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Physicians' beliefs about effectiveness of cancer screening tests: A national survey of family physicians, general internists, and obstetrician–gynecologists

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Abstract

Objective—To study physicians' beliefs about the effectiveness of different tests for cancer screening.

Methods—Data were examined from the *Women's Health Survey* of 1574 Family Medicine, Internal Medicine, and Obstetrics–Gynecology physicians to questions about their level of agreement about the clinical effectiveness of different tests for breast, cervical, ovarian, and colorectal cancer screening among average risk women. Data were weighted to the U.S. physician population based on the American Medical Association Masterfile. Multivariable logistic regression identified physician and practice characteristics significantly associated with physicians' beliefs.

Results—There were 1574 respondents, representing a 62% response rate. The majority of physicians agreed with the effectiveness of mammography for women aged 50–69 years, Pap tests for women aged 21–65 years, and colonoscopy for individuals aged 50 years. A substantial proportion of physicians believed that nonrecommended tests were effective for screening (e.g., 34.4% for breast MRI and 69.1% for annual pelvic exam). Physicians typically listed their respective specialty organizations as a top influential organization for screening recommendations.

Conclusions—There were several substantial inconsistencies between physician beliefs in the effectiveness of cancer screening tests and the actual evidence of these tests' effectiveness which can lead both to underuse and overuse of cancer screening tests.

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Disclaimer

The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Conflict of interest statement

The authors have no conflict of interest to report.

Keywords

Cancer screening; Breast cancer; Cervical cancer; Colorectal cancer; Ovarian cancer; Physician beliefs

Introduction

Prevention and early detection of cancer are the most effective ways to decrease cancer morbidity and mortality. Through appropriate cancer screening, some cancers may be prevented or detected early when treatment is most effective (Nelson et al., 2009; Preventive Services, 2008; Preventive Services Task Force (USPSTF), 1996; American College of Obstetricians and Gynecologists Committee on Practice Bulletins—Gynecology, 2009 Dec). However, not all cancers have effective screening tests, and symptom recognition may be the key to detecting some cancers early. (Baldwin et al., 2012a; Devlin et al., 2010; Goff et al., 2007; Meissner et al., 2010; Ryerson et al., 2007; Yabroff et al., 2011a) Despite these facts, there is a wide variation in cancer screening practices across the United States, resulting in both overscreening and underscreening.

Studies evaluating screening practices have shown that physicians' recommendations, along with patient barriers and beliefs, are important determinants of cancer screening (Coughlin et al., 2005; Goldzweig et al., 2004; Gorin et al., 2007; Najem et al., 1996; Ramirez et al., 2009; Rauscher et al., 2005; Schueler et al., 2008; Teng et al., 2006; Wong et al., 2010). While many studies have focused on physician knowledge, patient characteristics, and use of reminder systems to encourage screening, (Lester et al., 2009; Nadel et al., 2010; Nichols et al., 2009; Saraiya et al., 2010; Sequist et al., 2009; Werny et al., 2008; Yabroff et al., 2011b) only a few older studies have examined physician beliefs about the effectiveness of tests for cancer screening, and these studies have typically occurred in small, defined geographical areas (Clasen et al., 1994; Cummings et al., 1984).

In an attempt to minimize variation and increase the use of appropriate cancer screening tests, evidence-based guidelines targeted to health care providers have been developed. This is an important strategy, as patients have consistently reported that a physician recommendation is one of the most important influences on their decision to complete cancer screening tests (Goldzweig et al., 2004; Schueler et al., 2008). A previous review reported that physicians' lack of agreement with recommendations serves as a barrier to guideline adherence (Cabana et al., 1999 Oct 20). Understanding physician beliefs about the effectiveness of cancer screening tests is an essential step in ensuring that patients receive evidence-based cancer screening.

In this study, data from *Women's Health Survey* sent to a nationally representative sample of family medicine (FM), general internal medicine (IM), and obstetrics–gynecology (Ob/Gyn) physicians were used to examine their beliefs about the effectiveness of different tests to screen for breast, cervical, colorectal (CRC), and ovarian cancer among average risk women. The findings from this study can help guide the development of interventions to educate physicians about the effectiveness of cancer screening tests and ultimately to improve the appropriate use of these tests.

Methods

Study sample

The study sample included 3200 U.S. physicians aged 64 years and younger practicing in office or hospital settings. Equal numbers of FM, IM, and Ob/Gyn physicians were selected by stratified random sampling from the American Medical Association (AMA) Physician Masterfile. Physicians aged 65 years and older were excluded to ensure a sample of physicians most likely to be in active clinical practice.

Survey instrument and administration

A 12-page mail survey examining physicians' agreement with clinical effectiveness of cancer screening tests for breast, cervical, colorectal, and ovarian cancers; reported care for women's health through vignettes about preventive care services, specialty referral, and patient risk assessment; attitudes towards taking risks; sources of information about cancer screening; and personal cancer experience was administered November 2008–January 2009. The questionnaire also captured physician demographics and practice characteristics. Detailed descriptions of the survey and its administration have previously been reported (Baldwin et al., 2012b; Goff et al., 2011a,b; Trivers et al., 2011). Institutional Review Board approval was obtained from the University of Washington and the Centers for Disease Control and Prevention.

Variables of interest

For this study, we examined the question that asked physicians about their level of agreement (strongly disagree, disagree, agree, and strongly agree) with statements that various tests were clinically effective in screening for breast, cervical, ovarian, and CRC in the average risk population. We defined belief in the clinical effectiveness of a test for cancer screening if the physician responded “agree” or “strongly agree” with the statement. The tests for breast cancer screening included mammography for women aged 40–49 years, mammography for women aged 50–69 years, breast magnetic resonance imaging (MRI), and clinical breast examination (CBE); cervical cancer screening included human papillomavirus (HPV) test without Papanicolaou (Pap) test for women aged 30–65 years (primary HPV screening) and Pap test for those aged 21–65 years; ovarian cancer screening included cancer antigen 125 (CA-125) testing, transvaginal ultrasound (TVU), and annual pelvic examination; and CRC screening included colonoscopy, computed tomography (CT) colonography, sigmoidoscopy, and take-home fecal occult blood test (FOBT).

Physician characteristics (age, specialty, sex, board certification, years in practice, group versus solo practice, weekly average number of patients, involvement in clinical teaching, personal experience with cancer, geographic location, census division, level of risk-taking, and fear of malpractice) were examined as factors that might predict physicians' belief in the effectiveness of each test for cancer screening. Since beliefs may be related to where and from whom a physician receives cancer screening information, we also assessed which professional organizations influenced their cancer screening recommendations.

Statistical analysis

Initial physician exclusions from the 3200 study sample included 33 duplicates; 95 undeliverables; 19 retired, disabled, or deceased; and 11 not practicing or on leave. Of the remaining 3042 physicians who were mailed surveys, 1878 (61.7%) responded. Further exclusions were 200 respondents reporting not providing outpatient care to women; 71 working in settings not providing outpatient/primary care (e.g., emergency rooms); 10 reporting specialties other than FM, IM, and Ob/Gyn; and 23 in residency or fellowship training. The final sample included 1574 respondents. Responses were weighted to their representative number in the practicing U.S. physician population by medical specialty using AMA Physician Masterfile counts proportionately.

Stepwise multivariable logistic regression analysis identified the physician and practice characteristics that were independently and significantly associated with belief in the effectiveness of each test for cancer screening at the $p = 0.05$ level. The characteristics entered into the regression analysis were those significantly associated with belief in the test effectiveness for cancer screening in an unadjusted analysis. Only organizations that make recommendations on a specific type of cancer were included in that regression model, such as the use of the U.S. Preventive Services Task Force (USPSTF) and the American Cancer Society (ACS) for all four cancers and use of the American Congress of Obstetricians and Gynecologists (ACOG) for breast, cervical, and ovarian cancers. All analyses were conducted using SUDAAN 10.0 (RTI International, Research Triangle Park, NC). Because belief in the effectiveness of cancer screening tests was a common outcome, risk ratios within SUDAAN based on predicted marginals were calculated (Bieler et al., 2010).

Results

In the weighted study sample, 41.5% were FM, 41.0% IM, and 17.5% Ob/Gyn physicians (Table 1). Almost half (42.7%) of physicians were aged 50–64 years, 71.1% were Caucasian, and 40.4% were female. In addition, 91.6% were board certified and 82.0% had been in practice for more than 10 years.

Influential organizations for cancer screening recommendations

Most physicians ranked their respective specialty professional organization as one of the top organizations that influenced their cancer screening recommendations (Table 2). Across all three specialties, the majority of physicians reported the ACS as a top influential organization. More than half of FM and IM physicians reported the USPSTF, and almost half of the Ob/Gyn physicians ranked the National Institutes of Health/National Cancer Institute (NCI) as one of their top influential organizations.

Breast cancer

For breast cancer screening, half of the physicians strongly agreed and slightly less than half agreed that mammography is an effective test for women aged 40–49 years (Table 3). For women aged 50–69 years, 81.7% of physicians strongly agreed that mammography is an effective screening test for breast cancer. Large percentages of physicians also either strongly agreed (40.0%) or agreed (45.4%) that the CBE is an effective screening test. Over

one-third of physicians agreed that MRI is an effective screening test for average risk women.

In the adjusted analysis (Table 4), physicians who listed the ACS as one of their top influential organizations were significantly more likely to believe that mammography is an effective cancer screening test for women aged 40–49 years, whereas physicians listing the USPSTF as a top influential organization were less likely to believe this test is effective. Physicians who reported a personal cancer experience were less likely to believe that mammography is effective for women aged 50–69 years. Physicians who were involved in clinical teaching or who listed USPSTF as an influential organization were significantly less likely to believe that the CBE is an effective screening test.

Cervical cancer

Physicians strongly agreed (70.3%) or agreed (29.1%) that Pap testing is effective as a cancer screening test for women aged 21–65 years. Almost half of the physicians (48.0%) agreed or strongly agreed that the HPV test alone is effective for cervical cancer screening (Table 3). In the adjusted analysis (Table 4), FM and IM physicians were significantly less likely to believe that the HPV test alone is effective compared with Ob/Gyn physicians.

Ovarian cancer

Only 17.6% of physicians agreed or strongly agreed that CA-125 is an effective test and 30.3% of physicians agreed or strongly agreed that TVU is an effective test for ovarian cancer screening in the average risk population (Table 3). For the annual pelvic exam, 30.0% of physicians strongly agreed and 39.1% agreed that it is an effective ovarian cancer screening test.

In adjusted analysis (Table 4), physicians in practice for ≥20 years and FM and IM physicians were more likely to believe CA-125 is an effective ovarian cancer screening. In contrast, physicians who were board certified, in group practice, had a personal experience with cancer and listed USPSTF as a top influential organization were less likely to believe that CA-125 is an effective cancer screening test. Physicians who agreed that TVU is an effective screening test were more likely to have been in practice ≥20 years versus 0–10 years, to be an IM physician versus an Ob/Gyn physician, and to list the NCI as an influential organization. Physicians who were board certified, in group practice, and listed the USPSTF as a top influential organization were less likely to agree that TVU is an effective screening test. As with CA-125, FM and IM physicians were more likely to believe in annual pelvic exam as an effective screening test. Physicians less likely to believe that pelvic exam is effective were those listing USPSTF as a top influential organization, in group versus solo practice, and involved in clinical teaching.

Colorectal cancer

While 81.8% of physicians strongly agreed that colonoscopy is an effective screening test for CRC, only 24.0% strongly agreed that FOBT is effective (Table 3). Over a third (37.6%) of physicians agreed or strongly agreed that CT colonography is effective for CRC screening. In adjusted analysis (Table 4), no physician characteristics were significantly

associated with belief that either colonoscopy or CT colonography are effective CRC screening tests. IM physicians were less likely than Ob/Gyn physicians to believe that flexible sigmoidoscopy is effective. Those listing USPSTF as a top influential organization were more likely to believe that flexible sigmoidoscopy is an effective screening test.

Discussion

Just as cancer screening practices vary widely across the United States, so do physician beliefs in the effectiveness of cancer screening tests. Physicians believe that mammography for women aged 50–59 years and Pap testing for women aged 21–65 years are effective cancer screening tests, consistent with the recommendations of the USPSTF, ACS and ACOG. Interestingly, only half of the physicians believed that mammography is effective for women aged 40–49 years, which may be related to the controversy that has persisted for many years about the net benefits of mammography among this age group. However, at the time of the survey, the USPSTF, ACS and ACOG all recommended routine mammography screening for this age group. Since the survey, the USPSTF has changed its recommendations and no longer recommends routine mammography for this age group. Our finding is consistent with another study by Meissner et al. in which fewer primary care physicians reported that mammography was very effective for women aged 40–49 years compared to women aged ≥ 50 years (Meissner et al., 2011).

Although no organizations recommend MRI for breast cancer screening among average risk women, over one third of physicians believed that this test is effective. This finding is concerning because there is no evidence documenting its effectiveness as a screening test among average risk women. MRI has higher sensitivity than mammography, but a lower specificity and a higher false positive rate (Brennan et al., 2009). Similarly, it is concerning that over one quarter to half of physicians agreed that CA-125, TVU and pelvic exams are effective for ovarian cancer screening among average risk women, even though no organizations recommend this nor is there any evidence of their effectiveness (Smith et al., 2011; U.S. Preventive Services Task Force, 2004).

For cervical cancer screening, nearly half of physicians agreed that HPV testing alone is effective, though not currently recommended. Ob/Gyn physicians were more likely than either FM or IM physicians to believe that HPV testing alone is effective. This may be due to their understanding of the relationship between HPV and cervical cancer, and the sensitivity of HPV testing (Carter et al., 2011 Apr; Trottier and Franco, 2006).

For CRC screening, our findings were similar to previous published reports (Klabunde et al., 2009). Compared to colonoscopy, smaller percentages of physicians believed that sigmoidoscopy and FOBT are effective screening tests, even though these are the only CRC screening tests proven effective by randomized controlled trials. These FOBT findings are very similar to previous studies in which few physicians felt that FOBT was an effective screening test (Hawley et al., 2001; Klabunde et al., 2009; Nadel et al., 2005). Beliefs regarding some CRC screening tests may reflect confusion because there are multiple recommended tests with varying screening intervals. Also, some physicians' recommendations regarding specific CRC tests may be influenced by reimbursement

policies and rates from insurance providers. This may in turn influence their beliefs (Guessous et al., 2010; Palmer et al., 2010 Nov 24).

As expected, physicians frequently reported their own specialty professional organizations among the top organizations that influenced their cancer screening recommendations. The use of specialty specific professional organizations is not unexpected given that these are the certification organizations that typically provide practice guidelines for each medical specialty and play an important role in continuing medical education (Pellegrino and Relman, 1999). This finding is very similar to that of a study showing that the majority of FM and Ob/Gyn physicians rated guidelines for breast and cervical cancer screening from their own professional society as very influential (Han et al., 2011). This suggests that promoting the use of evidence-based recommendations through professional organizations could potentially be important interventions to improve appropriate use of screening tests.

Our study has several limitations. First, this study depends on self-reported responses to the level of agreement with effectiveness of specific screening tests. These responses could be influenced by the desire to report expected findings. Also, belief in test effectiveness is not necessarily related to the physicians' understanding and use of national recommendations, but may be related to the physician's personal practice style, test performance, or personal medical history. Finally, the survey did not define "effectiveness", therefore physicians may have different interpretations regarding decreasing mortality, improving 5-year survival, or preventing disease. Despite these limitations, this study has a strong response rate and is nationally representative of primary care physicians across the United States.

Conclusions

Physician beliefs about the effectiveness of specific screening tests may impact their recommendation or performance of these tests. We have demonstrated several substantial inconsistencies between physician beliefs in the effectiveness of cancer screening tests and the actual evidence of these tests' effectiveness. These inconsistencies can lead both to overuse of cancer screening resources and underdiagnosis of some cancers. Since physicians are typically influenced by their specialty organizations, collaborating with professional organizations on targeted intervention efforts can enhance physician education and help ensure that practice patterns match evidence-based recommendations regarding cancer screening. Understanding physician's beliefs, practices, and modes of learning are important for determining which intervention efforts and venues will be most effective in increasing evidence-based cancer screening practice.

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Table 1

Characteristics of physician respondents and their practices.

Physician and practice characteristics	All physicians
	N = 1574
	Weighted %
Specialty	
Family medicine	41.5
Internal medicine	41.0
Obstetrics–Gynecology	17.5
Age	
30–39 years	23.0
30–39 years	34.3
50–64 years	42.7
Race	
Caucasian	71.1
Asian/Pacific Islander	16.0
African American	5.1
American Indian/Alaska Native, mixed race, other, missing	7.8
Hispanic	4.9
Female	40.4
Board certified	91.6
Years in practice	
0–10 years	17.9
11–20 years	37.4
21+ years	44.6
Primary setting	
Office practice or freestanding clinic	78.8
Urgicenter	1.7
Hospital outpatient department	5.8
Health maintenance organization or other prepaid practice	2.5
Community health center	3.6
Federal government-operated clinic	2.7
Other, including institutional setting, non-federal government clinic, family planning clinic, and tribal health center/Indian Health Service or missing	4.8
Practice type	
Solo practice	23.3
Single-specialty group	42.8
Multi-specialty group	27.9
Other or missing	5.9
Weekly average number of patients	
1–60	27.5
61–90	28.8

Physician and practice characteristics	All physicians
	N = 1574
	Weighted %
91+	43.6
Involved in clinical teaching	40.4
Personal experience with cancer	
Family (immediate or extended)	78.7
Self	4.8
None	16.5
Geographic location	
Urban	84.6
Large rural	9.3
Small/remote rural	6.1
Census division	
New England	5.6
Middle Atlantic	14.1
East North Central	16.5
West North Central	8.0
South Atlantic	16.3
East South Central	5.5
West South Central	9.2
Mountain	6.9
Pacific	18.0
Level of risk taking	
Low	58.3
Medium	34.1
High	7.6
Fear of malpractice	
Low	14.1
Medium	28.0
High	57.9

Table 2

Organizations reported to influence physician cancer screening recommendations by specialty type.

Organizations	Family medicine physicians	Obstetrics/gynecology physicians	Internal medicine physicians
	%	%	%
<i>Physician specialty organizations</i>			
American Academy of Family Physicians (AAFP)*	86.9	2.0	8.4
American College of Obstetricians and Gynecologists (ACOG)*	24.4	96.8	9.4
American College of Physicians/ American Society of Internal Medicine (ACP/ASIM)*	4.3	1.6	71.9
American College of Surgeons (ACoS)*	1.2	6.8	0.2
<i>Other organizations</i>			
American Medical Association (AMA)*	8.9	17.1	21.2
American Cancer Society (ACS)*	60.4	73.7	67.2
National Institutes of Health (NIH)/ National Cancer Institute (NCI)*	27.1	47.0	34.6
U.S. Preventive Services Task Force (USPSTF)*	64.2	27.7	54.1
Local institution (for example, HMO)	3.6	4.3	4.2

Note: Columns do not sum to 100% because physicians could choose three organizations.

* $P = 0.001$ for chi-square test across the rows.

Table 3

Physicians' level of agreement on the effectiveness of various tests for breast, cervical, ovarian and colorectal cancer screening in the average-risk population.

	Level of agreement			
	Strongly agree	Agree	Disagree	Strongly disagree
	%	%	%	%
<i>Breast cancer</i>				
Mammography for 40–49 year olds	50.6	44.0	4.6	0.8
Mammography for 50–69 year olds	81.7	17.6	0.3	0.3
Clinical breast exam	40.0	45.4	12.6	2.0
Magnetic resonance imaging (MRI)	7.8	26.6	7.0	18.6
<i>Cervical cancer</i>				
Human papillomavirus (HPV) test without Papanicolaou (Pap) test for 30–65 year olds (primary screening, not reflexive)	13.5	34.5	40.2	11.7
Pap test for 21–65 year olds	70.3	29.1	0.4	0.2
<i>Ovarian cancer</i>				
Cancer antigen CA-125	3.8	13.8	47.5	34.9
Transvaginal ultrasound	5.9	24.4	46.1	23.5
Annual pelvic exam	30.0	39.1	23.3	7.6
<i>Colorectal cancer (for those 50 years and older)</i>				
Colonoscopy	81.8	17.2	0.7	0.2
Computed tomography (CT) colonography	5.6	32.0	48.2	14.2
Sigmoidoscopy	10.1	36.8	38.9	14.1
Stool card for occult blood (3-day take-home FOBT)	24.0	47.1	23.7	5.2

Table 4

Factors significantly associated with agreement in the clinical effectiveness of cancer screening tests among the average-risk population by cancer type.

Characteristics	Risk ratio	95% confidence interval
<i>Breast cancer</i>		
Mammography for 40–49 year olds		
USPSTF a top influential organization (yes vs. no)	0.96	0.94, 0.99
ACS a top influential organization (yes vs. no)	1.04	1.01, 1.07
Mammography for 50–69 year olds		
Personal experience with cancer vs. none	0.51	0.49, 0.53
Clinical breast exam		
USPSTF a top influential organization (yes vs. no)	0.88	0.84, 0.92
Involved in clinical teaching (yes vs. no)	0.93	0.89, 0.98
<i>Cervical cancer</i>		
HPV test for 30–65 year olds without Pap test		
Family medicine vs. obstetrics/gynecology	0.73	0.65, 0.82
Internal medicine vs. obstetrics/gynecology	0.87	0.77, 0.99
Pap test for 21–65 year olds		
ACS a top influential organization (yes vs. no)	1.02	1.01, 1.03
<i>Ovarian cancer</i>		
Cancer Antigen CA-125		
Personal experience with cancer vs. none	0.37	0.17, 0.78
USPSTF a top influential organization (yes vs. no)	0.44	0.33, 0.57
Board Certified (yes vs. no)	0.63	0.46, 0.88
Group practice vs. solo practice	0.67	0.52, 0.86
20 years in practice vs. 10 years	1.18	1.03, 1.36
30 years in practice vs. 10 years	1.39	1.07, 1.80
40 years in practice vs. 10 years	1.61	1.11, 2.35
Family medicine vs. obstetrics/gynecology	2.45	1.79, 3.35
Internal medicine vs. obstetrics/gynecology	2.82	2.06, 3.86
Transvaginal ultrasound		
USPSTF a top influential organization (yes vs. no)	0.63	0.52, 0.76
Board certified (yes vs. no)	0.76	0.59, 0.98
Group practice vs. Solo practice	0.71	0.59, 0.85
Personal risk taking low vs. medium	0.67	0.47, 0.97
Personal risk taking high vs. medium	0.81	0.67, 0.97
NIH/NCI one of top three influential organizations (yes vs. no)	1.30	1.09, 1.54
Internal medicine vs. obstetrics/gynecology	1.27	1.04, 1.55
20 years in practice vs. 10 years	1.17	1.06, 1.29
30 years in practice vs. 10 years	1.36	1.13, 1.64
40 years in practice vs. 10 years	1.56	1.20, 2.02
Pelvic exam		

Characteristics	Risk ratio	95% confidence interval
USPSTF a top influential organization (yes vs. no)	0.76	0.71, 0.82
Group practice vs. Solo practice	0.86	0.80, 0.93
Involved in clinical teaching (yes vs. no)	0.90	0.84, 0.97
Internal medicine vs. obstetrics/gynecology	1.13	1.03, 1.24
Family medicine vs. obstetrics/gynecology	1.14	1.05, 1.25
<i>Colorectal cancer</i>		
Flexible sigmoidoscopy		
Internal medicine vs. obstetrics/gynecology	0.85	0.74, 0.97
USPSTF a top influential organization (yes vs. no)	1.24	1.10, 1.40
Pacific vs. New England	1.48	1.09, 2.01
Fecal occult blood testing		
Middle Atlantic vs. New England	1.27	1.04, 1.54