

# Primary Care Provider Perceptions of Barriers to and Facilitators of Colorectal Cancer Screening in a Managed Care Setting

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**BACKGROUND.** Colorectal cancer (CRC) screening tests (e.g., fecal occult blood testing [FOBT], flexible sigmoidoscopy [FS], etc.) are underused. Primary care providers (PCPs) play a critical role in screening, but barriers to and facilitators of screening as perceived by PCPs in managed care settings are poorly understood. The objectives of the current study were to describe current CRC screening practices and to explore determinants of test use by PCPs in a managed care setting.

**METHODS.** In 2000, a self-administered survey was mailed to a stratified, random sample of 1340 PCPs in a large, network model health maintenance organization in California.

**RESULTS.** The survey response rate was 67%. PCPs indicated that 79% of their standard-risk patients were screened for CRC. PCP-reported median rates of recommendation for the use of specific screening tests were 90% for FOBT and 70% for FS. In logistic regression models, perceived barriers to the use of FOBT and FS included patient characteristics (e.g., education) and PCP-related barriers (e.g., failure to recall that patients were due for testing). Perceived facilitators of the use of FOBT and FS included interventions targeting certain aspects of the health care system (e.g., reimbursement) and interventions targeting certain aspects of the tests themselves (e.g., provision of evidence of a test's effectiveness). Assignment of high priority to screening, integrated medical group (as opposed to independent practice association) affiliation, and the proportion of patients receiving routine health maintenance examinations were positively associated with reported test use.

**CONCLUSIONS.** CRC screening tests appear to be underused in the managed care setting examined in the current study. The perceived barriers and facilitators that were identified can be used to guide interventions aimed at increasing recommendations for, as well as actual performance of, CRC screening. *Cancer* 2004;100:1843–52. © 2004 American Cancer Society.

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Colorectal cancer (CRC) is the second most common cause of malignancy-related mortality in the United States.<sup>1</sup> Most cases of CRC are detected at an advanced stage, and the overall 5-year case-fatality rate for CRC approaches 50%.<sup>2</sup> The natural history of CRC, in which progression from adenoma to carcinoma occurs over the course of several years, provides an opportunity for the prevention or early detection of this prevalent malignancy.<sup>3</sup> Screening via fecal occult blood testing (FOBT) or flexible sigmoidoscopy (FS) has been reported to decrease CRC-related mortality.<sup>4</sup> In addition, periodic CRC screening for standard-risk adults age  $\geq 50$  years is endorsed by medical professional societies, codified in widely disseminated practice guidelines, and covered by health care insurers.<sup>4</sup> Nonetheless, serial national surveys continue to document low rates of CRC screening test use (i.e.,  $< 50\%$ ) in the U.S. population.<sup>5,6</sup>

The sources of (and, therefore, the potential remedies for) underutilization of CRC screening tests are unclear. For those with access to health care, a recommendation made by a primary care provider (PCP) encouraging screening is an important initial facilitator of screening use.<sup>7-10</sup> Surveys of PCPs in a variety of practice settings in the U.S. have revealed a number of potential barriers to CRC screening test use; among these barriers are aspects of the PCP's training (e.g., specialty, facility with FS), the demographic characteristics of the PCP (e.g., age, number of years in practice), and the PCP's beliefs regarding the characteristics of a given test (e.g., diagnostic yield, efficacy).<sup>10-18</sup> Many surveys addressing barriers to test use have limited their focus to FS.<sup>19-24</sup> Most barriers cited in previous studies, such as provider training and test characteristics, may be relatively difficult to change at the level of the individual primary care office or even at the level of the provider organization (i.e., the independent practice association [IPA] or the integrated medical group [MedGrp]), due to practical constraints on scarce resources.<sup>25</sup> Few prior surveys of PCPs have described barriers to CRC screening that can be addressed through relatively inexpensive interventions, such as office reminder systems aimed at counteracting forgetfulness on the part of the provider or the patient.<sup>26,27</sup>

Although data suggest that patients enrolled in health maintenance organizations (HMOs) may have higher screening rates relative to patients with fee-for-service insurance plans,<sup>28,29</sup> only a limited number of studies have assessed the CRC screening practices of PCPs in managed care settings.<sup>30,31</sup> To our knowledge, no prior survey has focused on both barriers to and facilitators of CRC screening in managed care settings. Identification of such determinants of screening use

can guide the development of pragmatic interventions aimed at increasing CRC screening rates in HMOs as well as in other practice settings.

We conducted a survey of HMO PCPs to characterize current CRC screening practices and to identify possible determinants of CRC screening test use that might be amenable to change in a facilitated, continuous quality improvement intervention aimed at increasing CRC screening rates. We hypothesized that a set of key barriers to and facilitators of CRC screening would be associated with self-reported rates of use after adjustment for characteristics of the provider and the provider's office practice.

## MATERIALS AND METHODS

### Participant Identification

Potential participants in the current study were PCPs drawn from a large, network model HMO contracted with provider organizations (IPAs and MedGrps) throughout California; the HMO examined covered several million capitated lives.<sup>32</sup> The sampling frame for this survey consisted of 36 provider organizations (24 IPAs and 12 MedGrps) that were affiliated with this HMO and had previously agreed to participate in a randomized, controlled trial of an intervention aimed at increasing CRC screening rates. The survey was conducted before the start of the intervention trial.<sup>33</sup> Participating provider organizations were located throughout California and had either  $> 10,000$  health plan subscribers, or 1100-10,000 subscribers whom at least 500 were age eligible for CRC screening. Each organization's medical director provided a list of all member PCPs. Organizations were stratified according to number of PCPs and type of provider organization. The survey was administered to a stratified, random sample of providers who offered primary care to adult HMO enrollees in these provider organizations. The study was approved by the Office for the Protection of Research Subjects at the University of California-Los Angeles (Los Angeles, CA), and all respondents provided informed consent.

### Survey Administration and Design

Between November 1999 and August 2000, surveys were mailed together with a recruitment cover letter, a consent form, a \$20 financial incentive, and a postage-paid return envelope. Follow-up reminder letters, repeat survey mailings, and telephone calls to PCP offices were used in a standardized fashion to maximize the response rate. Survey responses were collected until January 1, 2001.

The survey instrument was an 11-page, 39-question, 194-individual response item, cross-sectional, self-report, mailed questionnaire designed specifically

for use in the current study following a structured literature review, acquisition of existing survey instruments, semistructured interviews with local PCPs, focus groups conducted with a convenience sample of HMO PCPs, and extensive pilot testing involving PCPs. In pilot testing, the average time required to complete the survey was 25 minutes. The content of the survey was divided into three main areas—PCP characteristics, office practice characteristics, and CRC screening practices—with an emphasis on barriers to and facilitators of screening test use. Several items on the survey were adapted from the work of others.<sup>32–35</sup> The referent was the PCP practicing in the office to which the survey was mailed.

### Measurement of CRC Screening Test Use

Providers were asked to indicate, using an integer scale running from 0–100, the percentage of their standard-risk office patients (as defined by age  $\geq$  50 years, absence of symptoms, and absence of personal/family history of CRC or any other known cancer risk factors) to whom they systematically recommended cancer screening via individual tests (e.g., FS, take-home FOBT, colonoscopy, dual-contrast barium enema [DCBE] evaluation). Recommendations for individual screening tests were not mutually exclusive, and therefore, responses for each test could not simply be summed. For example, we could not add the percentage of patients receiving a recommendation for FS to the percentage receiving a recommendation for colonoscopy, because we did not know what percentage of patients received recommendations for both procedures. The survey was conducted before the emergence of a widespread consensus regarding the role of screening colonoscopy. Consequently, data on barriers and facilitators were collected for FS and FOBT only.

The reported screening rates for FS and FOBT did not satisfy the normality requirements of the regression model used to estimate parameters, even after transformation. We therefore used the median reported rate to characterize providers as *users* (percentage of patients to whom screening was recommended  $\geq$  the median value) or *nonusers* (percentage  $<$  the median value) of individual screening tests. These dichotomous indicators were used as dependent variables in logistic regression models. The use of a number of different cutoff points for dichotomization (e.g., 70%, 90%) did not alter our conclusions.

### Conceptualization and Measurement of Barriers and Facilitators

Providers were asked to rate the degree of influence (Likert-type response variable range, 1 [*none*] to 5

[*strong*]) that a series of potential barriers had on their decision not to order or perform CRC screening using 1) FOBT and 2) FS for standard-risk office patients. Providers also were asked whether a series of potential facilitators would be helpful in increasing the number of their standard-risk office patients who underwent CRC screening with 1) FOBT and 2) FS; responses to these inquiries were dichotomous variables (*yes* or *no*).

Conceptually, individual barrier items were divided into four distinct categories (characteristics of the health care system, characteristics of screening tests, characteristics of the patient, and characteristics of the PCP), whereas facilitator items were divided into two groups (interventions targeting aspects of the healthcare system or screening tests and interventions targeting patients or providers) (Table 1). For FOBT and FS, additive scales combining responses to individual items were created and normalized to a 10-point scale for each of the 4 barrier factors. Additive scales combining responses to individual items also were created for both classes of facilitating factors for FOBT and FS. Confirmatory factor analyses revealed good model fit, with a Tucker–Lewis index of  $>$  0.95, a comparison-of-fit index of  $>$  0.95, a root mean square of approximation of  $<$  0.06, and a standardized root mean square residual of  $<$  0.08 for barrier scales as well as facilitator scales.<sup>36</sup>

### Analytic Strategy

SAS software (SAS Institute, Cary, NC) was used to perform data analysis. Proportions were compared using the Pearson chi-square test. Means were compared using the Wilcoxon rank-sum test, pooled *t* test, or Satterthwaite *t* test for unequal variances. A two-sided *P* value of  $<$  0.05 was considered to indicate statistical significance.

Logistic regression models were used to assess the relation between potential barriers or facilitators and reported use of FOBT or FS for CRC screening of standard-risk patients, with adjustments made for PCP and office practice characteristics. Less than 5% of values were unavailable for any given response item. A two-step multiple imputation procedure, with hot-deck imputation of the unavailable covariates followed by regression imputation of the unavailable response variables, was used to account for missing values before the assessment of multivariate regression models.<sup>37</sup> This imputation procedure was used to create five complete data sets for use in modeling.

### Model Selection

For each dependent variable, together with all accompanying independent variables, logistic regression models were estimated via the SAS GLIMMIX proce-

**TABLE 1**  
**Perceived Barriers to and Facilitators of Providers' Recommendations for Colorectal Cancer Screening of Standard-Risk Patients with Fecal Occult Blood Testing or Flexible Sigmoidoscopy as Addressed by Specific Items in the Survey Instrument**

Factor	Specific types of barriers and facilitators
Characteristics of health care system (Barrier 1)	Inadequate reimbursement Lack of time to perform test <sup>a</sup> Requests rejected/denied by insurance provider <sup>a</sup> Absence of available performing providers <sup>a</sup>
Characteristics of screening tests (Barrier 2)	Too many false-positive/false-negative test results Positive test results too rare
Patient characteristics (Barrier 3)	Lack of compliance Lack of knowledge of screening's risks and benefits
Provider characteristics (Barrier 4)	Failure to recall that patient is due for examination Assignment of higher priority to other health concerns
Interventions targeting the health care system or targeting screening tests (Facilitator 1)	Increased reimbursement Provision of additional evidence of tests' effectiveness Provision of clear practice guidelines for test use
Interventions targeting patients or providers (Facilitator 2)	Flag or flow sheet in office chart to remind provider Scheduling of annual health maintenance examinations by provider's office Increased patient education in provider's office Postcards or letters sent by provider's office to remind patients

<sup>a</sup> Barrier unique to use of flexible sigmoidoscopy.

cedure (SAS Institute) using each of the five data sets created by the imputation procedure. Data were adjusted for clustering at the level of the provider organization by allowing random intercepts for organizational level. Model selection was conducted by sequentially inserting blocks of independent variables into the regression equations. The blocks of independent variables corresponded to the survey's three primary content areas: PCP characteristics, office practice characteristics, and barriers to/facilitators of screening. As each block of covariates was added to the regression, all covariates that had exhibited significance in at least three of the imputed data sets in prior models were selected for inclusion in all subsequent models. PCP characteristics (Table 2) were entered as the first block of covariates. Significant provider characteristics identified in this step then were entered into models together with office characteristics, which represented the second block of covariates. All significant office characteristics identified in this step, as well as all previously identified provider characteristics, then were entered into models along with a third block of covariates, which included scales for barriers to and facilitators of FOBT or FS use (Table 1).

#### **Assessment of Interactions and Combined Model Estimates**

The final four models (FOBT barriers, FOBT facilitators, FS barriers, and FS facilitators) were applied to each of the five imputed data sets. Hypothesized first-order in-

teractions involving type of provider organization (IPA or MedGrp) and barrier/facilitator scales in the final models were tested. Specific hypothesized interactions were as follows: IPA\*Barrier 2, IPA\*Barrier 3, IPA\*Barrier 4, IPA\*Facilitator 1, and IPA\*Facilitator 2 for FOBT; and IPA\*Barrier 1, IPA\*Barrier 2, IPA\*Barrier 3, IPA\*Barrier 4, IPA\*Facilitator 1, and IPA\*Facilitator 2 for FS. Each model with all two-way interactions included was tested against the corresponding model with no interactions included. None of the models with interactions included was significantly different from the corresponding model without interactions included. Therefore, interaction terms were not included in any of the final models.

The SAS MIANALYZE procedure (SAS Institute) was applied to the five data sets to generate combined estimates for each model. The MIANALYZE procedure read the results of the analyses performed on each imputed data set, computed a combined estimate and standard error for each covariate, and derived statistical inferences for each covariate. Final beta coefficients were converted into adjusted odds ratios for ease of interpretation.

## **RESULTS**

### **Response Rate**

One thousand three hundred forty surveys were mailed to potentially eligible respondents, and 891 completed surveys were returned, yielding an overall response rate of 67%. Of the 891 completed surveys, 9 were from respondents who indicated that they did not provide

**TABLE 2**  
**Distribution of Responses to Individual Survey Items by 'Users' and 'Nonusers'<sup>a</sup> of Colorectal Cancer Screening Tests for Standard-Risk Patients**

Characteristic	Total	FOBT			FS		
		Nonusers	Users	<i>P</i> value <sup>b</sup>	Nonusers	Users	<i>P</i> value <sup>b</sup>
No. of PCPs <sup>c</sup>	840	407	433	NA	405	435	NA
PCP characteristics							
Male gender (%)	77	79	74	0.1309	82	72	0.0008
Mean (SD) age in yrs	48 (10)	49 (10)	48 (10)	0.0680	50 (10)	48 (10)	< 0.0001
Family/personal history of CRC (%)	18	17	18	0.6194	16	19	0.3595
Area of specialization (%)							
Family practice	49	50	48	0.5512	49	48	0.8590
Internal medicine	46	44	48	0.3304	44	48	0.3248
Affiliation with academic center (%)	28	26	29	0.3814	25	30	0.1028
IPA membership (%)	65	73	57	< 0.0001	76	54	< 0.0001
Practice characteristics							
Mean (SD) no. of unique office patients in preceding 2 yrs <sup>d</sup>	3003 (3100)	2983 (3270)	3022 (2936)	0.8656	2959 (3294)	3046 (2909)	0.7074
Most or all office patients age ≥50 yrs (%)	27	24	29	0.1183	29	25	0.1378
Most or all office patients in capitated health plans (%)	44	38	49	0.0019	40	47	0.0313
Most or all office patients seen for HME in preceding 2 yrs (%)	30	21	38	< 0.0001	21	37	< 0.0001
IPA/MedGrp has specific CRC screening approach (%)	76	74	79	0.0863	74	78	0.2435
IPA/MedGrp tracks CRC screening (%)	20	18	21	0.2228	21	18	0.3069
High or highest priority given to CRC screening vs. other preventive services (%)	65	52	79	< 0.0001	54	76	< 0.0001
PCP referred patient to other provider for FS (%)	69	71	68	0.3278	73	66	0.0214
PCP performed FS (%)	27	25	29	0.2130	20	33	< 0.0001
PCP did not recommend FS (%)	4	4	3	0.5841	7	1	< 0.0001
Highly significant barriers (%)							
Barrier 1: health care system-related	NA	5.7	2.8	0.0379	7.8	3.1	0.0026
Barrier 2: screening test-related	NA	9.4	3.8	0.0010	4.5	1.9	0.0304
Barrier 3: patient characteristics	NA	16.4	6.8	< 0.0001	17.7	11.5	0.0124
Barrier 4: provider characteristics	NA	14.3	4.5	< 0.0001	15.2	5.2	< 0.0001
Highly significant facilitators (%)							
Facilitator 1: health care system-or test-related intervention	NA	65.4	46.3	< 0.0001	65.4	46.2	< 0.0001
Facilitator 2: patient- or provider-related intervention	NA	92.9	92.4	0.7840	90.2	93.5	0.0813

FOBT: fecal occult blood testing; FS: flexible sigmoidoscopy; PCP: primary care provider; NA: not applicable; SD: standard deviation; CRC: colorectal cancer; HME: health maintenance examination; IPA: independent practice association; MedGrp: integrated medical group.

<sup>a</sup> Users and nonusers of a given test were defined using the median percentage of patients to whom that test was recommended as a cutoff point. Thus, providers who recommended screening with fecal occult blood testing to ≥90% of standard-risk patients were considered users of fecal occult blood testing, while providers who recommended screening with flexible sigmoidoscopy to ≥ 70% of standard-risk patients were considered users of flexible sigmoidoscopy.

<sup>b</sup> For comparison of nonusers and users of a given procedure. Pooled *t* test was used for comparisons of provider age, and Satterthwaite *t* test for unequal variances was used for comparisons involving mean number of unique patients. All other *P* values were computed using the chi-square test.

<sup>c</sup> Varies slightly from item to item due to missing data and skip patterns.

<sup>d</sup> Range, 30–25,000 patients.

primary care, and 42 did not contain values for the dependent variables used in the regression models. These 51 surveys were excluded, resulting in a sample size of 840 for the purposes of analysis. Supplementary analyses revealed that nonrespondents were similar to respondents with regard to gender, age, type of provider organization, and size of provider organization; however, providers with specialty training in family practice

were more likely to respond than were those with training in internal medicine (data not shown).

### Provider Characteristics

Table 2 summarizes PCP characteristics, office practice characteristics, and perceived barriers to/facilitators of current CRC screening practices for users and nonusers of FOBT and FS. Additional analyses (not

shown) indicated that few providers (3%) reported having subspecialty training in gastroenterology. Among the subset of providers age  $\geq 50$  years ( $n = 331$ ), personal use of CRC screening tests was reported by 72% of those without a personal or family history of CRC and by 95% of those with such a history.

### Practice Characteristics

Additional data (not shown in Table 2) indicated that most providers had been practicing in their current office location for an extended period of time (mean, 11 years; standard deviation, 9 years). Nearly two-thirds (65%) of all providers were members of IPAs, whereas the remaining providers belonged to MedGrps. One-third (33%) of all providers described themselves as sole practitioners. Most PCPs (63%) reported that at least one-third of their patients had undergone a routine physical examination at the office within the preceding 2 years, and 87% reported that at least one-third of their patients had visited the office at least twice within the preceding 2 years. Nearly one-half of all respondents (48%) reported that someone in their office performed FS. A majority of providers (71%) had cared for patients dying of CRC, and most respondents (81%) also had successfully used screening to identify early-stage or premalignant colorectal lesions.

### CRC Screening Practices

Compared with other preventive services, CRC screening was a relatively high priority at respondents' offices, with 65% of PCPs assigning it high or highest priority. More than 90% of all respondents reported having a systematic approach to screening office patients for CRC. On average, respondents reported systematically recommending at least 1 CRC screening test to 79% of eligible patients (standard deviation, 24%). Provider-reported rates of recommendation of individual CRC screening tests for standard-risk office patients, estimated rates of actual use by patients, and most commonly recommended screening intervals are shown in Table 3. It is important to note that the rates reported in Table 3 are median values. This means, for example, that 50% of respondents recommended screening colonoscopy to  $\geq 8\%$  of their standard-risk office patients. In contrast, 50% of respondents recommended screening FS to  $\geq 70\%$  of their standard-risk office patients. Thus, it is evident that the respondents recommended screening FS to their standard-risk office patients much more frequently than they recommended screening colonoscopy. Recommendations of individual screening tests were not mutually exclusive, and rates of recommendation therefore could not be summed, because respondents

**TABLE 3**  
Provider-Reported Rates of Recommendation for Use of Colorectal Carcinoma Screening Tests by Standard-Risk Office Patients Age  $\geq 50$  Years, with Respondent-Reported Estimates of Patient Compliance Rates and Most Commonly Recommended Screening Intervals for Each Test

Test type	Median (IQR)		
	% of patients to whom test was recommended	% of patients who followed screening recommendation	Most commonly recommended screening interval (yrs)
FOBT	90 (50-100)	70 (50-80)	1 (1-1)
FS	70 (30-90)	50 (30-75)	5 (3-5)
Barium enema	5 (0-20)	50 (10-80)	5 (5-5)
Colonoscopy	8 (0-30)	50 (10-90)	5 (5-10)

IQR: interquartile range; FOBT: fecal occult blood testing; FS: flexible sigmoidoscopy.

may have recommended multiple tests to some standard-risk office patients.

### Barriers to and Facilitators of CRC Screening with FOBT or FS

Associations between perceived barriers to/facilitators of CRC screening and provider-reported recommendation rates for FOBT and FS, with adjustment for provider and office characteristics, were evaluated in four logistic regression models. (Table 4; see Table 1 for definitions of barriers and facilitators.) The odds of recommending FOBT were decreased by test characteristics (Barrier 2), patient characteristics (Barrier 3), and provider characteristics (Barrier 4). The odds of recommending FS were decreased by health care delivery system characteristics (Barrier 1) and provider characteristics (Barrier 4).

The odds of reporting a recommendation for both FOBT and FS decreased with the provider-reported belief that interventions targeting the health care system or screening tests (Facilitator 1) would increase actual CRC screening rates in the PCP's office. In contrast, the odds of reporting FS use increased with the provider-reported belief that interventions targeting patients or providers (Facilitator 2) would increase actual CRC screening rates.

In all models, the reported proportion of office patients receiving a routine health maintenance examination in the preceding 2 years, as well as the priority assigned to CRC screening relative to other preventive services in the PCP's office, was positively associated with an increase in the odds of a recommendation for screening. Providers affiliated with a MedGrp (as opposed to an IPA) had significantly increased odds of recommending FOBT for screening

**TABLE 4**  
**Provider-Reported Rates of Recommendation for Colorectal Cancer Screening Test Use by Standard-Risk Office Patients Age  $\geq$  50 Years, with Responder-Reported Estimates of Patient Compliance Rates and Most Commonly Recommended Screening Intervals for Each Test**

Variable	Adjusted odds ratio (95% CI)			
	FOBT models		FS models	
	Barriers	Facilitators	Barriers	Facilitators
PCP characteristics				
Male gender (vs. female gender)	0.88 (0.59–1.30)	0.86 (0.60–1.26)	0.66 (0.44–1.00)	0.65 (0.44–0.98)
Increasing age	0.99 (0.98–1.01)	1.00 (0.98–1.01)	0.98 (0.96–0.99)	0.98 (0.96–0.99)
IPA affiliation (vs. MedGrp affiliation)	0.64 (0.42–0.97)	0.60 (0.40–0.90)	0.64 (0.31–1.32)	0.58 (0.28–1.21)
Practice characteristics				
Most or all patients received an HME in the preceding 2 yrs (vs. most patients did not receive an HME)	1.50 (1.21–1.86)	1.61 (1.31–1.98)	1.75 (1.41–2.18)	1.84 (1.48–2.29)
CRC screening had high priority in office (vs. CRC screening did not have high priority)	1.72 (1.40–2.10)	1.86 (1.54–2.25)	1.63 (1.33–2.00)	1.71 (1.40–2.08)
FS was not recommended (vs. FS was recommended)	NA	NA	0.12 (0.04–0.35)	0.14 (0.05–0.39)
Patient was referred to other provider for FS (vs. FS was performed by PCP)	NA	NA	0.47 (0.32–0.69)	0.47 (0.32–0.69)
Barriers and facilitators				
Barrier 1: health care system (vs. barrier absent)	NA <sup>a</sup>	NA	0.94 (0.90–0.99)	NA
Barrier 2: test (vs. barrier absent)	0.85 (0.78–0.93)	NA	NA <sup>a</sup>	NA
Barrier 3: patient (vs. barrier absent)	0.91 (0.83–0.99)	NA	1.06 (0.97–1.15)	NA
Barrier 4: provider (vs. barrier absent)	0.84 (0.76–0.92)	NA	0.88 (0.80–0.97)	NA
Facilitator 1: system- or test (vs. facilitator absent)	NA	0.71 (0.62–0.81)	NA	0.79 (0.68–0.92)
Facilitator 2: patient- or provider (vs. facilitator absent)	NA	NA <sup>a</sup>	NA	1.18 (1.00–1.39)

CI: confidence interval; FOBT: fecal occult blood testing; FS: flexible sigmoidoscopy; PCP: primary care provider; IPA: independent practice association; MedGrp: integrated medical group; HME: health maintenance examination; CRC: colorectal cancer; NA: not applicable.

<sup>a</sup> These factors did not exhibit statistical significance in preliminary models; therefore, they were not included in the final model.

and tended to have increased odds of recommending FS, although this tendency did not reach statistical significance. In addition, younger providers, female providers, and providers who performed FS for their own patients had increased odds of recommending screening FS.

## DISCUSSION

Although they have been shown to decrease CRC mortality, CRC screening tests remain underused. In the current study, one-half of all providers recommended FOBT and FS to  $< 90\%$  and  $< 70\%$ , respectively, of all eligible patients; rates of recommendation for colonoscopy and DCBE were much lower. PCPs play a critical role in screening, and the current survey provides insight into a variety of factors that appear to influence the CRC screening practices of PCPs in a managed care setting.

Using logistic regression models that were adjusted for provider and office characteristics, several key perceived barriers and facilitators were shown to be associated with rates of recommendation for CRC screening. PCP's beliefs regarding characteristics of the health care delivery system (Barrier 1)—namely,

inadequate reimbursement for performing tests, lack of time to perform tests, denial by insurance providers, and the absence of available clinicians to perform tests—decreased the odds of provider-reported recommendation of CRC screening with FS, but not with FOBT. This finding is not surprising, given the marked differences between these two tests in terms of cost and provider effort. In contrast, the perceived performance characteristics of the screening test (Barrier 2)—e.g., too many false-positive results or too few true-positive results—were barriers to FOBT use but not to FS use; these findings suggest that providers have more confidence in FS screening than they do in FOBT screening.

PCPs who reported that interventions targeting aspects of the health care delivery system or the test itself (Facilitator 1)—e.g., greater reimbursement for performing the test or provision of additional evidence of the test's effectiveness in decreasing CRC mortality—would facilitate screening had decreased odds of recommending FOBT and FS. It is likely that such interventions would need to be initiated at levels of health policy above the individual office or the provider organization. Providers who view these interven-

tions as being necessary may feel that improving CRC screening rates is beyond their control, and they may be less likely to recommend screening as a result.

Self-reported factors associated with the provider (Barrier 4)—namely, failure to recall that patients were due for screening and assignment of higher priority to other health concerns—decreased the odds of recommending screening with FOBT and FS. Patient characteristics (Barrier 3), such as poor compliance and lack of knowledge regarding the risks and benefits of screening, led to decreased odds of provider-reported FOBT recommendation. We speculate that PCPs who are concerned that patients will not follow through on home FOBT testing may be less likely to recommend this test and more likely to recommend a test, such as FS, that can be performed in the office.

These PCP-related and patient-related barriers may be addressed by relatively inexpensive interventions at the level of the provider organization or the individual office.<sup>38–42</sup> In particular, patient reminders have been shown to increase the use of preventive services.<sup>43–46</sup> In the current study, providers who reported that local interventions (Facilitator 2), such as patient education, reminder systems, and annually scheduled health maintenance examinations, would help to increase CRC screening rates in their offices had increased odds of recommending FS. This finding suggests that PCPs who recommend FS may be more aware of potential barriers to the use of this procedure and therefore may be eager to address such barriers.

The logistic models generated in the current study also demonstrated that PCPs participating in IPAs were significantly less likely to recommend the use of FOBT and somewhat less likely to recommend the use of FS compared with PCPs in MedGrps. This close association between organizational structure the PCP's reported provision of CRC screening services is worthy of further study, as the targets, methods, and outcomes associated with interventions designed to increase CRC screening rates are likely to vary with differences in organizational structure. For example, previous work performed by our group suggests that IPAs have greater mean numbers of physicians and practice sites than do MedGrps and that these differences may make dissemination of interventions more difficult for PCPs in IPAs.<sup>32</sup> In addition, IPAs appear to be far less likely to have shared medical record systems; as a result, tracking outcomes and providing feedback may also be more difficult for PCPs in IPAs.

The majority of providers reported that at least one-third of their office patients had received a routine health maintenance examination within the preceding 2 years. These examinations, in contrast to visits motivated by acute or chronic competing health concerns, may provide an ideal opportunity for pro-

viders to offer or recommend preventive services, including CRC screening. Across all models, the reported proportion of patients who attended a routine health maintenance examination within the preceding 2 years was strongly associated with the use of FOBT and FS. A recent telephone survey of English-speaking adults in three U.S. cities suggested that a public desire for annual physical examinations exists.<sup>47</sup> Other investigators have demonstrated a strong correlation between health maintenance examination visits and provision of cancer prevention services.<sup>48,49</sup> In addition, a recent metaanalysis of controlled clinical trials suggested that organizational change interventions, including the use of planned care visits for prevention, represent the most effective means of increasing the use of adult preventive services.<sup>46</sup> Although doing so is controversial from a cost-effectiveness perspective, providers may want to schedule routine health maintenance examinations for some subset of patients while also pursuing strategies (e.g., defining roles for office staff in the initiation of screening, using flow sheets in patient charts, etc.) that facilitate opportunistic screening when patients present with competing health concerns.

Only 27% of PCPs performed FS for their own patients. PCPs who referred their patients to other providers for FS instead of performing the procedure themselves had decreased odds of recommending FS for CRC screening. While this finding clearly suggests that continued efforts aimed at increasing the proportion of providers who perform FS are warranted, the process of referral for FS by PCPs may also be worthy of further investigation. The findings of such research may have implications for anticipated increases in the volume of referrals for screening colonoscopy.

Notable strengths of the current survey include the large sample size and the response rate of 67%. This high response rate may be at least partly attributable to the intensive efforts of the research staff and to the cooperation of the participating HMO and the administrative staffs of the individual provider organizations.<sup>50</sup> To our knowledge, the current study provides the most complete findings to date regarding the CRC screening practices of PCPs in a managed care setting. Because most physician organizations contract with multiple health plans, the data obtained from this stratified random sample of a large HMO's affiliates throughout California may provide a general demographic snapshot of HMO PCPs in California circa 2000. Knowledge of who these PCPs are may represent a useful prerequisite for increasing the rate at which they recommend CRC screening to their patients.

The current study also has several potential limitations. It is possible that respondents are systemati-

cally different from nonrespondents with regard to CRC screening practices. For example, nonrespondents may be less likely to recommend screening and thus may represent the true target group for any future intervention; however, the excellent response rate and the lack of discernible differences between respondents and nonrespondents suggest that this potential problem did not affect the study.

The current survey was conducted before the emergence of recent data supporting the use of screening colonoscopy and before Medicare's approval of reimbursement for this procedure. The survey included only a limited number of items pertaining specifically to screening colonoscopy and no items regarding barriers to or facilitators of its use. Future research should document the extent to which screening colonoscopy currently is being used and explore barriers to and facilitators of the use of this procedure.

The validity of providers' self-reported rates of recommendation for use of CRC screening tests was not established in the current study. Although the magnitude of the self-report bias, if any exists in the current study, is not known, the direction of such a bias would appear to be clear. Previous studies attempting to validate providers' self-reported cancer screening rates by chart review or patient survey have indicated that providers tend to overestimate screening rates.<sup>13,51</sup> Thus, actual screening rates in the managed care setting examined in the current study may be substantially lower than those reported by providers; this possibility magnifies the importance of developing strategies for increasing screening rates. Furthermore, providers in the current study reported rates of CRC screening test recommendation, rather than rates of test completion. The median rates of patient compliance as reported by PCPs were 50% for FS and 70% for FOBT. Thus, it is critical that interventions aimed at improving rates of recommendation be accompanied by efforts to improve patient compliance.

The current cross-sectional survey describes the CRC screening practices of PCPs in a large, network model HMO based in California and identifies provider-reported determinants of use for individual CRC screening tests. The results of the survey suggest that CRC screening is a priority for PCPs and that opportunities for CRC screening exist, but they also confirm that even the most frequently recommended CRC screening tests (namely, FOBT and FS) remain underused. Furthermore, these results indicate that a variety of barriers to and facilitators of CRC screening with FOBT and FS exist. These barriers and facilitators represent clear targets for health plans, provider organizations, and individual providers to address in design-

ing interventions aimed at increasing CRC screening use in current clinical practice.

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