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Colorectal cancer screening among obese versus non-obese patients in primary care practices

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Abstract

BACKGROUND—Obesity is associated with increased colorectal cancer incidence and mortality. Previous studies using telephone survey data showed that obese women were less likely to receive colorectal cancer screening. It is unknown if this is true among patients in primary care practices.

METHODS—Retrospective chart reviews were conducted in 2003–2004 of men and women in 22 suburban New Jersey and Pennsylvania primary care practices. Data from patients age 50 and over (n=1297) were analyzed using hierarchical logistic regression. The outcome measure was receipt of colorectal cancer screening (fecal occult blood test within 1 year, sigmoidoscopy within 5 years, colonoscopy within 10 years, or barium enema within 5 years) among obese and non-obese patients.

RESULTS—Overall, 39% of patients were obese and 29% received colorectal cancer screening. After controlling for age, gender, total number of co-morbidities, number of visits in the past two years, and number of years in the practice, obese patients had 25% decreased odds of being screened for colorectal cancer compared to non-obese patients (OR 0.75, 95% CI, 0.62–0.91). The relationship of obesity and colorectal cancer screening did not differ according to gender. Number of visits (OR 1.04, 95% CI, 1.01–1.06) and male gender (OR 1.53, 95% CI, 1.19–1.97) was associated with increased odds of receiving colorectal cancer screening.

CONCLUSION—Identification of physician and patient barriers to colorectal cancer screening is needed, particularly in obese patients, so that effective interventions may be developed to increase screening in this high-risk group.

Condensed abstract—Obese patients are less likely than non-obese patients to be screened for colorectal cancer. Identification of physician and patient barriers is needed.

Keywords

colorectal neoplasm; colonoscopy; obesity; primary healthcare; family practice; medical audit; medical records

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INTRODUCTION

Colorectal cancer (CRC) is the third most common cancer in the United States and the third leading cause of cancer death. In 2006, there will be approximately 149,000 new cases and 55,000 deaths from CRC. The five-year survival rate is 90% when the cancer is diagnosed at a localized stage; however only 39% of cases are diagnosed early.[1] Despite many medical organizations, including the American Cancer Society, the US Preventive Services Task Force, the American Medical Association, and the American Gastroenterological Association, recommending routine CRC screening in all adults over the age of 50 years, screening rates remain low. [2–4]

Obese people have 50% to 3-fold increased risk of CRC compared to normal weight people, as well as 23% to 90% increased risk of mortality from CRC.[5–9] In 2004, over 32% of US adults were obese, putting them at higher risk to develop and to die from CRC. [10] Screening for CRC in this high-risk population may be a key factor in decreasing morbidity and mortality; however, barriers to screening in obese people may exist. Two population-based studies using data from telephone surveys showed that obese women were less likely than non-obese women to be screened for CRC. [11,12] However, another study using data from a population-based in-person survey found no association with obesity and lower CRC screening. [13] All studies used self-reported data, which may underestimate obesity and overestimate cancer screening. [14–16] The authors could find no studies that examined the association of obesity with colorectal cancer screening using medical chart audit.

Because obesity is associated with increased risk of colorectal cancer as well as increased mortality, it is important to know if this high-risk group is being effectively screened. The purpose of this study was to examine whether obesity is associated with lower rates of colorectal cancer screening among patients in primary care practices.

MATERIALS AND METHODS

Sources of Data

Data were collected between April 2003 and December 2004 through chart abstraction in 22 family medicine practices located in New Jersey and eastern Pennsylvania that were participating in a National Heart, Lung, and Blood Institute funded intervention study, ULTRA (Using Learning Teams for Reflective Adaptation). ULTRA's primary aim was to evaluate the effectiveness of a facilitated team-building intervention in improving adherence to guidelines for multiple chronic diseases.[17] Baseline chart audit data from this intervention study was used for this analysis.

Information about the practice was also collected through a questionnaire completed by the office manager or director of the practice (response rate 100%). This included information about the type of practice, practice setting, race/ethnicity of patient population, and insurance mix of patients seen in the practice.

The University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School Institutional Review Board approved this study, which waived the requirement for informed consent of individual patients for the retrospective chart reviews.

Selection Criteria

Each practice participating in the study generated lists of patients seen in the office during the previous twelve months using ICD-9 codes for the following conditions: asthma, coronary artery disease, diabetes, hypertension, and any reason. Patients were excluded if they were deceased at the time of the audit, below 18 years of age or no longer a patient of the practice.

Within each practice, about 100 patients were randomly selected (20 from each list of patients, based on power calculation requirements for ULTRA). In practices where there were not 20 patients with a particular ICD-9 code, all patients with the code were used. For all patients, one nurse chart auditor from the research team noted the dates of relevant cancer screenings using a standardized abstraction form. Only patients aged 50 and over (n=1297) were used in this analysis.

Determination of measurements

The main outcome of interest was colorectal cancer screening. Colorectal cancer screening was documented by searching the medical record for any documentation of the test being done including: progress reports, preventive flow sheets, lab tests, x-rays, and consultant reports. Recommendation or referral for screening by the physician was not recorded for this study, because Stange et al have shown that only 58% of referrals are documented in the medical record when compared to direct observation.[18] Patients were considered to have been screened according to guidelines (1=yes, 0=no) if they had documentation in the medical record of having received one of the following tests in the recommended time period based on recommendations from the American Cancer Society (ACS): 1) fecal occult blood test (FOBT) within 1 year, 2) sigmoidoscopy within 5 years, 3) colonoscopy within 10 years, or 3) double contrast barium enema within 5 years.[19] Information was not available on whether the tests were done for screening or diagnostic purposes due to symptoms or other findings. Therefore, the patient was considered to have undergone screening if any of the above tests were completed during the recommended time period, whether it was for screening or diagnostic purposes.

The main independent variable of interest was obesity, defined as having a body mass index (weight [kg]/height [m]²) greater than or equal to 30 kg/m² as documented at the most recent visit. [20] For those who didn't have height documented in the chart (N=448), they were considered to be obese if the weight was 200 pounds or greater in women or 235 pounds or greater in men. These cutoff weights corresponded to the lower limit of obesity for heights of 68 inches and 74 inches, which were the 90th percentile heights in women and men, respectively, in the sample population.

Potential confounding variables included age, gender, number of co-morbidities, number of visits in the past 2 years, and number of years attending the practice. The following chronic diseases were considered as co-morbidities: hypertension, diabetes, asthma, coronary heart disease, chronic heart failure, peripheral arterial disease, chronic renal failure, and stroke. The number of co-morbidities was determined by taking a count of the number of chronic diseases noted in a patient's chart, for a maximum total of eight.

Statistical Analysis

Obese and non-obese patients were compared with respect to potential confounding variables by calculating frequencies or means with standard deviations, depending on whether the variable was categorical or continuous, respectively, for each group of patients. Significant differences between the two groups of patients (obese and non-obese) were determined by chi square tests or t-tests, as appropriate. Similarly, bivariate analysis was conducted to assess the relationship between each of the independent variables with colorectal cancer screening. Multivariate analysis was then conducted to control for potential confounders. To examine whether obesity status of the patient was associated with differences in CRC screening, hierarchical logistic regression was used to account for clustering of patients within practices. The model controlled for the effects of age, gender, number of visits in the last two years, number of co-morbidities and number of years attending the practice. This analysis was performed using Proc GENMOD in the SAS programming language. [21] Generalized Estimating Equations were used for estimation, using an exchangeable correlation structure

for the working correlation matrix.[22,23] Data was also analyzed separately for men and women to see if obesity-related screening rates differed according to gender. Adjusted odds ratios and 95% confidence intervals were computed. All reported p-values are 2-tailed. Statistical significance was set at alpha level 0.05.

RESULTS

Descriptive Findings

There were 1297 patients eligible for colorectal cancer screening (age 50 and over) from the total patient population of 2034. All of the 22 practices included in the sample were located in suburban areas of New Jersey or Pennsylvania. Twenty practices (91%) were group practices, while two (9%) were solo practices. On average, practices estimated their racial composition of patients to be: 80% White, 9% African-American, 3% Asian or Pacific Islander, and 8% other. Approximately 4% of patients were estimated to be Hispanic. On average, the practices reported the majority of patients to have private insurance (64%), with 25% having Medicare, 4% having Medicaid, and 7% having no insurance.

Table I summarizes the characteristics of obese and non-obese patients. The mean age was 66.65 (SD 10.85). Overall, 39.2% of patients were obese and 49% were female. Compared with non-obese patients, obese patients were significantly more likely to be younger ($p < 0.0001$) and to have more visits in the past 2 years ($p < 0.0001$).

The proportion of patients receiving colorectal cancer screening according to guidelines was low overall at 29%. Of the patients who were screened for CRC according to guidelines, 72% ($n=276$) had a colonoscopy, 22% ($n=84$) had a fecal occult blood test, 12% ($n=45$) had a sigmoidoscopy, and 2% ($n=9$) had a barium enema. There was no significant difference in the type of test received between obese and non-obese patients in this smaller sample.

Bivariate Analysis

Table II shows the unadjusted association of colorectal cancer screening with covariates. Thirty-one percent of non-obese patients were screened for colorectal cancer compared with 27% of obese patients ($p=0.12$). Thirty-four percent of male patients were screened for CRC compared with 25 % of female patients ($p=0.0010$). Patients who were screened for CRC had higher mean number of visits in the past 2 years compared with those who were not screened ($p=0.0179$).

Multivariate Analysis

Table III shows the adjusted odds ratio for receiving CRC screening according to guidelines. After controlling for age, gender, total number of co-morbidities, number of visits in the past two years and number of years attending the practice, obese patients had 25% decreased odds of being screened for CRC compared to non-obese patients ($p=0.004$). Despite more frequent visits, obese patients were less likely to be screened for CRC. After controlling for age, obesity, total number of co-morbidities, and number of visits in the past two years, men had 53% increased odds of receiving CRC screening compared to women ($p=0.001$). After adjusting for other covariates, each 1-unit increase in number of visits in the past 2 years was associated with a 4% increase in odds of receiving CRC screening ($p=0.006$). Stratified analysis showed no interaction with obesity and gender in CRC screening ($p=0.7922$). The odds of screening when obese versus non-obese for men and women were 0.73 (95%CI: 0.55, 0.97) and 0.77 (95% CI: 0.57, 1.05), respectively.

DISCUSSION

To our knowledge, this is the first study to report the association of obesity with decreased colorectal cancer screening using medical record chart audits, as well as the first such study to use the complete CRC screening guidelines. The chart audit method supports the findings from the previous studies that used self-report, population based data,[11,12] but it gives more accurate information on services that are provided in actual practice, while controlling for other potential confounders such as number of comorbid conditions, number of visits, and number of years in a practice. Self-reported data may over-estimate cancer screening rates and underestimate the interval since the last screening procedure.[14] Heo et al's study only included FOBT and sigmoidoscopy as outcomes, while Rosen et al's study included colonoscopy in the last 5 years, rather than 10 and did not include barium enema within the past 5 years.[11,12] Unlike the earlier two studies, this study did not find gender related disparities in the association between obesity and colorectal cancer screening. Obese men as well as obese women had decreased odds of CRC screening. Our smaller sample relative to the national survey studies precluded multivariate analyses by type of screening test and severity of obesity.

This study supports other findings that colonoscopy has become a preferred CRC screening modality,[24] yet the low screening rates in this sample suggest that even screening colonoscopy is not a high priority for primary care physicians, patients or both. That obese patients, who constitute a high-risk population, receive CRC screening even less often than others is a troubling finding. Though it would be helpful to know if this disparity held true for each screening method individually, the numbers of fecal occult blood testing and sigmoidoscopy were too small in this sample to do these sub-analyses using multivariate models. It may be technically more difficult to do colonoscopy on obese patients, and their general risk of complications for all surgical procedures is higher. [25,26] For these reasons, primary care physicians may be more reluctant to refer obese patients for an invasive screening procedure such as colonoscopy, or even sigmoidoscopy. Physicians may also delay performing colorectal cancer screening or referral of obese patients for CRC screening due to competing demands of other comorbid conditions. Comorbidity, however, was not independently associated with CRC screening in this study. Other studies showing comorbidity to be associated with decreased breast and cervical cancer screening did not control for obesity. [27–29]

From the patient point of view, obese persons may avoid getting CRC screening, particularly colonoscopy and sigmoidoscopy, more than other persons because of embarrassment, concerns about modesty, or fear of pain. In a 1994 study, Olson et al. found that obese women commonly delayed or cancelled a physician appointment, including appointments for pelvic exams, because of embarrassment or to avoid being weighed or receiving a lecture about obesity. [30] Increasing weight has also been associated with having negative opinions about one's appearance and reluctance to obtain pelvic examinations. [31]

A more disturbing possible explanation for the CRC screening disparity in obese persons is prejudice. Obese people are viewed negatively by both the general public and health care providers. [32–38] Obese patients are considered to have less willpower and be less concerned about their health than non-obese patients. [36,37] Providers may subconsciously feel that obese patients are less interested or less worthy of their efforts at preventive care, and thus be less likely to suggest CRC screening.

Further studies using both qualitative and quantitative methods are needed to determine which, if any, of these possible explanations account for the disparity in CRC screening for obese patients. Such studies should also investigate what screening methods and locations are most

acceptable to obese patients (as well as non-obese patients). It may be premature to abandon fecal occult blood testing, which has been shown to decrease colon cancer mortality in prospective randomized controlled trials, [39] and sigmoidoscopy, which has been shown to decrease mortality in case-control trials. [40–42] Both of these are less invasive than colonoscopy. Sigmoidoscopy can be done in the primary care office with minimal colon preparation and without the need for sedation. In addition, in home FOBT may be associated with fewer patient barriers as it does not require patients to disrobe in the office. In fact, in Heo et al's study, use of FOBT was not associated with BMI.[12] The effectiveness of cancer screening increases in direct proportion to the degree in which it is targeted toward high-risk groups. [43] Obese patients constitute such a high-risk group and should receive CRC screening at a higher rate than non-obese patients. Yet, this study shows the opposite result.

Male gender was an independent predictor for being screened for CRC according to guidelines. This is consistent with other studies showing men receive colorectal cancer screening in higher proportions than women.[13,24,44–47] Barriers to women obtaining CRC screening include concerns about modesty and other procedural concerns such as bowel preparation. [24,48] In addition, female patients frequently prefer a female endoscopist, and this preference has been reported as being strong enough to delay the procedure and to incur personal expense.[49]

Increasing number of visits was also an independent predictor for being screened for CRC. This is similar to a previous study showing increasing number of visits to be associated with increased rates of Pap smear screening. [50] Patients who see physicians more often have greater opportunities to be screened or be referred for CRC screening. Obesity is associated with more frequent outpatient visits, [51] so obese patients should have more opportunities to be screened for colorectal cancer than non-obese patients. Instead, this study shows that despite obese patients having more visits to the physician than normal weight patients, they were less likely to be screened for CRC. Obese people may visit physicians more to manage their comorbid conditions, but they might postpone preventive exams that do not address specific symptoms or current diseases.

This study has several limitations. First, it was conducted in suburban primary care practices in New Jersey and Pennsylvania and consisted of a relatively homogeneous group of predominantly white patients with private or Medicare insurance; therefore it may not be generalized to patients in other settings. The sample population was more obese than the general population, probably because our sampling strategy was designed to specifically include patients with hypertension and diabetes, which are both associated with obesity. However, a similar prevalence of obesity has been observed in other primary care patient populations. [52] Second, this was a chart review study, which is limited by lack of documentation of certain information. For instance, there were many charts with missing heights, so a proxy was used in those cases to determine obesity. We chose a conservative cut-off weight of 200 pounds for women and 235 pounds for men to define obesity, so underestimation of obese individuals would bias our results toward the null. Due to the large number of missing heights in our data, which precluded determination of body mass index (BMI) for those patients, we could not detect if there was a threshold BMI at which lower screening rates occurred, or if there were differences according to BMI categories, as was found in Heo et al's and Rosen et al's studies. [11,12] In addition, we did not have data on socioeconomic status (SES) of patients; however health insurance could be used as a crude indicator of SES. Since 64% of our sample had private insurance and only 11% had Medicaid or no insurance, our relatively homogeneous population of predominantly white suburban patients makes it less likely that the associations found in this study would be confounded by SES. Our overall screening rate of 29% was substantially lower than the 36% to 50% CRC screening rates found in patient self-report studies. [11,13, 53,54] This may reflect lack of chart documentation of some CRC screening, over-reporting by patients in telephone surveys, or, more likely, a combination of both. Some patients may

have gone directly to gastroenterologists for their CRC screening. To the degree that such direct screenings were not reported to their primary care physicians, our total screening rates would be artificially low. Alternatively, there could have been inadequate documentation of referral for CRC screening. There is no reason to suspect, however, that obese patients would be more likely to go directly to gastroenterologists than non-obese patients or be less likely to have referrals documented, so this effect is unlikely to bias our findings about comparative screening rates of obese and non-obese patients. Finally, our study did not distinguish between screening and diagnostic procedures. Because of our low overall screening rates, testing for diagnostic reasons would bias our results toward overstating screening rates. In addition, since obese patients are at higher risk for colorectal cancer, they may have more symptoms related to the colon and receive more diagnostic colonoscopies than non-obese patients. This overestimation of CRC screening in obese individuals would bias our results toward the null.

CONCLUSION

Colorectal cancer screening rates are low in primary care practices in New Jersey and eastern Pennsylvania, and obese patients in particular are less likely to receive CRC screening. Because people who are obese are at increased risk of developing and dying from colorectal cancer, strategies are needed to identify and overcome patient and provider barriers to increase colorectal cancer screening in this high-risk group. Perhaps physicians may have to change how and which test (i.e. more FOBT rather than colonoscopy) they recommend to obese patients to make them feel more comfortable about obtaining CRC screening.

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Table I

Characteristics of Study Sample

Characteristic	Total		Non-obese		Obese		P value
Total sample N (%)	1297	(100%)	788	(60.8%)	509	(39.2%)	
Age							
Mean (SD)	66.65	(10.85)	68.71	(11.22)	63.47	(9.40)	<0.0001
Gender							0.5823
Male N (%)	640	(50.7%)	404	(61.5%)	253	(38.5%)	
Female N (%)	657	(49.3%)	384	(60.0%)	256	(40.0%)	
Total number of comorbidities							
Mean (SD)	1.74	(1.04)	1.72	(1.08)	1.79	(0.98)	0.2538
Number of visits in past 2 years							
Mean (SD)	7.83	(5.49)	7.32	(4.89)	8.62	(6.22)	<0.0001
Years attending practice							
Mean (SD)	9.01	(7.37)	8.86	(7.25)	9.23	(7.56)	0.3711
Mode of screening for those receiving screening (N=381)^a							
Colonoscopy N (%)	276	(72.4%)	173	(70.9%)	103	(75.2%)	0.4042
Fecal occult blood test N (%)	84	(22.1%)	61	(25%)	23	(16.8%)	0.0717
Sigmoidoscopy N (%)	45	(11.8)	27	(11.1%)	18	(13.1%)	0.6202
Barium enema N (%)	9	(2.4%)	7	(2.9%)	2	(1.5%)	0.4984

^aNumbers for each test do not add to total, as some patients may have received more than one test.

Table II
Unadjusted Association of Colorectal Cancer Screening with Covariates

Predictor Variables	Screened	Not screened	P value
Obesity			0.1180
Non-obese N (%)	244 (31.0%)	544 (69.0%)	
Obese N (%)	137 (26.9%)	372 (73.1%)	
Age Mean (SD)	66.1 (10.1)	66.9 (11.1)	0.2706
Gender			0.0010
Female N (%)	161 (25.2%)	479 (74.8%)	
Male N (%)	225 (33.6%)	444 (66.4%)	
Number of comorbidities			
Mean (SD)	1.75 (1.04)	1.74 (1.04)	0.8499
Number of visits in past 2 years			
Mean (SD)	8.39 (5.41)	7.60 (5.51)	0.0179
Years attending practice			
Mean (SD)	9.15 (6.87)	8.95 (7.57)	0.6568

Table III

Adjusted odds ratio for colorectal cancer screening versus no colorectal cancer screening according to guidelines^a

Predictor Variables	Odds Ratio (95% CI)	P value
Obesity		
Non obese	1.00	
Obese	0.75 (0.62, 0.91)	0.004
Age	0.91 (0.81, 1.03) ^b	0.138
Gender		
Female	1.00	
Male	1.53 (1.19, 1.97)	0.001
Total number of co-morbidities	0.98 (0.85, 1.12) ^b	0.758
Number of visits in past 2 years	1.04 (1.01, 1.06) ^b	0.006
Years attending practice	1.00 (0.98, 1.02)	0.764

^aFecal occult blood test within 1 year, sigmoidoscopy or double contrast barium enema within 5 years, or colonoscopy within 10 years

^bFor each unit increase (age in 10 year increments).