to study the effect of race in a very large and diverse sample.

We reasoned that disparities in care would affect survival in 2 ways. Short-term survival would be driven by care received during an acute illness, such as during hospitalization. Long-term survival, conversely, would reflect chronic management of HIV and comorbid conditions. We therefore conducted a retrospective cohort study using data from national VA databases to examine 30-day and long-term survival of patients after hospitalization with HIV in VA facilities during the HAART era. Our objective was to determine whether there were differences in survival for black patients compared with white patients during and after first hospitalization with HIV infection in a VA facility.

METHODS

We conducted a retrospective cohort study of U.S. veterans with data from national VA databases. The VA's patient treatment file (PTF) contains hospitalization records, including dates, vital status, and discharge diagnoses coded according to the International Classification of Diseases, 9th revision (ICD-9). These codes are entered into the computerized database at each facility by professional coders who assign the codes based on findings recorded in progress notes and discharge summaries in patients' records. The PTF does not contain pharmacy records or laboratory test results. Survival was also assessed from the Beneficiary Identification and Records Locator Subsystem Death File, which records all veteran deaths reported by VA medical centers, the Social Security Administration, the VA cemetery system, and funeral directors. Ninety to 95% of veteran deaths are captured by this file or the PTF compared with the National Death Index.⁷ The study cohort included all veterans with HIV as a discharge diagnosis, as indicated by ICD-9 codes V08 or 042-044, first hospitalized with HIV between October 1, 1996 (near the beginning of the HAART era) and September 30, 2000. Follow-up began on the

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date of admission of that hospitalization and ended at death or September 30, 2002.

We studied hospitalized patients for a number of reasons. First, as laboratory results are not included in the databases, we needed to be able to assess and adjust for HIV disease severity. We used the Severity Classification for AIDS Hospitalizations (SCAH), a method to assess HIV disease severity based on ICD-9 discharge diagnoses after hospitalization with HIV, which has been validated for both short-term and long-term survival.^{8,9} Second, we also needed to assess and adjust for comorbidities not related to HIV. For this, we relied on Deyo's modification of the Charlson index, which has also been validated in hospitalized patients.¹⁰ We separately adjusted for coinfection with HCV, defined by ICD-9 codes 070.51, 070.54, 070.41, 070.44, and V02.62 recorded between October 1, 1992 and September 30, 2001. We also assessed the primary discharge diagnosis, which was categorized as HIV, other infectious diseases, psychiatric/substance use, or other diagnoses, to further enhance the case-mix adjustment. Third, administrative data for inpatients, including the data for race/ethnicity, are more complete than for outpatients. We restricted the sample to first hospitalization to capture patients earlier in their disease course rather than later so that the results would be more reflective of chronic care received in the HAART era. We restricted the sample to first hospitalization with HIV by examining records back to October 1, 1989 and excluding all patients hospitalized with an HIV diagnosis before October 1, 1996.

The main outcomes were overall survival, hospital mortality (death during hospitalization or within 30 days of discharge), and long-term survival (survival among those who survived 30 days beyond discharge). Race was categorized as Hispanic, non-Hispanic black, and non-Hispanic white. Race/ethnicity is assigned in the database by patient self-report or as recorded in the medical record. Patients with other or unknown race/ethnicity were excluded.

We analyzed these outcomes in 3 ways: unadjusted comparisons of survival by race, multivariate analyses adjusted for differences in HIV disease severity (SCAH score), age (on a log scale to achieve a more normal distribution), sex, primary discharge diagnosis category, hepatitis C infection, and non-HIV-related comorbidities (Deyo score), and multivariate analyses that further adjusted for unmeasured facility effects and non-random distribution of patients by race across the VA facilities.

Univariate comparisons of categorical data were made with the χ^2 test, while comparisons of continuous data were made with analysis of variance. Unadjusted cumulative survival was estimated by the Kaplan-Meier method, and statistical significance was assessed with the log-rank test. Adjusted analyses were accomplished with logistic regression (hospital mortality) and Cox proportional hazard regression (overall and long-term survival). To adjust for unmeasured facility effects in the hospital mortality analyses, we used logistic regression with clustering at the facility level and the Huber/white/sandwich estimator of variance, a robust method for variance estimates that accounts for nonindependence of the data within each facility.¹¹ To adjust for unmeasured facility effects in the long-term mortality analyses, we used Cox proportional hazard modeling, fitted with shared frailty. This method computes a unique regression coefficient for each site that is fitted with maximization of the log-likelihood function. Thus, the variance within each facility was allowed to vary and was estimated as

part of the regression, adjusting for nonindependence of the data within each facility.¹² Univariate analyses and data management were performed with SAS (SAS Institute, Cary, NC). Regression analyses were performed with STATA (StataCorp, College Station, TX).

The study was approved by the Institutional Review Board for Baylor College of Medicine and Affiliated Hospitals and by the Michael E. DeBakey Veterans Affairs Research and Development Committee. As an analysis of administrative databases, individual informed consent was not required.

RESULTS

There were 6,710 patients with first HIV hospitalization between October 1, 1996 and September 30, 2000. We excluded 17 American Indian, 22 Asian, and 580 Hispanic patients, as well as 146 patients of unknown race. The excluded patients comprised 11.4% of the original sample.

There were 5,945 patients included in the study, hospitalized at 138 different facilities. Their baseline characteristics are presented in Table 1. About 61% of the study population was black and 39% was white. The black and white patients were of similar age and sex, although nearly the entire study population was male (98%). Black patients had more severe HIV disease and more non-HIV-related comorbidities, although the absolute differences were small. Consistent with national trends, black patients were more likely to be diagnosed with hepatitis C infection.¹³ Finally, compared with white patients, black patients were more often hospitalized with a psychiatric or substance use disorder as their primary diagnosis and less often hospitalized with "other" diagnoses as their primary diagnosis.

Four hundred and two patients, or 6.8%, died either as inpatients or within 30 days of discharge. The hospital mortality rate of blacks and whites was not statistically different (Table 2). In the multivariate analysis, black patients did not have significantly higher odds of hospital mortality compared with white patients (odds ratio (OR) 1.20, $P=.11$). Very similar results were obtained after adjusting for clustering at the facility level.

Table 1. Baseline Characteristics of the Cohort (n=5,945)

Characteristic (%)	White	Black	P value
	(n=2,304)	(n=3,641)	
Age (mean, SD)	46.5 (10.2)	46.0 (9.2)	0.09
Male sex (%)	98.1	97.5	0.08
Hepatitis C coinfection (%)	24.7	31.8	<0.001
Severity classification for AIDS hospitalizations score (%)			
1 < 2	71.1	70.5	0.03
2 < 3	16.8	15.2	
3 or >	12.1	14.2	
Non-HIV-related comorbidity score* (%)			
0	79.1	77.1	0.03
1	14.1	13.9	
2	4.0	5.6	
3 or >	2.8	3.4	
Primary discharge diagnosis category for index hospitalization (%)			
HIV	21.7	21.0	<0.001
Other infections	24.2	24.4	
Psychiatric/substance use	18.9	23.5	
Other	35.2	31.2	

*Does not include hepatitis C.

Table 2. Crude and Adjusted Hospital Mortality by Race/Ethnicity

Group	Crude Death Rate (%)	P value	Adjusted Odds Ratio of Death (95% Confidence Interval)	P value	Facility Adjusted Odds Ratio of Death (95% Confidence Interval)	P value
White (n=2,304)	6.4	Referent	Referent		Referent	
Black (n=3,641)	7.0	0.35*	1.20 (0.96 to 1.51)	0.11	1.20 (0.97 to 1.50)	0.10

*P value for 2×2 comparison with white patients with χ^2 test. Adjusted odds ratios are estimated from logistic regression models adjusted for age, sex, severity classification for AIDS hospitalizations score, non-HIV comorbidity score, primary discharge diagnosis category, and hepatitis C status. Facility-adjusted results are adjusted for the same variables as well as clustering at the facility level.

The average follow-up time per patient during the HAART era was 3.2 years. Unadjusted Kaplan-Meier curves showing overall and long-term survival by race are presented in Figure 1. There were no statistically significant differences between black and white patients, both for overall and long-term survival. Table 3 presents the results of the multivariate Cox proportional hazard analyses. White and black patients had similar overall and long-term survival, whether adjusted for clustering at the facility level or not.

We conducted a number of regression analyses to examine the robustness of these findings. First, we used a more conservative estimate of follow-up time, and censored persons at the time of last contact with the VA system. The results did not differ substantially from the results presented. Second, we adjusted for year of entry into the cohort, again with no substantial differences compared with the results presented. Finally, we compared the presented results with the results obtained when Hispanic patients were included in the analyses. The inclusion of the Hispanic patients had trivial effects on the estimates of the relative risks, confidence intervals, and P values for the black patients compared with the white patients.

DISCUSSION

To our knowledge, this is the largest study of survival by race of a U.S. population with HIV during the HAART era, excluding CDC surveillance data. We analyzed the data in 3 different ways. The first was an unadjusted analysis that compared survival by race, which would answer the question, "Is crude survival worse for black patients compared to white patients?" The second was an attempt to determine whether the survival for the 2 groups differed after adjusting for differences in HIV disease severity, age, and other characteristics. This analysis would answer the question, "Are there differences in survival for the population of black patients compared to white patients even after adjusting for disease severity, age, and other comorbidities?" The third analysis further adjusts for unmeasured characteristics at the level of the facility. These facility effects might include regional differences in the populations, local practice patterns, availability of HIV specialists, and access to research protocols. As some facilities care for more black patients than others, these unmeasured characteristics that cluster at the level of the facility may confound the relationship between race and survival. This analysis would answer the question, "Are there differences in survival for the individual black patient compared to white patients even after adjusting for disease severity, age, and other comorbidities, as well as clustering at the facility level?"

We found that among veterans using VA hospitals, black and white patients had similar overall, hospital, and long-term survival in all 3 analyses. While there may be a trend for black patients to have worse overall survival, the effect was relatively small and due to differences that emerged later in follow-up, when there were fewer data available (see Fig. 1). These observations warrant further study. In summary, however, we did not find statistically significant evidence for a disparity in survival by race for veterans, despite the relatively large sample and long follow-up included in this study.

FIGURE 1. Kaplan-Meier survival curves. (A) Overall cumulative survival of all patients (P value comparing black and white curves=.24). (B) Long-term cumulative survival of patients who did not die in the hospital or within 30 days of discharge (P value comparing black and white curves=.39).

Table 3. Adjusted Overall and Long-Term Survival by Race/Ethnicity

Group	Adjusted Hazard Ratio of Death (95% Confidence Interval)	P value	Facility-Adjusted Hazard Ratio of Death (95% Confidence Interval)	P value
Overall survival (all patients; n=5,931)*				
White	Referent		Referent	
Black	1.08 (0.99 to 1.19)	0.09	1.09 (0.99 to 1.21)	0.09
Long-term survival (patients who survived >30 days postdischarge; n=5,543)				
White	Referent		Referent	
Black	1.07 (0.96 to 1.19)	0.24	1.07 (0.96 to 1.20)	0.21

Adjusted hazard ratios are estimated from Cox proportional hazards models adjusted for age, sex, severity classification for AIDS hospitalizations score, non-HIV comorbidity score, primary discharge diagnosis category, and hepatitis C status. Facility-adjusted results are adjusted for the same variables as well as clustering at the facility level.

*Fourteen patients did not contribute to the analysis because the date of their death was on the day of admission.

These results are in contrast to national CDC data from the early HAART era demonstrating that black men who have sex with men with AIDS had poorer survival compared with white men who have sex with men with AIDS.³ Similarly, CDC data for all persons with AIDS demonstrate poorer long-term survival for black patients after an AIDS diagnosis.^{2,3} Why these worse outcomes have been observed is not clear, but data from outside the VA indicate that black patients are more likely to delay care for HIV,¹⁴ present with more advanced HIV disease,¹⁵ and are less likely to receive HAART.^{4,5}

The VA health care system, in contrast to most health care systems in the United States, has few barriers to care and provides care and prescription drugs at little or no cost, characteristics that may account for our findings. For example, data from the pre-HAART era showed that black patients hospitalized with *Pneumocystis pneumonia* in VA facilities did not receive less aggressive care compared with white patients, although they did in non-VA hospitals.¹⁶ Previous studies have not shown race-based differences in receipt of antiretroviral medications in the VA.^{17,18} Survival and type of care received have also been found not to differ by race among veterans hospitalized with other diseases.^{19–21} Our results are consistent with studies of the outcomes of populations with HIV cared for in countries with universal health care.^{22,23} It is possible that the more universal access of the VA system minimizes the differential access to care and prescription medications that correlate with race.

Our results differ from those of a previous VA study. McGinnis et al.¹⁷ analyzed the data of 5,676 patients with HIV, and found that mortality was worst for Hispanic and black patients, and best for white patients. There are a number of important methodologic differences between these studies. Their study included persons with an HIV diagnosis recorded at an inpatient or outpatient encounter, only included patients with a first HIV diagnosis in the VA between June 1999 and September 2001, did not distinguish between hospital mortality and long-term survival, had a median follow-up of 1.9 years, and adjusted only for age. These differences make it difficult to compare the results of their study and our study.

This study has certain limitations. Our adjustment for HIV disease severity did not include data on CD4 cell counts, which may be a better marker of disease severity than the SCAH. However, the SCAH has been validated for both in-hospital and long-term survival.^{8,9} Further, the SCAH score was a

significant predictor of survival in all of the present analyses (data not shown). We also do not have data from non-VA facilities, and as a result may not have excluded all patients with a prior hospitalization. However, our primary outcome of interest, death, was accurately captured. We could not adjust for exposure to HAART, although, as noted, previous studies have not shown race-based differences in receipt of antiretroviral medications in the VA.^{17,18} Data on the cause of death were not available. The results may not be generalizable to women as the study included very few women. We assembled the cohort based on a hospitalization that may have occurred some time after first HIV diagnosis. Residual confounding related to duration of infection could be present, and the results may not be generalizable to persons never hospitalized for HIV. Finally, preliminary data analyses showed that the number of Hispanic patients who could be included in this study was relatively small and the results for this population were not stable to various sensitivity analyses. Given the small sample size of the Hispanic patients and the unstable findings, we were unable to present data for this group.

This study has a number of important strengths. It includes a large number of patients from across the U.S., all cared for in the HAART era. The duration of follow-up was relatively long, averaging over 3 years per patient. As a result, the study had an 80% power (with $\alpha=0.05$) to detect a hazard ratio in overall mortality as low as 1.14 for the black-white comparison. We were also able to adjust for important factors, including HIV disease severity and non-HIV comorbidities as well as facility effects, unlike studies conducted with CDC data. The findings of the study were generally robust to various sensitivity analyses.

This cohort study of nearly 6,000 veterans with HIV found little indication that black VA patients have worse survival than white patients, in contrast to other national data from the United States. The lack of disparities in survival for racial minority patients with HIV in the VA may indicate similar effectiveness of care for HIV. Further research is needed to understand the reasons for the lack of disparities for VA patients with HIV and whether the VA's results could be replicated.

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