

Screening Colonoscopy in the US: Attitudes and Practices of Primary Care Physicians

Jane Zapka, ScD¹, Carrie N. Klabunde, PhD², Stephen Taplin, MD, MPH², Gigi Yuan, MS³, David Ransohoff, MD⁴, and Sarah Kobrin, PhD, MPH²

¹ Department of Medicine, Division of Biostatistics and Epidemiology, Medical University of South Carolina, Charleston, SC, USA;

² Division of Cancer Control and Population Sciences, National Cancer Institute, Bethesda, MD, USA; ³ Information Management Services, Inc., Silver Spring, MD, USA; ⁴ University of North Carolina, Chapel Hill, NC, USA.

BACKGROUND: Rising colorectal cancer (CRC) screening rates in the last decade are attributable almost entirely to increased colonoscopy use. Little is known about factors driving the increase, but primary care physicians (PCPs) play a central role in CRC screening delivery.

OBJECTIVE: Explore PCP attitudes toward screening colonoscopy and their associations with CRC screening practice patterns.

DESIGN: Cross-sectional analysis of data from a nationally representative survey conducted in 2006–2007.

PARTICIPANTS: 1,266 family physicians, general practitioners, general internists, and obstetrician-gynecologists.

MAIN MEASURES: Physician-reported changes in the volume of screening tests ordered, performed or supervised in the past 3 years, attitudes toward colonoscopy, the influence of evidence and perceived norms on their recommendations, challenges to screening, and practice characteristics.

RESULTS: The cooperation rate (excludes physicians without valid contact information) was 75%; 28% reported their volume of FOBT ordering had increased substantially or somewhat, and the majority (53%) reported their sigmoidoscopy volume decreased either substantially or somewhat. A majority (73%) reported that colonoscopy volume increased somewhat or substantially. The majority (86%) strongly agreed that colonoscopy was the best of the available CRC screening tests; 69% thought it was readily available for their patients; 59% strongly or somewhat agreed that they might be sued if they did not offer colonoscopy to their patients. All three attitudes were significantly related to substantial increases in colonoscopy ordering.

CONCLUSIONS: PCPs report greatly increased colonoscopy recommendation relative to other screening tests, and highly favorable attitudes about colonoscopy. Greater emphasis is needed on informed decision-making with patients about preferences for test options.

KEY WORDS: colorectal cancer screening; primary care physicians; colonoscopy screening practices.

J Gen Intern Med 27(9):1150–8

DOI: 10.1007/s11606-012-2051-3

© Society of General Internal Medicine 2012

INTRODUCTION AND BACKGROUND

Over the past decade, the US Preventive Services Task Force, American Cancer Society, American College of Gastroenterology, and other organizations have published guidelines recommending a number of testing options for colorectal cancer (CRC) screening.^{1,2} CRC screening rates continue to be suboptimal,^{3,4} and guidelines continue to encourage screening by one of several effective tests. The prevalence of screening by colonoscopy specifically, however, has greatly increased compared with other testing options.^{5–7} National trend data show a rise in CRC screening rates since 2000 that is attributable almost entirely to increased use of colonoscopy.

Even though the increase in colonoscopy use has been dramatic, little is known about what factors influenced this increase. Numerous studies have illustrated that patient, provider, practice, and health system factors affect primary care physician (PCP) behavior related to cancer screening,^{8–10} and the pivotal role of PCPs in recommending and increasing CRC screening is well established.¹¹ However, PCPs' opinions about colonoscopy have not previously been assessed.

In this study, using data from a nationally representative survey of practicing PCPs, we (1) investigate physicians' reports of changes in the past 3 years in the volume of CRC screening tests that they order, perform or supervise, with a particular focus on colonoscopy; (2) explore physicians' attitudes related to colonoscopy and potential associations of their attitudes with screening colonoscopy practice patterns; and (3) investigate the relationships of selected known or postulated factors with the reported changes in volume of colonoscopy ordering. These data may be helpful for understanding practice variation and to guide thinking about future research priorities and potential interventions.

Received October 12, 2011

Revised February 14, 2012

Accepted March 9, 2012

Published online April 27, 2012

METHODS

A nationally representative sample of PCPs participated in a survey between September 2006 and May 2007, sponsored by the National Cancer Institute (NCI) in collaboration with the Agency for Healthcare Research and Quality (AHRQ) and the Centers for Disease Control and Prevention (CDC). Eligible physicians included office-based family physicians, general internists, general practitioners, and obstetrician/gynecologists (OB/GYNs) aged 75 or younger. A sample of PCPs was selected from the American Medical Association's Physician Masterfile using the four specialties as sampling strata. Prior to selection, the sampling frame database was sorted by age, gender, US Census region, and urban-rural practice location within each stratum. Detailed survey content and sampling strategy are reported elsewhere.^{12,13} The study was reviewed by the institutional review boards of the NCI and CDC and determined to be exempt.

In September 2006, 1,975 PCPs were sent a questionnaire on colorectal and lung cancer screening via express mail, and several methods were used to encourage participation.¹⁴ These methods included letters of endorsement from national physician organizations, postage-paid return envelopes, a \$50 honorarium, two additional mailings, up to three follow-up telephone reminders to non-respondents, and the option to complete the survey by telephone. Additional details have been published elsewhere.¹²

The dependent measure of interest was physicians' reports of changes in the volume of screening tests they ordered, performed, or supervised in the past 3 years for FOBT, sigmoidoscopy, and colonoscopy. Response categories were on a 5-point scale (increased substantially, increased somewhat, stayed the same, decreased somewhat, or decreased substantially).

Guided by the social ecological perspective—which recognizes the influence of multi-level factors on behavior—and the Theory of Planned Behavior,^{15,16} we assessed the relationship of selected factors with test ordering reports. The Theory of Planned Behavior highlights the potential influence on behavior of a physician's attitudes, perceived norms, and perceived challenges.

Physicians' attitudes toward colonoscopy screening included agreement with three statements: "it is the best of the available CRC screening tests," "it is readily available for my patients," and "I worry that I might be sued if I do not offer screening colonoscopy to my patients." Responses to these statements were measured on a 4-point scale, from "strongly agree" to "strongly disagree." Additionally, we created a summary measure of the strength of agreement across the three items: strongly agree with none of the three items, strongly agree with one of the three items, strongly agree with two, or strongly agree with all three items.

Three items related to reported influence of perceived norms. Respondents rated local collegial norms, patient preferences, and national recommendations (USPSTF, ACS,

and published clinical evidence) on a scale of "very influential," "somewhat influential," and "not influential" to their practice of CRC screening. Respondents were also given a "not applicable/not familiar" choice.

With respect to perceived challenges, they were asked how influential two items were in their recommendations for CRC screening: the cost of screening tests for patients with no third party coverage and availability of reimbursement by third party payers, including Medicare and Medicaid.

Additional measures included individual physician characteristics, that is specialty, age, sex, race, and medical school affiliation. Practice context measures included size (number of physicians), geographic location (urban, large rural city/town, small/isolated rural town), and the practice's panel of patients, including percent of uninsured patients. Practice systems support measures included whether CRC screening guidelines had been implemented, whether CRC screening reminders were provided to the physician and/or patients, and type of medical records system used (paper, in transition, or electronic).

We used descriptive statistics to examine reported changes in ordering by test type, reports of agreement with attitudes concerning colonoscopy, and the distribution of factors potentially associated with physicians' colonoscopy test ordering. Further, we used chi-square statistics to assess the bivariate associations of these measures with the reported change in colonoscopy ordering. Variables with an association at $p < 0.10$ were retained for multivariate models. Polytomous logistic regression models assessed factors associated with changes in colonoscopy ordering. We estimated two models: one with the three attitude items included separately as covariates and one with a summary attitude measure as a single covariate. We used the statistical program SUDAAN version 9.1 to account for the complex survey design and to incorporate survey weights to obtain national estimates. Analyses were conducted in 2010–2011.

RESULTS

Description of Respondents

As previously reported, 1,266 PCPs responded to the survey on colorectal and lung cancer screening.¹² The survey's absolute response rate was 69.3% and cooperation rate (excludes physicians lacking valid contact information) was 75.0%. Physicians' personal and practice characteristics are reported in Table 1. These characteristics produced by the weighted analyses are nationally representative of practicing PCPs in the US. The majority of respondents were male, non-Hispanic white, not affiliated with a medical school, in solo or small group practices, and in urban environments. The majority reported that a low proportion of their patients were uninsured, CRC screening guidelines were implemented in the practice, and they used paper rather than electronic

Table 1. Physician and Practice Characteristics (n=1,266)

	Unweighted n	Weighted %
Specialty		
Family, general practice	547	45.2
General internal medicine	415	36.9
Obstetrics/gynecology	304	17.9
Age		
<40	251	20.1
40–49	385	30.7
50–59	398	31.9
≥60	232	17.4
Gender		
Female	400	31.2
Race		
Non-Hispanic White	925	72.1
Non-Hispanic Black	46	3.9
Hispanic	66	5.5
Asian*	184	14.7
Other*	45	3.8
Affiliation with medical school		
Yes	441	35.1
No	818	64.3
Missing	7	0.5
Geographic location		
Urban [†]	1032	81.8
Large rural city/town [‡]	133	10.2
Small/isolated rural town [§]	101	8.0
Practice size		
Solo	328	26.0
2–5	511	40.7
6–15	274	21.4
≥16	145	11.2
Missing	8	0.7
Percentage of patients uninsured		
0–5%	759	60.3
6–25%	366	28.8
>26%	82	6.4
Don't know/missing	59	4.5
Guidelines implemented in practice		
Yes	763	61.5
Reminders to MD		
Yes	363	30.0
Reminders to patients		
Yes	186	15.1
Type of medical record		
Paper	709	56.4
Partial/in transition to electronic	329	26.1
Full electronic	218	17.3

*Includes American Indian/Alaska Native, Native Hawaiian/Other Pacific Islander, Multiple races, Other race, and Unknown

[†]Rural Urban Commuting Area (RUCA) 2 codes 1.0, 1.1, 2.0, 2.1, 3.0, 4.1, 7.1

[‡]RUCA2 codes 4.0, 4.2, 5.0, 5.2, 6.0

[§]RUCA2 codes 7.0, 7.2, 7.3, 7.4, 8.0, 8.2, 8.3, 9.0, 9.1, 10.0, 10.2, 10.4, 10.5, 10.6

^{||}In main practice location

medical records. A minority reported systems in place for CRC screening reminders for the physician or the patient.

Changes in Test Ordering In Past 3 Years

As reported in Figure 1, 28% of respondents reported their volume of FOBT ordering had increased substantially or somewhat. In contrast, the majority (53%) reported their sigmoidoscopy volume had *decreased* either substantially or somewhat. The vast majority (73%) reported that colonoscopy volume had increased somewhat or substantially.

Attitudes, Normative Perceptions and Perceived Barriers

Figure 2 and Table 2 (see “total” column) show PCPs’ attitudes about colonoscopy. The majority (86%) strongly agreed that colonoscopy was the best of the available CRC screening tests. A smaller proportion (69%) thought it was readily available for their patients. Asked whether they might be sued if they did not offer colonoscopy to their patients, 59% either strongly or somewhat agreed and 42% somewhat or strongly disagreed. The majority of respondents (53%) strongly agreed with two of the three items, and 14% agreed with all three items.

As shown in Table 2, 56% of PCPs indicated that local collegial norms were very or somewhat influential in their screening practices and 80% that patient preferences were very or somewhat influential. A majority reported ACS (69%) and USPSTF guidelines (68%) and published clinical evidence (72%) as very influential. In response to two measures related to financial issues, 81% reported that the cost of CRC screening tests for patients with no third party coverage was very or somewhat influential, while 65% reported that reimbursement availability by third party payers was very or somewhat influential.

Factors Associated with Reported Change in Colonoscopy Ordering

Table 2 also shows the bivariate relationships of attitudes, perceived norms, and challenges with reported changes in colonoscopy ordering. The three individual colonoscopy attitude measures were each significantly related to reporting substantial increases in colonoscopy ordering as was the summary measure (Fig. 3). Table 3 shows the findings of the regression analyses. Agreement with the three individual attitude measures was significantly related to reporting substantial increases in colonoscopy ordering compared to other reports. Those who opined it was the best available test, strongly or somewhat agreed it was readily available, or strongly or somewhat agreed or somewhat disagreed they worried they might be sued were more likely to report a substantial increase in colonoscopy ordering.

With respect to other physician perception measures (influence of norms and patient preference and challenges), only one was independently related to increased colonoscopy ordering. PCPs who indicated that availability of third party reimbursement for CRC screening tests was very influential in their recommendations were significantly more likely to report substantially increased colonoscopy ordering than were PCPs who said that third party reimbursement was somewhat or not influential.

Several individual-level demographic measures were independently associated, notably specialty and age. Two practice-level measures, having CRC screening guidelines

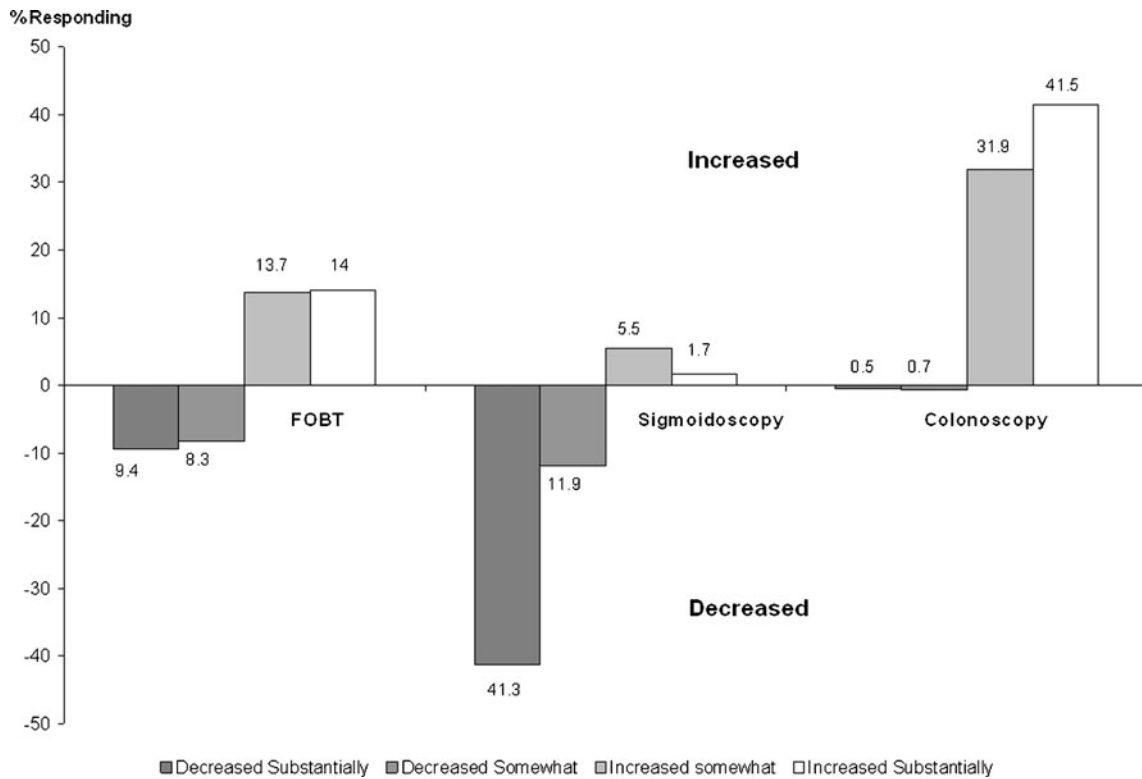


Figure 1. Reported change over the past 3 years in volume of CRC screening procedures that PCPs order, perform, or supervise.

implemented in the practice and having EMR partially or fully in place, were related to reporting a substantial increase in colonoscopy ordering.

Table 4 shows the findings of the polytomous logistic regression model that included the attitude summary

measure (other item findings not reported in table). Those who strongly agreed with one or more of the three colonoscopy attitude items were significantly more likely to have substantially or somewhat increased their ordering of colonoscopy. The magnitude of the odds ratios increased

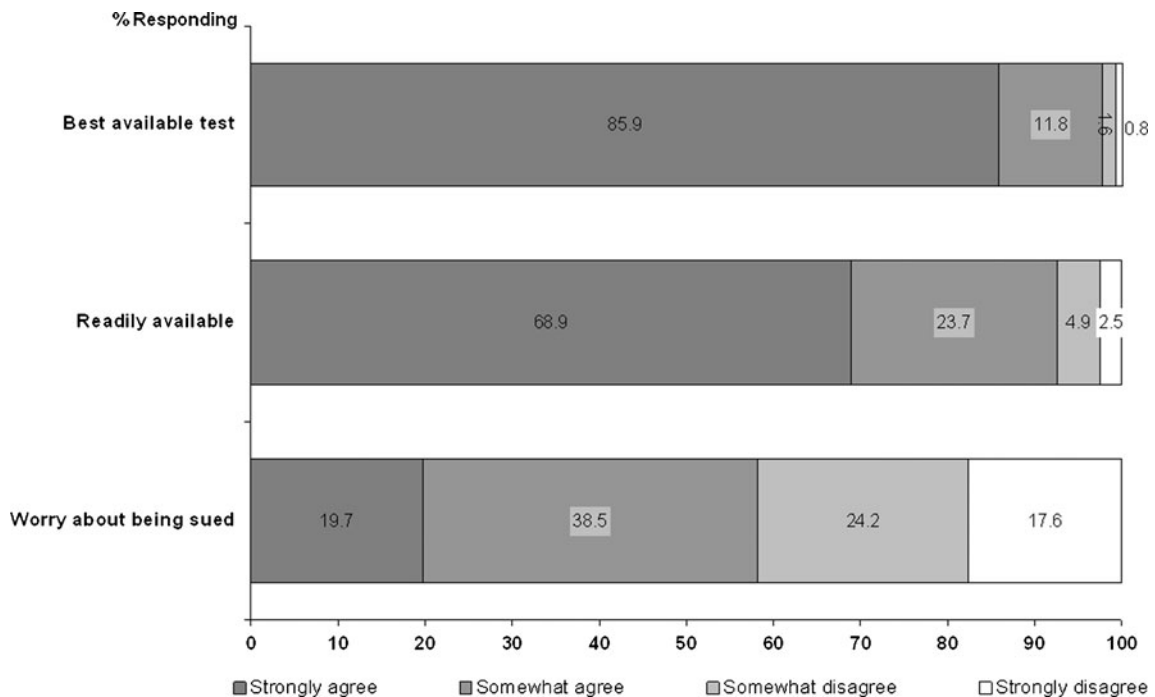


Figure 2. PCPs' attitudes about screening colonoscopy.

Table 2. Primary Care Physicians' Attitudes, Perceived Norms, and Challenges by Reported Change in Colonoscopy Ordering (Weighted)

Statement	Increased substantially N=479	Increased somewhat N=406	Stayed the same/ decreased N=339	Total N=1,224	P values
It is the best of the available tests					
Strongly agree	90.3	87	79.3	86.3	
Somewhat agree	8.6	11.3	16.1	11.4	
Somewhat disagree/strongly disagree	1.1	1.7	4.7	2.2	0.004
It is readily available for my patients					
Strongly agree	78	64.3	60.9	69.1	
Somewhat agree	18.7	27.4	26.3	23.5	
Somewhat disagree/strongly disagree	3.3	8.2	12.8	7.4	<0.001
I worry I might be sued if I do not offer this test					
Strongly agree	23.2	17.6	17.3	19.9	
Somewhat agree	43	38.1	32	38.6	
Somewhat disagree	21.9	25.4	26.5	24.2	
Strongly disagree	11.8	18.9	24.2	17.3	0.0016
Summary measure of 3 colonoscopy attitudes					
Strongly agree with none	3.9	5.8	13.8	7.1	
Strongly agree with one	19.9	31.3	28.1	25.7	
Strongly agree with two	57.9	52.2	47.0	53.2	
Strongly agree with three	18.2	10.7	11.1	13.9	<0.001
Local collegial norms					
Very influential	18.6	14.2	12.9	15.7	
Somewhat influential	37.5	41.4	42.9	40.1	
Not influential	43.9	44.4	44.2	44.1	0.1988
Patient norms (perceptions of Patient preferences)					
Very influential	26.5	25.8	26.9	26.4	
Somewhat influential	52.9	55	52.2	53.4	
Not influential	20.5	19.2	20.9	20.2	0.9575
USPSTF					
Very influential	72	66.7	62.9	68	
Somewhat influential	26.8	31.1	34.7	30.2	
Not influential	1.2	2.2	2.3	1.8	0.1178
ACS					
Very influential	70.7	68.8	66.7	69.1	
Somewhat influential	28.1	30.6	30.1	29.4	
Not influential	1.2	0.6	3.1	1.5	0.3172
Clinical published evidence					
Very influential	78.3	66.4	66.9	71.5	
Somewhat influential	20.5	32.7	32.5	27.6	
Not influential	1.2	0.9	0.6	0.9	0.0002
Cost for patients who lack 3rd party insurance coverage					
Very influential	32.3	32.5	27.2	31	
Somewhat influential	51.1	48.7	51.2	50.4	
Not influential	16.6	18.8	21.6	18.6	0.2675
Reimbursement available by 3 rd party payers					
Very influential	30.2	26.7	20.4	26.5	
Somewhat influential	36.6	40.8	37.3	38.1	
Not influential	33.1	32.5	42.3	35.3	0.0015

incrementally with the number of items with which the physician agreed. Other significant items in this model remained essentially the same as the first model.

DISCUSSION

This national survey confirms other studies documenting greatly increased recommendation and use of colonoscopy for CRC screening.^{5-7,17} Only a decade ago, a national survey conducted by NCI showed that very small proportions of PCPs endorsed colonoscopy as the CRC screening test they most often recommended to their patients.¹⁸ Following that survey, in 2001, the Centers for Medicare and Medicaid Services added coverage of screening colonoscopy for average-risk Medicare beneficiaries.¹⁹ In

2002, the US Preventive Services Task Force (USPSTF) added colonoscopy to the menu of recommended options for CRC screening,²⁰ but did not single out one test as more effective than other recommended options, which included FOBT and sigmoidoscopy. Thus, when our data were collected, all major organizations were unanimous in saying that any of several CRC screening strategies were appropriate. Colonoscopy also was not considered the best test in quantitative analyses performed by the USPSTF and the Institute of Medicine.²¹ Further, guidelines explicitly recommended that physicians discuss available test options with their patients and that choices among options be made based on cost, availability, convenience, and personal preference. However, as we and others have documented, discussing these options with patients does not appear to be routine practice for most PCPs,²² and PCPs' discussions with patients about CRC screening are cursory and omit explana-

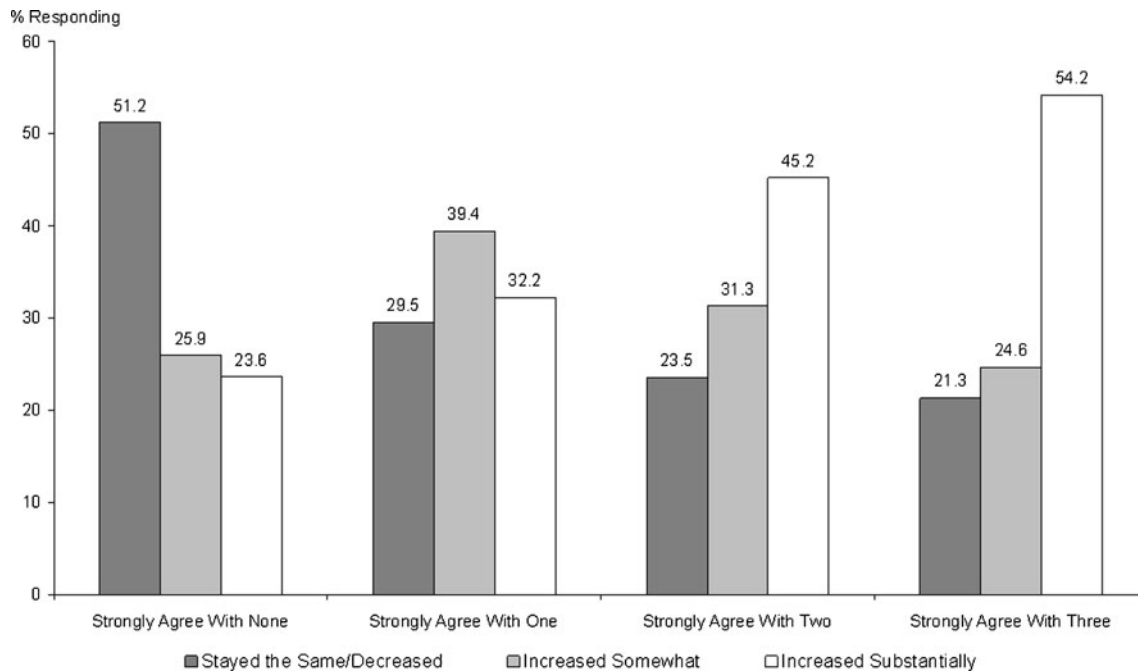


Figure 3. Reported change over past 3 years in volume of colonoscopy ordering by strong agreement with three attitude items.

tion of procedure risks.^{23,24} Instead, colonoscopy—the most expensive option that also carries significant risk²⁵—has become the screening test choice in the US.

Why has colonoscopy recommendation and ordering overwhelmed other colorectal cancer screening tests? Our data provide insights into influences that may be driving this change. A large proportion of PCPs (70%) viewed colonoscopy as *the best of the available colorectal cancer screening tests*. The majority (64%) strongly agreed that *colonoscopy testing was readily available* for their patients. More than half (58%) strongly or somewhat agreed that *they worried they might be sued* if they did not offer screening colonoscopy to their patients. Strong agreement with each of these three attitude items was independently and significantly related to PCPs' reports of substantially increased colonoscopy ordering. To our knowledge, these attitude questions about being the *best available test* and *fear of lawsuits* have not been asked before in a national survey. They provide a credible explanation for increased referral to colonoscopy but do not elucidate how these opinions were shaped.

The proportion of PCPs feeling strongly about being sued is curious.²⁶ Interestingly, gastroenterologists may fear being sued because of injury during colonoscopy, but PCPs may be concerned about not recommending the perceived “gold standard.”²⁷ Gastroenterologists who perform the procedure may be particularly important in influencing its use.²⁸ For example, one newspaper advertisement was titled: “Your golden years deserve the *gold standard* of colon cancer screening.”²⁹ The number of websites and blogs advocating colonoscopy³⁰ as the gold standard may reflect marketing to PCPs as well as to the public who increasingly use the web for health information.³¹

From the community perspective, it is important to note that 31% of respondents reported that colonoscopy was not readily available for their patients. If accurate, this perception may reflect lower specialist capacity in certain geographical areas or regional variation in practice patterns.³² Medicare coverage of screening colonoscopy may have lessened the concern about patients not having insurance and increased the ordering of colonoscopy.³³ These effects may increase following implementation of the Affordable Health Care Act, which provides coverage without co-payments.³⁴

However, access to CRC screening remains an issue given persistent evidence of disparities for certain racial/ethnic groups, individuals with low socioeconomic status, and the uninsured.¹⁷ Subramanian and colleagues³⁵ argue that, at the population level and in an era of tight budgets, screening patients with FOBT as opposed to colonoscopy would result in more people being screened and a greater gain in life-years. As discussed in the 2010 NIH State of the Science Conference on Enhancing Use and Quality of Colorectal Cancer Screening, continued heavy reliance on screening colonoscopy is unlikely to facilitate attainment of high rates of CRC screening because current capacity to provide this procedure to the millions of adults aged 50–75 who have not been screened may be insufficient.⁴

Practice level measures were also significantly related to reports of increased colonoscopy ordering. Numerous studies have highlighted the major role of reminder systems in increasing screening prevalence.⁹ In our analyses, while reminders were not independently related to reports of increased colonoscopy recommendation, physicians in practices with partial or full electronic medical record systems were more likely to report substantial increases in

Table 3. Polytomous Logistic Regression Model and Measures Associated with Changes in Colonoscopy Ordering

	Increased substantially compared with stayed the same or decreased	Increased somewhat compared with stayed the same or decreased
It is the best of the available tests		
Strongly agree	5.3(1.6–17.9)	3.0(1.0–9.7)
Somewhat agree	3.5(0.9–13.3)	1.7(0.5–5.7)
Somewhat disagree/ strongly disagree	1.0(1.0–1.0)	1.0(1.0–1.0)
It is readily available for my patients		
Strongly agree	3.7(1.9–7.2)	1.7(0.9–3.2)
Somewhat agree	2.6(1.2–5.4)	1.9(1.0–3.6)
Somewhat disagree/ strongly disagree	1.0(1.0–1.0)	1.0(1.0–1.0)
I worry I might be sued if I do not offer this test		
Strongly agree	2.0(1.1–3.6)	1.2(0.7–2.1)
Somewhat agree	2.2(1.3–3.7)	1.6(1.0–2.6)
Somewhat disagree	1.9(1.2–3.0)	1.5(0.9–2.5)
Strongly disagree	1.0(1.0–1.0)	1.0(1.0–1.0)
Clinical published evidence		
Very influential	0.6(0.1–4.2)	1.0(0.2–5.4)
Somewhat influential	0.4(0.1–2.6)	1.1(0.2–6.0)
Not influential	1.0(1.0–1.0)	1.0(1.0–1.0)
3rd party reimbursement		
Very influential	1.7(1.2–2.5)	1.5(1.0–2.3)
Somewhat influential	1.2(0.8–1.8)	1.3(0.9–1.9)
Not influential	1.0(1.0–1.0)	1.0(1.0–1.0)
Specialty		
Family medicine/ general practice	1.2(0.8–1.9)	0.9(0.6–1.4)
Internal medicine	1.0(1.0–1.0)	1.0(1.0–1.0)
Obstetrics/gynecology	0.4(0.3–0.7)	0.7(0.4–1.2)
Age		
<40	1.0(1.0–1.0)	1.0(1.0–1.0)
40–49	1.1(0.7–1.8)	1.1(0.7–1.8)
50–59	2.0(1.3–3.1)	1.8(1.1–2.8)
≥60	2.1(1.2–3.9)	2.0(1.1–3.7)
Race of PCP		
Non-Hispanic White	1.0(1.0–1.0)	1.0(1.0–1.0)
Non-Hispanic Black	1.7(0.7–4.2)	0.8(0.2–2.7)
Hispanic	1.3(0.5–2.8)	0.6(0.3–1.4)
Asian	1.7(0.9–2.9)	1.1(0.6–2.0)
Other	1.6(0.7–3.7)	1.0(0.4–2.9)
Geography		
Urban	1.0(1.0–1.0)	1.0(1.0–1.0)
Large rural city/town	0.8(0.5–1.4)	0.9(0.5–1.4)
Small/isolated small rural town	1.5(0.7–2.9)	2.0(1.0–3.8)
% Uninsured		
0–5%	1.0(1.0–1.0)	1.0(1.0–1.0)
6–25%	0.9(0.6–1.3)	1.3(0.9–1.8)
≥26%	0.7(0.3–1.6)	0.9(0.4–2.1)
Guideline implementation		
Yes	1.5(1.1–2.0)	0.8(0.5–1.1)
No	1.0(1.0–1.0)	1.0(1.0–1.0)
MD reminders in place		
Yes	1.1(0.8–1.7)	1.2(0.8–1.8)
No	1.0(1.0–1.0)	1.0(1.0–1.0)
Patient reminders in place		
Yes	1.1(0.7–1.8)	1.0(0.6–1.6)
No	1.0(1.0–1.0)	1.0(1.0–1.0)
Record system		
Paper charts	1.0(1.0–1.0)	1.0(1.0–1.0)
Partial EMR/in transition from paper to EMR	2.2(1.6–3.1)	1.5(1.0–2.2)
Full electronic medical records	1.7(1.1–2.7)	1.5(1.0–2.3)

colonoscopy ordering. Perhaps EMRs cue more efficiently and therefore result in more ordering.^{36,37}

Table 4. Polytomous Logistic Regression Model and Summary Attitude Measure Associated with Changes in Colonoscopy Ordering (Other Measures Not Reported Here)

	Increased substantially compared with stayed the same or decreased	Increased somewhat compared with stayed the same or decreased
Summary measure of opinions		
Strongly agree with none	1.0(1.0–1.0)	1.0(1.0–1.0)
Strongly agree with one	2.2(1.1–4.6)	3.4(1.7–6.9)
Strongly agree with two	3.4(1.6–7.1)	3.1(1.5–6.1)
Strongly agree with three	3.9(1.8–8.2)	2.4(1.1–5.2)

We found that OB/GYNs were less likely than other PCPs to report substantial increases in colonoscopy ordering. This difference may be a reflection of the younger patient population that is typically seen by OB/GYNs. It also could be related to their propensity to use in-office FOBT.³⁸ Another differentiating physician characteristic was age. Older PCPs were more likely to report substantially increased use of screening colonoscopy. The explanation for this is speculative, but perhaps younger physicians have been ordering more colonoscopy right along while older physicians report an increase given changes in coverage over the years.

We acknowledge several limitations of this study. While we investigated three potential attitudes' relationship to increases in screening colonoscopy, there may indeed be other factors worthy of investigation. Additionally, our study does not include the patient perspective. It is based on a physician survey, and direct patient reports therefore were beyond its scope. We attempted to assess the extent to which physicians were influenced by patients' preferences, but our measure may have been too indirect and subject to socially desirable responses. A more direct assessment, such as "How often do your patients ask specifically for screening colonoscopy," could be informative in future research. Our assessment of what physicians thought was the best test was also limited, and we did not ask how often PCPs use personalized discussion to determine the best test for each patient. This issue should be addressed in future study. For example, how would recommendations be modified in the presence or absence of a family history of colorectal cancer or a family or personal history of adenomatous polyps?^{1,21} The survey items were not explicit about the categorization of FOBT and FIT tests. Finally, we analyzed physicians' reports of their practice patterns without corroborating evidence from chart reviews or insurance claims. Some studies have reported that physicians overestimate their screening recommendations,³⁹ while a more recent report documented the reliability of physician self-report of preventive care activities.⁴⁰ Other

validation studies support use of survey data for profiling CRC screening trends and patterns.⁷

SUMMARY

This study strongly confirms the significant increases in colonoscopy ordering for CRC screening in other national reports, and the findings provide insight into factors related to PCPs' recommendations and ordering practices. It is important to note, particularly in an era of increasing social media, that additional normative factors may influence attitudes, as well as other factors that we were unable to assess in this survey. Clearly, influences in addition to practice guidelines are shaping PCPs' recommendations. Perhaps engaging clinicians in discussion about screening test efficacy, availability, costs, and harms, as well as the legitimacy of litigation fears, could promote more acceptance of recommendations that call for patient-centered decision making. While CRC screening use has been increasing in the US, a significant proportion of the adult population remains unscreened, and encouraging patient and physician discussions about options for screening may help to increase appropriate use and address disparities. Interventions might include those to promote increased CRC screening and shared decision making since both are consistent with health care reform and other efforts that emphasize evidence-based practice, the patient-centered medical home, and enhanced access and cost-effectiveness.⁴¹

Acknowledgements: Funding support for this study was provided by the National Cancer Institute (contract no. N02-PC-51308); the Agency for Healthcare Research and Quality (inter-agency agreement nos. Y3-PC-5019-01 and Y3-PC-5019-02); and the Centers for Disease Control and Prevention (inter-agency agreement no. Y3-PC-6017-01). The findings and conclusions in this report are those of the authors and do not necessarily represent the views or official position of the National Cancer Institute, the Agency for Healthcare Research and Quality, or the Centers for Disease Control and Prevention.

Conflict of Interest: The authors declare they have no conflicts of interest.

Corresponding Author: Jane Zapka, ScD; Department of Medicine, Division of Biostatistics and Epidemiology, Medical University of South Carolina, 135 Cannon street, Charleston, SC 29425, USA (e-mail: zapka@musc.edu).

REFERENCES

1. **Pignone M, Rich M, Teutsch SM, Berg AO, Lohr KN.** Screening for colorectal cancer in adults at average risk: A summary of the evidence for the US Preventive Services Task Force. *Ann Intern Med.* 2002;137:132-41.
2. US Preventive Services Task Force. Screening for Colorectal Cancer: US Preventive Services Task Force Recommendation Statement. Rockville, MD: Agency for Healthcare Research and Quality; 2008. Report No.: AHRQ Publication 08-05124-EF-3.
3. Colorectal Cancer Screening Among Adults Aged 50-75 United States 2008. *MMWR Vital Signs.* 2010;59:808-12.
4. **Steinwachs D, Allen JD, Barlow WE, et al.** National Institutes of Health state-of-the-science conference statement: Enhancing use and quality of colorectal cancer screening. *Ann Intern Med.* 2010;152:663-7.
5. **Phillips KA, Liang SY, Ladabaum U, et al.** Trends in colonoscopy for colorectal cancer screening. *Med Care.* 2007;45:160-7.
6. **Marbet UA, Bauerfeind P, Brunner J, Dorta G, Vallotton JJ, Delco F.** Colonoscopy is the preferred colorectal cancer screening method in a population-based program. *Endoscopy.* 2008;40:650-5.
7. **Schenck AP, Peacock SC, Klabunde CN, Lapin P, Coan JF, Brown ML.** Trends in colorectal cancer test use in the medicare population, 1998-2005. *Am J Prev Med.* 2009;37:1-7.
8. **Zapka JG, Lemon SC.** Interventions for patients, providers, and health care organizations. *Cancer.* 2004;101:1165-87.
9. **Anhang Price R, Zapka J, Edwards H, Taplin SH.** Organizational factors and the cancer screening process. *J Natl Cancer Inst Monogr.* 2010;2010:38-57.
10. Theory at a Glance. A Guide for Health Promotion Practice. Bethesda, MD: National Cancer Institute, US Department of Health and Human Services, National Institutes of Health 2005. Report No.: NIH Publication No. 05-3896.
11. **Klabunde CN, Lanier D, Breslau ES, et al.** Improving colorectal cancer screening in primary care practice: innovative strategies and future directions. *J Gen Intern Med.* 2007;22:1195-205.
12. **Klabunde CN, Lanier D, Nadel MR, McLeod C, Yuan G, Vernon SW.** Colorectal cancer screening by primary care physicians: recommendations and practices, 2006-2007. *Am J Prev Med.* 2009;37:8-16.
13. National Survey of Primary Care Physicians' Recommendations & Practice for Breast, Cervical, Colorectal, & Lung Cancer Screening. National Cancer Institute; 2008; Available at: http://healthservices.cancer.gov/surveys/screening_rp/. Accessed March 14, 2012.
14. **Dillman D.** Mail and Internet Surveys. The Tailored Design Method. 2007 update with new Internet, visual and mixed-mode guide. 2nd ed. Hoboken: John Wiley & Sons; 2007.
15. **Ajzen I.** The theory of planned behavior. *Organizational Behav and Human Decision Process.* 1991;50:179-211.
16. **Montano DE, Kasprzyk D.** The theory of reasoned action and the theory of planned behavior. In: **Glanz K, Rimer BK, Lewis FM, eds.** Health Behavior and Health Education Theory, Research and Practice. 3rd ed. San Francisco: Jossey-Bass; 2002:67-98.
17. **Klabunde CN, Cronin KA, Breen N, Waldron WR, Ambs AH, Nadel MR.** Trends in colorectal cancer test use among vulnerable populations in the United States. *Cancer Epidemiol Biomarkers Prev.* 2011;20:1611-21.
18. **Klabunde CN, Frame PS, Meadow A, Jones E, Nadel M, Vernon SW.** A national survey of primary care physicians' colorectal cancer screening recommendations and practices. *Prev Med.* 2003;36:352-62.
19. Medicare Preventive Services. Quick Reference Information: Preventive Services. Bethesda, MD: Department of Health and Human Services, Centers for Medicare and Medicaid Services; Available at: https://www.cms.gov/MLNProducts/downloads/MPS_QuickReferenceChart_1.pdf. Accessed March 14, 2012.
20. US Preventive Services Task Force Urges Colorectal Cancer Screening for All Americans 50 and Over. Rockville, MD: Agency for Health Care Research and Quality; Press Release, July 15, 2002; Available at: <http://www.ahrq.gov/news/press/pr2002/coloscpr.htm>. Accessed March 14, 2012.
21. **Ransohoff DF.** Colon cancer screening in 2005: status and challenges. *Gastroenterology.* 2005;128:1685-95.
22. **Zapka JM, Klabunde CN, Arora NK, Yuan G, Smith JL, Kobrin SC.** Physicians' colorectal cancer screening discussion and recommendation patterns. *Cancer Epidemiol Biomarkers Prev.* 2011;20:509-21.
23. **Wolf MS, Baker DW, Makoul G.** Physician-patient communication about colorectal cancer screening. *J Gen Intern Med.* 2007;22:1493-9.
24. **Canada RE, Turner B.** Talking to patients about screening colonoscopy—where conversations fall short. *J Fam Pract.* 2007;56:E1-9.
25. **Warren JL, Klabunde CN, Mariotto AB, et al.** Adverse events after outpatient colonoscopy in the Medicare population. *Ann Intern Med.* 2009;150:849-57. W152.
26. **Deshpande SP, Deshpande SS.** Factors impacting perceived threat of malpractice lawsuits by various medical specialists. *Health Care Manag.* 2011;30:55-65.
27. **Slay MW.** Screening Colonoscopies: Good Patient Care and Smart Medical Business. Birmingham Medical News; 2008; Available at: <http://www.birminghammedicalnews.com/news.php?viewStory=896>. Accessed March 14, 2012.

28. Experts: Get colonoscopies after age 50. July 21, 2007; Available at: <http://abcnews.go.com/WN/OnCall/story?id=34016118&page=1>. Accessed March 14, 2012.
29. American College of Gastroenterology. Your golden years deserve the gold standard of colon cancer screening. Straight Talk: Complete Colonoscopy is the most effective screening method for colon cancer.: American College of Gastroenterology; Available at: <http://www.acg.gi.org/patients/ccrk/crcad2.pdf>. Accessed March 14, 2012.
30. Gastroenterology Associates of Central Virginia. Colon Cancer...You Can Prevent It. Available at: <http://www.gastrocentralva.com/screening/>. Accessed March 14, 2012.
31. **Cohen RA, Adams PF.** use of the Internet for Health Information: United States, 2009. July 2011. Report No.: NCHS Data Brief No. 66.
32. **Haas JS, Fitzmaurice G, Brawarsky P, et al.** Association of regional variation in primary care physicians' colorectal cancer screening recommendations with individual use of colorectal cancer screening. *Prev Chronic Dis.* 2007;4:A90.
33. **Chen X, White MC, Peipins LA, Seeff LC.** Increase in screening for colorectal cancer in older Americans: results from a national survey. *J Am Geriatr Soc.* 2008;56:1511-6.
34. **Koh HK, Sebelius KG.** Promoting prevention through the Affordable Care Act. *N Engl J Med.* 2010;363:1296-9.
35. **Subramanian S, Bobashev G, Morris RJ.** When budgets are tight, there are better options than colonoscopies for colorectal cancer screening. *Health Aff.* 2010;29:1734-40.
36. **Ornstein S, Nemeth LS, Jenkins RG, Nietert PJ.** Colorectal cancer screening in primary care: translating research into practice. *Med Care.* 2010;48:900-6.
37. **Jimbo M, Nease DE Jr, Ruffin MT, Rana GK.** Information technology and cancer prevention. *CA Cancer J Clin.* 2006;56:26-36. quiz 48-9.
38. **Nadel MR, Berkowitz Z, Klabunde CN, Smith RA, Coughlin SS, White MC.** Fecal occult blood testing beliefs and practices of US primary care physicians: serious deviations from evidence-based recommendations. *J Gen Intern Med.* 2010;25:833-9.
39. **Montano D, Phillips W.** Cancer screening by primary care physicians: a comparison of rates obtained from physician self-report, patient survey, and chart audit. *Am J Public Health.* 1995;85:795-800.
40. **Yeazel MW.** Lindstrom Bremer KM, Center BA. A validated tool for gaining insight into clinicians' preventive medicine behaviors and beliefs: the preventive medicine attitudes and activities questionnaire (PMAAQ). *Prev Med.* 2006;43:86-91.
41. **Sheridan SL, Harris RP, Woolf SH.** for the Shared Decision-Making Workgroup of the US Preventive Services Task Force. Shared decision making about screening and chemoprevention. *Am J Prev Med.* 2004;26:56-66.