

Factors Influencing Physicians' Screening Behavior for Liver Cancer Among High-risk Patients

Tung T. Nguyen, MD, Ginny Gildengorin, PhD, Amy Truong, and Stephen J. McPhee, MD

Suc Khoe La Vang! (Health is Gold!), Vietnamese Community Health Promotion Project, Division of General Internal Medicine, Department of Medicine, University of California, San Francisco, 400 Parnassus Avenue, A-405, San Francisco, CA 94143-0320, USA.

BACKGROUND: Little is known about physicians' screening patterns for liver cancer despite its rising incidence.

OBJECTIVE: Describe physician factors associated with liver cancer screening.

DESIGN: Mailed survey.

PARTICIPANTS: Physicians practicing in family practice, internal medicine, gastroenterology, or nephrology in 3 northern California counties in 2004.

MEASUREMENTS: Sociodemographic and practice measures, liver cancer knowledge, attitudes, and self-reported screening behaviors.

RESULTS: The response rate was 61.8% ($N=459$). Gastroenterologists (100%) were more likely than Internists (88.4%), family practitioners (84.2%), or nephrologists (75.0%) to screen for liver cancer in high-risk patients ($p=0.016$). In multivariate analysis, screeners were more likely than nonscreeners to think that screening for liver cancer reduced mortality (odds ratio [OR] 1.60, CI 1.09–2.34) and that not screening was a malpractice risk (OR 1.88, CI 1.29–2.75). Screeners were more likely than nonscreeners to order any screening test if it was a quality of care measure (OR 4.39, CI 1.79–10.81).

CONCLUSIONS: Despite debate about screening efficacy, many physicians screen for liver cancer. Their screening behavior is influenced by malpractice and quality control concerns. More research is needed to develop better screening tests for liver cancer, to evaluate their effectiveness, and to understand how physicians behave when there is insufficient evidence.

KEY WORDS: liver cancer; screening; prevention.

DOI: 10.1007/s11606-007-0128-1

© 2007 Society of General Internal Medicine 2007;22:523–526

BACKGROUND

Liver cancer is the fourth most common cancer worldwide, and its incidence is rising in the United States.^{1,2} Approximately 2 million Americans are at risk, particularly those with

hepatitis C cirrhosis or chronic hepatitis B.^{3,4} Ethnic minorities, particularly Asian-Americans, have high rates of viral hepatitis and liver cancer.⁵

Current screening tests include serum alpha-fetoprotein (AFP) and radiologic imaging. Screening detects smaller tumors at diagnosis and may prolong survival, but lead-time bias is a problem.⁶ Positive predictive values range from 46% to 58% for AFP, 69% to 73% for ultrasound, and 67% for computed tomography (CT) in cirrhotic patients but are lower in those without cirrhosis.⁷ The National Cancer Institute (NCI) concluded that there is no evidence for a mortality reduction when screening high-risk patients.⁸ However, some guidelines recommend screening of high-risk patients, and most hepatologists screen.^{9,10} Because of the conflicting evidence and recommendations, this study aimed to describe liver cancer screening practices among primary care physicians (PCPs) and gastroenterologists, who provide care to most high-risk patients, and nephrologists, as hemodialysis patients also have a high prevalence of viral hepatitis.

METHODS

The study sample was drawn from the 2003 American Medical Association (AMA) Masterfile. Eligible physicians were board certified in family practice, internal medicine, gastroenterology, or nephrology and had office-based practices in 3 northern California counties with high proportions of ethnic minorities. The sample included all gastroenterologists, nephrologists, Asian-American PCPs, and 50% of randomly selected non-Asian PCPs. We oversampled Asian-American physicians because they may have heightened awareness of liver cancer and different screening behaviors.^{11,12} Excluding those whose address did not match telephone directories and medical center listings, the sample consisted of 743 physicians.

The survey instrument was developed, pilot-tested with 20 physicians, and revised. In 2004, the survey was mailed, followed by a second mailing in 4 weeks and a reminder card 6 weeks later. Respondents chose \$10 or a chance for \$100 in gift cards as incentives. The Institutional Review Board of the University of California, San Francisco approved the protocol.

Measures

Physician sociodemographic measures were age, gender, race, languages spoken, and country of birth. Practice measures included country of medical training, specialty, years in practice, type of practice, number of patients seen daily, and proportions of patients with public health insurance or who

Received February 15, 2006

Revised August 8, 2006

Accepted January 8, 2007

Published online January 30, 2007

Table 1. Physician Characteristics, Knowledge, Attitudes, and Intention Regarding Screening for Liver Cancer Compared to Screening Practice

	Screeners (n=406)	Nonscreeners (n=53)	Total (n=459)	p value
	Percentage or mean (standard deviation)			
<i>Physician sociodemographics</i>				
Sex, male	60.1	62.3	60.3	0.88
Age, in years	45.2 (11.3)	44.6 (9.7)	45.1(11.1)	0.69
Race				
White	41.9	52.8	43.1	0.35
Asian	53.7	45.3	52.7	
Other	4.4	1.9	4.1	
Birthplace in the United States	54.9	67.9	56.4	0.08
Speaks language other than English				
None	31.5	34.0	31.8	0.28
Asian	44.3	34.0	43.1	
Other	24.1	32.1	25.0	
Trained in U.S. medical school	79.4	81.1	79.6	0.86
Primary medical specialty				
General internal medicine	64.2	64.1	64.2	0.003
Family practice	21.1	30.2	22.2	
Gastroenterology	12.4	0.0	11.0	
Nephrology	2.2	5.7	2.6	
Years in specialty	13.6 (10.9)	14.6 (10.7)	13.8 (10.8)	0.56
<i>Practice characteristics</i>				
Primary medical practice				
Private	53.0	62.3	54.0	0.19
University	17.5	20.7	17.9	
Health maintenance organization (HMO)	21.4	9.4	20.0	
Other	8.1	7.5	8.1	
Average number of patients seen each day	19.6 (10.9)	17.5 (8.9)	19.3 (7.5)	0.06
Proportion of patients who are...				
Asian	30.7 (27.0)	24.9 (22.0)	30.0(26.5)	0.13
Non-English speaking	20.8 (23.7)	16.5 (22.9)	20.3 (23.6)	0.23
Aged 18–39 years	23.2 (13.9)	22.1 (17.8)	23.0 (14.4)	0.61
Aged 40–64 years	37.8 (14.9)	30.1 (16.0)	36.9 (15.2)	<0.001
Aged 65+ years	35.2 (20.0)	39.0 (27.2)	35.6 (21.0)	0.21
Proportion of patients with...				
Public health insurance	29.0 (24.6)	33.7 (29.9)	29.6 (25.2)	0.20
Private managed care health insurance	37.0 (32.5)	34.7 (31.9)	36.8 (32.4)	0.63
Private non-managed care health insurance	21.0 (23.0)	17.3 (21.7)	20.3 (22.8)	0.28
No health insurance	7.6 (15.8)	9.7 (19.7)	7.8 (16.3)	0.36
<i>Physician knowledge (scale 1–5[†])</i>				
Asian-Americans have a high incidence of liver cancer compared to Whites	4.6 (0.7)	4.4 (0.9)	4.5 (0.7)	0.18
Patients with chronic hepatitis B have a higher risk of liver cancer than patients with chronic hepatitis C	3.4 (1.2)	3.2 (1.2)	3.4 (1.2)	0.21
Asian-Americans have a lower prevalence of chronic hepatitis B compared to Whites ^{††}	1.5 (0.9)	1.9 (1.2)	1.5 (1.0)	0.008
Screening for colon cancer reduces colon cancer mortality	4.7 (0.6)	4.6 (0.7)	4.7 (0.6)	0.17
<i>Physician attitudes (scale 1–5[†])</i>				
Screening for liver cancer among high-risk patients reduces liver cancer mortality	3.8 (0.9)	3.3 (1.0)	3.8 (0.9)	<0.001
Screening for liver cancer among high-risk patients is cost-effective	3.5 (0.9)	3.0 (0.9)	3.4 (1.0)	<0.001
Not screening for liver cancer among high-risk patients is a malpractice risk	3.5 (1.0)	2.8 (0.9)	3.4 (1.0)	<0.001
<i>Physician intention regarding cancer screening^{†††}</i>				
Would order a screening test if...				
there is evidence that it decreases mortality	94.3	88.7	93.7	0.11
recommended by a national organization	72.7	73.6	72.8	0.89
see more of the cancer in practice	25.4	15.1	24.2	0.10
a patient asks for it	49.5	43.4	48.8	0.40
used as a quality-of-care measure	35.5	15.1	33.1	0.003
covered by health insurance	27.1	20.7	26.4	0.33

[†]Likert scale from 1=strongly disagree to 5=strongly agree^{††}Incorrect answer^{†††}Percentage responding "yes"

were non-English speakers. Using a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree), the survey included 7 items to assess attitude toward and knowledge about liver cancer, its risks, and its screening. There were also 5 questions

on what influenced the respondent to order any screening test. The dependent variable was screening for liver cancer in high-risk patients, defined as responding "yes" to the question "Do you screen for liver cancer in high-risk patients?" Respondents

were subsequently asked which patients they considered “high-risk” and to describe the tests and intervals employed.

Analysis

The hypothesis was that gastroenterologists were more likely to screen for liver cancer than PCPs. Descriptive statistics were computed for screeners and non-screeners. To examine the association of each variable with screening behavior, Fisher’s exact test or chi-square test for categorical measures and Student’s *t* test for continuous measures were used in bivariate analyses. A multivariate model was developed initially including all variables with a bivariate $p < 0.20$ for the association with screening behavior. This was followed by a backward elimination procedure. Physician age, gender, and race were forced into the final model. Gastroenterologists were excluded because their screening rate was 100%. All analyses utilized SAS version 9.1 (SAS Institute, 1999).

RESULTS

The overall response rate was 61.8%, with 71.4% of gastroenterologists, 65.0% of family practitioners, 60.3% of general internists, and 48.0% of nephrologists responding. Compared to responders ($N=459$), nonresponders ($N=284$) were older (mean 50.5 vs 45.1 years) and had lower proportions of women (30.9% vs 39.7%) and Asians (34.4% vs 52.7%). Most responders (88.5%) reported screening for liver cancer in high-risk patients.

Physicians identified as high-risk conditions chronic hepatitis B with cirrhosis (86.1% of physicians), hepatitis C with cirrhosis (83.0%), chronic hepatitis B without cirrhosis (72.3%), and non-B non-C cirrhosis (57.9%). More than half (56.6%) used 2 tests to screen, with 52.3% using both AFP and ultrasound (32.9% using both at intervals of ≤ 12 months) and 1.7% using both AFP and CT. Only 4.1% used 1 test to screen (3.2% AFP and 0.9% ultrasound), whereas 26.5% used all 3 tests to screen.

Physician specialty was significantly associated with screening with 100% of gastroenterologists, 88.4% of General Internists, 84.2% of family practitioners, and 75.0% of nephrologists reporting screening ($p=0.016$; Table 1). Screeners were more likely than nonscreeners to know that the prevalence of chronic hepatitis B was higher among Asian Americans than Whites ($p=0.008$). Screeners were more likely to think that screening reduced mortality and was cost-effective, and that not screening was a malpractice risk (all $p < 0.001$). Screeners were more likely than nonscreeners to report they were influenced by quality of care considerations when ordering any screening test ($p=0.003$).

Compared to general internists, gastroenterologists were more likely to know that the risk for liver cancer was higher among patients with hepatitis B than C ($p=0.01$) and to believe that not screening was a malpractice risk ($p=0.05$) but less likely to use a screening test that was a quality measure ($p=0.03$). Family practitioners were more likely than general internists to believe that not screening was a malpractice risk ($p=0.05$).

In multivariate analysis (Table 2), physicians were more likely to screen for liver cancer if they thought that screening

Table 2. Multivariate Logistic Model Identifying Physician Factors Associated with Screening for Liver Cancer ($n=348$)*

	Screen for liver cancer odds ratio (95% confidence interval)
Age, 5-year increments	1.00 (0.97, 1.04)
Male sex (female=reference category [ref.])	0.73 (0.34, 1.58)
Asian race (non-Asian=ref.)	1.08 (0.48, 2.42)
Birthplace in U.S.	0.56 (0.25, 1.26)
Medical specialty (general internal medicine=ref.)	
Family practice	0.99 (0.44, 2.21)
Nephrology	0.39 (0.07, 2.13)
Primary medical practice (private=ref.)	
University	1.48 (0.58, 3.76)
Health Maintenance Organization (HMO)	3.18 (0.96, 10.57)
Other	0.99 (0.24, 4.05)
Asian Americans have a lower prevalence of chronic hepatitis B compared to Whites [†]	0.74 (0.54, 1.01)
Screening for liver cancer among high-risk patients reduces liver cancer mortality	1.60 (1.09, 2.34)
Not screening for liver cancer among high-risk patients is a malpractice risk	1.88 (1.29, 2.75)
Would order a cancer screening test if it is a quality of care measure	4.39 (1.79, 10.81)

Model characteristics: $R\text{-square}=0.271$; Hosmer-Lemeshow goodness-of-fit $p\text{ value}=0.546$

*Excludes gastroenterologists since 100% screened for liver cancer

[†]Incorrect answer

reduced liver cancer mortality (OR 1.60, CI 1.09–2.34) and that not screening was a malpractice risk (OR 1.88, CI 1.29–2.75). Screeners were more likely than nonscreeners to order a test if its use was a quality of care measure (OR 4.39, CI 1.79–10.81).

DISCUSSION

This study found that many physicians responding to this survey in northern California reported screening for liver cancer in high-risk patients. The proportion who reported screening was similar to those reporting screening for prostate cancer, another controversial test.^{13,14} Our finding that gastroenterologists were more likely to screen for liver cancer than PCPs and nephrologists confirmed our hypothesis that specialists were more likely to screen for cancer in their specialty. However, the rate of screening was surprisingly high, with 100% of gastroenterologists reporting screening, whereas the proportion of PCPs who screened was similar to that reported by hepatologists in an earlier study.¹⁰ These findings indicate that despite the lack of clear evidence of effectiveness, many physicians screen for liver cancer in high-risk patients.

Early prospective studies of liver cancer screening did not have control groups, found that the tests had poor characteristics, or did not show an effect on tumor size or mortality.^{15–17} Two recent randomized controlled trials from China reported conflicting results. One showed that screening among 18,816 hepatitis B-infected participants reduced mortality by 37%.¹⁸

Another showed no mortality benefit.¹⁹ The NCI interpreted these data as showing no mortality benefit, but in our survey, screeners thought that liver cancer screening reduced mortality. This may reflect lack of knowledge of the evidence, disagreement about its interpretation, or selective use of the evidence to support their behavior.

Perhaps owing to the conflicting evidence and recommendations, screeners were susceptible to factors such as fear of malpractice and quality control. Fear of malpractice has been associated with screening behaviors in other studies.^{10,20} Because liver cancer has a high case fatality rate, can occur among young adults with hepatitis B, and some guidelines do recommend screening, physicians may perceive a high risk of being sued for failure to screen. Whereas liver cancer screening is not usually a quality of care measure, quality control concerns in general affected screeners more than nonscreeners, although the effect varied by specialty.

The high rate of screening found in this sample may be caused by several biases. First, the response rate of 61.8% was low, although not unusually so for published surveys on screening behaviors among community-based physicians. The only published survey on liver cancer screening had a response rate of 54%.¹⁰ Second, respondents may have been more interested in screening and screened more than nonrespondents, especially because response rates were highest among gastroenterologists and Asian-American physicians. Nonetheless, even if no one screened among nonresponders, the reported screening rate in this sample would be 54.6%. Third, self-reports overestimate actual behaviors, and responders, knowing the survey's purpose, may have overstated their screening behaviors. However, this bias, if true, indicates that responders perceive screening as the socially desirable outcome. Finally, the survey area had a high proportion of high-risk patients, and the results may not be generalizable to areas with low prevalence of high-risk patients.

Despite debate regarding effectiveness, many physicians screen for liver cancer in high-risk patients. When the evidence is unclear and the stakes are high, these physicians are influenced by concerns about malpractice and quality control. Along with the need to improve screening tests and evaluate their effectiveness, research is also needed to understand and influence how physicians behave when facing inconsistencies in the scientific literature.

Acknowledgment: This study was funded by a Cancer Control Career Development Award (CCDA-02-221-01) from the American Cancer Society. Drs. Nguyen and McPhee were also supported by the Asian-American Network for Cancer Awareness, Research, and Training (National Cancer Institute U01/CA86322).

Potential Financial Conflict of Interest: None disclosed

Corresponding Author: Tung T. Nguyen, MD; *Suc Khoe La Vang!* (Health is Gold!), Vietnamese Community Health Promotion Project, Division of General Internal Medicine, Department of Medicine,

University of California, San Francisco, 400 Parnassus Avenue, A-405, San Francisco, CA 94143-0320, USA (e-mail: Tung.Nguyen@ucsf.edu).

REFERENCES

1. **Parkin DM, Whelan SL, Ferlay J, et al., eds.** Cancer Incidence in Five Continents 1993–1997. Lyon, France: IARC Scientific Publications; 2002.
2. **Ries LAG, Eisner MP, Kosary CL, et al., eds.** SEER Cancer Statistics Review, 1973–1998. Bethesda, MD: National Cancer Institute; 2001.
3. **Sherman M.** Screening for hepatocellular carcinoma. *Bailliere's Best Pract Res Clin Gastroenterol.* 1999;13(4):623–35.
4. **Sakuma KS, Kasai M, Jitsukawa H, et al.** Relative risks of death due to liver disease among Japanese male adults having various statuses for hepatitis B s and e antigen/antibody in serum: a prospective study. *Hepatology.* 1988;8(6):1642–6.
5. **Morris CR, Cohen R, Perkins CI, et al.** Cancer in California 1988–1996. Sacramento, CA: California Department of Health Services, Cancer Surveillance Section; 1999.
6. **Lok AS, McMahon BJ.** Chronic hepatitis B. *Hepatology.* 2001;34(6):1225–41.
7. **De Masi N, Tosti ME, Mele A.** Screening for hepatocellular carcinoma. *Dig Liver Dis.* 2005;37(4):260–8.
8. National Cancer Institute. Hepatocellular (Liver) Cancer Screening. Available at: <http://www.cancer.gov/cancertopics/pdq/screening/hepatocellular/HealthProfessional>. Accessed October 28, 2005.
9. **Lok AS, McMahon BJ.** American Association for the Study of Liver Diseases (AASLD) Practice Guidelines: Chronic Hepatitis B. Available at: <https://www.aasld.org/>. Accessed October 28, 2005.
10. **Chalasan N, Said A, Ness R, et al.** Screening for hepatocellular carcinoma in patients with cirrhosis in the United States: results of a national survey. *Am J Gastroenterol.* 1999;94(8):2224–9.
11. **Lee MM, Lee F, Stewart S, et al.** Cancer screening practices among primary care physicians serving Chinese Americans in San Francisco. *West J Med.* 1999;170(3):148–55.
12. **Lew AA, Moskowitz JM, Ngo L, et al.** Effect of provider status on preventive screening among Korean-American women in Alameda County, California. *Prev Med.* 2003;36(2):141–9.
13. **Fowler FJ Jr., Bin L, Collins MM, et al.** Prostate cancer screening and beliefs about treatment efficacy: a national survey of primary care physicians and urologists. *Am J Med.* 1998;104(6):526–32.
14. **Voss JD, Schectman JM.** Prostate cancer screening practices and beliefs. *J Gen Intern Med.* 2001;16(12):831–7.
15. **Pateron D, Ganne N, Trinchet JC, et al.** Prospective study of screening for hepatocellular carcinoma in Caucasian patients with cirrhosis. *J Hepatol.* 1994;20(1):65–71.
16. **Zoli M, Magalotti D, Bianchi G, et al.** Efficacy of a surveillance program for early detection of hepatocellular carcinoma. *Cancer.* 1996;78(5):977–85.
17. **McMahon BJ, Bulkow L, Harpster A, et al.** Screening for hepatocellular carcinoma in Alaska natives infected with chronic hepatitis B: a 16-year population-based study. *Hepatology.* 2000;32(4 Pt 1):842–6.
18. **Zhang BH, Yang BH, Tang ZY.** Randomized controlled trial of screening for hepatocellular carcinoma. *J Cancer Res Clin Oncol.* 2004;130(7):417–22.
19. **Chen JG, Parkin DM, Chen QG, et al.** Screening for liver cancer: results of a randomised controlled trial in Qidong, China. *J Med Screen.* 2003;10(4):204–9.
20. **Collins MM, Fowler FJ Jr., Roberts RG, et al.** Medical malpractice implications of PSA testing for early detection of prostate cancer. *J Law Med Ethics.* 1997;25(4):234–42.