Awareness of Hepatitis C Infection Among Women With and At Risk for HIV

Mardge H. Cohen^{1,2,3}, Dennis Grey⁴, Judith A. Cook⁴, Kathryn Anastos⁵, Eric Seaberg⁶, Michael Augenbraun⁷, Pam Burian⁸, Marion Peters⁹, Mary Young¹⁰, and Audrey French^{1,2,3}

¹CORE Center, Cook County Bureau of Health Services, Chicago, IL, USA; ²Department of Medicine, Stroger (formerly Cook County) Hospital, Chicago, IL, USA; ³Department of Medicine, Rush Medical College, Chicago, IL, USA; ⁴Department of Psychiatry, University of Illinois at Chicago, Chicago, IL, USA; ⁵Epidemiology, Population Health & Medicine, Montefiore Medical Center, Bronx, NY, USA; ⁶Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA; ⁷Health Science Center of Brooklyn, State University of New York, Brooklyn, NY, USA; ⁸AIDS Healthcare Foundation, Los Angeles, CA, USA; ⁹University of California of SF, San Francisco, CA, USA; ¹⁰Department of Medicine, Georgetown Medical Center, Washington, DC, USA.

BACKGROUND: Treatment guidelines recommend all HIV/HCV-co-infected persons be considered for hepatitis C virus (HCV) treatment, yet obstacles to testing and accessing treatment for HCV continue for women.

OBJECTIVE: To assess awareness of HCV, and describe diagnostic referrals and HCV treatment among women in the Women's Interagency HIV Study (WIHS).

DESIGN: Prospective epidemiologic cohort.

PARTICIPANTS: Of 3,768 HIV-infected and uninfected women in WIHS, 1,166 (31%) were HCV antibody positive.

MEASUREMENTS AND MAIN RESULTS: Awareness of HCV infection and probability of referrals for diagnostic evaluations and treatment using logistic regression. Follow-up HCV information was available for 681 (390 died, 15 withdrew, 80 missed visit) in 2004. Of these 681, 522 (76.7%) reported knowing their HCV diagnosis. Of these, 247 of 522 (47.3%) stated their providers recommended a liver biopsy, whereas 139 of 247 or 56.3% reported having a liver biopsy. A total of 170 of 522 (32.6%) reported being offered treatment and 74.1% (n=126 of 170) reported receiving HCV treatment. In multivariate regression analyses, African-American race, Hispanic/Latina ethnicity, poverty, and current crack/cocaine/heroin use were negatively associated with treatment referrals, whereas elevated alanine aminotransferase (ALT) was associated with increased likelihood of referral and increased likelihood of treatment.

CONCLUSION: One quarter of women with HCV in this cohort were not aware of their diagnosis. Among those aware of their HCV, 1 in 4 received liver biopsy and treatment for HCV. Both provider and patient education interventions regarding HCV testing and HCV treatment options and guidelines are needed to enhance HCV awareness and participation in HCV evaluation and treatment.

KEY WORDS: women; hepatitis C; HIV; race; drug use; therapy.

J Gen Intern Med 22(12):1689-94

DOI: 10.1007/s11606-007-0395-x

© Society of General Internal Medicine 2007

Chronic hepatitis C is a leading cause of morbidity and mortality from end-stage liver disease and hepatocellular carcinoma. According to the National Health and Nutrition Examination Survey, more than 4 million persons in the United States (1.6% of the total population) have antibodies to hepatitis C virus (HCV), more than 3.2 million of whom are estimated to have chronic hepatitis C.¹ African-American women in their fifth decade have the highest rate (~6%) of HCV among women.

As a result of shared routes of transmission, HCV infection is common among HIV-infected persons in the United States.^{2,3} Prevalence rates vary depending on rates of injection drug use, sexual transmission, geography, and origin of cohort. For example, veterans on antiretroviral therapy for HIV infection had a co-infection rate of 37%, whereas an urban homeless HIV-infected cohort in San Francisco had a co-infection rate of 73%. Screening of former opiate or heroin addicts currently in methadone maintenance treatment demonstrated a co-infection rate of 26%.⁴⁻⁶ HCV has emerged as a significant cause of morbidity and mortality among HIV-infected persons and is expected to become more significant over time.⁷

Since 2004, HCV screening and treatment guidelines have recommended targeting populations likely to be unaware of their infection, especially those who are at higher risk for infection or with obstacles to accessing treatment.⁸ With antiretroviral therapy prolonging the lives of persons with HIV and advances in treatment for HCV, treatment guidelines

Part of this work was presented at the XV International AIDS Conference, July 11, 2004.

The WIHS centers (Principal Investigators) are located at New York City/Bronx Consortium (Kathryn Anastos); Brooklyn, NY (Howard Minkoff); Washington DC Metropolitan Consortium (Mary Young); the Connie Wofsy Study Consortium of Northern California (Ruth Greenblatt); Los Angeles County/Southern California Consortium (Alexandra Levine); Chicago Consortium (Mardge Cohen); Data Coordinating Center (Stephen Gange).

Received March 28, 2007

Revised September 7, 2007

Accepted September 18, 2007

Published online October 9, 2007

recommend that all HIV/HCV co-infected persons be evaluated and considered for hepatitis C treatment.^{9–11}

However, patient- and system-based obstacles to accessing testing and treatment for HCV continue to be documented among persons with HIV infection.^{5,12,13} A fuller understanding of patients' perceptions of HCV diagnosis, prognosis, and treatment efficacy and patterns of referrals for specialized HCV care may allow providers to better address these barriers. Therefore, we conducted this study to ascertain the level of awareness of HCV and its indicated treatment among women with and at risk for HIV infection and to determine the patterns of referral and treatment available to women with HCV.

METHODS

Sample. The Women's Interagency HIV Study (WIHS) enrolled women with and at risk for HIV from October 1994 to September 1995 and from October 2001 to September 2002 at 6 consortia sites: Brooklyn, NY; the Bronx, NY; Chicago, IL; Los Angeles, CA; San Francisco, CA, and Washington, DC. After institutional review board approval at each site, research staff obtained informed consent from eligible patients. WIHS methods have been described previously.¹⁴ In short, every 6 months, study participants completed WIHS study visits including face-to-face interviews regarding mental and physical health, use of medical and social services, and demographic status, physical exams, and specimen collection. Women were queried about all medications they had taken since their last study visit including specific queries for antiretroviral therapy for HIV and HCV therapies.

HCV Status. At baseline, all women were screened for HCV by a second generation HCV antibody (Ab) enzyme immunoassay (HCV EIA 2.0; Abbott Laboratories). In 1999, frozen plasma samples from women who were initially HCV-seronegative were retested for antibody to HCV by a third-generation EIA (HCV EIA 3.0; Ortho-Diagnostic Systems). For women with discordant results between this repeat specimen and the initial HCV antibody results, testing was repeated and reactive specimens were confirmed with recombinant immunoblot assay (RIBA; RIBA HCV 3.0; Chiron).¹⁵

Beginning in 1999, local study staff informed all WIHS participants of their HCV antibody status (positive or negative) at a research visit. In addition, results were forwarded with a standardized WIHS cover letter to the primary provider of consenting participants. Generally, primary providers made the referrals for further specialized HCV care, but WIHS staff also identified HCV specialists for referral if requested by participants.

Referral for HCV Treatment and Receipt of Treatment. Starting at the WIHS research visit in 2003, women were asked whether they had ever been informed that they had HCV and, if so, whether they were referred for a liver biopsy or treatment. Those referred for biopsy were asked whether they had received a biopsy and those participants referred for HCV treatment were asked whether they had received treatment. All those reporting that they received HCV treatment were asked

whether they had completed it and, if so, whether the treatment had been successful. This information was used to create the study's 2 outcome variables: 1) being offered HCV treatment; and 2) receiving HCV treatment, the latter including those successfully or unsuccessfully completing treatment as well as those still receiving this therapy.

Covariates. To characterize the HIV disease progression, CD4 counts were measured by immunofluorescence using flow cytometry at laboratories participating in the AIDS Clinical Trials quality assurance program. Plasma HIV-RNA levels were measured using a nucleic acid sequence-based amplification technique (Organon Teknika, Durham, USA). Nadir CD4 was categorized as >500, 200–500, and <200 as the reference category. HIV-RNA was coded as <4,000, 4,000–20,000 or >20,000. Ethnicity was assessed as African American, Hispanic/Latina, Caucasian, and other. Age in years was measured at baseline and, for the HCV-positive cohort, at the time of HCV treatment report. Dichotomous variables coded as "1" were used to indicate those women who had completed high school or a General Equivalency Degree (GED), reported incomes less than \$12,000 per year, were HIV-positive, were seeing the same health care provider consistently, were currently in treatment for alcohol dependence, reported using crack, cocaine, or heroin since the last study visit, and reporting that they had used intravenous (IV) drugs before baseline.

Alanine aminotransferase (ALT) values were measured in fresh specimens by standard methodology in Clinical Laboratory Improvement Amendments—certified laboratories annually from October 1994 through March 2001 and semiannually thereafter. We chose 2 times the upper limit of normal of ALT for the individual laboratories as a dichotomous variable coded as "1" used to indicate evidence of liver inflammation in keeping with inclusion criteria for therapeutic HCV studies.

STATISTICAL ANALYSIS

Data from 18 semiannual visits from the WIHS cohort were analyzed to characterize each participant at the time the HCV questionnaire was administered in 2003–2004. Descriptive, univariate, and bivariate statistics were computed for all variables. The odds ratio (OR) of ever having been referred to treatment for HCV and receiving treatment for HCV (vs not) was calculated by fitting multivariate logistic regression models. The models tested included age, education, race/ethnicity, income, HIV status, recent use of crack, cocaine or heroin, recent use of alcohol, ever having been in treatment for alcohol dependence, elevation of ALT at least twice the upper limit of normal, IV drug use before baseline, and study site. Sites were compared on the indicator variables with the Chicago site as the arbitrary reference category in the multivariate analyses.

RESULTS

Prevalence and Background Characteristics of Women with HCV. Of 3,768 women in the WIHS, 1,166 (31%) were HCV Ab-positive, 2,510 (67%) were HCV antibody (Ab) negative, and

Table 1. Comparison of Characteristics of a Multi-site Cohort of HCV-positive Versus HCV-negative Women

Background characteristics	HCV Positive		HCV Negative		Total Cohort	
	%	N*	%	N†	%	N‡
African American	57.6	672	54.3	1412	55.3	2084
Hispanic/Latina	22.6	263§	28.0	729§	26.3	992
White	19.8	231//	13.4	336//	15.0	567
Other	2.2	26¶	3.8	99¶	3.3	125
HIV-positive	83.5	974§	70.5	1835§	74.5	2809
Income	70.3	762§	48.1	1136§	55.0	1898
<*\$12,000/year						
ALT>2X	23.4	271	—	—	—	—
Sees consistent health care provider	42.6	497§	13.1	329§	21.9	826
In alcohol treatment	32.9	384§	8.7	219§	23.1	603
Currently using alcohol	22.5	262§	59.0	1481§	47.3	1743
Baseline IDU	83.2	969§	7.4	193§	30.9	1162
Current CCH Use	26.4	299§	8.7	223§	13.9	522
High School graduate/GED	56.1	653§	65.3	1689§	62.4	2342
Mean age at baseline (sd)	38.8 (6.65)§		32.8 (8.09)§		34.6 (8.17)	
Mean age at HCV report	48.4 (8.46)		—		—	

Missing values for some variables

*N=1166

†N=2510

‡N=3768

§p<0.001 chi square or t test difference

//p<0.01

¶p<0.05.

results for 92 women (2%) were not available. Table 1 presents the background characteristics of the 1,166 women who were HCV Ab-positive, those who were HCV Ab-negative, and the total group. Omitted were the 2% whose HCV Ab status was not known. The mean age of HCV-positive women was 48.4 years in 2003, at the visit when HCV referral data were first elicited. The large majority (84%) were HIV-positive. Most HCV Ab-positive women (58%) were African American, 23% were Hispanic/Latina, 20% were White, and 2% were of other race/ethnicities. Twenty-two percent reported currently using alcohol and 33% reported that they had ever been treated for alcohol addiction. A quarter said they were currently using crack, cocaine, or heroin; 83% reported a history of injection drug use at study baseline. Almost one-fourth had ALT values greater than 2 times the upper limit of normal.

As shown in Table 1, compared with the HCV Ab-negative women, the HCV Ab-positive cohort was significantly more likely to be White, to be HIV-infected, to have very low incomes, to have a consistent health care provider, to have ever been in treatment for alcohol addiction, to have engaged in IV drug use before the baseline interview, and to report current use of crack, cocaine, or heroin. HCV Ab-positive women were less likely to be currently using alcohol and were significantly older than HCV Ab-negative women at study baseline.

Referral and Treatment of Women with HCV. Follow-up health history regarding HCV collected during 2003–2004 was

available for 681 out of 1,166 participants with HCV. Of those for whom this health history was unavailable, 80% (n=390) had died, whereas the remainder had withdrawn from the study (n=15) or missed subsequent study visits (n=80). Of the 681 HCV-positive women reporting health histories, 522 (76.7%) reported knowing they were HCV-Ab positive. We explored differences between women with HCV who were aware of their diagnosis and those who reported being unaware of their HCV diagnosis (Table 2). Women who were unaware of their HCV diagnosis were more likely to be African American and younger than women who reported knowing they were HCV Ab-positive. Those women who were aware of their HCV were significantly more likely to have had alcohol treatment in the past, to have a history of injection drug use, and to have elevated ALT, compared to those unaware of their HCV.

Three quarters (394 of 522 or 75%) of those acknowledging their HCV status were aware that HCV treatment exists; however, 230 (58.4 %) said they had no opinion about the likely outcomes of HCV treatment, 63 (16.0 %) thought it worked for most people, 85 (21.6 %) thought it worked in less than half of all cases, and 14 (3.6 %) not at all. Two respondents were missing data for this question.

Of the 522 who reported awareness of their HCV status, 247 women (47.3%) stated that providers had recommended they have a liver biopsy. Of these patients, the majority or 56.3% (n=139) reported that they had actually undergone a liver biopsy. Most common reasons given for declining the liver

Table 2. Comparison of Characteristics of a Multi-site Cohort of HCV Unaware Versus HCV Aware Women

Background Characteristics	HCV Unaware		HCV Aware	
	%	N*	%	N†
African American	64.1§	107	56.2§	289
Hispanic/Latina	22.8	38	24.3	125
White	12.0	20	16.5	85
Other	1.2	2	2.9	15
HIV-positive	78.4	131	82.7	425
Income <*\$12,000/year	67.3	142	66.1	359
ALT>2X	23.5§	52	31.8§	179
Sees consistent health care provider	73.8	163	78.9	444
In alcohol treatment	31.7//	70	45.0//	253
Currently using alcohol	42.9	90	39.7	217
Baseline IDU	68.8//	152	87.2//	491
Current CCH use	20.4	45	21.0	118
High school graduate/GED	56.3	94	57.4	295
Nadir CD4‡				
<200	57.1§	96	47.1§	181
200–350	23.8§	40	34.1§	131
>350	18.4	31	18.8	72
Viral load‡				
<4,000	14.3	24	13.5	52
4,000–20,000	13.7§	23	20.8§	80
>20,000	72.0	121	65.6	252
Mean age at baseline (sd)	37.9 (6.52)¶		39.3 (6.16)¶	
Mean age at HCV report	46.6 (6.52)¶		48.3 (6.16)¶	

Missing values for some variables

*N=167

†N=514

‡N=556 (HIV Positive only)

§p<0.05

//p<0.01

¶p<0.001 chi square or t test difference

biopsy were: fear of the procedure (53%); not being able to accept an HCV treatment regimen (17%); not being sure treatment would help (15%); and feeling that the biopsy procedure was not explained well enough (15%).

Of 522 participants who were aware of their HCV status, 205 (39%) report that they were offered treatment, 58 since their last study visit and 147 before their last study visit. Of the 147 women asked about this prior treatment, 84 (57%) reported that they agreed to receive HCV treatment. Of the 84 women who said they received treatment, 27 women reported successfully completing treatment and 21 were still in treatment. Thus, 57% of those who reported receiving HCV treatment said they had successfully completed it or were still in treatment. Five women reported the therapy was not successful. Of the remaining 31 women, therapy was stopped because of leukopenia ($n=1$), anemia ($n=2$), other blood abnormalities ($n=4$), psychological side effects ($n=4$), pregnancy ($n=1$), expense ($n=1$), being unable to keep further medical appointments ($n=2$), and miscellaneous other reasons ($n=16$).

Multivariate Associations with Referral and Treatment. Among the 681 women who were HCV-positive, multivariate analysis was used to predict 2 outcomes: 1) being offered treatment; and 2) receiving treatment (which included those successfully or unsuccessfully completing it, as well those still receiving treatment). In this analysis, the 159 women who were unaware of their HCV status were assumed to be null on each of the 2 dependent variables, that is, they were assumed to have neither been offered treatment nor received it. In the model predicting referral for treatment, presented in the left hand columns of Table 3, African-American race, Hispanic/Latina ethnicity, low income, and current crack/cocaine/heroin use were negatively associated with being offered treatment, whereas elevated ALT was significantly associated with increased likelihood of treatment referral. However, in the model

predicting treatment received or completed, only elevated ALT significantly increased the likelihood of treatment, whereas all other model variables were nonsignificant. We also ran these 2 models limiting the sample to the 522 women who reported awareness of their HCV status and the same variables were significant.

DISCUSSION

One-third (31%) of the WIHS cohort of low-income HIV-positive and HIV-at risk-negative women were found to be co-infected with HCV. However, one quarter of these HCV Ab-positive women reported being unaware of their HCV diagnosis. This lack of awareness occurred in the context of the WIHS protocol that included informing participants of their HCV status and often communicating the result to the participants' primary providers. Our findings are consistent with previous studies that have documented unawareness, denial, or stigma related to drug use, racial discrimination, previous negative experiences with the health care system, and lack of knowledge among health care providers as barriers to HCV screening and treatment among women, especially those with a history of injection drug use.^{5,16-18}

Among WIHS women who were aware of their HCV diagnosis, 1 in 4 reported evaluation by liver biopsy and treatment for HCV (with over one third of these successfully completing treatment). This rate of diagnostic and therapeutic intervention is similar to rates of HCV evaluation and treatment reported by others. Restrepo et al. in a review of HIV/HCV co-infected patients followed in a gastroenterology clinic, reported that only 20% had received a liver biopsy and 15% received treatment for HCV.¹⁹ The majority of those not receiving treatment in that report were considered ineligible because of noncompliance with clinic appointments, active substance use, psychiatric illness, and advanced liver disease and other comorbidities. In a review of the Veterans Affairs National Patient Care Database, treatment rate for HCV was 11.8%, with increasing age, black race, incarceration, drug and alcohol abuse and dependence, and comorbid illnesses being associated with nontreatment.^{20,21} In 2004, French investigators surveyed physicians caring for HCV/HIV co-infected patients and identified inaccurate indications, lack of available liver biopsy, psychiatric contraindication, and physician conviction that the patient would have poor compliance, as main reasons why only half of the patients had received any treatment.²² Hall et al. found an even lower rate (4%) of treatment among homeless low-income injection drug users in San Francisco, with non-white poor persons less likely to access screening and treatment.⁵

Our study also demonstrates that although poverty, ongoing substance use, and race/ethnicity are negatively associated with women being referred for HCV treatment, the majority of women who were referred for liver biopsy or HCV treatment did follow their physician's recommendations. When the same multivariate model used to predict referral for treatment was used to predict actually receiving treatment, none of the variables was significant, except for elevated ALT. Thus, patient and physician education about HCV and HCV treatment options are needed to enhance awareness and treatment access. Improving education about HCV status includes increasing awareness of HCV programs at drug treatment

Table 3. Multivariate Logistic Regression: Factors Associated with Referral for and Receipt of HCV Treatment Among HIV-infected and Uninfected Women with HCV (N=681)

Characteristics	Referred for HCV Treatment		Received HCV Treatment	
	Odds Ratio	Confidence Int.	Odds Ratio	Confidence Int.
African American	0.52	(0.29–0.95)*	0.70	(0.28–1.73)
Hispanic/Latina	0.50	(0.25–0.99)*	1.46	(0.55–3.88)
Other	0.50	(0.13–1.96)	2.93	(0.60–14.45)
White	—	—	—	—
HIV-positive	0.63	(0.36–1.10)	0.60	(0.27–1.31)
Income <\$12,000/yr	0.52	(0.33–0.80)†	0.97	(0.50–1.86)
ALT>2X	2.08	(1.29–3.34)†	2.31	(1.23–4.34)*
Same health care provider	1.68	(0.96–2.94)	1.68	(0.80–3.53)
In alcohol treatment	1.10	(0.70–1.73)	1.20	(0.62–2.30)
Currently using alcohol	0.81	(0.52–1.28)	0.59	(0.29–1.19)
Baseline IDU	1.55	(0.82–2.90)	1.03	(0.40–2.66)
Current CCH Use	0.44	(0.23–0.85)*	0.75	(0.30–1.90)

Analysis was controlled for site.

* $p<0.05$

† $p<0.01$

programs and health centers, better physician–patient communication, and small-group, peer-mentoring intervention workshops that emphasize harm reduction methods to reduce transmission of HCV to others.^{23,24}

Women in WIHS co-infected with HIV and HCV were significantly more likely than others in WIHS to report a history of injection drug abuse and participation in alcohol treatment programs, and less likely to report currently drinking alcohol. This evidence of disproportionate numbers of HCV-infected women receiving help for alcohol problems as well as a lower percentage continuing to drink is encouraging, as was the finding that a higher proportion of the HCV-infected patients had continuity in their relationship with primary care providers. However, nearly 1 out of 4 women co-infected with HIV/HCV did report current alcohol consumption and 1 in 4 report current heroin, crack or cocaine use. This suggests that effective education about alcohol cessation is needed to minimize HCV liver disease progression and to reduce barriers to pegylated interferon therapy. Our study reinforces the need for more intensive treatment approaches for alcohol and drug issues.²⁵

LIMITATIONS

These findings should be evaluated in light of the study's limitations. Self-report was used to determine the incidence of all the outcomes in this study. It is not possible to determine from our data whether women who reported being unaware of their diagnosis had actually been told that they were HCV Ab-positive by their providers. We have little reason to doubt that women would erroneously report such major events as liver biopsy or HCV treatment. However, events such as specialist referrals that were not completed may have been forgotten by some women.

At the time of our study, 390 participants with HCV had already died. This group was obviously unable to be considered for HCV treatment. If we considered this group of all women with HCV in WIHS as our denominator, a much smaller percentage would have been referred for or completed therapy. Also, although this is a large study with a significant cohort of HIV Ab-positive women, analysis of the number of women receiving treatment was limited in its power to identify predictors by the small sample size for some characteristics being evaluated.

Finally, the study was conducted in 6 urban areas and the results may not be generalizable to more rural settings.

CONCLUSION

As experience with treatment of HCV increases and continues to produce successful virologic responses, and as patients with HIV infection live longer on antiretroviral therapy, ensuring diagnosis and access to HCV treatment for co-infected patients becomes increasingly important.^{10,26–28} More effort is needed to increase patient–provider communication, to insure that women understand the need to be tested and insure follow-up care for HCV. The majority of women who are offered evaluation and treatment for HCV disease accept the interventions. Providing such services in a comprehensive manner inclusive of mental health and alcohol and drug treatment and in sites

where patients with HCV/HIV regularly seek HIV care represents a challenge and an opportunity to reach more of those in need of HCV treatment.^{29–32} These sites are often located in underfunded public settings. Addressing the intersecting epidemics of HCV, HIV, drug use, and mental illness will require the resources to support innovative and integrated intervention models to overcome barriers to care.

Acknowledgment: The WIHS is funded by the National Institute of Allergy and Infectious Diseases, with supplemental funding from the National Cancer Institute, the National Institute of Child Health & Human Development, the National Institute on Drug Abuse, the Agency for Health Care Policy and Research, and the National Center for Research Resources. Grant numbers U01-AI-35004, U01-AI-31834, U01-AI-34994, U01-AI-34989, U01-HD-32632, U01-AI-34993, U01-AI-42590, MO1-RR00071, MO1-RR00079, and MO1-RR00083.

Conflict of Interest: None disclosed.

Corresponding Author: Mardge H. Cohen, Cook County Bureau of Health Services, Chicago, IL, USA (e-mail: mardgecohen@aol.com).

REFERENCES

1. **Armstrong GL, Wasley A, Simard EP, McQuillan GM, Kuhnert WL, Alter MJ.** The prevalence of hepatitis C virus infection in the United States, 1999 through 2002. *Ann Intern Med.* 2006;144:705–14.
2. **Bini EJ, Currie SL, Shen H, et al.** National multicenter study of HIV testing and HIV seropositivity in patients with chronic hepatitis C virus infection. *J Clin Gastroenterol.* 2006;40:732–9.
3. **Rockstroh JK.** Management of hepatitis C/HIV coinfection. *Curr Opin Infect Dis.* 2006;19:8–13.
4. **Backus LI, Boothroyd D, Deyton LR.** HIV, hepatitis C and HIV/hepatitis C virus co-infection in vulnerable populations. *AIDS.* 2005;19 (Suppl 3):13–9.
5. **Hall CS, Charlebois ED, Hahn JA, Moss AR, Bangsberg DR.** Hepatitis C virus infection in San Francisco's HIV-infected urban poor. *J Gen Intern Med.* 2004;19:357–65.
6. **Piccolo P, Borg L, Lin A, Melia D, Ho A, Kreek MJ.** Hepatitis C virus and human immunodeficiency virus-1 co-infection in former heroin addicts in methadone maintenance treatment. *J Addict Dis.* 2002;21: 55–66.
7. **Weber R, Sabin CA, Friis-Moller N, et al.** Liver-related deaths in persons infected with HIV: the D.A.D. study. *Arch Intern Med.* 2006; 166:1632–41.
8. **Strader DB, Wright T, Thomas DL, Seeff LB.** American Association for the Study of Liver Diseases. Diagnosis, management, and treatment of hepatitis C. *Hepatology.* 2004;39:1147–71.
9. **Strader DB.** Coinfection with HIV and hepatitis C virus in injection drug users and minority populations. *Clin Infect Dis.* 2005 1:41(Suppl 1):7–13.
10. **Tien PC.** Management and treatment of hepatitis C virus infection in HIV-infected adults: recommendations from the veterans affairs hepatitis C resource center program and national hepatitis C program office. *Am J Gastroenterol.* 2005;100:2338–54.
11. **Herrine SK, Rossi S, Navarro VJ.** Management of patients with chronic hepatitis C infection. *Clin Exp Med.* 2006;6:20–6.
12. **Zucker DM.** A case of health disparity: treatment issues in women with hepatitis C. *Gastroenterol Nurs.* 2006;29:137–41.
13. **Nunes D, Saitz R, Libman H, Cheng DM, Vidaver J, Samet JH.** Barriers to treatment of hepatitis C in HIV/HCV-co-infected adults with alcohol problems. *Alcohol Clin Exp Res.* 2006;30:1520–6.
14. **Barkan S, Melnick S, Preston-Martin, et al.** The Women's Interagency HIV Study (WIHS)—design, methods, sample, cohort characteristics and comparison with reported AIDS cases in US women. *Epidemiology.* 1998; 9:117–25.
15. **Augenbraun M, Goedert JJ, Thomas D, Feldman J, Seaberg EC, French AL, et al.** Incident hepatitis C virus infection in women with HIV:

- a report from the women's interagency HIV study. *Clin Infect Diseases*. 2003;37:1357-64.
16. **Cullen W, Kelly Y, Stanley J, Langton D, Bury G.** Experience of hepatitis C among current or former heroin users attending general practice. *Ir Med J*. 2005;98:73-4.
 17. **Crockett B, Gifford SM.** "Eyes Wide Shut": narratives of women living with hepatitis C in Australia. *Women Health*. 2004;39:117-37.
 18. **Coulon M, Rey D, Loubiere S, Fuzibet JG, Gastaut JA, Obadia Y.** Perception of hepatitis C infection and its management in women infected by HIV following intravenous use of drugs. *Presse Med*. 2003;32:1642-8.
 19. **Restrepo A, Johnson TC, Widjaja D, et al.** The rate of treatment of chronic hepatitis C in patients co-infected with HIV in an urban medical centre. *Clin Exp Med*. 2006;6:20-6.
 20. **Butt AA, Wagener M, Shakil AO, Ahmad J.** Reasons for non-treatment of hepatitis C in veterans in care. *J Viral Hepat*. 2005;12:81-5.
 21. **Butt AA, Justice AC, Skanderson M, Rigsby M, Good CB, Kwok CK.** Rate and predictors of treatment prescription for hepatitis C. *Gut*. 2007;56:385-9.
 22. **Cacoub P, Rosenthal E, Halfon P, Sene D, Perronne C, Pol S.** Treatment of hepatitis C virus and human immunodeficiency virus coinfection: from large trials to real life. *J Viral Hepatitis*. 2006;13:678-82.
 23. **Strauss MS, Astone-Twerell J, Munoz-Plaza CE, et al.** Drug treatment program patients' hepatitis C virus (HCV) education needs and their use of available HCV education services. *BMC Health Serv Res*. 2007;7:39. Published online 2007 March 8.
 24. **Kapadia F, Latka MH, Hagan H, et al.** Design and feasibility of a randomized behavioral intervention to reduce distributive injection risk and improve health-care access among hepatitis C virus positive injection drug users: the Study to Reduce Intravenous Exposures (STRIVE). *J Urban Health*. 2007;84(1):99-115, Jan.
 25. **Nunes D, Saitz R, Libman H, Cheng DM, Vidaver J, Samet JH.** Barriers to treatment of hepatitis C in HIV/HCV-co-infected adults with alcohol problems. *Alcohol Clin Exp Res*. 2006;30:1520-6.
 26. **Santos SA, Kontorinis N, Dieterich DT.** Management of Chronic Hepatitis C Virus in Patients with HIV. *Curr Treat Options Gastroenterol*. 2005;8:433-441.
 27. **Brau N.** Treatment of chronic hepatitis C in human immunodeficiency virus/hepatitis C virus-co-infected patients in the era of pegylated interferon and ribavirin. *Semin Liver Dis*. 2005;25:33-51.
 28. **Rockstroh JK.** Management of hepatitis C/HIV coinfection. *Curr Opin Infect Dis*. 2006;19:8-13.
 29. **Clanon KA, Johannes Mueller J, Harank M.** Integrating treatment for hepatitis C virus infection into an HIV clinic. *Clin Infect Dis*. 2005;40(Suppl 5):362-6.
 30. **Knott A, Dieperink E, Willenbring ML, et al.** Integrated psychiatric/medical care in a chronic hepatitis C clinic: effect on antiviral treatment evaluation and outcomes. *Am J Gastroenterol*. 2006;101:2254-62.
 31. **Backus LI, Boothroyd D, Deyton LR.** HIV, hepatitis C and HIV/hepatitis C virus co-infection in vulnerable populations. *AIDS*. 2005;19(Suppl 3):13-9.
 32. **Huckans MS, Blackwell AD, Harms TA, Indest DW, Hauser P.** Integrated hepatitis C virus treatment: addressing comorbid substance use disorders and HIV infection. *AIDS*. 2005;19(Suppl 3):106-15.