Attachment 5
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A national survey of primary care physicians' colorectal cancer screening recommendations and practices

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Abstract

Background. National data on providers' colorectal cancer (CRC) screening knowledge, attitudes, and practices are sparse. This study assessed primary care physicians' (PCPs') beliefs about the effectiveness of CRC screening, their recommendations for screening, their perceptions of the influence of published guidelines on their CRC screening recommendations, and how they conduct CRC screening in their clinical practices.

Methods. A questionnaire was administered to a nationally representative sample of practicing PCPs. Of 1718 eligible physicians, 1235 (72%) responded.

Results. Only 2% of PCPs said they did not recommend CRC screening. Over 80% indicated that they most often recommend CRC screening with fecal occult blood testing and/or flexible sigmoidoscopy, although colonoscopy was perceived as the more effective screening modality. Nearly two-thirds of obstetrician/gynecologists and one-fourth of other practitioners reported conducting fecal occult blood testing exclusively by digital rectal exam. Only 29% of PCPs said they perform sigmoidoscopy. Estimated volumes of ordering, performing, or referring for CRC screening were low, and <20% reported that three-fourths or more of their older patients were up to date with CRC screening as recommended by the physician. Many PCPs reported recommending CRC screening at nonstandard starting ages or too-frequent intervals.

Conclusions. Awareness of CRC screening among PCPs in the United States is high. However, knowledge gaps about the timing and frequency of screening and suboptimal screening delivery were evident.
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Keywords: Colorectal cancer; Screening; Primary care; Health services delivery

Introduction

During the latter half of the 1990s, evidence emerging from clinical studies [1–9] prompted a number of expert groups [10–12] to issue or revise their recommendations for colorectal cancer (CRC) screening. With varying ap-

proaches to evaluating evidence and formulating recommendations, these groups developed guidelines that differ somewhat in the CRC screening modalities they support as well as the frequency with which recommended modalities are to be applied. Nevertheless, a consensus has emerged in recent years that average-risk adults aged 50 years and older should be screened for CRC.

Despite the evidence in support of screening for CRC and the dissemination of screening guidelines, national surveys of the public indicate that the majority of adults aged 50 and older have never been screened for this disease. For

example, data from the 1998 National Health Interview Survey (NHIS), an in-person household survey of a nationally representative sample of the noninstitutionalized U.S. population, show 33% of adults aged 50 years and older to have received a fecal occult blood test (FOBT) in the 2 years before the interview and 38% to have ever undergone a proctoscopy/sigmoidoscopy examination [13]. The 1999 Behavioral Risk Factor Surveillance System (BRFSS), a population-based, random-digit-dialed telephone survey of the noninstitutionalized U.S. population, indicates that 40% of adults aged 50 years and older have ever had an FOBT and 44% a sigmoidoscopy or colonoscopy examination [14]. Trend data from these surveys demonstrate only modest improvement in CRC screening rates over time [13–15].

Health care providers play a key role in recommending screening to eligible patients. Yet nationally representative data on providers' CRC screening knowledge, attitudes, and practices are sparse. Prior studies have been state or locally based, with small sample sizes, low response rates, a focus on opinions about guidelines rather than actual practice or, if addressing provider practices, have targeted only one or two of the four currently recognized CRC screening modalities [16–27]. To address these gaps, the National Cancer Institute—in collaboration with the Centers for Disease Control and Prevention and the Centers for Medicare and Medicaid Services—fielded the Survey of Colorectal Cancer Screening Practices in Health Care Organizations. This comprehensive survey of primary care and specialty physicians and health plan medical directors is designed to obtain current, nationally representative data on how CRC screening is being conducted in the United States, and to identify barriers to screening delivery in community practice [28]. In this report, we summarize primary care physicians' (PCPs') beliefs about the effectiveness of CRC screening, their recommendations to patients for CRC screening, and their self-reported CRC screening activities in their clinical practices.

Methods

Sampling methodology

Using the American Medical Association's Physician Masterfile as the sampling frame, we surveyed a nationally representative sample of PCPs in 1999–2000. The Masterfile contains demographic and practice-related data on all allopathic and virtually all osteopathic physicians in the United States. Eligible respondents were PCPs aged 75 years and younger who were listed in the database as having an active license to practice medicine and whose major professional activity involves patient care. We selected physicians practicing the primary care specialties of general practice (GP), family practice (FP), general internal medicine (IM), and obstetrics/gynecology (OBG). Physicians who were retired, in residency training, or involved in full-time teaching, research, or administration were excluded. Obstetrician/gynecologists were included in the sample because of their role as providers of preventive services for many women in the United States [29]. We selected a systematic, stratified random sample of 2098 physicians using physician specialties as the sampling strata and selection proportional to the specialty's representation in the total U.S. physician population. Sample sizes in each specialty group were selected to provide point estimates of population proportions within ±3% at a 95% confidence interval. Sample selection was accomplished after the sampling frame database had been sorted by U.S. Census region (Northeast, North Central, South, and West), urban vs. rural practice location, and physician gender to ensure adequate representation of rural and female physicians and each Census region in the samples. Of the initial sample, 380 physicians subsequently were determined to have retired or died, to not currently practice primary care medicine, or to be unlocatable following an extensive search for current contact information. Exclusion of these physicians left 1718 eligible physicians.

Survey methodology

Sampled physicians were sent an advance mailing in the fall of 1999 that contained a cover letter describing the objectives of the survey, letters of support from five medical societies and the U.S. Surgeon General, and a postcard with a stamped return envelope on which physicians were asked to (1) verify their specialty and status as a practicing PCP, and (2) indicate their preferred mode of response to the survey (i.e., mail, fax, telephone, or secure Internet Web site). Physicians who responded to the advance mailing were sent a subsequent mailing that included the mail or fax version of the questionnaire or instructions on how to complete the survey by telephone or Internet, depending on their stated preference. Approximately 6 weeks later, physicians who did not respond to the advance mailing were sent a follow-up mailing containing the mail version of the questionnaire. A second follow-up mailing of the questionnaire was sent by express mail to eligible nonrespondents in February 2000. Telephone follow-up of nonrespondents was undertaken in March and early April 2000. All respondents received a prepaid $50 honorarium check.

The survey took approximately 20 min to complete and was organized into the following four sections: cancer screening beliefs and practices, attitudes toward and training in CRC screening, recommendations for and use of CRC screening modalities, and practice and other characteristics. Items inquiring about PCPs' CRC screening recommendations and practices were specific to asymptomatic, average-risk patients and encompassed the four CRC screening modalities most commonly mentioned in published guidelines, i.e., FOBT, sigmoidoscopy, colonoscopy, and double-contrast barium enema (DCBE). Physicians were asked whether they recommended a specific modality as a CRC

Table 1

Characteristics of primary care physicians and their practice settings, Survey of Colorectal Cancer Screening Practices, 1999–2000

	Family practice (n = 423; %)	General practice (n = 100; %)	General internal medicine (n = 488; %)	Obstetrics/ gynecology (n = 224; %)
Physician				
Gender[a] (male)	77.9	84.5	79.4	70.8
Race[b] (white, non-Hispanic)	79.7	62.4	66.8	75.4
Board certified[b]	81.8	11.1	78.0	82.2
International medical graduate[b]	15.1	34.5	27.3	20.6
Medical school affiliation[b]	40.0	12.9	41.1	37.5
Age $\geq$ 50[b]	36.5	79.0	38.8	47.7
Been screened for colorectal cancer[b]	51.5	74.2	47.6	63.1
Practice				
Metropolitan location[b]	49.4	57.2	68.7	66.5
Practice type[b]				
Solo	24.8	42.7	21.1	29.6
Single specialty group	46.0	32.6	37.2	44.0
Multispecialty setting	29.2	24.7	41.7	26.4
$\geq$50% of patients are age 50+ [b]	32.1	41.3	69.4	14.9
Sees >100 patients during a typical week[b]	47.3	34.5	27.8	31.6
>50% of patients are covered by managed care[b]	39.5	29.2	40.9	61.5

[a] $P < 0.05$.

[b] $P < 0.001$.

screening strategy to their patients and, if so, their policies on starting age, test frequency, and stopping age. They also were asked to identify the test or test combination that they most often recommend for CRC screening. Items assessing perceived test effectiveness and the influence of published guidelines on physicians' CRC screening recommendations were measured by using three-point Likert scales that included the categories "very effective," "somewhat effective," and "not effective," or "very influential," "somewhat influential," and "not influential," as appropriate. A separate set of items inquired about how often physicians order, perform, or refer patients for CRC screening with each modality. Physicians reporting use of a specific modality were asked additional items about such practice details as home- versus office-based FOBT, whether the physician performs or refers patients for sigmoidoscopy, and to whom referrals are made for non-FOBT modalities. Finally, to assess patients' screening status, physicians were asked to estimate the proportion of their patients aged 50 years and older who are up to date with the CRC screening recommended by the physician, according to the following response categories: <25%, 25–50%, 51–75%, 76–100%, and "don't know."

Statistical analysis

We used descriptive statistics and contingency tables with χ^2 tests to examine physicians' CRC screening recommendations and practices. A sample weight that accounts for the probability of selection into the sample as well as a slightly higher rate of nonresponse among GPs, IMs, and physicians aged 60 years and older was assigned to each

respondent. Sampling weights were applied in the statistical analyses to permit generalization of the results to the U.S. population of practicing PCPs. Analyses were stratified by the four primary care specialties represented in this study to facilitate the reporting and interpretation of findings in a format that has relevance to practitioners as well as policy makers.

Results

Description of respondents

A total of 1235 practicing PCPs responded to the survey (overall response rate = 72%; GPs = 68%, FPs = 75%, IMs = 69%, OBGs = 75%). Ninety percent responded by mail, 6% by Internet, 2% by telephone, and 2% by fax. The majority were male, white, graduates of U.S. medical schools, and in group practice (Table 1). The mean age was 48.0 years (range, 29–75 years). Differences in physician and practice characteristics by specialty were apparent. For example, GPs tended to be older, to lack board certification or an affiliation with a medical school (defined as an adjunct, clinical, or other faculty appointment), and to be graduates of non-U.S. medical schools and in solo practice. FPs reported the highest patient volumes of the four specialties and were more likely to practice in rural locations. IMs tended to provide care to an older patient population and to practice in multispecialty settings. OBGs indicated that they saw younger patients, many of whom were covered by managed care plans.
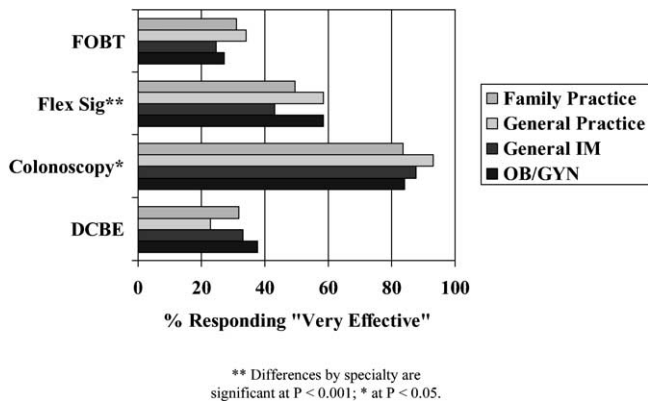
Fig. 1. Primary care physicians' perceived effectiveness of colorectal cancer screening tests for average-risk adults aged 50+, Survey of Colorectal Cancer Screening Practices, 1999–2000

Perceived test effectiveness and screening strategy most often recommended

Over 80% of respondents reported the belief that colonoscopy is a "very effective" screening procedure in reducing CRC mortality in patients aged 50 and older, compared with 43% (IMs) to 59% (GPs) who indicated that flexible sigmoidoscopy is "very effective" (Fig. 1). Respondents were less likely to rate DCBE (23–38%) and FOBT (25–34%) as "very effective." IMs and OBGs more often rated DCBE than FOBT as "very effective." Among GPs, the pattern was reversed, with a higher percentage reporting FOBT than DCBE to be "very effective." FPs were equally likely to rate DCBE and FOBT as "very effective."

In contrast to their perceptions of test effectiveness, 79% (GPs and OBGs) to 89% (FPs) of respondents indicated that they most often recommended FOBT and flexible sigmoidoscopy—either alone or in combination—to their average-risk patients as a CRC screening strategy (Table 2). In all specialty groups except GP, the combined use of FOBT and flexible sigmoidoscopy was most often reported (40–55%), followed by FOBT alone (22–30%), either FOBT or flexible

sigmoidoscopy (7–11%), and flexible sigmoidoscopy alone (1–4%). GPs were more likely than other practitioners to indicate that they most often recommend FOBT alone (41%). Colonoscopy (3–13%) and DCBE (0–4%) were less frequently mentioned as the CRC screening strategies most often recommended. Overall, only 2% of respondents said that they did not recommend CRC screening in their practices.

Modality-specific recommendations for and practice of colorectal cancer screening

Ninety-five percent of respondents indicated that they recommend FOBT as a CRC screening modality to asymptomatic, average-risk patients (Table 3). A range of recommended starting ages was reported for this test. Although age 50 was commonly cited, 49% (IMs) to 69% (GPs) mentioned a starting age other than 50. Up to 43% of respondents cited age 40 as their recommended starting age. Ninety-four percent or more indicated that they recommend screening with FOBT on an annual or biennial basis. Most reported that they did not have a "stopping" age at which they no longer recommended FOBT screening to patients. GPs reported a lower monthly ordering volume for FOBT screening than did other PCPs: 23% of GPs compared with 41–51% of other practitioners indicated that they order or perform the test 21 or more times during a typical month. A low percentage (11–32%) of PCPs reported that they exclusively use home-based FOBT for the majority of their patients. Of note is the sizeable percentage of OBGs (64%) who indicated that they exclusively use office-based FOBT.

There was less consistency in recommendations for flexible sigmoidoscopy as a CRC screening modality; 82% of FPs and IMs reported recommending this test to asymptomatic, average risk patients, compared with 61% of GPs and 68% of OBGs (Table 4). Age 50 was the most commonly mentioned starting age (65–87%). A test frequency of once every 5 years was most often reported by FPs, IMs, and OBGs. However, 57% of GPs and one-third of other prac-

Table 2
Test or test combination most often recommended to average-risk patients as a colorectal cancer screening strategy by primary care physicians, Survey of Colorectal Cancer Screening Practices, 1999–2000[a]

	Family practice (n = 423; %, 95% CI)	General practice (n = 100; %, 95% CI)	General internal medicine (n = 488; %, 95% CI)	Obstetrics/gynecology (n = 224; %, 95% CI)
Both FOBT and FS[b]	47.1 (42.3–51.9)	23.7 (15.3–32.1)	55.3 (50.9–59.7)	40.1 (33.7–46.6)
FOBT alone[b]	27.3 (23.1–31.6)	41.1 (31.3–50.9)	21.8 (18.1–25.4)	30.4 (24.3–36.4)
Either FOBT or FS[b]	10.5 (7.6–13.4)	13.9 (7.0–20.8)	7.2 (4.9–9.5)	7.1 (3.7–10.5)
Colonoscopy[b]	3.4 (1.7–5.2)	9.1 (3.4–14.9)	5.6 (3.5–7.6)	13.0 (8.6–17.4)
DCBE ± FS	1.9 (0.6–3.2)	4.0 (0.1–8.0)	3.1 (1.5–4.6)	0.0 (0.0–0.0)
FS alone	3.7 (1.9–5.5)	0.0 (0.0–0.0)	2.5 (1.1–3.8)	1.3 (0.0–2.8)
Other	4.1 (2.2–6.0)	6.0 (1.3–10.8)	2.2 (0.9–3.6)	2.7 (0.6–4.9)
Do not recommend CRC screening[c]	1.7 (0.4–2.9)	2.1 (0.0–5.1)	1.8 (0.6–3.0)	4.9 (2.1–7.8)

[a] CI = confidence interval; FOBT = fecal occult blood testing; FS = flexible sigmoidoscopy; CRC = colorectal cancer.
[b] P < 0.001.
[c] P < 0.05.

Table 3
Recommendations for and practice of colorectal cancer screening with FOBT, Survey of Colorectal Cancer Screening Practices, 1999–2000[a]

	Family practice			General practice			General internal medicine			Obstetrics/gynecology		
	n	%	CI	*n*	%	CI	*n*	%	CI	*n*	%	CI
Recommend FOBT to asymptomatic, average-risk patients												
	416			98			479			213		
		95.8	93.8–97.7		94.9	90.5–99.3		95.4	93.5–97.3		94.8	91.7–97.8
Recommended starting age (yr)												
	398			93			457			202		
≤35		8.1	5.3–10.8		19.6	11.4–27.9		6.2	4.0–8.5		9.1	5.1–13.1
40		39.5	34.6–44.4		42.6	32.3–52.9		35.1	30.7–39.4		42.4	35.5–49.3
45		5.9	3.6–8.3		3.1	0.0–6.7		6.0	3.8–8.2		3.5	0.9–6.0
50		45.7	40.8–50.7		31.5	21.9–41.2		51.0	46.4–55.6		43.0	36.1–49.9
≥55		0.8	0.0–1.6		3.1	0.0–6.7		1.8	0.5–3.0		2.0	0.0–3.9
Recommended test frequency												
Every 1 year		85.6	82.1–89.1		76.4	67.7–85.2		87.7	84.7–90.7		91.6	87.8–95.5
Every 2 years		9.9	7.0–12.9		18.3	10.3–26.3		5.9	3.8–8.1		4.9	1.9–7.9
Every >2 years		3.5	1.7–5.2		4.2	0.1–8.4		6.1	3.9–8.3		2.0	0.0–3.9
No longer recommend FOBT screening when patients reach a certain age												
		14.3	10.9–17.8		8.5	2.7–14.2		17.6	14.1–21.1		2.5	0.0–4.7
No. of times order or perform FOBT screening during a typical month												
	423			100			488			224		
Zero		4.5	2.5–6.5		8.8	3.2–14.4		6.2	4.0–8.3		10.8	6.7–14.9
1–10		20.4	16.5–24.2		38.5	28.8–48.3		20.5	16.9–24.1		20.2	14.9–25.5
11–20		32.8	28.3–37.3		29.4	20.4–38.5		26.3	22.4–30.2		18.3	13.2–23.4
21–40		26.1	21.9–30.3		13.2	6.4–19.9		23.5	19.8–27.3		22.3	16.8–27.7
>40		15.3	11.9–18.8		10.1	4.1–16.1		23.1	19.4–26.8		28.5	22.5–34.4
How FOBT is conducted												
	400			91			456			200		
Office-based[b]		23.7	19.5–27.9		29.7	20.1–39.3		23.9	20.0–27.8		64.0	57.3–70.7
Home-based[c]		23.5	19.4–27.7		31.0	21.3–40.7		32.2	28.0–36.5		10.5	6.2–14.8
Both office-based and home-based		49.3	44.4–54.2		30.5	20.9–40.1		41.3	36.7–45.8		20.5	14.9–26.2
Other		2.9	1.3–4.6		5.6	0.7–10.4		1.5	0.4–2.7		3.0	0.6–5.3

[a] FOBT = fecal occult blood testing; CI = confidence interval.
[b] Office-based test involves completing a single FOBT card during a digital rectal examination.
[c] Home-based test involves giving or mailing patients a set of FOBT cards to complete at home, using multiple stool specimens.

titioners indicated that they recommend a frequency of every 1–3 years for this modality. One-third or fewer respondents said they no longer recommend screening sigmoidoscopy when patients reach a certain age. Sixty-four percent of FPs and IMs, 77% of GPs, and 95% of OBGs reported that they do not perform or supervise screening sigmoidoscopy exams during a typical month. However, 70–83% of those who do not perform or supervise screening sigmoidoscopy indicated that they usually refer their patients to another provider, most often a gastroenterologist, for the procedure. Of the respondents who reported performing or supervising screening sigmoidoscopy, 50% (IMs) to 68% (GPs) noted that they perform or supervise the procedure only one to five times during a typical month.

Fewer respondents recommended colonoscopy and DCBE as CRC screening modalities than FOBT and sigmoidoscopy (Tables 5 and 6). Thirty-four percent of FPs and IMs and 49% of GPs and OBGs indicated that they recommend screening colonoscopy to asymptomatic, average-risk patients; 5% of OBGs, 15% of FPs and IMs, and 24% of GPs recommend DCBE. For both procedures, age

50 was the most commonly mentioned starting age, and every 1–5 years the most often cited test frequency. From 54% to 63% of respondents reported that they order, perform, or refer patients for screening colonoscopy during a typical month, whereas 13–32% reported doing so for screening DCBE. Of those who indicated that they order, perform, or refer patients for screening colonoscopy or DCBE, three-fourths or more noted that they do so only one to five times during a typical month, and the majority (≥72%) refer their patients to a provider outside of their practice for the procedure.

Influence of published guidelines on screening practice and screening status of patients

When asked to rate the influence of published guidelines on their CRC screening practices, 49% of all respondents noted the 1997 American Cancer Society (ACS) guidelines as "very influential" in contrast to the 28% who cited the 1996 U.S. Preventive Services Task Force guidelines, 17% citing the 1997 G.I. Consortium guidelines, and 15% citing

Table 4
Recommendations for and practice of colorectal cancer screening with flexible sigmoidoscopy,
Survey of Colorectal Cancer Screening Practices, 1999–2000[a]

	Family practice			General practice			General internal medicine			Obstetrics/gynecology		
	n	%	CI	n	%	CI	n	%	CI	n	%	CI
Recommend flexible sigmoidoscopy to asymptomatic, average-risk patients[b]												
	416			98			479			213		
		81.6	77.9–85.4		61.1	51.2–70.9		81.8	78.3–85.3		67.5	61.2–73.8
Recommended starting age (yr)												
	340			60			392			144		
≤40		8.0	5.1–11.0		20.2	9.7–30.7		6.5	4.0–9.0		5.1	1.4–8.8
45		2.1	0.6–3.7		8.2	1.1–15.2		4.6	2.5–6.8		2.1	0.0–4.5
50		83.3	79.3–87.3		64.8	52.4–77.3		83.9	80.3–87.6		87.1	81.5–92.7
≥55		6.5	3.8–9.1		6.7	0.2–13.3		4.9	2.7–7.0		5.7	1.8–9.6
Recommended test frequency												
Every 1–3 years		31.1	26.1–36.1		56.9	43.9–69.7		29.8	25.4–34.5		34.9	26.9–42.6
Every 3–5 years		12.2	9.0–16.0		6.6	0.2–13.0		15.0	11.5–18.6		13.9	8.2–19.6
Every 5 years		50.3	44.1–54.8		33.4	21.1–45.7		49.8	44.0–53.9		45.8	37.6–54.1
Every > 5 years		6.2	4.0–9.4		3.2	0.0–7.7		5.4	3.5–8.1		4.9	1.3–8.4
No longer recommend sigmoidoscopy screening when patients reach a certain age												
		24.6	20.0–29.2		9.8	2.1–17.4		30.5	25.9–35.1		5.5	1.8–9.3
No of times perform or supervise screening sigmoidoscopy during a typical month												
	423			100			488			224		
Zero		63.7	59.1–68.3		77.0	68.6–85.4		63.5	59.2–67.8		95.9	93.3–98.5
1–5		23.1	19.1–27.1		15.0	7.9–22.1		17.6	14.3–21.0		1.8	0.0–3.6
6–10		8.0	5.4–10.6		6.2	1.3–11.0		10.9	8.1–13.6		0.9	0.0–2.1
11–20		3.3	1.6–4.9		0.0	0.0–0.0		4.7	2.8–6.5		0.4	0.0–1.3
>20		1.2	0.2–2.3		1.0	0.0–2.9		2.3	0.9–3.6		0.0	0.0–0.0
Physicians not performing or supervising screening sigmoidoscopy who reported they usually refer their average-risk patients to another provider for this test												
	269			77			310			215		
		78.5	73.6–83.4		70.3	59.9–80.8		82.6	78.4–86.8		83.2	78.1–88.2

[a] CI = confidence interval.
[b] $P < 0.001$.

other specialty society guidelines (Fig. 2). IMs (29%) and FPs (35%) were more likely than OBGs (15%) and GPs (18%) to state that the U.S. Preventive Services Task Force guidelines were "very influential." GPs (19%) and IMs (21%) more often noted the G.I. Consortium guidelines as "very influential" than did FPs (13%) or OBGs (16%). One-third of OBGs reported other specialty society guidelines to be "very influential," compared with 8–12% of other practitioners. Of particular note is that 24% of all respondents indicated that they were unfamiliar with the 1996 U.S. Preventive Services Task Force guidelines on CRC screening, and 37% reported they were unfamiliar with the G.I. Consortium guidelines. In contrast, only 8% stated that they were unfamiliar with the ACS guidelines.

Lastly, less than 20% of respondents reported that three-quarters or more of their patients aged 50 and older were up-to-date with CRC screening as recommended by the physician (Fig. 3). IMs (22%) were more likely than other PCPs to indicate this. Moreover, a higher percentage of IMs (60%) than other specialty groups reported that half or more of their older patients were up to date with CRC screening. Consistent with these patterns was the finding that GPs and OBGs (23%) more often estimated that less than a fourth of

their patients aged 50 and older were up to date than did IMs (6%) or FPs (15%).

Discussion

Given the low documented rates of CRC screening among older adults in the United States, there is a critical need to understand current screening beliefs and practices from the provider perspective. This survey of PCPs' CRC screening attitudes and practices is unique because it covers all of the CRC screening modalities (FOBT, sigmoidoscopy, colonoscopy, and DCBE) most commonly mentioned in published guidelines, and provides national estimates of CRC screening recommendations and practices for the four primary care specialty groups that are most actively engaged in delivering preventive services to older adults.

A key finding of the study is that several of the CRC screening recommendations and practices reported by physicians were inconsistent with current guidelines, raising concerns about the appropriateness and quality of screening delivery within some primary care practice settings. Although most guidelines stipulate that CRC screening in

Table 5
Recommendations for and practice of colorectal cancer screening with colonoscopy, Survey of Colorectal Cancer Screening Practices, 1999–2000[a]

	Family practice			General practice			General internal medicine			Obstetrics/gynecology		
	n	%	CI	n	%	CI	n	%	CI	n	%	CI
Recommend screening colonoscopy to asymptomatic, average-risk patients[b]												
	416			98			479			213		
		33.6	29.0–38.2		49.1	39.1–59.2		34.0	29.7–38.2		49.4	42.7–56.2
Recommended starting age (yr)												
	137			48			162			105		
≤40		6.1	2.0–10.3		20.8	8.9–32.6		5.5	2.0–9.1		3.0	0.0–6.4
45		4.6	0.9–8.2		10.6	1.5–19.7		3.7	0.8–6.6		1.0	0.0–2.9
50		75.3	67.9–82.7		58.3	43.8–72.7		77.8	71.3–84.2		86.1	79.2–93.0
≥55		14.0	8.1–19.9		10.4	1.4–19.3		13.0	7.8–18.3		9.9	4.0–15.8
Recommended test frequency												
Every 1–5 years		78.8	72.2–85.9		91.8	83.9–99.8		64.4	56.3–71.2		90.4	84.6–96.1
Every 5–10 years		20.3	13.5–27.0		6.2	0.0–13.2		35.6	28.2–43.0		6.8	1.9–11.7
Every >10 years		0.0	0.0–0.0		2.0	0.0–6.1		0.0	0.0–0.0		2.9	0.0–6.1
No longer recommend screening colonoscopy when patients reach a certain age												
		18.6	12.0–25.1		14.4	4.1–24.6		30.2	23.1–37.3		5.8	1.2–10.3
No. of times order, perform, or refer patients for screening colonoscopy during a typical month												
	423			100			488			224		
Zero		46.4	41.6–51.1		36.7	27.1–46.3		41.5	37.2–45.9		40.1	33.7–46.6
1–5		43.6	38.9–48.4		48.2	38.2–58.2		44.5	40.1–48.9		42.0	35.5–48.5
6–10		7.3	4.8–9.8		10.2	4.1–16.3		8.4	5.9–10.8		9.9	6.0–13.8
11–20		1.6	0.4–2.8		1.9	0.0–4.6		3.5	1.9–5.1		4.5	1.7–7.2
>20		0.6	0.0–1.3		0.0	0.0–0.0		0.6	0.0–1.3		2.2	0.3–4.2
How screening colonoscopy is conducted												
	223			60			278			131		
Respondent conducts		5.1	2.1–8.0		8.1	1.1–15.1		5.1	2.5–7.6		0.0	0.0–0.0
Refers within practice		14.9	10.3–19.6		12.0	3.4–20.5		19.3	14.7–24.0		14.6	8.5–20.7
Refers outside of practice		77.8	72.4–83.3		79.9	69.5–90.4		74.5	69.4–79.7		83.1	76.6–89.6
Did not specify		2.2	0.3–4.1		0.0	0.0–0.0		1.1	0.0–2.3		2.3	0.0–4.9

[a] CI = confidence interval.
[b] $P < 0.001$.

average-risk adults should begin at age 50 [10–12,30,31], one-half of PCPs stated that they recommend initiating FOBT screening in younger patients, a result paralleling that of other studies [20,21,27]. This finding supports prior work showing the limited effect of practice guidelines in influencing physician behavior [32]. It also may reflect clinical practices established under older ACS guidelines, which prior to 1992 designated 40 as the recommended starting age for FOBT screening [33]. Furthermore, it is consistent with our finding that PCPs cite the ACS guidelines as the most influential on their screening practices, and illustrates the difficulty of changing physician practice once a clinical policy has been adopted. In contrast, PCPs were more consistent in specifying age 50 as the recommended starting age for screening with sigmoidoscopy, colonoscopy, and DCBE.

While the recommended FOBT screening interval noted by most PCPs was consistent with guidelines and evidence, this was not the case for the non-FOBT screening modalities. Over one-third indicated a test interval of less than 3 years for sigmoidoscopy, and two-thirds or more reported that they recommended a test interval of every 1–5 years for colonoscopy and DCBE. In addition, a minority of PCPs indicated a stopping age for each of the four modalities,

with higher proportions of FPs and IMs compared to GPs and OBGs reporting upper age limits for stopping screening. The variability in recommended screening intervals for sigmoidoscopy, colonoscopy, and DCBE may reflect a lack of specificity concerning test intervals in some of the CRC screening guidelines [11,31,34] as well as the limited available evidence demonstrating optimal intervals for these modalities. Similar reasons may explain the lack of an upper age cutoff for recommending screening. Screening average-risk patients at ages at which they are less likely to benefit from the procedure or at too-frequent intervals has important implications for the efficient use of resources to perform screening endoscopy and follow-up procedures [35], and may negatively affect patients' acceptance of screening.

The finding that one-fourth of FPs, GPs, and IMs and nearly two-thirds of OBGs use office-based FOBT for the majority of patients screened with this modality also merits attention. FOBT efficacy, as established in clinical trials, was based on administration of home testing kits with stool samples collected over a 3-day period. The sensitivity of home-based, 3-day FOBT is likely to be greater than office-based FOBT [12], thus generating a lower false-negative rate. Although the G.I. Consortium [12] and ACS [10] CRC screening guidelines are explicit in specifying that home test

Table 6
Recommendations for and practice of colorectal cancer screening with double contrast barium enema,
Survey of Colorectal Cancer Screening Practices, 1999–2000[a]

	Family practice			General practice			General internal medicine			Obstetrics/gynecology		
	n	%	CI	*n*	%	CI	*n*	%	CI	*n*	%	CI
Recommend screening double contrast barium enema to asymptomatic, average-risk patients[b]												
	416			98			479			213		
		14.8	11.3–18.2		24.4	15.8–33.0		15.0	11.8–18.2		5.2	2.2–8.1
Recommended starting age (yr)												
	61			24			72			11		
≤40		10.3	2.2–18.2		29.4	9.6–49.0		7.0	1.0–13.2			
45		1.6	0.0–4.8		4.0	0.0–12.3		5.7	0.1–11.2			
50		78.3	67.5–89.0		50.2	28.6–71.8		75.9	65.7–86.1			
≥55		9.9	2.2–17.7		16.5	0.5–32.4		11.4	3.8–18.9			
Recommended test frequency												
Every 1–5 years		88.8	80.8–96.9		87.5	73.3–100.0		79.2	69.5–88.8			
Every 5–10 years		9.6	2.1–17.1		8.0	0.0–19.5		20.8	11.2–30.5			
No longer recommend screening double contrast barium enema when patients reach a certain age												
		29.3	17.2–41.5		9.1	0.0–22.3		37.9	26.4–49.5			
No. of times order, perform, or refer patients for screening double contrast barium enema during a typical month												
	423			100			488			224		
Zero		74.7	70.5–78.9		67.7	58.4–77.1		72.0	68.0–75.9		86.6	82.1–91.1
1–5		19.8	16.0–23.6		25.3	16.6–33.9		22.3	18.6–26.0		9.4	5.5–13.2
6–10		3.1	1.4–4.8		3.0	0.0–6.3		3.5	1.9–5.1		0.4	0.0–1.3
11–20		0.9	0.0–1.8		0.0	0.0–0.0		0.4	0.0–1.0		0.4	0.0–1.3
>20		0.0	0.0–0.0		0.0	0.0–0.0		0.2	0.0–0.6		0.4	0.0–1.3
How screening double contrast barium enema is conducted												
	100			28			129			24		
Refers within Practice		11.7	5.4–18.0		7.5	0.0–18.1		21.6	14.5–28.8		20.9	3.4–38.4
Refers outside of Practice		84.3	77.1–91.5		82.0	66.8–97.2		76.1	68.7–83.5		74.9	56.3–93.6
Did not specify		4.1	0.1–8.1		10.5	0.0–22.5		2.3	0.0–4.9		4.1	0.0–12.7

[a] CI = confidence interval.
[b] $P < 0.001$.

kits should be used, other guidelines [11,30,31,34] do not provide this specific guidance.

Another potential quality issue is the low volume of screening sigmoidoscopy procedures reported by the 36% of FPs and IMs and the 23% of GPs who said that they perform or supervise this procedure in their practices.

Twenty percent of fewer of these physicians indicated that they perform or supervise screening sigmoidoscopy 11 or more times during a typical month (i.e., three or more times per week). One-half of IMs and two-thirds of FPs and GPs noted that they perform or supervise the procedure only one to five times per month. Such low volumes may be inadequate for the conduct of an efficient, thorough, safe, accurate, and comfortable screening examination. We are un-

** Differences by specialty are
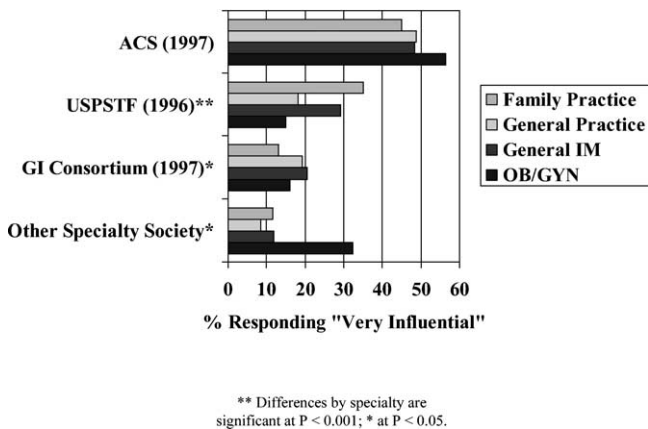significant at P < 0.001; * at P < 0.05.

Fig. 2. Self-reported influence of published guidelines on primary care physicians' colorectal cancer screening practices, Survey of Colorectal Cancer Screening Practices, 1999–2000

* Differences by specialty are
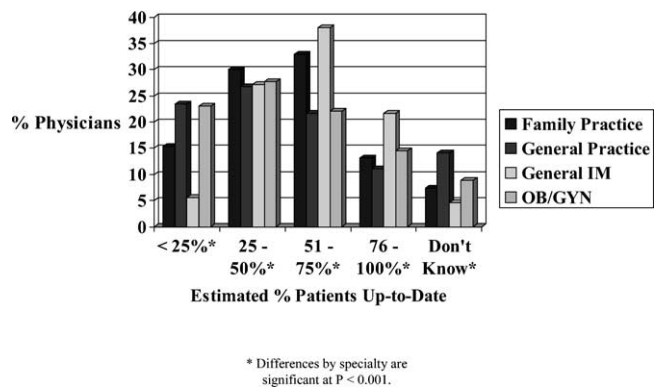significant at P < 0.001.

Fig. 3. Estimated proportion of patients 50+ who are up-to-date with the CRC screening recommended by the primary care physician, Survey of Colorectal Cancer Screening Practices, 1999–2000

aware of any published standards for the conduct of screening sigmoidoscopy in primary care practice. A small but growing literature on the relationship between physician procedure volume and patient outcomes suggests that physicians who perform a lower volume of a given procedure have poorer outcomes than do those who perform high volumes [36–38]. This relationship also is reflected in the federal Mammography Quality Standards Act, which mandates a minimum volume threshold for physicians who interpret mammograms [39].

Although nearly all PCPs (98%) reported recommending CRC screening to average-risk patients, the relatively low volumes of ordering, performing, or referring that they noted indicate that the majority are not providing screening to all eligible patients in their practices. Under the assumption that the typical FP cares for 800 patients aged 50 and older in his or her practice and works 45 weeks per year, this physician on a weekly basis would need to order 18 FOBTs (1-year screening interval), perform or refer for four sigmoidoscopies (5-year screening interval), or refer for two colonoscopies or two DCBE exams (10-year screening interval) to screen most of these patients. Although we recognize that some eligible patients may receive screening through other providers and the categorical nature of our data precludes precise estimates, we can infer that at best one-fourth of PCPs are generating this level of screening volume. Consistent with these estimates, the majority of PCPs acknowledged in this study that many of their older, average-risk patients are not up to date with the CRC screening recommended by the physician. There are many possible reasons for the low levels of screening delivery. Some physicians may not be knowledgeable about current CRC screening guidelines, and the multiple modalities available may create uncertainty about how best to screen. The reluctance of many patients to undergo CRC screening has been well documented [40], and insurance coverage for CRC screening may be lacking or inadequate to cover costs for some modalities [41]. PCPs also may lack office systems to ensure that CRC screening is systematically offered to eligible patients [42] or may encounter barriers to referring patients for more involved screening procedures such as sigmoidoscopy, colonoscopy, or DCBE.

Strengths of this study include its large sample size, high response rate, and nationally representative sample. A limitation is that it is based on physician self-reports of screening practice, which may be higher than actual practice [43,44]. However, as noted, estimates of CRC screening volume in this study were low, and comparable to national surveys of the public that document low screening rates [13–15]. Our data help to elucidate findings from studies of patients by demonstrating that most PCPs are not systematically recommending or providing CRC screening to a high proportion of eligible patients. Patient report of a physician recommendation for screening consistently has been shown to be one of the strongest predictors of screening utilization [40,45–47].

This study demonstrates high awareness of CRC screening among PCPs in the United States but also knowledge gaps about the timing and frequency of screening and suboptimal screening delivery. Results suggest several opportunities for improvement. Efforts to educate the public and PCPs about the appropriateness and importance of regular screening for CRC must accelerate. Practice guidelines that are explicit in providing physicians with information about when to begin screening, how frequently to screen with a given modality or combination of modalities, and the techniques to employ to optimize the benefits of screening are needed. In addition, detailed assessment of the complex factors that influence physicians' adherence to screening guidelines is an important area for future work [32]. Practice enhancements such as office systems to systematically identify eligible patients and track screening uptake, as well as involving other members of the primary care practice team (e.g., physician assistants or nurses) in certain aspects of CRC screening delivery, also might be beneficial in many primary care settings [48–52]. Finally, further research to investigate the patient, provider, and health system barriers that contribute to low rates of CRC screening and to identify innovative approaches to overcoming these barriers is needed. Ongoing analysis of data from this survey will enhance our understanding of these barriers and help to foster improvements in screening delivery.

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