Short Communication

Prevalence of Colorectal Cancer Screening in a Large Medical Organization

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Abstract

The primary objective of this study was to determine the prevalence of colorectal cancer (CRC) screening among eligible patients in a large medical practice. A secondary objective was to compare CRC screening rates obtained from medical records with physician self-reported CRC screening recommendation. We conducted a retrospective record review of 214 patients ages ≥ 50 years of a large multispecialty medical organization in Houston, Texas, for receipt of fecal occult blood test (FOBT), flexible sigmoidoscopy (SIG), and/or colonoscopy (COL). We estimated prevalence using two definitions: (*a*) FOBT in past year or SIG in past 5 years or COL in past 10 years; and (*b*) FOBT in past year and SIG in past 5 years or COL in past 10 years. Age, gender, race/ethnicity, family history, number of chronic conditions, and index visit were independent variables. Contingency table and logistic regression analysis were used to test for associations between outcomes and independent variables. Our study population was 48% male with a mean age of 63 years (range: 53–84 years). One-quarter of the records showed FOBT by 3-day kit (51 of 214) and 27% by digital rectal exam (57 of 214). SIG was recorded in 32% of records. Half (54%) of the records had documentation of CRC screening according to definition no. 1 and 19% according to definition no. 2. Screening rates from medical record review were lower than those derived from physician self-report. Our findings underscore the need for interventions to improve CRC screening in primary care settings.

Introduction

Colorectal cancer (CRC) is the fourth most common cancer and the second leading cause of cancer death in the United States.[5] Such high morbidity and mortality is unfortunate because there currently are four tests for the early detection of CRC, including fecal occult blood testing (FOBT), sigmoidoscopy (SIG), colonoscopy (COL), and double contrast barium enema (DCBE; Refs. 1–3).[5] The strongest evidence for a mortality reduction comes from three randomized controlled trials of FOBT (4–6), whereas three case-control studies have demonstrated support for SIG in reducing CRC mortality (7–9). Although the ability of COL to reduce mortality has not been determined from clinical trials, there is evidence to support the effectiveness of screening COL in reducing incidence and mortality (10–12).

Despite some variation in the recommended screening test and/or interval, most professional organizations concur that average-risk persons > age 50 years should be screened for CRC (2, 12, 13). The recommendations of the American Cancer Society (ACS) have been shown to be those most widely recognized by primary care physicians (14). For CRC screening, the ACS currently recommends one of the following screening options: (*a*) annual FOBT by 3-day kit; (*b*) SIG every 5 years; (*c*) a combination of an annual FOBT plus SIG every 5 years; (*d*) a DCBE every 5–10 years; or (*e*) a COL every 10 years (2). The 2002 guidelines reflect a change from the ACS 1997 recommendations (15); annual FOBT or SIG every 5 years now appear as separate screening options, whereas the two tests were previously recommended in combination. The FOBT approach currently recommended is the 3-day take-home kit method, but the digital rectal exam (DRE), a one-time, in-office test for occult blood, continues to be performed at high rates (14, 16), despite the lack of evidence in support of its effectiveness (13, 17).

National data show that screening rates for CRC are less than the goal of 50% outlined in Healthy People 2010.[6] Data from the Behavioral Risk Factor Surveillance System, which does not distinguish between screening and diagnostic tests, showed that in 1999, 40% of respondents reported ever having FOBT by the take-home kit method, and 44% reported ever receiving SIG or COL (18). For tests within the recommended period, 21% of respondents reported completing a home-administered FOBT kit in the past year and 34% reported a SIG/COL within 5 years (18). These rates are similar to the prevalence of CRC screening reported in the 2000 National Health Interview Survey; rates of FOBT in past year were 17%, and rates of endoscopy in the past 10 years were 34% (19).

Methodologic issues, including the concordance between self-report and medical records, are critical to the accuracy of reported CRC screening prevalence estimates (20). Few studies

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have used the medical record to evaluate CRC screening, although it is considered the gold standard for determining services received compared with patient or physician self-report (21). Two studies used medical records to evaluate prevalence of cancer screening services including CRC screening (22, 23), whereas another focused specifically on CRC screening (24). One of these studies evaluated screening only among women (23), one used records from community-based practices where receipt of tests was not always known (22), and one used an electronic medical record to assess screening prevalence (24). Screening rates in these studies ranged from 35 to 37% for occult blood testing by DRE, 25 to 45% for FOBT by a 3-day kit, and 10 to 25% for SIG (22–24).

The primary objectives of this study were to estimate the prevalence of CRC screening in a large multispecialty medical organization where patients receive both primary and specialty care and to examine factors associated with receipt of CRC screening in that setting. A secondary objective was to compare CRC screening rates obtained from the medical record with self-reported rates obtained from a survey of primary care physicians in the same medical organization during the same time period (25).

Materials and Methods

Setting. Kelsey-Seybold Clinic (KSC) is a large multispecialty medical organization with 23 clinics and 284 physicians (112 primary care physicians) in the Houston, Texas, area. KSC documents > 1 million patient visits/year and provides care to an ethnically diverse population of ~200,000 patients. Approximately two-thirds of KSC patients are Caucasian, with the remaining one-third representing African American, Asian, Hispanic, and other racial/ethnic groups. Administrative data show that two-thirds of KSC patients have been with the organization for over a year, with average length of enrollment ~4.5 years. Sixty-five percent of KSC patients belong to managed care plans (including both health maintenance organizations and preferred provider organizations), whereas the rest are fee-for-service.

Study Design and Population. We conducted a retrospective medical record audit. Potential patient names were generated from an administrative database according to our eligibility criteria. To be selected, a patient must have been age ≥ 53 years, a member of KSC for at least 1 year, and have had an index visit during the study timeframe related to primary care (*e.g.*, physical, flu shot, joint aches). Age 53 years was chosen because patients would have had adequate time to receive CRC screening according to recommended guidelines. These inclusion criteria insured that records reviewed were of current KSC patients who were using primary care services. We obtained a list of patients meeting the criteria over the study timeframe (January 1, 1999 through February 1, 2000) and randomly selected 20–25 records/month for a total of 270 records. Of these, 52 did not have an index visit related to primary care and/or the patient had not been a KSC member for at least 1 year. The majority of visits not related to primary care ($n = 35$) were those with a dermatologist where the patient was only using KSC for that purpose. Additionally, 4 patients were eliminated because they were between the ages of 50 and 52 for a total of 214 eligible records. Ten percent of these (22 of 214) had an index visit for a health maintenance examination (*e.g.*, a physical or well-woman exam).

Medical records were reviewed using a data abstraction form developed to collect information on colorectal cancer screening. The data abstraction form was pilot tested on 20 medical records at KSC before initiating data collection.

Outcome Variables. Our outcome measures included receipt of CRC screening using two definitions and physician recommendation for CRC screening.

Receipt of CRC Screening. CRC screening options were: FOBT by 3-day kit in the past year; SIG in the past 5 years; and/or COL in the past 10 years. We did not collect information on receipt of DCBE because primary care physicians report low rates of recommending screening DCBE (14).

Two outcome measures evaluated receipt of CRC screening in accordance with ACS recommendations. We used ACS recommendations as the basis for developing our definitions for two reasons: (*a*) they were used to determine physician knowledge and practices in our primary care physician survey (25); and (*b*) ACS recommendations have been shown to be those most widely recognized by primary care physicians in a national survey (14). For our study, definition no. 1 used the 2002 ACS recommendation: FOBT by 3-day kit in the past year or SIG in the past 5 years (or both), or COL in the past 10 years (2). Definition no. 2 used the 1997 ACS recommendation: FOBT by 3-day kit in past year AND SIG in past 5 years or COL in past 10 years (15).

To determine whether FOBT occurred on an annual basis, as recommended by national organizations, we collected this information over the 3 years before the index visit. However, because of extremely low rates of receipt of consecutive FOBT via the 3-day kit method over the 3-year period, we focused our analysis on FOBT within the past year. Looking at FOBT in the past year also eliminated potential bias from length of time patients had been with KSC. We collected information on occult blood testing by either the 3-day kit or DRE in-office method; but our analysis focused on the former.

For FOBT in past year and SIG in past 5 years, the reason for testing (screening *versus* diagnosis) was recorded. It was not possible to distinguish screening from nonscreening COL due to lack of notation to that effect in the medical record. If the record indicated a test was performed as part of a physical or well-woman exam, it was considered a screening test. If specific symptoms were listed leading to the test, the test was considered diagnostic. Because previous studies have not clearly distinguished between tests done for screening *versus* diagnosis or follow-up (18, 19, 22–24), we used receipt of CRC tests for any reason as our primary outcome (*i.e.*, FOBT by DRE in past year, FOBT by 3-day kit in past year, SIG in past 5 years, and COL in past 10 years). However, we also evaluated receipt of FOBT by 3-day kit or SIG in the past 5 years, excluding tests that were not done specifically for screening. We omitted COL from the latter analysis because of the inability to distinguish screening from nonscreening tests.

Physician Recommendation for CRC Screening. For occult blood, by either 3-day kit or DRE, and SIG, we also assessed whether recommendations for these tests by a physician were documented. Where the medical record had a documented recommendation but no evidence of a received test, we recorded a "recommended but not received status." Because physician recommendation for tests may have been made but not documented, the consistency with which this variable was recorded is questionable.

Independent Variables. Independent variables were abstracted from the medical record and included birth date, gender, race/ethnicity, chronic conditions, family history of colorectal cancer, and date of (year 1999 or 2000) and reason for

index visit. Other studies have found associations between most of these variables and CRC screening behaviors (20, 26–30).

We categorized reason for index visit into health maintenance visit (physical or well woman exam) *versus* other primary care visit. Race/ethnicity was recorded from the medical record as white, African American, Hispanic, Asian, or unknown. Because of small numbers of patients in most racial/ethic groups, this variable was categorized as white or nonwhite. Existing health conditions noted in the record were recorded on the abstraction form in open-ended format. Chronic conditions (*e.g.*, diabetes, hypertension, asthma, arthritis) were coded as none *versus* one or more. Family history was defined as having at least one first-degree relative with colorectal cancer listed in the medical record (yes/no). There were no missing values for race/ethnicity, gender, or chronic conditions; one record did not indicate family history.

Data Analysis. Data were entered into an ACCESS database and converted to SAS 6.0 for Windows. Frequencies were generated on all variables to assess missing values. χ^2 and Fisher's exact tests were performed to evaluate the association between receipt of occult blood testing (by either 3-day kit or DRE), SIG, and/or CRC screening in accordance with guidelines and the independent variables. For FOBT, we performed 2×3 contingency table analysis with χ^2 tests to determine the association between each independent variable and receipt of occult blood testing by 3-day kit, DRE, or nothing. For significant associations in the 2×3 analysis ($P < 0.10$), we conducted pairwise comparisons to determine the underlying significant associations (*i.e.*, FOBT kit *versus* nothing and DRE *versus* nothing). CRC screening according to our two definitions was analyzed using 2×2 contingency table analysis. This analysis was repeated excluding patients where tests were classified as nonscreening. We fit logistic regression models separately for definition no. 1 and definition no. 2 of CRC screening. Independent variables with a $P \leq 0.25$ in univariate analyses were included in step one of the logistic regression analyses as recommended by Hosmer and Lemeshow (31). In subsequent steps, we considered covariates with $P < 0.05$ to be statistically associated with CRC screening.

To address our secondary objective, we compared prevalence rates obtained from medical record audit with those from our survey of physicians who were practicing in the same medical environment during an overlapping time period (1998–2000; Ref. 25). Our survey measured physicians' self-report of their recommendation and/or performance of CRC screening (*e.g.*, for FOBT: "do you recommend or perform/order FOBT by the 3-day take-home kit method to your average-risk, asymptomatic patients over age 50?").

Results

Description of Sample. Our study population was composed of relatively equal proportions of male and female patients, and approximately two-thirds of patients were white. Patients in our study had a mean age of 63 years (range: 53–84 years); 54% were ages 53–64 years. Eleven percent (24 of 214) had documentation of a family history (Table 1).

Prevalence and Correlates of CRC Screening Tests. Half of the records ($n = 108$ of 214) had documentation of FOBT by either 3-day kit or DRE in the year preceding the index visit; 24% by 3-day kit (51 of 214); and 27% by DRE (57 of 214). Of these, only 4 had documentation of annual FOBT by 3-day kit in the 3 years preceding the index visit. Ninety-five percent (103 of 108) of all occult blood testing were done for screening purposes.

Approximately one-third (67 of 214) of the records had documentation of SIG in the 5 years preceding the index visit. Two-thirds of these (46 of 67) were for screening. Thirteen percent (27 of 214) of the records had documented COL within the 10 years before the index visit.

The mean age of those tested with FOBT was 63 years (range: 53–80 years) for the 3-day kit and 62 years (range: 54–78 years) for DRE, compared with 64 years (range: 53–84 years) for those not getting tested. The prevalence of occult blood testing did not differ significantly by gender (Table 1). Race/ethnicity, chronic conditions, health maintenance visit, and family history were associated with receipt of occult blood testing in the past year (Table 1). In pairwise comparisons of no

Table 1 Prevalence of occult blood testing (3-day kit or DRE)[a] in past year or SIG in past 5 years by patient characteristics ($n = 214$)

	Sample characteristics	FOBT in past year			SIG in past 5 years
	% (n)	None ($n = 106/214$) %	Kit ($n = 51/214$) %	DRE ($n = 57/214$) %	($n = 67/214$) %
Age (years)					
53–64	54 (115)	52	19	29	29
65 or older	46 (99)	46	29	27	35
Gender					
Male	53 (113)	51	23	26	30
Female	47 (101)	48	25	27	33
Race/ethnicity					
White	69 (147)	48	24	29	31
Nonwhite	31 (67)	53	23	22[b]	33
≥1 chronic condition					
Yes	67 (144)	50	25	30	33
No	33 (70)	47	22	25[c]	28[b]
Health maintenance index visit					
Yes	10 (22)	32	23	45	23
No	90 (192)	52	24	24[c]	32
Family history					
Yes	11 (24)	25	33	42	42
No	89 (183)	52	23	25[c]	30[b]

[a] FOBT, fecal occult blood test; DRE, digital rectal exam; Kit, 3-day take home kit; SIG, flexible sigmoidoscopy. Tests may have been done for screening or diagnosis.
[b] $P \leq 0.10$.
[c] $P \leq 0.05$.

Table 2 Prevalence of colorectal cancer (CRC) screening in accordance with recommended guidelines using two definitions ($n = 214$)

	CRC screening in accordance with guidelines	
	Definition no. 1[a] ($n = 115$)	Definition no. 2[a] ($n = 40$)
Prevalence rate	54	19
Age (years)		
53–64	46	16
65 or older	63[b]	22[c]
Gender		
Male	53	15
Female	54	22
Race/ethnicity		
White	54	17
Nonwhite	42	22
≥1 chronic condition		
Yes	57	24
No	47	7[b]
Health maintenance index visit		
Yes	45	18
No	55	19
Family history		
Yes	70	29
No	52[b]	17[c]

[a] Definition no. 1: fecal occult blood test by 3-day kit in the past year or flexible sigmoidoscopy in the past 5 years (or both) or colonoscopy in the past 10 years. Definition no. 2: fecal occult blood test by 3-day kit in past year and flexible sigmoidoscopy in past 5 years or colonoscopy in past 10 years. Both definitions include screening and non-screening tests.
[b] $P \leq 0.05$, [c] $P \leq 0.10$; all variables were associated ($P \leq 0.25$) with CRC screening for both definitions and were included in multivariable analysis.

test *versus* DRE, whites were more likely than nonwhites to have received a DRE ($P < 0.10$). Likewise, patients with at least one chronic condition, those coming for a health maintenance visit and those with a family history, were more likely than their counterparts to have received a DRE ($P < 0.05$). For the pairwise comparison of no test *versus* 3-day kit, only those with a family history were significantly more likely than their counterparts to have done the test ($P < 0.05$).

The mean age of those having SIG in the past 5 years was 63 years (range: 53–79 years). The prevalence of SIG did not differ by age, gender, race/ethnicity, or health maintenance visit. Those with one or more chronic conditions were slightly more likely to have received SIG than those without such conditions (Table 1).

CRC Screening According to Definitions. Of the 214 records, 115 (54%) had documented CRC testing according to definition no. 1 that included screening and nonscreening tests (*i.e.*, FOBT by 3-day kit in the past year or SIG within the past 5 years (or both) or a COL within the previous 10 years). All independent variables were associated with CRC screening compliance at $P < 0.25$ (Table 2) and were included in the logistic regression model. Older persons (≥65 years) were more likely than younger persons (age 53–64 years) to have received CRC screening [odds ratio (OR) 1.86; 95% confidence interval (CI) 1.05–3.24; $P = 0.03$) according to definition no. 1. None of the other variables was significantly associated with CRC screening in multivariable analysis.

The prevalence of screening using definition no. 2 (*i.e.*, FOBT by 3-day kit in the past year and SIG in the past 5 years or COL within the previous 10 years) was 19% ($n = 40$ of 214). In bivariate analyses, all independent variables were associated with this outcome at $P < 0.25$ were entered into the logistic regression model. In the multivariable having at least one chronic condition was the only variable significantly associated with CRC screening in multivariable analysis for this definition (OR 4.01; 95% CI 1.45–11.11; $P = 0.007$).

When we repeated the analysis excluding tests done for diagnostic purposes, those with a family history and those who had a health maintenance index visit were significantly more likely to have received an occult blood test via the 3-day kit for screening than their counterparts ($P < 0.05$). People with a family history and those ≥65 years were more likely than their counterparts to have received a screening SIG ($P < 0.05$). The patterns for receipt of FOBT or SIG and the other independent variables were similar to that are seen in Table 1.

In multivariable analysis of CRC testing for screening purposes (*i.e.*, FOBT by 3-day kit in the past year or SIG in the past 5 years), having a family history (OR 3.71; 95% CI 1.30–10.68), age ≥ 65 years (OR 1.84; 95% CI 1.03–3.29), and having a health maintenance index visit (OR 3.26; 95% CI1.11–9.26) were significant predictors.

Recommendation *versus* Receipt of CRC Screening. For the 3-day kit method, we did not find any cases where a test was recommended without an associated laboratory report. For the DRE, there was only one case where a physician indicated "patient refusal," thus the assumption was made that the test was suggested but not completed. All other cases of DRE were documented as completed tests. In the case of SIG, we found documentation of 91 recommended SIG exams, with evidence of only 67 tests received.

Comparison to Physician Self-Report. Fig. 1 shows rates obtained via physician self-report from our prior work (25) and the current rates obtained from this medical record review. For each CRC test, physician self-reported rates of recommending and/or ordering/performing the test are considerably higher than those found in medical record review. Although >80% of physicians at this organization reported recommending the 3-day kit to their average-risk patients > age 50 years, only 50% were receiving any occult blood testing and only 24% by this method (25). Although the timing of this medical record review was slightly later than our prior physician survey (25), the time periods were overlapping [1998–2000] and fewer than 3% of physicians who participated in the physician survey had left KSC by the time of the medical record review.

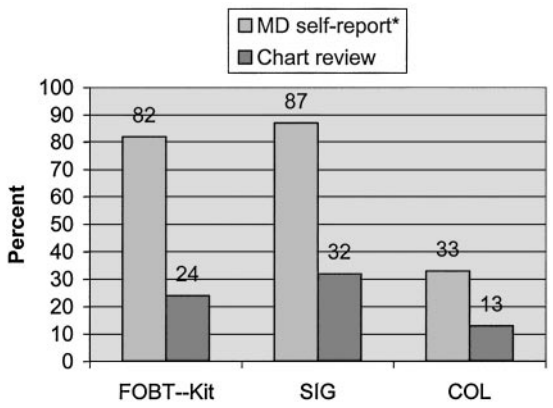

Fig. 1. Methods for evaluating prevalence of colorectal cancer screening in primary care settings. *, M.D. self-reported data obtained from prior work by Hawley *et al.* (25).

Discussion

Our data show that the prevalence of CRC screening in a large medical organization is low. Rates of testing according to recommended methods, occult blood testing by 3-day kit and SIG, were <50%, whereas rates of occult blood testing by DRE were higher than expected. These results are similar to other studies that have evaluated CRC screening prevalence using medical record review (22–24). In a retrospective review of >5000 medical records, Ruffin *et al.* (22) found rates of FOBT by DRE, FOBT by 3-day kit in the previous year, and SIG in the past 5 years to be ~35, 27, and 20%, respectively. Blair (23) conducted a retrospective record audit of 201 records to assess cancer screening among older women and found that in 1993, 53% of records documented a FOBT by DRE, 37% an FOBT by 3-day kit, and 11% a SIG over a 2-year study period. These studies and ours show that DRE for CRC screening is being done more often than the take-home kit, despite not being a recommended screening method. A review of electronic medical records conducted by Walsh *et al.* (24) showed FOBT by 3-day kit in the past year had been performed in 44% of patients and SIG in the past 5 years performed in 26%. None of these studies distinguished screening from nonscreening tests.

We found that the prevalence of CRC screening varied depending on the definition of "recommendations." Using definition no. 1, based on 2002 ACS recommendations (2), the prevalence was ~50%, whereas using definition no. 2, based on 1997ACS recommendations (15), the prevalence was 19%. In multivariable analysis using definition no. 1, older age was the only predictor of getting screened, whereas having at least one chronic condition was the only predictor of CRC screening using definition no. 2. Analyses of our data, excluding tests done for nonscreening, showed that this association was due to more diagnostic tests being done among patients with chronic conditions.

As expected, we found that prevalence was lower when tests done for nonscreening were excluded. Our findings that >90% of occult blood testing and 60% of SIG were done for screening mirror those from the 2000 National Health Interview Survey in which ~88% of FOBT and 61% of endoscopies were done for screening.[7] In our multivariable analysis, excluding tests done for diagnosis or follow-up, patients with a family history of CRC, those who were age ≥ 65 years, and those coming specifically for a health maintenance visit were more likely than their counterparts receive screening FOBT or SIG. Ruffin *et al.* (22) found that a documented health maintenance visit was the single strongest predictor of CRC screening, whereas other studies using patient self-report similarly found that receiving a regular medical check-up was significantly associated with receipt of CRC screening (32). These studies together with ours reinforce the importance of the health maintenance exam in achieving desired screening outcomes. Our findings also are consistent with other studies based on patient self-report that found older age (33, 34) and family history (26) were associated with higher usage of CRC screening tests. As found by others (20, 35), our results did not show a consistent association between gender and testing.

Although we could not link specific patients to physicians, our comparison of medical record data to physician self-report from our prior work (Ref. 25; Fig. 1) is consistent with national data (14), suggesting that there is overreporting of CRC screening by primary care physicians. Similar to our results, national data (14) show that physician reports of recommendation or performance of CRC screening are much higher than estimates obtained from population data in the 2000 National Health Interview Survey (19).[7] Our findings also are consistent with studies that explored the association between patient and/or physician self-report and medical records. Montano and Phillips (36) determined that physician self-report was least correlated with either patient self-report or medical record, which had a strong correlation with one another. In that study, physicians overestimated their recommendations compared with rates obtained from the other two methods. In a comparison of medical records to physician survey reports, Zack *et al.* (37) found that residents overestimated their perceived SIG and FOBT screening rates by close to 80%.

Discrepant findings between physician reports and screening rates may be because of physician practices or to limitations such as incomplete documentation of recommendations in the medical record, particularly for FOBT. In fact, our finding that no 3-day kits were recommended without an associated laboratory report may be attributable to lack of documentation of recommending the 3-day kit. Because physician recommendation has consistently been reported by patients to be an important factor in utilization of CRC screening (33, 38, 39), systematic documentation of procedures that are recommended, whether or not received, would be useful in determining where to focus efforts to increase CRC screening. For example, if recommendations consistent with guidelines are being made, focusing on physician education may not be successful. Rather, interventions targeting patient adherence would be indicated. Future studies are needed to directly link physician self-report to patient records.

Our study should be interpreted in the context of several limitations. First, because our sample size was small, estimates of screening prevalence are imprecise, and we lacked power to detect small associations. Second, we did not have information on the exact length of time patients had been with the medical care organization. Third, our measure of chronic conditions was crude and may have underestimated the association between chronic conditions and CRC screening. Future studies using measures of chronic conditions could benefit by using more specific measures as outlined by Klabunde *et al.* (40). Fourth, we were unable to evaluate whether different types of coverage were associated with CRC screening, although a recent study found that among insured patients—like ours—type of insurance had little impact on CRC testing (36). Fifth, although our comparison of screening to nonscreening tests represents a unique feature of our analysis, failure to clearly document reason for testing (*i.e.*, screening *versus* diagnostic) is a limitation of our study. Last, the large medical organization in which our study was conducted may not generalize to all types of primary care practices.

Despite these limitations, our findings are consistent with those of others (22–24) and show that rates of CRC screening in primary care are low. Strengths of our study include: the use of the medical record to measure CRC prevalence; a setting where it is unlikely patients received screening elsewhere; and comparison of two definitions of CRC screening prevalence, including distinguishing screening from nonscreening exams. More information is needed about measurement and reporting of CRC screening prevalence and about how this information can be used to develop interventions to improve CRC screening rates in different primary care settings.

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