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Colorectal Cancer Screening Among Primary Care Patients: Does Risk Affect Screening Behavior?

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Abstract

Lifestyle factors including smoking, obesity, and diabetes can increase colorectal cancer (CRC) risk. Controversy exists regarding screening rates in individuals at increased CRC risk. To examine the effect of risk on CRC screening in primary care, cross-sectional data collected during January 2006–July 2007 from 720 participants in 24 New Jersey primary care practices were analyzed. Participants were stratified by risk: high (personal/family history of CRC, history of polyps, inflammatory bowel disease), increased (obesity, Type II diabetes, current/former smokers), and average. Outcomes were up-to-date with CRC screening, receiving a physician recommendation for screening, and recommendation adherence. Chi-square and generalized linear modeling were used to determine the effect of independent variables on risk group and risk group on outcomes. Thirty-seven percent of participants were high-risk, 46% increased-risk, and 17%

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average-risk. Age, race, insurance, education, and health status were related to risk. High-risk participants had increased odds of being up-to-date with screening (OR 3.14 95% CI 1.85–5.32) and adhering to physician recommendation (OR 7.18 95% CI 3.58–14.4) compared to average-risk. Increased-risk participants had 32% decreased odds of screening (OR 0.68, 95% CI 0.42–1.08). Low screening rates among increased-risk individuals highlight the need for screening interventions targeting these patients.

Keywords

Colorectal cancer; Cancer screening; Primary care; Risk factors; Physician recommendation; Recommendation adherence

Introduction

Colorectal cancer (CRC) remains the third most common cancer in the US [1–4] with an estimated 49,920 CRC deaths occurring in 2009 [1]. CRC has a 90% 5-year survival rate when detected and treated at a localized stage [1, 5, 6], however, fewer than 40% of cases are detected early [1]. Screening guidelines recommend that average-risk individuals initiate CRC screening at age 50 [1, 7], while high-risk individuals should obtain screening earlier [1, 4]. CRC screening rates remain low in the average-risk population [7–12] due to confusion over testing modalities [4, 8, 13], fear of embarrassment or discomfort [10, 13–18], or lack of physician recommendation [10, 16, 18–20].

Individuals with a personal or family history of CRC [1, 16, 21], history of polyps [1, 4], Crohn's disease [22–24], or ulcerative colitis [22] are at high risk for CRC. This population tends to adhere to CRC screening guidelines at a higher rate than average-risk individuals. For example, rates of compliance with sigmoidoscopy and colonoscopy ranging from 56 to 80% [16, 25] have been reported in individuals with hereditary genetic CRC syndrome or a family history of CRC. These rates are much higher than the CRC screening rate of 45.6% reported in 2004 for the general population [7].

Certain lifestyle factors including smoking, obesity, and Type II diabetes may increase CRC risk. A body mass index (BMI) of 30 or greater has been linked to increased CRC mortality [26] and Larsen et al. [27] found a dose–response relationship between BMI and CRC incidence [27]. A dose–response relationship also exists between HbA1c level and CRC [28]. Seow et al. [29] found that diabetics have a 50% higher CRC risk than non-diabetics, although others suggest this relationship exists in women only [30]. Both duration of smoking [31] and number of cigarettes smoked per day [27] have been found to be positively associated with CRC incidence.

The rate at which diabetics, smokers and the obese obtain CRC screening relative to the general population remains unclear. Many studies show that smokers are less likely to obtain screening than non-smokers [6, 12, 19, 27, 32–34], but others show higher screening rates in both former [8, 35, 36] and current smokers [36]. Obese women may be less likely to obtain screening than normal-weight women [5, 37]. Ferrante et al. [37] reported 25% decreased odds of screening in obese patients when compared to normal-weight patients. However, other findings suggest that CRC screening is not affected by weight [38] and that overweight and moderately obese individuals are more likely to obtain screening by sigmoidoscopy [39]. Zhao et al. [40] found that a significantly higher proportion of diabetic women than non-diabetic women had undergone CRC screening in 2006. This is in contrast to other studies reporting decreased rates of CRC screening in diabetic women [41].

The purpose of this study is to examine the effect of risk on CRC screening in primary care patients. To our knowledge, this is one of the first studies to compare CRC screening rates among community primary care patients at various risk levels. We aim to add to the existing knowledge of screening practices in high-risk individuals while exploring screening adherence and physician recommendation in patients that are at increased CRC risk due to obesity, diabetes or smoking status. Further knowledge of the screening behaviors of primary care patients at all risk levels can inform the application of CRC screening interventions in a more effective way.

Methods

Study Sample

We analyzed baseline, cross-sectional patient survey and medical record data collected during January 2006 to July 2007, as part of a quality improvement intervention study, Supporting Colorectal Outcomes through Participatory Enhancements (SCOPE). Twenty-four family and internal medicine practices were recruited to participate from the New Jersey Primary Care Research Network. Each participating practice provided written, informed consent, as did all participants. The University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School Institutional Review Board approved this study.

Research assistants approached consecutive patients as they entered each practice, with the goal of enrolling 30 participants [42]. Eligible patients were 50 or older, had at least one prior visit in the practice, and could read/write in English or Spanish. Participants completed a self-administered paper survey that included questions on demographics, risk factors, cancer screening dates, self-rated health and satisfaction with care. Participants also agreed to a one-time review of their medical record by a research nurse in order to verify cancer screening dates and abstract additional data. Abstracted data included patient weight, number of clinical visits in the past 2 years, physician recommendation for cancer screening, and presence of comorbidities. Data were collected by three participant recruiters and three research nurses, all of whom were trained in standardized data collection techniques.

Risk Stratification

Participants were divided into three risk groups based on survey and medical record data: (1) high-risk (Crohn's disease and/or ulcerative colitis, history of polyps, and/or personal/family history of CRC), (2) increased-risk (diabetes, obesity, and/or former or current smoking status), and (3) average-risk (50 or older with no other risk factor). BMI was calculated by dividing participants' weight in kilograms by height in meters squared. Obesity was defined as BMI greater than or equal to 30.0 [43]. Weight was obtained from participant medical records while height was obtained from participant surveys. Participants' diabetic status was determined using medical record data only. All other risk factors were considered to be present if they were noted in the medical record or were self-reported by the participant on the paper survey.

Outcome Measures

Outcome measures included up-to-date with CRC screening, receipt of physician recommendation for CRC screening, and adherence to physician recommendation.

CRC Screening

Participants were considered to have received screening if the month and year of a CRC-specific screening test were documented in their medical record. Average and increased-risk participants were considered up-to-date with CRC screening if colonoscopy in the past 10

years, sigmoidoscopy in the past 5 years, or fecal occult blood test (FOBT) in the past year was documented in their medical record [1, 7]. Participants with Crohn's disease or ulcerative colitis were considered up-to-date with screening if they had a colonoscopy or sigmoidoscopy documented within the past 2 years or FOBT documented within the past year [4]. The rest of the high-risk group (participants with a family/personal history of CRC) was considered to be up-to-date with screening if they had a colonoscopy or sigmoidoscopy documented within the past 5 years or FOBT in the past year [4]. Participants that had CRC at the time of enrollment into the study were excluded from this analysis.

Physician Recommendation for Screening

Participants who had received an FOBT, colonoscopy or sigmoidoscopy within the screening guidelines recommended for their risk level were considered to have received a recommendation for screening [44]. In addition, participants who were never screened or were not up-to-date with screening were considered recommended for screening if there was evidence of physician recommendation in the medical record. Patient adherence to physician recommendation was defined as the proportion of patients receiving physician recommendation who were up-to-date with screening guidelines.

Independent Variables

The main independent variable of interest when determining CRC screening rates was risk group (high, increased, or average). Potential confounding variables included age, gender, race/ethnicity (Black, Hispanic, White, other), health insurance (Medicare, Medicaid, commercial, none/unknown), education level (some high school or lower, high school diploma/some college, college or higher), marital status (single, married, divorced, widowed/other), self-rated health (excellent, very good, fair/poor), and number of clinical visits in the past 2 years.

Statistical Analysis

A binary variable was created to indicate whether participants were up-to-date with CRC screening (0 = no, 1 = yes). Similar binary variables were created to indicate if participants had received a physician recommendation for screening and if they were adherent to the received recommendation. CRC screening rates were calculated for each risk group based on the CRC screening intervals defined above. The effect of potential confounding variables on screening was evaluated for all participants and was also compared between risk groups. Chi-square tests were used to evaluate the effect of each independent variable on risk group. Generalized estimating equations were used, assuming a logit link, and the binomial distribution to model the outcome variables. Unadjusted modeling was performed to determine the prevalence of the outcome variables by CRC risk group. An adjusted model using score tests to evaluate the effect of risk group and other independent variables on CRC outcomes was also performed. Potential confounding variables were controlled for and clustering of patients within practices was accounted for. Adjusted odds ratios and 95% confidence intervals (CI) were calculated based on the regression parameter estimates. All statistical analyses were performed using SAS 9.2 for Windows [45].

Results

Participant demographics at baseline are summarized in Table 1. Approximately 37% of participants were considered to be high-risk (n = 267, 37.1%) with 328 (45.6%) and 125 (17.4%) comprising the increased and average-risk groups, respectively. Age group, race/ethnicity, insurance, education level and self-rated health status were significantly associated with risk group (Table 1).

The unadjusted prevalence of being up-to-date with CRC screening, receiving a physician recommendation for screening, and adhering to a physician recommendation for screening is presented in Table 2. Forty-four percent of all participants were up-to-date with CRC screening. All three outcome variables were significantly associated with risk group. Thirty-one percent of increased-risk participants were up-to-date with CRC screening as compared to 41% of average-risk and 63% of high-risk participants. Of the 454 participants that received a physician recommendation for screening, approximately 71% were adherent to the recommendation. Increased-risk participants were the least likely to receive a physician recommendation for screening or to adhere to a screening recommendation if received.

Adjusted odds ratios for being up-to-date with CRC screening, receiving a physician recommendation for screening, and adhering to a physician recommendation for screening by risk group are presented in Table 3. High-risk participants had more than three times the odds of being up-to-date with CRC screening and more than seven times the odds of adhering to a physician recommendation for screening when compared to average-risk participants. Participants in the increased risk group had 32% decreased odds of screening relative to those at average-risk, although this difference was not statistically significant (P = 0.10, 95% CI 0.42–1.08) Increased-risk participants also had 35% decreased odds of receiving a physician recommendation for screening and 20% decreased odds for adhering to a physician recommendation for screening when compared to average-risk participants, although again these results were not statistically significant (P = 0.08 95% CI 0.40–1.06; P = 0.12 95% CI 0.46–1.42).

Discussion

To our knowledge, this is one of the first studies to compare CRC screening rates among community primary care patients with differing risk levels. Our findings add to the evidence that patients who are at increased CRC risk due to obesity, diabetes, and smoking are undergoing CRC screening at lower rates than high- or average-risk patients. Increased-risk patients were the least likely to be screened for CRC, to have received a physician recommendation for screening, and to adhere to physician recommendations. Similar to previous findings, high-risk participants were most likely to be up-to-date with CRC screening, receive a physician recommendation for screening, and adhere to this recommendation [25, 46].

The increased rate of CRC screening and physician recommendation for screening in high-risk participants is likely due to increased CRC knowledge and perceived risk in this group. High-risk individuals, particularly those with a family history, may be more likely to initiate screening discussions with their primary care physician because their family member's condition has heightened their awareness of CRC, their increased risk, and the need for screening. In addition, physicians are more likely to recommend screening to these individuals [46] and physician recommendation has been shown to be a highly significant predictor of screening behavior in the high-risk [47, 48].

The screening rate in our increased-risk population (31%) is the same or lower than rates previously reported for diabetics, the obese, and/or current smokers [5, 40, 49]. Increased-risk status was not a statistically significant independent predictor of screening status. However, the low percentage of increased-risk patients who were up-to-date with screening guidelines is worrisome in light of the increasing body of evidence that suggests that lifestyle factors such as obesity [26, 27] and Type II diabetes [28, 29] can play a significant role in CRC incidence and mortality. Reasons increased-risk patients do not obtain CRC screening include fear of embarrassment and discomfort, specifically in the case of the obese [37] and low adherence to preventive health behaviors in general [12, 19, 34]. Increased-risk

patients may not be aware that lifestyle choices can elevate CRC risk and may not view CRC screening as a priority, especially if they are already managing multiple health concerns.

Equally worrisome is the low rate of physician recommendation in the increased-risk group which may be due to physicians' focus on management of chronic conditions or more pressing acute concerns [17, 20, 37] rather than preventive care during the limited timeframe of a primary care visit. In addition, physicians may not be aware of the recent research linking certain lifestyle behaviors to increased CRC risk or may be unsure how to translate this research into clinical application for increased-risk patients since the current national screening guidelines do not address this population specifically. Development of guidelines that specifically target this population for CRC screening may become necessary as the incidence of diabetes [50, 51] and obesity [52, 53] continues to rise, therefore increasing the number of patients at increased risk for CRC. CRC screening interventions in primary care should include educational components that target both increased-risk patients and the physicians that treat them, and highlight the role lifestyle plays in the development of CRC.

Several limitations to our analysis should be considered. Firstly, the small sample size and lack of diversity in our sample limits our ability to generalize our findings. Participants in this analysis were mainly White, highly educated and had a commercial insurance plan and may therefore not be representative of the majority of primary care patients. The reliance solely on patient medical record data to determine screening status may have led to an underestimation of screening rates. While screening data obtained from medical records is generally considered to be more accurate than self-reported data [54, 55], it's probable that some patients received screening but that their medical record did not contain documentation of this screening at the time of the medical record audit. This is especially likely for colonoscopies and sigmoidoscopies, which are typically performed by specialists. There is no reason, however, to suspect that this under-documentation of screening would differ by participant risk group. Finally, we did not differentiate between CRC testing done for screening purposes versus diagnostic purposes, which may have led to an inflation of our CRC screening rates. This is especially likely for the high-risk group which would be more likely to obtain tests for diagnostic rather than screening purposes.

Conclusion

Our findings highlight the need for continued CRC screening education for both primary care patients and physicians. In particular, education and intervention efforts should be focused on patients that have diabetes, are obese, or are former/current smokers. This population represents a sub-group of patients who are obtaining CRC screening at a rate lower than the average-risk population. Significant reductions in CRC incidence and mortality might be possible by providing targeted screening interventions to increased-risk individuals and by educating physicians on the importance of recommending screening to these patients even in the face of multiple competing demands.

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Table 1

Characteristics of participants by CRC risk, supporting colorectal outcomes through participatory enhancements (SCOPE), New Jersey, 2006–2007

Total *n* = 720	**Average-risk**	**Increased-risk**	**High-risk**
Number of respondents	125	328	267
Proportion of total sample (%)	17.4	45.6	37.1
Age group (years)*			
≥50–60	52.8	44.8	35.6
> 60–70	21.6	33.5	32.6
> 70	25.6	21.7	31.8
Gender			
Male	32.0	37.5	43.8
Female	68.0	62.5	56.2
Race/ethnicity*			
White	68.0	64.0	74.9
Black	10.4	21.9	15.7
Hispanic	15.2	9.2	5.6
Other	6.4	4.9	3.8
Insurance*			
Commercial	59.7	48.2	52.3
Medicare	33.1	38.8	41.3
Medicaid	2.4	6.2	4.5
None/unknown	4.8	6.8	1.9
Education*			
College or higher	55.2	30.7	44.7
High school diploma or some college	36.8	50.9	48.5
Some high school or lower	8.0	18.4	6.8
General health*			
Excellent	12.0	5.9	8.7
Very good	61.6	52.2	53.4
Fair or poor	26.4	41.9	37.9
Marital status			
Single	7.2	13.2	11.0
Married	68.0	60.1	66.3
Divorced	13.6	10.7	7.9
Widowed/other	11.2	16.0	14.8
Number of clinical visits in the past 2 years			
< 5	36.0	35.4	31.1
5–8	33.6	29.9	32.2
9–12	19.2	20.1	21.3
> 12	11.2	14.6	15.4

* $P < 0.05$

Table 2

Unadjusted prevalence of CRC screening, physician recommendation, and adherence to physician recommendation by CRC risk group, supporting colorectal outcomes through participatory enhancements (SCOPE), New Jersey, 2006–2007

	Total *n* (%)	Average-risk *n* (%)	Increased-risk *n* (%)	High-risk *n* (%)	*P* value
n (%)	720 (100)	125 (17.4)	328 (45.6)	267 (37.1)	
Up-to-date with CRC screening	320 (44.4)	51 (40.8)	100 (30.5)	169 (63.3)	< .0001
Physician recommendation for CRC screening	454 (63.1)	84 (67.2)	180 (54.9)	190 (71.2)	0.004
Adherence to physician recommendation for CRC screening[a]	320 (70.5)	51 (60.7)	100 (55.6)	169 (88.9)	< .0001

[a]Defined as proportion of participants receiving a physician recommendation who were up-to-date with CRC screening

Table 3

Adjusted odds ratios for CRC screening, physician recommendation, and adherence to physician recommendation by CRC risk category, supporting colorectal outcomes through participatory enhancements (SCOPE), New Jersey, 2006–2007

	Total *n*	Average-risk	Increased-risk		High-risk	
		OR	OR (95% CI)	*P* value	OR (95% CI)	*P* value
Up-to-date with CRC screening	320	1.00	0.68 (0.42–1.08)	0.10	3.14 (1.85–5.32)	< .0001
Physician recommendation for CRC screening	454	1.00	0.65 (0.40–1.06)	0.08	1.41 (0.81–2.46)	0.22
Adherence to physician recommendation for CRC screening	320	1.00	0.80 (0.46–1.42)	0.12	7.18 (3.58–14.4)	< .0001

Adjusted for age, gender, race/ethnicity, insurance, education, general self-rated health status, marital status, and number of clinical visits in the past 2 years