Racial Differences in the Evaluation and Treatment of Hepatitis C Among Veterans: A Retrospective Cohort Study

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Objectives. We examined the association between race and hepatitis C virus (HCV) evaluation and treatment of veterans in the Northwest Network of the Department of Veterans Affairs (VA).

Methods. In our retrospective cohort study, we used medical records to determine antiviral treatment of 4263 HCV-infected patients from 8 VA medical centers. Secondary outcomes included specialty referrals, laboratory evaluation, viral genotype testing, and liver biopsy. Multiple logistic regression was used to adjust for clinical (measured through laboratory results and *International Classification of Diseases, Ninth Revision*, codes) and sociodemographic factors.

Results. Blacks were less than half as likely as Whites to receive antiviral treatment (odds ratio [OR] = 0.38; 95% confidence interval [CI] = 0.23, 0.63). Both had similar odds of referral and liver biopsy. However, Blacks were significantly less likely to have complete laboratory evaluation (OR = 0.67; 95% CI = 0.52, 0.88) and viral genotype testing (OR = 0.68; 95% CI = 0.51, 0.90).

Conclusions. Race is associated with receipt of medical care for various medical conditions. Further investigation is warranted to help understand whether patient preference or provider bias may explain why HCV-infected Blacks were less likely to receive medical care than Whites. (*Am J Public Health.* 2008;98: 846–852. doi:10.2105/AJPH.2007.113225)

Hepatitis C virus (HCV) is the leading chronic blood-borne pathogen in the United States, infecting approximately 2.7 million Americans.[1] In response to several reports indicating that HCV was more common among veterans than among the general US population,[2–6] the Department of Veterans Affairs (VA) conducted a nationwide survey of HCV infection among veterans who used VA facilities; it found that prevalence was at least twice as high among veterans.[7] This increased prevalence, which was found to be associated with traditional risk factors of infection (e.g., transfusion, intravenous drug use) likely to be more common among users of VA facilities, left the VA facing significant challenges in providing medical care for this population.

Antiviral therapy has improved over the past decade, especially with the introduction of interferon and ribavirin combination therapy.[8–13] However, because these antiviral treatments have several contraindications, only 13% to 30% of infected individuals are eligible for therapy.[14–16] Furthermore, because of possible side effects, long antiviral treatment duration, limited efficacy, and high antiviral treatment cost, many choose not to be treated.[15]

Black Americans are twice as likely to be infected with HCV as White Americans[1] and have several characteristics associated with lower treatment response rates (e.g., greater transcriptional response to interferon, high frequency of genotype 1 infection, high Histological Activity Index[17] scores, increased weight, increased iron stores).[1,18–20] Blacks have also been shown to be less likely to respond to interferon monotherapy.[21–23] Although there is some evidence to suggest that combination therapy at least partially eliminates this difference,[19] more recent studies have reported that Whites are more likely than are Blacks to have sustained response to peginterferon alfa-2b and ribavirin.[24–26] Nevertheless, antiviral treatment remains recommended for HCV-infected individuals regardless of race.[27]

In the VA, Blacks have been found to be less likely than Whites to undergo diagnostic imaging and treatment for a variety of conditions, including cerebrovascular disease, peripheral vascular disease, esophageal cancer, and psychosis.[28–33] Provider racial bias, clinical factors, sociodemographic factors (race, economic status, marital status, homelessness, etc.), or patient preference for medical treatment could explain these observed differences. However, race was not associated with delay in seeking care or with attitudes, beliefs, and experiences related to cardiac care at VA facilities.[34,35] Because the VA system has a relatively homogeneous patient population with regard to sociodemographic status and is an equal access health care system, sociodemographic factors are less likely to be involved in racial differences associated with treatment than in private sector health care.

Because treatment decisionmaking for HCV infection is complex, involving several clinical and sociodemographic factors, treatment practices are relatively subjective, allowing potential biases to become more evident. Furthermore, the substantial risk of side effects, combined with the incomplete viral response to therapy, results in some patients electing to defer therapy. We sought to determine whether there were racial differences in the evaluation and treatment for HCV in the VA system.

METHODS

Database

Patients were identified through the VA Consumer Health Information and Performance Sets database, which included clinical and administrative medical records from each of the 8 VA medical centers of the Northwest Network: Anchorage, Alaska; Boise, Idaho; Portland, White City, and Roseburg, Oregon; and Puget Sound (Seattle and Tacoma), Spokane, and Walla Walla, Washington. Liver biopsy results were available only for patients treated at the VA Puget Sound facility (where

75% of all Black veterans' liver biopsies were performed) through manual review of medical records. For logistical reasons, liver biopsies from the remaining facilities were not available.

Study Population

Because only those patients with documented viremia are eligible for antiviral treatment, we identified all veterans (n=5460) with a positive HCV polymerase chain reaction (PCR) test result from January 1, 2000, to December 31, 2002 (enrollment period). In general, patients were first tested with an HCV antibody test, which, if positive, was routinely confirmed with a PCR test. Among the patients with a positive antibody test result for HCV during the study period, 92% of Blacks and 89% of Whites had confirmatory PCR testing. The date of the first PCR positive result during the enrollment period was defined as the date of study entry. Additional clinical data from January 1, 1994, to December 31, 2003, were extracted to determine comorbidities and outcomes.

Patients with 1 or more of the following absolute contraindications[36] to antiviral therapy at any time up to the end of the study were excluded (n=673): (1) an inpatient or outpatient diagnosis of malignant neoplasms (excluding nonmelanoma skin cancer; n=497); (2) any solid organ transplantation (n=159); (3) decompensated cirrhosis (i.e., esophageal varices, hepatic coma, portal hypertension, hepatorenal syndrome, or ascites; n=65). These contraindications were identified with *International Classification of Disease, Ninth Revision* (*ICD-9*),[37] diagnostic and procedure codes and current procedural terminology[38] codes.

Patients previously treated with interferon monotherapy were eligible for entry into the study (n=41). However, we excluded veterans whose prior treatment included ribavirin (n=49), because retreatment after failure with interferon–ribavirin combination therapy was not recommended[39] during the period of the study. We excluded veterans who died (n=406) or did not have any clinic or hospital visits during the study period (n=107), leaving 4263 patients in our final cohort.

Race/ethnicity was grouped into 4 categories, White (n=2523), Black (n=422), Hispanic or other (Hispanic, Asians, American Indian, Alaska Natives, and Hawaiian/Pacific Islanders; n=132), and unknown (n=1186). In general, clerical staff recorded race at the time of registration; however, this was not always completed. To validate the race information in the VA databases, we used data from a study of 34789 veterans who self-reported race as part of a previously published study[40] (David Au, MD, VA Puget Sound Health Care System, written communication, June 14, 2007). On the basis of self-reported race in this earlier study, we determined that the racial distribution among those classified as "unknown race" (26.1%) was the same as the distribution among those with known race in the VA database, indicating that race information was unlikely to be missing in a biased manner.

Outcome Variables

The primary outcome measure was any prescription during the enrollment period or subsequent year for anti-HCV medications (i.e., interferon alpha, pegylated interferon alpha, or ribavirin). Secondary outcome measures, reflecting intermediate steps in the treatment decision, were measured during the enrollment period plus 1 year following; they included (1) referral to a specialty clinic (defined as the scheduling of an appointment to see a specialist in gastroenterology or infectious disease, whether or not patient attended), (2) liver biopsy (identified through inpatient and outpatient *ICD-9* procedure codes, current procedural terminology codes, and surgical specimen descriptions), (3) complete laboratory evaluation (defined as test results for all of the following: white blood cell count, hemoglobin concentration, platelet count, serum creatinine, serum bilirubin, serum alanine aminotransferase, prothrombin time–international normalized ratio, and serum albumin), and (4) viral genotype testing.

Clinical and Sociodemographic Variables

ICD-9 diagnostic and procedure codes, Current Procedural Terminology codes, and laboratory data were used to identify clinical and sociodemographic variables that may have influenced the decision to treat HCV with antiviral therapy.[36] Compensated cirrhosis was identified through codes for alcoholic, nonalcoholic, or biliary cirrhosis. Abnormal laboratory test results within 1 year prior to and 3 months following study entry were defined with the criteria shown in Table 1. Serum alanine aminotransferase levels were evaluated within 5 years prior to study entry and were classified as ever elevated (≥40 U/L) or normal. HIV infection was defined by a diagnosis of HIV or a positive HIV laboratory test result. Individuals with compensated cirrhosis, abnormal laboratory test results, persistently normal serum alanine aminotransferase, or HIV infection as defined here were considered to have contraindications to treatment.

Viral genotype was grouped by expected antiviral treatment outcome: genotype 1 or 4 (more resistant to antiviral treatment) and genotype 2 or 3 (more susceptible to antiviral treatment). Liver fibrosis was categorized as follows: 0 (no fibrosis), 1 (portal fibrosis), 2 (periportal fibrosis with few septae), 3 (bridging fibrosis), and 4 (cirrhosis). For assessment of comorbidity, the Charlson index[41,42] was adapted to the database. Psychological disorders were categorized as previously described[43] and combined into 3 variables: (1) psychosis or bipolar disorder, (2) posttraumatic stress or anxiety disorder, and (3) depression. We examined both current psychiatric diagnoses (i.e., a diagnosis within 1 year of study entry) and those given prior to study entry. Because both of these analyses yielded similar results, only data from the latter are presented here. The presence of alcohol or drug abuse was defined by *ICD-9* codes or a positive blood or urine test.

Age at entry was categorized as shown in Table 1. The medical facility was defined as the most frequently visited site during the 5 years prior to the patient's study entry. Homelessness and poverty were defined by *ICD-9* codes. Priority status for VA health care indicated the level of compensation given to a veteran as determined by the number of the veteran's health conditions related to military service (i.e., military service–related connection) and income (i.e., means test); it was grouped into 5 categories: service-connected disability, below means test, compensable, above means test, and unknown. The number of appointments at any of the 8 facilities within 1 year prior to study entry was determined as a measure of VA health care utilization. Patient referral to either a gastroenterology or infectious disease specialty clinic

TABLE 1—Demographic and Clinical Characteristics of Veterans Viremic for Hepatitis C, by Racial/Ethnic Group (n = 4263): Department of Veterans Affairs Northwest Network, January 1, 2000 to December 31, 2002

	White, No. (%)	Black, No. (%)	Hispanic/Other, No. (%)
Age at entry, y			
<40	189 (7.5)	23 (5.5)	8 (6.1)
40–49	1363 (54.0)	249 (59.0)	73 (55.3)
50–59	850 (33.7)	133 (31.5)	41 (31.2)
≥60	121 (4.8)	17 (4.0)	10 (7.6)
Men	2456 (97.3)	414 (98.1)	128 (97.0)
Facility[a]			
A	841 (33.3)	269 (63.7)	70 (53.0)
B	95 (3.8)	25 (5.9)	5 (3.8)
C	154 (6.1)	4 (1.0)	3 (2.3)
D	439 (17.4)	50 (11.9)	26 (19.7)
E	275 (10.9)	8 (1.9)	7 (5.3)
F	191 (7.6)	13 (3.1)	5 (3.8)
G	192 (7.6)	4 (1.0)	10 (7.6)
H	336 (13.3)	49 (11.6)	6 (4.6)
Homeless or with inadequate housing[a]	1057 (41.9)	250 (59.2)	57 (43.2)
Married[b]	696 (27.6)	93 (22.0)	42 (31.8)
Priority status			
Service-connected disability	1050 (41.6)	173 (41.0)	58 (43.9)
Below means test	1113 (44.1)	167 (39.6)	44 (33.3)
Compensable	19 (0.8)	5 (1.2)	0 (0)
Above means test	120 (4.8)	18 (4.3)	11 (8.3)
Unknown[b]	221 (8.8)	59 (14.0)	19 (14.4)
Poverty[b]	585 (23.2)	165 (39.1)	32 (24.2)
Year of entry into study			
2000[a]	690 (27.4)	139 (32.9)	46 (34.9)
2001	1052 (41.7)	133 (31.5)	48 (36.4)
2002[a]	781 (31.0)	150 (35.6)	38 (28.8)
No. appointments, median[a]	14 (7, 27)	19 (9, 36)	13 (6, 25)
Depression	1631 (63.9)	265 (62.8)	77 (58.3)
Posttraumatic stress, anxiety	1616 (64.1)	248 (58.8)	78 (59.1)
Bipolar, psychotic	769 (30.5)	130 (30.8)	29 (22.0)
Alcohol/drug abuse	1971 (78.1)	347 (82.2)	97 (73.5)
Comorbidity score			
0	1154 (45.7)	175 (41.5)	62 (47.0)
1	777 (30.8)	117 (27.7)	43 (32.6)
≥2[b]	592 (23.5)	130 (30.8)	27 (20.5)
HIV infection	146 (5.8)	24 (5.7)	7 (5.3)
Compensated cirrhosis[b]	272 (10.8)	28 (6.6)	17 (12.9)
Laboratory tests			
White blood cells < 3000 per mm^3	55 (2.2)	8 (1.9)	5 (3.8)
Hemoglobin < 13 g/dL (men) or <12 g/dL (women)	316 (12.5)	64 (15.2)	22 (16.7)
Platelet count < 75 000 per mm^3[b]	97 (3.8)	6 (1.4)	6 (4.6)
Creatinine ≥ 1.5 mg/dL[a]	69 (2.7)	25 (5.9)	6 (4.6)

Continued

and patient adherence was grouped into 1 variable with 3 categories: never referred to an appointment, referred but never attended an appointment, and referred to and attended at least 1 appointment.

Data Analysis

We extracted data from computerized medical records using specific key terms and exported the data into Stata 8.0 statistical software (StataCorp LP, College Station, Tex). Race/ethnicity and clinical or sociodemographic characteristics were compared by the χ^2 or Wilcoxon rank sum test. We used multiple and conditional logistic regression (grouped by facility) to determine the association between race and outcome variables, adjusted for demographic variables (i.e., age, gender, facility, homelessness, marital status, priority status, poverty, year of entry into the study, number of appointments 1 year prior to entry [log transformed]) and clinical variables (i.e., psychiatric diagnoses, alcohol or drug abuse, comorbidity, HIV status, cirrhosis, and each laboratory test [except those tests that included a complete laboratory evaluation as the outcome]).

We used conditional logistic regression to account for the possibility that there may have been facility-specific determinates for treatment. Because the results of conditional logistic regression were similar to those of standard logistic regression, only the latter values are presented. The influence of genotype on the association between race/ethnicity and antiviral treatment was also evaluated by multiple and conditional regression; this evaluation was limited to those for whom viral genotypes (genotype 1 or 4 vs genotype 2 or 3) were available. Patients with unknown race were excluded from all regression analyses. Because race information was missing for 28% of the patients, in an additional analysis, we imputed race using chained equations.[44] We performed standard logistic regression with the same covariates on the imputed data sets (n = 10) and combined the results using the command "micombine."[44]

RESULTS

Characteristics of the Study Population

Overall, 536 of 4236 patients (12.6%) were treated during a mean of 873 days of follow-up (range = 366–1459 days). Mean

TABLE 1—*Continued*

Bilirubin ≥ 1.5 g/dL	155 (6.1)	21 (5.0)	10 (7.6)
Alanine aminotransferase ≥ 40 U/L	2230 (88.4)	356 (84.3)	117 (88.6)
PT-INR ≥ 1.5	69 (2.3)	9 (2.1)	7 (5.3)
Albumin ≤ 3.4 g/dL	249 (9.9)	39 (9.2)	14 (10.6)
Referral/adherence[a]			
No referral	658 (26.1)	146 (34.6)	31 (23.5)
Referred but did not attend any appointment	290 (11.5)	56 (13.3)	14 (10.6)
Referred and attended at least 1 appointment	1575 (62.4)	220 (52.1)	87 (65.9)

Note. PT-INR = prothrombin time–international normalized ratio. Numbers may not add up to total because of missing data or rounding. "Unknown race" (n = 1186) is not shown.
[a]Characteristic is significantly different for Blacks vs Whites ($P < .001$). Percentages refer to percentiles.
[b]Characteristic is significantly different for Blacks vs Whites ($P < .05$).

time between HCV RNA detection and antiviral treatment was 309 days and did not differ by race. Blacks (n=422) and Whites (n=2523) were similar in age, gender, psychiatric disease, alcohol or drug abuse, HIV infection, white blood cell counts, hemoglobin concentration, serum bilirubin concentration, serum alanine aminotransferase concentration, prothrombin time–international normalized ratio, and serum albumin concentration (Table 1).

However, significantly greater proportions of Blacks than of Whites were homeless ($P<.001$), were not married ($P=.003$), had unknown priority status ($P=.009$), had defined poverty status ($P=.002$), entered the study in 2000 or 2002 ($P<.001$), had a comorbidity score of 2 or more ($P=.005$), had no cirrhosis ($P=.009$), had normal platelet counts ($P=.012$), and had abnormal creatinine levels ($P=.001$). Blacks also had a greater median number of appointments in the 5 years prior to the study than did Whites (19 vs 14; $P<.001$). However, they were less likely to get a referral to a specialty clinic ($P<.001$) and, among those who did get a referral, were less likely to attend an appointment than were Whites ($P<.030$). Because Blacks were more likely to be seen in more-urban facilities, a significant difference in medical facilities visited by Blacks and Whites was observed ($P<.001$).

Race and Antiviral Treatment

Blacks were significantly less likely to receive antiviral treatment for hepatitis C than were Whites (4.5% vs 13.7%) in both unadjusted ($P<.001$) and adjusted ($P<.001$) analyses (Table 2). Unadjusted analyses also indicated that Blacks had significantly lower frequencies of referral to a specialty clinic, liver biopsy, complete laboratory evaluation, and viral genotyping (Table 2). After adjustment for clinical and sociodemographic factors, Blacks remained significantly less likely than Whites to receive complete laboratory evaluation and to have their viral genotype ascertained. When the analysis was restricted to those with neither absolute nor relative contraindications (n=1845), Blacks were still less likely than were Whites to receive treatment (adjusted odds ratio [OR]=0.32; 95% confidence interval [CI]=0.15, 0.65; $P=.002$). When the analysis was repeated with all study participants of unknown race reclassified as Black, Blacks were less likely to be treated than were Whites (10.8% vs 13.7%; $P=.006$). When missing race was imputed and the analysis was repeated, Blacks were again significantly less likely than were Whites to be treated (OR=0.54; 95% CI=0.33, 0.89; $P=.016$).

Among those who had their virus genotyped (n=1340), Blacks were more likely

TABLE 2—Evaluation and Antiviral Treatment of Veterans Viremic for Hepatitis C, by Race/Ethnicity: Department of Veterans Affairs Northwest Network, January 1, 2000 to December 31, 2002

	No. (%)	OR (95% CI)	AOR[a] (95% CI)
Specialty clinic referral			
White (Ref)	1865 (73.9)	1.00	1.00
Black	276 (65.4)	0.74 (0.57, 0.96)	0.91 (0.68, 1.21)
Hispanic and other	101 (76.5)	1.09 (0.67, 1.78)	1.22 (0.72, 2.02)
Complete laboratory evaluation			
White (Ref)	716 (28.4)	1.00	1.00
Black	99 (23.5)	0.77 (0.61, 0.98)	0.67 (0.52, 0.88)
Hispanic and other	48 (36.4)	1.44 (1.00, 2.08)	1.34 (0.90, 1.98)
Genotype evaluation			
White (Ref)	770 (30.5)	1.00	1.00
Black	95 (22.5)	0.77 (0.61, 0.98)	1.44 (1.00, 2.08)
Hispanic and other	40 (30.3)	0.67 (0.52, 0.88)	1.34 (0.90, 1.98)
Liver biopsy			
White (Ref)	449 (17.8)	1.00	1.00
Black	51 (12.1)	0.63 (0.47, 0.87)	0.78 (0.55, 1.10)
Hispanic and other	28 (21.2)	1.24 (0.81, 1.91)	1.30 (0.82, 2.08)
Antiviral treatment			
White (Ref)	345 (13.7)	1.00	1.00
Black	19 (4.5)	0.30 (0.19, 0.49)	0.38 (0.23, 0.63)
Hispanic and other	18 (13.6)	1.00 (0.60, 1.66)	1.26 (0.71, 2.25)

Note. AOR = adjusted odds ratio; OR = odds ratio; CI = confidence interval. Whites, n = 2523; Blacks, n = 422; Hispanic and other, n = 132.
[a]Adjusted for age, gender, facility, homelessness, marital status, priority, poverty, year, appointments (log transformed), psychiatric diagnoses, alcohol or drug abuse, comorbidity, HIV, cirrhosis, each laboratory test (white blood cell count, hemoglobin, platelet count, creatinine, bilirubin, alanine aminotransferase, prothrombin time–international normalized ratio, albumin), and referral and adherence. "Unknown race" is not shown.

TABLE 3—Race/Ethnicity as a Predictor of Antiviral Treatment Among Veterans Viremic for Hepatitis C (n = 1340) Whose Viral Genotype Was Known, After Adjustment for Genotype: Department of Veterans Affairs Northwest Network, January 1, 2000 to December 31, 2002

Variable	Antiviral Treatment, No. (%)	Adjusted OR[a] (95% CI)
Race/ethnicity		
White (Ref)	345 (34.2)	1.00
Black	19 (14.6)	0.53 (0.27, 1.01)
Hispanic or other	18 (45.0)	2.07 (0.98, 4.45)
Genotype		
2 or 3 (Ref)	162 (40.0)	1.00
1 or 4	248 (27.5)	0.48 (0.34, 0.67)

Note. OR = odds ratio; CI = confidence interval.
[a]Adjusted for age, gender, facility, homelessness, marital status, priority, poverty, year, appointments (log transformed), psychiatric diagnoses, alcohol or drug abuse, comorbidity, HIV, cirrhosis, each laboratory test (white blood cell count, hemoglobin, platelet count, creatinine, bilirubin, alanine aminotransferase, prothrombin time–international normalized ratio, albumin), and referral and adherence. "Unknown race" is not shown.

than were Whites to be infected with viral genotype 1 or 4 (91.6% vs 66.5%; $P<.001$). Because of the unequal distribution of viral genotype among race categories and because this may have influenced the decision to provide or receive antiviral treatment, a subgroup analysis was conducted that examined the effect of viral genotype on the association between race and antiviral treatment. Those with genotype 1 or 4 were significantly less likely to receive antiviral treatment ($P<.001$; Table 3). A trend for lower treatment rates for Blacks remained after adjustment for genotype and covariates as in the previous analyses ($P=.053$; Table 3).

Finally, to assess whether race was associated with liver fibrosis, another determinant of the appropriateness of treatment, we examined liver biopsy results from 38 Black and 138 White patients at the VA Puget Sound facility. Both races had a median fibrosis stage of 1, indicating portal fibrosis ($P=.25$). Moreover, no fibrosis or only portal fibrosis was found in 66% of Blacks and 66% of Whites.

DISCUSSION

Racial Disparity

Our study demonstrates that Black veterans in the Northwest network with chronic HCV are significantly less likely to have their virus genotyped, receive complete laboratory evaluation, and receive antiviral treatment than are White veterans after adjustment for measured clinical and sociodemographic characteristics. Differences in HCV genotype distribution did not explain this racial disparity in antiviral treatment rates. Although the adjusted estimates of the association between Black race and specialty referral and liver biopsy did not reach statistical significance, each step in the progression to antiviral treatment revealed a trend or significantly lower odds of Blacks receiving care. In our study, which expands on results from a previous report that demonstrated lower treatment rates for Black veterans,[45] we added an analysis of the steps leading up to the treatment decision. Moreover, our database contains laboratory results that allow confirmation of viremia and adjustment for relevant laboratory abnormalities that would affect the treatment decision process.

Similar to what was found in other studies, we found that a relatively small proportion (13%) of HCV-infected patients were treated during the study period. Cawthorne et al.[14] reported that only 14% of infected St. Louis veterans received antiviral treatment, and a Cleveland specialty clinic found that 28% were treated.[15] In the latter study, 11% were considered ineligible because they declined antiviral treatment after considering possible side effects, cost, and length of treatment. It is important to note that the study, unlike Cawthorne et al.'s and ours, did not include the relatively high proportion of patients who are not referred or who failed to attend their consultation appointment. Interestingly, one study found that only 41% of patients who received a referral sought additional medical care (e.g., blood tests or liver ultrasound[46]). The primary reason survey participants gave for failure to follow up was that they "did not want more bad news." Nevertheless, 27% of veterans in our study had no evidence of a specialist referral during the study period. Therefore, consideration should be given to the development of system-level interventions to ensure that all patients with HCV are properly notified and educated about their diagnosis and referred to a specialist, as appropriate.

Possible Explanations

There are several possible explanations for the disproportionate treatment rates seen in our study, including provider bias, patient preference, and other unmeasured clinical factors. Black patients and their providers may have been discouraged from pursuing antiviral treatment because of the disappointing results of both interferon monotherapy studies,[21–23] despite more-recent evidence suggesting that the combination therapy is more-equally efficacious for Blacks and Whites.[19] Although several reports eventually demonstrated that a smaller proportion of Blacks had sustained response to peginterferon alfa-2b and ribavirin compared with Whites,[24–26] these data were not available until well after treatment decisions were being made for the patients in our study. To help adjust for the wide range of attitudes providers may have had regarding treatment, we used conditional logistic regression, grouped by facility. Nevertheless, we would have expected that Black veterans would have been equally likely to undergo many of the preliminary steps in the evaluation and management of HCV. The finding that Blacks were significantly less likely to undergo laboratory evaluation and genotyping, and had a trend toward receiving less referrals to specialists, suggests that there are racial differences in care that may not be easily attributable to differences in the absolute rate of sustained virological response to antiviral therapy.

Second, it is conceivable that patient preference for treatment varies by race. Therapy for HCV is complicated and toxic, leading some patients to decline treatment because of concerns about side effects, work demands, or lack of social support, or simply to wait for better treatment options. Because we were to able to adjust for patient referral and patient adherence (i.e., attendance at appointments), our results show that regardless of racial differences in these

categories, Blacks are still less likely to receive antiviral treatment for HCV than are Whites. Thus, provider bias or a difference in patient preference that influences treatment decisions occurred after patients attended the referral appointment.

Third, other unmeasured covariates could explain the racial differences in treatment. Because mild or no fibrosis is regarded by some physicians as evidence that antiviral treatment may not be necessary, it is possible that Blacks were less likely to be treated because of lower rates of worrisome histology. However, we found no racial difference in the distribution of fibrosis stage among the sample of veterans who underwent biopsies at the facility where over three quarters of all biopsies on Black veterans were performed. Moreover, we attempted to adjust for liver function by taking into account several laboratory test results that reflect liver status. Any potential difference in liver morphology between Blacks and Whites was not likely to be large enough to account for the strong association observed in our study. Although missing or inaccurate information on race could have produced misclassification bias, it would be more likely to result in less evidence of racial differences. On the basis of self-reported race from another VA study, however, we did not observe any bias regarding missing race (see "Study Population" of "Methods" section).

In addition, our study included a 1-year follow-up to allow sufficient time for the evaluation process to occur. There was no evidence that this process took longer for Blacks than for Whites. Furthermore, we reanalyzed the data imputing the missing race data or reclassifying those with unknown race as Black; both reanalyses gave similar results, suggesting that the unknown race category is unlikely to be responsible for the observed outcome. Finally, we cannot exclude the possibility that residual confounding of comorbidities, relative contraindications, or other factors influenced our results.

Furture Directions

Because our study found that Blacks were approximately one third as likely as Whites to be treated for HCV infection, future studies are warranted to explore the source for this difference. It remains unclear whether this difference reflects true disparity or bias as defined by Rathore et al.[47] and whether Blacks are undertreated. Racial differences exist for some, but not all, disease treatment at VA facilities. For example, previous studies in the VA and military medical facilities have not found racial differences in either colon or prostate cancer treatment.[48,49] Perhaps because the treatment decision processes for these diseases are more straightforward, there is less room for bias or patient preference to play a role. Because our study focused on veterans receiving care from the Northwest, our findings may not be generalizable to the entire VA system or the medical community at large.

As more racial differences in health care are identified, there is a growing need to identify the cause of these differences and, if appropriate, methods to remedy them.[50,51] However, many studies have not been able to exclude the possibility that clinical factors or sociodemographic factors are responsible. A key strength of our study was our ability to adjust for important clinical and sociodemographic variables on the basis of both laboratory results and diagnostic codes. By so doing, we provided enough evidence of racial inequity with respect to HCV evaluation and antiviral therapy to merit further investigation. One example would be the evaluation of patient education and empowerment methods such as patient navigators[52,53] and focus groups. Furthermore, conjoint analysis can be used to evaluate patient views on HCV treatment.[54] These studies might lead to educational or other interventions at the patient, provider, or system level, encouraging a more equitable distribution of health care for this disproportionately affected population. ■

About the Authors

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Contributors

C.M. Rousseau synthesized the analyses and led the writing. G.N. Ioannou, J.A. Todd-Stenberg, and K.L. Sloan assisted with the study design and analyses. M.F. Larson assisted with data management and statistical analysis. C.W. Forsberg assisted with statistical analysis. J.A. Dominitz conceptualized the study and supervised all aspects of its implementation. All authors helped to conceptualize ideas, interpret findings, and review drafts of the article.

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The study protocol was approved by the University of Washington institutional review board and the VA Puget Sound research and development committee.

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