

Family Physicians' Knowledge and Screening of Chronic Hepatitis and Liver Cancer

Jeanne M. Ferrante, MD; Dock G. Winston;
Ping-Hsin Chen, PhD; Andrew N. de la Torre, MD

Background and Objectives: *Studies show that primary care providers may suboptimally diagnose, treat, or refer patients with hepatitis C virus (HCV) infection. In addition, little is known about family physicians' knowledge and practices regarding chronic hepatitis B virus (HBV) infection or monitoring for hepatocellular carcinoma (HCC).* **Methods:** *We used a cross-sectional mail survey of members of the New Jersey Academy of Family Physicians (n=217). Outcome measures were knowledge of risk factors, screening, counseling for chronic HCV and HBV, and screening for HCC.* **Results:** *Mean knowledge score for risk factors was 79% (HBV) and 70% (HCV). Physicians who diagnosed \geq six cases per year had higher knowledge of HBV risk factors. Physicians in practice >20 years had lower knowledge of HCV risk factors. Mean knowledge score for counseling was 77%. About 25% screened for liver cancer. Screening for HCC in patients with HBV was related to years in practice, female physicians, and group practice. Physicians in academic settings were more likely to screen patients with HCV for HCC. Forty-two percent and 51% referred patients with chronic HBV and chronic HCV, respectively, to the specialist for total management.* **Conclusions:** *Family physicians have insufficient knowledge about screening and counseling for chronic hepatitis and hepatocellular carcinoma.*

(Fam Med 2008;40(5):345-51.)

The incidence of hepatocellular carcinoma (HCC) in the United States has doubled during the past 20 years and continues to increase rapidly.¹ The major causes of this disease are chronic hepatitis B and C virus infections.

There are approximately 3.5 million Americans chronically infected with hepatitis C virus (HCV), with a higher prevalence among African Americans and persons of lower socioeconomic status. The majority of these individuals have yet to be diagnosed.² For chronic hepatitis B virus (HBV), it is estimated that 1.25 million people in the United States are chronically infected, with a higher proportion among immigrants from Asia, sub-Saharan Africa, and parts of the Middle East and South America.³ Prevalence rates of HBV are

probably higher than estimated, however, due to the increasing numbers of immigrants from hepatitis B-endemic areas, especially on the East and West coasts and in metropolitan cities.⁴⁻⁶

It is estimated that primary care physicians with an average panel of 2,000 patients should have about 32 patients with HCV in their practice and about 60 patients if they serve mainly non-Hispanic blacks or patients with low socioeconomic status.² While the estimated prevalence of chronic HBV in an average practice is lower (at least eight patients),⁷ physicians who serve high numbers of Asian immigrant populations may have more than 300 patients with chronic HBV in their panel.⁸

Since most people with chronic hepatitis are asymptomatic until cirrhosis or HCC are established, initial diagnosis and management of chronic hepatitis rely on primary care physicians to identify and screen high-risk individuals.⁹ Studies have shown that primary care providers in the United States may suboptimally diagnose, treat, or refer patients with HCV.¹⁰⁻¹⁹ Limitations of these studies include poor response rates of

From the Department of Family Medicine (Dr Ferrante, Mr Winston, and Dr Chen) and Department of Surgery (Dr de la Torre), UMDNJ-New Jersey Medical School, Newark, NJ; and Department of Family Medicine, UMDNJ-Robert Wood Johnson Medical School and Cancer Institute of New Jersey, New Brunswick, NJ (Dr Ferrante).

32% to 53% on surveys,^{10,12,15,19} studies confined to one health delivery system^{10,11,16} or one county,^{14,15} or limited to residents in training.^{13,17,18} There is only one study that compared the association of screening and treatment for HCV infection with physician or practice characteristics.¹¹ This study of mostly internal medicine physicians found that 70% of physicians ordered screening serum alanine aminotransferase (ALT) measurements during a complete physical examination, despite absence of guidelines recommending it. Physicians in practice longer and those in affluent, suburban settings were more likely to order ALT tests. We could find no studies on the knowledge and practices of primary care physicians in the United States regarding chronic HBV infection or monitoring for HCC.

Our study evaluated the knowledge and practices of family physicians in north central New Jersey (NJ) regarding chronic hepatitis B and C and monitoring of patients for hepatocellular carcinoma. We focused on seven counties within northern central NJ that had at least 50,000 black, Hispanic, or Asian residents²⁰ because these populations have higher prevalence of chronic hepatitis.

Methods

Design

We developed a self-administered confidential survey to assess information relating to screening for hepatitis, diagnostic testing, chronic hepatitis management, counseling, and monitoring of patients for HCC. Basic demographic information (race, ethnicity, gender, years in practice) and practice characteristics (group versus solo, type of practice setting, number of patients seen per typical week, race/ethnicity mix of patients) were collected. The survey was pilot tested with three family physicians for content validity, clarity, comprehensiveness, and appropriateness of items and response categories. Additionally, survey content was reviewed by a transplant hepatologist with expertise in chronic hepatitis.

Using a mailing list from the New Jersey Academy of Family Physicians (NJAFP), the confidential survey was mailed to all active members (n=388) in seven counties within north and central NJ. The survey was distributed using a modified Dillman method.²¹ This method included an initial mailing that consisted of a cover letter, the survey, a self-addressed stamped envelope, and an \$11 bookstore gift card (covered \$10 item plus tax) as incentive. After 1 week, a postcard was mailed thanking physicians for participating and reminding them to complete and return the questionnaire. After another 2 weeks, a second questionnaire and return envelope were mailed to nonrespondents. Physicians who did not respond within 2 weeks of the second mailing received a third mailing.

Each survey was assigned a unique identification number to track respondents and nonrespondents; however, no identifying information was used in subsequent data analysis or reporting of data. This study was reviewed and approved by the UMDNJ-New Jersey Medical School Institutional Review Board.

Outcome Measures

The main outcome measures were knowledge of risk factors, testing, counseling of chronic hepatitis, and screening for liver cancer. Secondary outcomes were interest in chronic hepatitis education and preferred formats.

We developed a knowledge scale for risk factors for screening based on guidelines from the American Association for the Study of Liver Diseases (for hepatitis B) and the National Institute of Health and Centers for Disease Control and Prevention (for hepatitis C).^{3,9,22} Respondents received 1 point per risk factor appropriately identified that would warrant screening for HBV or HCV based on the guidelines. They also received 1 point per risk factor appropriately identified that should not warrant screening.

The scale ranged from 0 to 9 points for Hepatitis B and 0 to 10 points for Hepatitis C. A knowledge scale for counseling was also developed based on the guidelines above. Those who responded that they would give the recommended counseling to “most” or “all” patients received 1 point, as well as those who responded giving advice to “none” or “few” patients on items that are not recommended. The scale ranged from 0 to 14 points.

Statistical Analysis

Descriptive statistics were used to describe the responses to each question and means and standard deviations (SDs) to knowledge scales. Scores on knowledge scales for screening and counseling were compared for physician characteristics (gender, years in practice, number of patients seen per week, number of patients screened for hepatitis in past year, number of patients diagnosed with hepatitis B or C) and practice characteristics (solo or group, practice setting, race/ethnicity mix of patients) using the Wilcoxon rank sum test for two subgroups or the Kruskal-Wallis test for more than two subgroups. Pearson's chi-square test or Fisher's exact test were used to determine whether practice patterns for managing chronic hepatitis B, chronic hepatitis C, and screening for liver cancer were related to physician or practice characteristics. Similarly, interest in chronic hepatitis education and preferred formats were compared by physician and practice characteristics. Survey results were analyzed using SPSS 12.0 software (SPSS Inc, Chicago).

Results

Surveys were mailed to 388 physicians. Fourteen were returned due to unknown address or inability to forward, two physicians were dead, four were retired, and 18 were no longer practicing family medicine. Of the remaining 350 subjects, 217 completed the survey (response rate 62%).

Table 1

Characteristics of Respondents (n=217)

Characteristics	n*	%
Gender		
Male	114	53.5
Female	99	46.5
Race/ethnicity		
White	133	63.3
Black	18	8.6
Hispanic	18	8.6
Asian	36	17.1
Other	5	2.4
Years in practice		
0-5	59	27.6
6-10	47	22.0
10-20	61	28.5
>20	47	22.0
Practice type		
Solo	52	24.5
Group	160	75.5
Practice setting		
Academic	37	17.3
Community urban	43	20.1
Community suburban	134	62.6
Number of patients seen per week		
0-30	31	14.5
31-50	32	15.0
51-75	32	15.0
75-100	59	27.6
100-125	37	17.3
>125	23	10.7
African-American patients		
≤10%	109	53.7
11-25%	56	27.6
>25%	38	19.7
Hispanic patients		
≤10%	119	58.3
11%-25%	56	23.5
>25%	38	19.1
Asian patients		
≤10%	163	80.3
11%-25%	29	14.3
>25%	11	2.0

* Numbers for individual categories may not add up to total due to missing data

Table 1 shows the characteristics of respondents and the demographics of the patients that the physicians in the study treat. Compared with the overall NJAFP membership, the percentage of females (46.5%) who responded was higher than in the NJAFP (41%). Physicians in academic practices had a higher percentage of minority patients than those in private practice (65.4% versus 44.4%, *P*=.002).

Screening

Twenty-nine percent of respondents screened more than 30 patients for viral hepatitis in the past year, while 34% screened 10 or fewer patients. Ninety-one percent diagnosed five or fewer cases of hepatitis B in the past year (34% diagnosed 0 cases). Eighty-nine percent diagnosed five or fewer cases of hepatitis C in the past year (29% diagnosed 0 cases).

The mean knowledge score for screening for HBV was 7.1 (SD=1.7, 79% correct). Twenty-four percent scored 9 (100% correct); 32% scored 6 or less (67% correct). Table 2 shows the percentage of respondents who would screen for HBV with certain risk factors, along with the guideline recommendations. Knowledge of risk factors was higher for physicians who diagnosed six or more cases of HBV per year (mean score 8.0) than those who diagnosed five or fewer cases per year (mean score 6.8, *P*=.02).

The mean knowledge score for screening in hepatitis C was 7 (SD=1.6, 70% correct). Four percent scored 10 (100% correct), while 56% scored 7 or less (70% correct). Table 3 shows the percentage of respondents that would screen for HCV with certain risk factors, along with the guideline recommendations. Knowledge of risk factors was lowest in physicians who were in practice for greater than 20 years (mean score 6.6) and highest in those in practice for 5 or fewer years (mean score 7.5, *P*=.022).

Table 2

Hepatitis B Screening

Risk Factors (Guidelines Recommend Screening)	% Recommended Screening
Sexual partners of chronic hepatitis B	97%
HIV positive patients	96%
Injection drug users	95%
Men who have sex with men	93%
Pregnant women	78%
Dialysis patients	76%
Immigrant from Southeast Asia	68%
Immigrant from Subsaharan Africa	57%
Household nonsexual contacts	50%

Table 3
Hepatitis C Screening

Risk Factors (Guidelines Recommend Screening)	% Recommended Screening
Injection drug users	95%
Patients with elevated liver function tests	95%
Health care worker with exposure	90%
Transfusion in 1982 (guidelines recommend in recipients before 1992)	81%
Dialysis patients	69%
Incarcerated persons	65%
Risk Factors (Guidelines Uncertain on Screening)	
Long-term sexual partners	88%
Have multiple sexual partners	83%
Diagnosed with sexually transmitted disease	71%
Tattooing or body piercing	65%
Risk Factors (Guidelines Recommend No Screening)	
All health care workers	42%
Transfusion in 1995	42%
Household nonsexual contacts	37%
Pregnant women	34%

Table 4
Advice on Counseling

Advice (Guidelines Recommend)	Checked Most or All
Use condoms if multiple partners	96%
Chronic hepatitis is a serious medical condition	90%
Have sexual partners screened	90%
Chronic hepatitis can result in cirrhosis	88%
Do not share razors or toothbrushes	86%
Abstain from alcohol	86%
Receive hepatitis B vaccine (in HCV)	83%
Screen for HIV	83%
Chronic hepatitis can result in liver cancer	81%
Cover open wounds	76%
Irreversible liver damage could be present	74%
Receive hepatitis A vaccine	70%
Chronic hepatitis progresses very slowly	66%
Advice (Guidelines Do Not Recommend)	Checked Few or None
Avoid pregnancy	65%
Do not share eating utensils or glasses	44%

Testing

Some physicians had limited knowledge regarding diagnostic tests. For HBV, 21% didn't know what to do next or would refer to a specialist for further testing after screening positive for hepatitis B surface antigen (HbsAg). For HCV, 31% didn't know what to do next or would refer to a specialist for further testing after screening positive for HCV by enzyme-linked immunosorbent assay (ELISA), 12% would incorrectly repeat the test, and 2% of physicians would incorrectly reassure patients that they are immune to hepatitis C.

Counseling

The mean knowledge score for counseling was 10.8 (SD=2.7, 77% correct). Five percent scored 14 (100% correct). Thirty-four percent of respondents scored 10 or less (71% correct). Table 4 shows the percent of respondents who answered they would give the recommended counseling to "most" or "all" or "none" or "few" patients with chronic hepatitis. There was no significant difference in counseling scores based on physician or practice characteristics.

Screening for Liver Cancer

In patients with HBV and normal liver function tests, 25% of physicians would order serum alpha-fetoprotein (AFP) or liver imaging. Screening rates were highest in those who were in practice 10–20 years ($P=.039$). In patients with HBV and abnormal liver function test, 29% would order AFP or liver imaging. Screening

for HCC in patients with HBV was higher for physicians who were female ($P=.022$) and in group practice ($P=.042$). For patients with HCV, 26% of respondents would order liver imaging in patients with abnormal liver functions. Physicians in academic settings were more likely to screen patients with HCV and abnormal liver functions for liver cancer (40.5%) than those in community-based urban (37%) or community-based suburban practices (18%, $P=.004$).

Management

In patients with chronic hepatitis B, 42% of the respondents referred the patient to a specialist for total management, while 54% monitored along with the specialist. In patients with chronic hepatitis C, 51% referred the patient to the specialist for total management, while 47% monitored along with the specialist. There was no significant difference in management based on physician or practice characteristics.

Education

Eighty-three percent of respondents were interested in receiving education about chronic hepatitis. Most preferred literature by mail (53%) or pocket card (43%), while about one third preferred a dinner meeting (33%) or conference (30%). The only physician or practice characteristic that was significantly associated with interest in education was gender (89% of female physicians were interested versus 73% of male physicians, $P=.03$). A higher proportion of women also preferred

receiving a pocket card (46.3% of females versus 24.6% of males, $P=.02$).

Discussion

In the United States, up to 6 million people are infected with chronic viral hepatitis (HBV and HCV). For comparison, HIV is estimated to affect approximately one million people.²³ Yet, educational efforts regarding chronic viral hepatitis have lagged behind HIV. For instance, since 1987 the US government has funded a national system of AIDS Education and Training Centers to provide education about HIV infection to health care workers.²⁴

The low rates of screening for chronic hepatitis in our study may be attributed to multiple factors such as conflicting guidelines, lack of evidence from controlled trials, or lack of physician knowledge.

In 1997 and 1998, the NIH and CDC, respectively, issued guidelines that addressed indications for HCV testing.^{22,25} In 2002, the NIH consensus panel updated its recommendations to screen all groups at high risk of HCV infection, including injection-drug users and incarcerated persons.⁹ In addition, the American Association for the Study of Liver Diseases (AASLD) published practice guidelines for chronic hepatitis B and C in 2001 and 2004, respectively.^{3,26,27} However, in 2004, the United States Preventive Services Task Force (USPSTF) concluded there was insufficient evidence to recommend for or against screening high-risk patients for hepatitis C.²⁸ Additionally, the USPSTF strongly recommended screening all pregnant women for HBV, but it made no statement for other individuals at high risk.²⁹

The lack of evidence from controlled trials showing clear long-term benefits of screening and diagnosis of chronic hepatitis may make screening for hepatitis low on the family physician's list of priorities. Family physicians in our study population may follow USPSTF guidelines and may not be aware of other guidelines, leading to low screening rates for HBV and HCV. Still, only 78% of respondents recommended screening pregnant women for HBV, one population for which the USPSTF makes strong recommendations for screening. In addition, when there is insufficient evidence or no clear statement from the USPSTF regarding screening, family physicians need to look to other guidelines such as those from the CDC, NIH, or other specialty organizations to define the standard of care.

Our study confirms findings from others that there is limited knowledge of risk factors of HCV that might prompt screening; in addition, it is the first to evaluate knowledge and screening practices for HBV. The majority of our respondents correctly identified IV drug use, high-risk sexual behavior, and HIV infection as risk factors for HBV and HCV but were confused on other risks. Less than 70% would screen immigrants from

endemic areas for HBV, and only 50% would screen household contacts of persons infected with HBV. For HCV, more than 40% would screen patients who received a blood transfusion in 1995, although screening recipients of blood transfusions after 1992 is not recommended since blood donor screening for HCV antibody was implemented in 1990, with second-generation ELISA testing initiated in 1992.²² In addition, 37% of respondents incorrectly identified casual household contact as a risk factor for HCV infection.

The low rate of diagnosis of patients with HBV and HCV may be attributed to the low rates of screening by the respondents. Only 29% of physicians screened more than 30 patients per year for hepatitis, and about 90% of the physicians diagnosed fewer than five patients with chronic hepatitis during the past year, similar to a previous study.¹⁰ With prevalence estimates of about 32 patients with HCV per physician panel of 2,000 patients, and more than 60 patients in practices serving non-Hispanic blacks and lower socioeconomic populations,² these data suggest that the respondents to our survey are unaware of the patients with chronic hepatitis in their practice.

Although there has been insufficient time to show that antiviral therapies directly decrease morbidity and mortality from chronic HCV, several long-term cohort studies have shown that antiviral treatment of chronic HBV reduces or reverses liver injury and prolongs survival.³⁰ Compared with treatment for chronic HCV, newer antiviral agents for chronic HBV are easier to administer (oral versus parenteral), less toxic, and increasingly effective.³⁰ These treatment differences, along with the presence of a highly effective and cost-effective vaccine against HBV and high sexual transmissibility (25% to 59% seroprevalence in sexual contacts of HBV patients)³¹ should make screening for chronic HBV important to family physicians.

In the United States the incidence of and mortality rates from liver cancer are currently highest in Asian-Americans, followed by Hispanics/Latinos, reflecting the higher prevalence of chronic HBV among recent immigrants.³² However, the incidence of HCC will continue to rise in the United States, mainly driven by increasing numbers of persons with long-standing chronic HCV who develop cirrhosis.³³ Although 90% of HCV-associated hepatocellular carcinoma occurs with concurrent cirrhosis or advanced fibrosis,³⁴ 30% to 50% of liver cancers associated with chronic HBV occur in the absence of cirrhosis.³ Chronic HBV carriers from endemic countries have a 100-fold relative risk of developing HCC compared with noncarriers.³³ There are recent studies showing the benefit of screening HCC in high-risk groups with ultrasound and AFP. Data from uncontrolled studies have suggested that screening detects HCC at an earlier stage with substantial improvement in survival, and one randomized

controlled study showed a mortality reduction of 37% in patients screened every 6 months with ultrasound and alpha-fetoprotein.³⁵ In addition, decision analysis/cost-efficacy models show that surveillance (every 6 months with ultrasound and AFP) for HCC is cost-effective in certain high-risk groups.³⁵ These groups include all HBV and HCV patients with cirrhosis and certain non-cirrhotic HBV carriers (Asian males \geq 40 years, Asian females \geq 50 years, Africans $>$ 20 years, and family history of HCC).

Limitations

This study has several limitations. It was conducted in family physicians in northern and central New Jersey, so the results may not generalize to other physicians. However, it supports findings from surveys conducted elsewhere of primary care physicians' knowledge and screening practices of HCV.^{10-12,15,36} Although we targeted physicians in counties that have high minority populations with a higher prevalence of chronic hepatitis B or C, most practices were in suburban areas and consisted of 25% or fewer minority patients. In addition, although we had a high response rate, those who responded may have differed from those who did not respond.

Conclusions

To identify the large number of patients with unrecognized chronic hepatitis and risk for cirrhosis and hepatocellular carcinoma, further education of family physicians, with emphasis on whom to screen and appropriate testing is needed. In addition, systems changes such as adding risk factors to patient self-administered questionnaires at well visits, standing orders for hepatitis screening in those at high risk, and integrating chronic hepatitis prevention and detection activities into current public health HIV efforts may increase the numbers of patients screened and diagnosed with chronic hepatitis. Fortunately, most physicians in our study were interested in receiving education about chronic viral hepatitis. Improving awareness of primary care physicians and increasing their screening rates for chronic hepatitis may potentially decrease the high disease and economic burdens of cirrhosis and hepatocellular carcinoma related to HBV and HCV.³⁷

Acknowledgments: This study was supported in part by an educational grant from Roche Pharmaceuticals and a cancer education research traineeship by the National Cancer Institute (R25 CA19536). This study was previously presented at the 2005 North American Primary Care Research Group Annual Meeting in Quebec City, Quebec.

Corresponding Author: Address correspondence to Dr Ferrante, 1 World's Fair Drive, Suite 1515, Somerset, NJ 08873. 732-743-3386. Fax: 732-743-5363. ferranjm@umdnj.edu.

REFERENCES

1. El-Serag HB, Davila JA, Petersen NJ, McGlynn KA. The continuing increase in the incidence of hepatocellular carcinoma in the United States: an update. *Ann Intern Med* 2003;139(10):817-23.
2. 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(10):705-14.
3. Lok ASF, McMahon BJ. Chronic hepatitis B. *Hepatology* 2001;34(6):1225-41.
4. Logan J. Metropolitan racial and ethnic change—Census 2000. <http://mumford.albany.edu/census/index.html>. Accessed October 25, 2006.
5. Chao S, Le PV, Prapong W, Su J, So S. High prevalence of chronic hepatitis B (HBV) infection in adult Chinese Americans living in California. *Hepatology* 2004;40(4 suppl 1):717A.
6. Guane R, Siu P, Lam K, et al. Prevalence of HBV and risk of HBV acquisition in hepatitis B screening program in large metropolitan cities in the United States. *Hepatology* 2004;40(4 suppl 1):716A.
7. McQuillan GM, Coleman PJ, Kruszon-Moran D, Moyer LA, Lambert SB, Margolis HS. Prevalence of hepatitis B virus infection in the United States: the National Health and Nutrition Examination Surveys, 1976 through 1994. *Am J Public Health* 1999;89(1):14-8.
8. Centers for Disease Control and Prevention. Screening for chronic hepatitis B among Asian/Pacific Islander populations—New York City, 2005. *MMWR-Morb Mortal Wkly Rep* 2006;55(18):505-9.
9. Anonymous. NIH Consensus Statement on Management of Hepatitis C: 2002. NIH Consensus and State-of-the-Science Statements 2002;19(3):1-46.
10. Shehab TM, Sonnad SS, Jeffries M, Gunaratnam N, Lok AS. Current practice patterns of primary care physicians in the management of patients with hepatitis C. *Hepatology* 1999;30(3):794-800.
11. Nicklin DE, Schultz C, Brensinger CM, Wilson JP. Current care of hepatitis C-positive patients by primary care physicians in an integrated delivery system. *J Am Board Fam Pract* 1999;12(6):427-35.
12. Shehab TM, Sonnad SS, Lok AS. Management of hepatitis C patients by primary care physicians in the USA: results of a national survey. *J Viral Hepat* 2001;8(5):377-83.
13. Shehab TM, Sonnad S, Gebremariam A, Schoenfeld P. Knowledge of hepatitis C screening and management by internal medicine residents: trends over 2 years. *Am J Gastroenterol* 2002;97(5):1216-22.
14. Yawn BP, Wollan P, Gazzuola L, Kim WR. Diagnosis and 10-year follow-up of a community-based hepatitis C cohort. *J Fam Pract* 2002;51(2):135-40.
15. Navarro VJ, St Louis TE, Bell BP. Identification of patients with hepatitis C virus infection in New Haven County primary care practices. *J Clin Gastroenterol* 2003;36(5):431-5.
16. Shehab TM, Orrego M, Chunduri R, Lok AS. Identification and management of hepatitis C patients in primary care clinics. *Am J Gastroenterol* 2003;98(3):639-44.
17. Coppola AG, Karakousis PC, Metz DC, et al. Hepatitis C knowledge among primary care residents: is our teaching adequate for the times? *Am J Gastroenterol* 2004;99(9):1720-5.
18. Rocca LG, Yawn BP, Wollan P, Kim WR. Management of patients with hepatitis C in a community population: diagnosis, discussions, and decisions to treat. *Ann Fam Med* 2004;2(2):116-24.
19. Clark EC, Yawn BP, Galliher JM, Temte JL, Hickner J. Hepatitis C identification and management by family physicians. *Fam Med* 2005;37(9):644-9.
20. US Census Bureau. Census 2000 redistricting data (Public Law 94-171) summary file, Matrices PL1 and PL2.
21. Dillman DA. Mail and Internet surveys. The Tailored Design Method, second edition. New York: John Wiley & Sons, Inc, 2000.
22. Centers for Disease Control and Prevention. Recommendations for prevention and control of hepatitis C virus (HCV) infection and HCV-related disease. *MMWR Morb Mortal Wkly Rep* 1998;47(RR-19):1-39.
23. Centers for Disease Control and Prevention. A glance at the HIV/AIDS epidemic. August 12, 2006. www.cdc.gov/hiv/resources/factsheets/At-A-Glance.htm. Accessed October 20, 2006.
24. Bradley-Springer L, Vojir C, Messeri P. Hard-to-reach providers: targeted HIV education by the national AIDS education and training centers. *J Assoc Nurses AIDS Care* 2003;14(6):25-36.
25. Anonymous. National Institutes of Health Consensus Development Conference Panel statement: management of hepatitis C. *Hepatology* 1997;26(3 Suppl 1):2S-10S.

26. Lok AS, McMahon BJ, Practice Guidelines Committee, American Association for the Study of Liver Diseases (AASLD). Chronic hepatitis B: update of recommendations. *Hepatology* 2004;39(3):857-61.
27. 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(4):1147-71.
28. US Preventive Services Task Force. Screening for hepatitis C in adults: recommendation statement. *Ann Intern Med* 2004;140:462-4.
29. US Preventive Services Task Force. Screening for hepatitis B infection: recommendation statement. Rockville, Md: Agency for Healthcare Research and Quality, February 2004. www.ahrq.gov/clinic/3rdsupstf/hepbscr/hepbrs.htm.
30. Keeffe EB, Marcellin P. New and emerging treatment of chronic hepatitis B. *Clin Gastroenterol Hepatol* 2007;5(3):285-94.
31. Centers for Disease Control and Prevention. A comprehensive immunization strategy to eliminate transmission of hepatitis B virus infection in the United States: recommendations of the Advisory Committee on Immunization Practices (ACIP). Part 2: Immunization of adults. *MMWR Recomm Rep* 2006;55(RR-16):1-33.
32. Ward E, Jemal A, Cokkinides V, et al. Cancer disparities by race/ethnicity and socioeconomic status. *CA Cancer J Clin* 2004;54(2):78-93.
33. Llovet JM, Burroughs A, Bruix J. Hepatocellular carcinoma. *Lancet* 2003;362(9399):1907-17.
34. Bosch FX, Ribes J, Cleries R, Diaz M. Epidemiology of hepatocellular carcinoma. *Clin Liver Dis* 2005;9(2):191-211.
35. Bruix J, Sherman M. Management of hepatocellular carcinoma. *Hepatology* 2005;42(5):1208-36.
36. Boaz K, Fiore AE, Schrag SJ, Gonik B, Schulkin J. Screening and counseling practices reported by obstetrician-gynecologists for patients with hepatitis C virus infection. *Infect Dis Obstet Gynecol* 2003;11(1):39-44.
37. Wong JB, McQuillan GM, McHutchison JG, Poynard T. Estimating future hepatitis C morbidity, mortality, and costs in the United States. *Am J Public Health* 2000;90(10):1562-9.