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Sudha Xirasagar
University of South Carolina, sxirasag@sc.edu

Thomas G. Hurley
University of South Carolina - Columbia

James B. Burch
University of South Carolina - Columbia

Ali Mansaray
University of South Carolina - Columbia

James R. Hébert
University of South Carolina - Columbia, jhebert@sc.edu

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Colonoscopy Screening Rates Among Patients of Colonoscopy-trained African-American Primary Care Physicians

Sudha Xirasagar, MBBS, PhD[1,2], **Thomas G. Hurley, MSc**[2,3], **James B. Burch, PhD**[2,3], **Ali Mansaray, MPH**[1], and **James R. Hebert, ScD**[2,3,4]

[1] Department of Health Services Policy and Management, Arnold School of Public Health, University of South Carolina, Columbia, SC

[2] South Carolina Statewide Cancer Prevention & Control Program, University of South Carolina, Columbia, SC

[3] Department of Epidemiology and Biostatistics, Arnold School of Public Health, University of South Carolina, Columbia, SC

[4] Department of Family and Preventive Medicine, School of Medicine, University of South Carolina, Columbia, SC

Abstract

Background—When performed competently, colonoscopy screening can reduce colorectal cancer rates, especially in high-risk groups such as African Americans (AAs). Training primary care physicians (PCPs) to perform colonoscopy may improve screening rates among underserved high-risk populations.

Methods—We compared colonoscopy screening rates and computed adjusted odds ratios for colonoscopy-eligible patients of trained AA PCPs (study group) vs. untrained PCPs (comparison group), before and since initiating colonoscopy training. All colonoscopies were performed at a licensed ambulatory surgery center with specialist standby support. Retrospective chart review was conducted on 200 consecutive, established outpatients aged ≥50 years at each of 12 PCP offices (7 trained AA PCPs and 5 untrained PCPs, practicing in the same geographic region), total 1,244 study group and 923 comparison group patients.

Results—Post-training colonoscopy rates in both groups were higher than pre-training rates: 48.3% vs. 9.3% in the study group, 29.6% vs. 9.8% in the comparison group (both $p<0.001$). AA patients in the study group showed over 5-fold increase (8.9% pre-training vs. 52.8% post training), with no change among Whites (18.2% vs. 25.0%). Corresponding pre- and post-training rates among comparison patients were 10.4% and 38.7% respectively among AAs ($p<0.001$), and 13.3% vs. 13.2% respectively among Whites. After adjusting for demographics, duration since becoming the PCP's patient, and health insurance, the study group had a 66% higher likelihood of colonoscopy in the post-training period (OR=1.66; CI, 1.30, 2.13), and AAs had a five-fold increased likelihood of colonoscopy relative to Whites.

*Address Correspondence requests to: Sudha Xirasagar, MBBS, PhD, Department of Health Services Policy and Management, Arnold School of Public Health, University of South Carolina, Columbia, SC 29208 Phone: (803) 576-6093 Fax: (803) 777-1836 sxirasagar@sc.edu.

Contributors:
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Conclusions—Colonoscopy-trained PCPs may help reduce colorectal cancer disparities.

Keywords

Screening colonoscopy; Colorectal cancer screening; African American screening rate; Colonoscopy-trained primary care physicians

Background

Colorectal cancer (CRC) is a public health priority well-suited to large-scale intervention. It is the second leading cause of cancer deaths, and has a relatively long latency of 10–15 years during which incipient, clinically accessible polyps progress to cancer.[1] Colonoscopy is a cost-effective[2–6] and a safe outpatient procedure for polyp detection and removal with proven efficacy for primary prevention.[7,8] The at-risk age group is well defined, because 90% of patients with CRC are >50 years old.[9] Despite declining CRC mortality among Whites since 1973, the US Healthy People 2010 goal[10] (CRC mortality ≤ 13.9/100,000) remains elusive due to continuing high CRC incidence and mortality among African Americans (AA), particularly in the southeastern United States.[11]

Nationally, African Americans (AA) have 12.3% higher CRC incidence than Whites.[12] In South Carolina, the disparity is worse, with 33% and 30% higher incidence among AA men and women respectively, and 57% and 40% higher mortality rates, respectively.[13] Consistent with the low sensitivity and specificity of the other major CRC screening modalities [fecal occult blood testing (FOBT) and flexible sigmoidoscopy],[14–16] the American College of Gastroenterology and American Society of Gastrointestinal Endoscopy prefer colonoscopy over other screening tools.[4]

The ASGE/ACG guidelines also recommend that AAs begin colonoscopy screening at an earlier age (45 years) rather than 50 years for normal-risk populations. Colonoscopy is particularly critical for AAs for several reasons. The majority of AAs with CRC are diagnosed with advanced disease (57%). [13] AAs present with CRC at younger ages, have lower 5-year survival (53% v. 63%), experience higher and earlier mortality at all stages of cancer diagnosis,[12] and suffer a higher proportion of proximal colon adenomas that are missed by sigmoidoscopy.[17] Yet, AAs have significantly lower colonoscopy rates than Whites.[1819]

This study examined the disparity-reduction potential of a unique program based at a licensed ambulatory surgery center for colonoscopy in Columbia, South Carolina. In this program, primary care physicians (PCPs) are trained by a specialist, using training methods similar to gastroenterology fellowship training, including expert supervision for the prescribed number of colonoscopies that qualify gastroenterologists for independent practice privileges.[20] In the South Carolina program, however, post-training, the PCPs perform their cases at the center, follow the center's procedure and colonic inspection protocols, and are assisted hands-on by the center's technical staff. An on-site specialist is available for completion or rescue assistance (verbal, manual, or technical). Our earlier study documented the high clinical quality and outcome yield of these procedures, exceeding the prescribed quality benchmarks for lesion yield (polyps, adenomas and advanced neoplasia rates), cecal intubation, procedure duration, and adverse events. [20]

The current study examined whether patients of colonoscopy-trained AA PCPs have higher colonoscopy rates than untrained PCPs. Our study's focus on a primary care outpatient population is important from a programmatic perspective. Persons with a usual source of care are more compliant with CRC screening guidelines than the general population;[21]

therefore a PCP-focused intervention may help reduce colon cancer disparities. This study focused on AA physicians because AAs represent the dominant minority in South Carolina,[10,13] and AA physicians are more likely to care for minority patients.[22,23]

Methods

We compared colonoscopy rates among established patients of purposively sampled AA PCPs, both trained and untrained in colonoscopy. Our study was designed to test the following hypotheses: 1) AA patients of colonoscopy-trained AA PCPs have higher colonoscopy rates than patients of untrained PCPs (comparison group), 2) Among trained PCPs' patient panels, post-training rates will be higher than before (initiating) training. We conducted a retrospective observational study based on patient chart review of age-eligible patients of colonoscopy-trained AA PCPs (or those in-training) and patients of untrained PCPs practicing in the same geographic region. All trained PCPs practice within a 70-mile radius of the endoscopy center where they perform colonoscopies.

Of 54 PCPs who were trained or initiated training under the program, 15 were AA. All 15 were contacted to request study participation, and the first 6 who agreed were included. Untrained AA PCPs were recruited through professional networks of the trained PCPs, practicing in the same geographic region. The first 6 untrained PCPs who agreed were included in the study. Based on statistical power calculations and the documented characteristics of PCP patient panels,[24] we sought samples of 200 established outpatients in each PCP's practice, aged >50 years (seeking 1200 patients each from trained and untrained PCPs, with >90% statistical power to detect a 10% difference).

Each PCP office was requested to provide charts of 200 consecutive, established patients aged >50 years who most recently completed an office visit relative to the scheduled date for chart review. "Established patients" were defined as patients seeing the same PCP for at least one year with at least two visits prior to the current appointment. Data were extracted without patient identifiers and entered into scan-compatible forms. Research team members were trained under the University of South Carolina research compliance protocol, and signed HIPAA confidentiality agreements. Chart reviews focused solely on CRC screening and were conducted between February and July 2008.

One PCP who had performed 49 colonoscopies as a trainee before discontinuing performing procedures was mistakenly selected as an untrained physician. His patients were reclassified into the trained group. One untrained PCP of Asian ethnicity was recruited in error, which was discovered later. The final PCP sample consisted of 7 trained AA PCPs, and 5 untrained PCPs (4 AA and 1 Asian). The study was approved by the University of South Carolina Institutional Review Board.

Determining colonoscopy eligibility status of patients in the pre and post training periods

Cross-sectional and longitudinal comparisons of colonoscopy rates were made as follows: 1) post-training colonoscopy-eligible patients of trained PCPs (study group) vs. untrained PCPs (comparison group), and 2) pre vs. post-training colonoscopy-eligibles among the study group were evaluated against the corresponding time periods among comparison patients (secular time trends).

For trained PCPs' patients, the cut-off date to determine pre- and post-training colonoscopy-eligibility was their PCP's date of first training colonoscopy. Patients were included in the pre-training eligible group if they: a) were >50 years old at the training start date; and b) had an office visit prior to this date; and c) had not completed a colonoscopy prior to their first visit to this PCP. Patients were post-training colonoscopy-eligible if they belonged to one of

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three categories: a) colonoscopy-eligible pre-training, but did not complete a colonoscopy prior to the training start date; or b) turned 50 years of age after the cut-off date and did not have a prior colonoscopy; or c) aged ≥51 years by the date of our chart review, and became a patient of this PCP after the training date, and did not have a prior colonoscopy. For category c) above, the age criterion allowed one year after their 50th birthday to schedule a routine physical exam and colonoscopy. By design, pre-training eligible patients who did not complete colonoscopy in the pre-training period were eligible for inclusion in the post-training group. (Due to sketchy documentation of other CRC screening tests in patient records, this information was deemed unreliable for determining colonoscopy-eligibility.)

Untrained PCPs' patients served as the comparison group to capture the comparable outpatient community rates in this region in the pre- and post-training periods. The cut-off date to determine the pre- and post- periods for the comparison group was the training start date of the trained PCP, matched on practice zip code. Comparison patients were included in the "pre-training" colonoscopy-eligible group if they: a) were aged >50 years as of the cut-off date; and b) had an office visit prior to the cut-off date, and c) had not completed screening colonoscopy prior to their first visit to the PCP. A patient was considered "post-training" eligible if they belonged to one of three categories: a) colonoscopy-eligible pre-training but did not get a colonoscopy by the cut-off date; b) turned 50 years of age after the cut-off date and did not have a prior colonoscopy; or c) reached ≥51 years of age by our chart review date, became a patient of this PCP after the cut-off date, and did not have a prior colonoscopy. Untrained PCPs whose zip code did not match a trained PCP were assigned the mean training start date across all seven trained PCPs as the cut-off date.

Statistical Analysis

Colonoscopy rates were compared using Chi Square or Fisher's exact tests between: a) post-training eligibles among the study and companion groups (cross-sectional comparisons); and b) pre vs. post-training eligibles among the study group, and a similar period comparison among the comparison group (longitudinal comparisons). Logistic regression was used to examine the odds of receiving a screening colonoscopy by trained versus untrained PCPs in both the pre- and post-training periods. We adjusted for age, gender, race, duration of being the PCP's patient, and health insurance. Odds ratios and 95% confidence intervals are presented. SAS version 9.2 (SAS Institute Inc, Cary, North Carolina) was used.

Results

The 7 trained study AA PCPs were similar in age, year/month of starting training and mean number of annual procedures since starting the training compared to the 8 trained AA PCPs not included in the study (table not shown). Of 2,371 patient charts reviewed, 92 were excluded due to missing information on age. Figure 1 shows the exclusions leading up to the final study sample of 2,167 patients, 1,244 of trained PCPs and 923 of untrained PCPs and their colonoscopy-eligibility status in the pre- and post-training periods.

Among the trained sample, 483 patients were pre-training colonoscopy-eligible and 1,183 were post-training eligible. Corresponding pre- and post-eligibles in the untrained PCP patient sample were 234 and 900, respectively (Fewer pre-training eligibles were in the comparison group because more of the untrained PCPs had moved into the region recently and had accrued fewer patients qualifying for pre-training inclusion). Training start dates span a long period, i.e., from October 1999 to July 2006, which in itself enables some adjustment for secular trends in screening rates.

The trained vs. comparison patient groups were of similar age in the two time periods (Table 1). In the post-training period; the patients in study group were more likely to be AA (91% vs. 63%; p<0.001), and on Medicaid or without insurance (12% vs. 7%; p<0.001) relative to patients among untrained PCPs.

Table 2 presents colonoscopy rates of the study vs. comparison groups. Pre-training rates were similar between the two groups for the overall sample, among AAs, Whites, men, and women (all p>0.05). Post-training, the rates among both the study and comparison groups increased over pre-training levels (9.3% to 48.3% among trained PCPs, p<0.001), and 9.8% to 29.6% among comparison patients, both p<0.001). Post-training, the trained group rate was higher than the comparison group rate (48.3% vs. 29.6%; p<0.001), the large increase was observed among AAs (10.3% pre-training vs.52.8% post training, p<0.0001) with no statistically significant change among Whites (18.2% vs. 25.0%). Gender-wise, the observed post-training increase was higher among men, (49.8% post- vs. 8.4% pre-), compared to women (47.7% post-vs. 10.2% pre-training). Among comparison patients, the increase from pre- to post- was driven by AAs (10.4% pre vs. 38.7% post), while rates among Whites remained unchanged (13.3% pre-vs. 13.2% post). The increase from pre- to post- was greater among women patients in the study group relative to the comparison group (47.7% vs. 26.7%, p<0.001). Also the increase from pre-to post- in the study group was led by Medicare and privately insured patients. Notably, Medicaid patients showed a significant post-training increase in the study group, (3.7% pre- vs. 47.7% post-; p<0.001), with no corresponding change in the comparison group (0% to 6.7%).

Multiple logistic regression analyses were conducted to examine the colonoscopy odds of the study vs. comparison patients, pre- and post-training, controlling for demographics, duration of being the PCP's patient, and health insurance status (Table 3). Pre-training, study and comparison patients had a similar colonoscopy likelihood (OR=1.12; 95% CI=0.58, 2.17), and, AAs were as likely as Whites to have had a colonoscopy (OR=1.26; 95% CI=0.45, 3.56). Post-training, the study group had a significantly higher odds of colonoscopy (OR=1.66; 95% CI=1.30, 2.13), and AAs were five times more likely to have had colonoscopy relative to Whites (OR=5.03; 95% CI=3.48, 7.28). A sensitivity analysis was conducted to evaluate potential confounding by demographic factors. When analyses were conducted within strata defined by gender, race, and insurance status, the training effect was undiminished (results not presented).

Table 4 shows that after initiating training the PCP was the provider for the colonoscopy for 79% of patients (slightly more among men than women). Among comparison patients the provider for almost all colonoscopies was a specialist (data not shown).

Because one of the comparison PCPs (untrained) was Asian, and we were concerned about the role of race concordance in AA patients' compliance with a colonoscopy recommendation, we excluded this PCP in a set of secondary analyses. We found that none of the results shown in Tables 1–4 were materially affected by the exclusion (tables not presented).

Discussion

Our study finds that AA PCPs trained in screening colonoscopy have a significant positive impact on their AA patients' colonoscopy screening rates. By design, we focused on AA PCPs' patients because past studies suggest that minority physicians may be the most appropriate vehicle through which to address health disparities, particularly when invasive procedures are involved. Minority patients who perceive race-based medical discrimination by their provider have lower CRC screening rates than those who do not.[25] Race concordance is an important driver of minority patients' trust in their physician, and in the initiation of CRC-related communication.[26] Patient-physician interaction regarding CRC is critical, because physician recommendation is strongly associated with CRC screening including colonoscopy.[27–29] Studies show that physicians recommend colonoscopy less frequently for AA patients relative to Whites, even among Medicare beneficiaries.[30] Correspondingly, Medicare screening rates are lowest among AA metropolitan beneficiaries, after adjusting for education and income.[31]

The utility of mobilizing PCPs to increase CRC screening rates has been documented.[32, 33] Because AAs report difficulties in accessing specialist care,[34,35] these studies in conjunction with our findings make a strong case for expanding program innovations that leverage existing culturally competent patient-PCP connections, particularly race-concordant relationships.

Consistent with the documented literature, the AA PCPs' patient panels in our study were overwhelmingly (about 90%) AA. [22,23] We found that the post-training increase in colonoscopy screening among patients of AA PCPs was overwhelmingly accounted for by AA patients who showed a 5-fold increase relative to pre-training (9.3% to 48.3%). Among comparison patients the corresponding period rates were 9.8% and 29.6% respectively, which provides the background rate against which to assess the excess increase achieved among the trained group over time. The increased background rate found in our study is consistent with the national trend in screening colonoscopies following the Medicare Benefits and Improvement Act, which authorized coverage of colonoscopy screening.[36] Another key finding of our study is that the five-fold increase among AAs is sustained among AA men, a documented hard-to-reach constituency for screening programs. Finally, the increased post-training rate among Medicaid patients reinforces the potential utility of training AA PCPs in colonoscopy as a strategy to reduce AA colonoscopy screening disparities.

Our findings are significant given the nation-wide gap between specialist availability and the screening-eligible population, an estimated cumulative backlog of 41.8 million. [37] In South Carolina alone, over a three-fold increase in the number of specialists is needed to cover all adults aged over 50 years.[38] When demand for a premium service outstrips supply, underserved populations are disproportionately excluded.[39–42] Endoscopic screening rates among Whites increased between 1995 and 2004, but remained stagnant among AAs residing in counties with higher uninsurance rates, low PCP supply and high poverty rates,[42] characteristics that are typical of most AA communities in the southeastern United States. Among federally qualified health center patients (mostly poor, minority, or both), a CRC screening rate of 7% is documented; 94% of these FOBT,[41] with similar rates reported in other studies.[43] CRC screening trends among Medicare beneficiaries show worsening of colonoscopy disparities, and a disproportionate preponderance of FOBT and sigmoidoscopy among minorities, although the rates of *any* CRC screening are similar among minorities and Whites.[39] Similar racial disparities in screening modality? among the privately insured population are observed despite identical insurance coverage.[40] The apparent similarity of AA and White screening rates reported in some studies [39] conceals the hidden disparities in CRC protection due to the preponderance of *de facto* low-efficacy screening modalities (FOBT and sigmoidoscopy) among AAs.

Our study is important because it provides the evidence for a realistic way out of the compromise approach underlying current screening guidelines. Currently, the FOBT and flexible sigmoidoscopy (FS) strategies are recommended on par with colonoscopy,[44,45] despite significant shortfalls in the primary prevention effectiveness of FOBT and sigmoidoscopy even under stringent clinical trial conditions, shortfalls that are further magnified under community practice conditions. [46–51] The current recommendation of FOBT, FS and colonoscopy as acceptable screening alternatives is driven by a gastroenterologist shortage, and sustained by inadequate clarity among stakeholders on the magnitude of the effectiveness gap between colonoscopy and these alternative tests. Our current study, together with the earlier study on the clinical quality of PCP colonoscopies[20] present an evidence base for reaching underserved populations by expanding colonoscopy capacity using well-trained PCPs with specialist back-up support. Our studies provide the evidence for increasing colonoscopy performance capacity in the health system and concurrently to reach out to underserved populations.

The study has some limitations. Both trained and untrained PCPs were convenience samples, based on willingness to collaborate. However, the trained PCPs included in this study were similar on most relevant variables to the trained AA PCPs who were excluded (table not presented). We have no comparisons for untrained study physicians. The study also did not assess patients of trained White PCPs, which limits our ability to assess the role of PCP-patient race-concordance in patients' adoption of colonoscopy screening. We observed a much higher rate increase among AA patients while White patients' rates remained stagnant following AA PCP's colonoscopy training, but we do not know the comparable status of AA and White patients of White PCPs. Future research must explore this important finding of concern. Another limitation was the lack of reliable data on other CRC screenings (particularly on being up-to-date) that could cause some patients to be misclassified as colonoscopy-eligible. Very few patients had an alternative screening test documented, and consideration of these patients as colonoscopy-ineligible would alter the pre-training colonoscopy completion rates from 9.3% to 9.6% among trained PCP patients, and 9.8% to 10.2% among untrained PCPs. Post training the rates would change from 48.3% to 49.1%, and 29.6% to 29.9% respectively. Our findings remain robust to this limitation. Another limitation is that despite a nested sample design, multi-level modeling was not feasible due to too few physicians and imbalanced cell sizes between trained and comparison groups. Finally, our findings, based on an outpatient, predominantly AA population may not generalize to the general population and to other racial groups.

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References

1. Newcomb PA, Norfleet RG, Storer BE, et al. Screening Sigmoidoscopy and Colorectal-Cancer Mortality. J Natl Cancer Inst. Oct; 1992 84(20):1572–1575. [PubMed: 1404450]
2. Vijan S, Hwang EW, Hofer TP, et al. Which colon cancer screening test? A comparison of costs, effectiveness, and compliance. Am J Med. Dec; 2001 111(8):593–601. [PubMed: 11755501]
3. Sonnenberg A, Delco F, Inadomi JM. Cost-effectiveness of colonoscopy in screening for colorectal cancer.[see comment]. Ann Intern Med. Oct 17; 2000 133(8):573–584. [PubMed: 11033584]
4. Rex DK, Johnson DA, Anderson JC, et al. American College of Gastroenterology Guidelines for Colorectal Cancer Screening 2008. Am J Gastroenterol. Mar; 2009 104(3):739–750. [PubMed: 19240699]
5. Lieberman DA, Weiss DG, Bond JH, et al. Use of colonoscopy to screen asymptomatic adults for colorectal cancer. Veterans Affairs Cooperative Study Group 380. N Engl J Med. Jul 20; 2000 343(3):162–168. [PubMed: 10900274]

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6. Theuer CP, Wagner JL, Taylor TH, et al. Racial and ethnic colorectal cancer patterns affect the cost-effectiveness of colorectal cancer screening in the United States. Gastroenterology. Mar; 2001 120(4):848–856. [PubMed: 11231939]
7. Winawer SJ, Zauber AG, Ho MN, et al. Prevention of colorectal cancer by colonoscopic polypectomy. The National Polyp Study Workgroup. N Engl J Med. Dec 30; 1993 329(27):1977–1981. [PubMed: 8247072]
8. Imperiale TF, Glowinski EA, Lin-Cooper C, et al. Five-year risk of colorectal neoplasia after negative screening colonoscopy.[see comment]. N Engl J Med. Sep 18; 2008 359(12):1218–1224. [PubMed: 18799558]
9. Rim SH, Seeff L, Ahmed F, et al. Colorectal Cancer Incidence in the United States, 1999–2004 An Updated Analysis of Data From the National Program of Cancer Registries and the Surveillance, Epidemiology, and End Results Program. Cancer. May; 2009 115(9):1967–1976. [PubMed: 19235249]
10. US Cancer Statistics Working Group. United States Cancer Statistics: 1999–2002 Incidence and Mortality Web-based Report. Atlanta: Department of Health and Human Services, Centers for Disease Control and Prevention, and National Cancer Institute; 2005.
11. Agrawal S, Bhupinderjit A, Bhutani MS, et al. Colorectal cancer in African Americans. Am J Gastroenterol. Mar; 2005 100(3):515–523. discussion 514. [PubMed: 15743345]
12. Rex DK, Rawl SM, Rabeneck L, et al. Colorectal cancer in African Americans. Rev Gastroenterol Disord. 2004; 4(2):60–65. [PubMed: 15184825]
13. Daguise VG, Burch JB, Horner MJ, et al. Colorectal cancer disparities in South Carolina: descriptive epidemiology, screening, special programs, and future direction. J S C Med Assoc. Aug; 2006 102(7):212–220. [PubMed: 17319233]
14. Collins JF, Lieberman DA, Durbin TE, et al. Accuracy of screening for fecal occult blood on a single stool sample obtained by digital rectal examination: a comparison with recommended sampling practice. Ann Intern Med. 2005; 142:81–85. [PubMed: 15657155]
15. American Society of Gastrointestinal Endoscopy. ASGE guideline: colorectal cancer screening and surveillance. Gastrointest Endosc. 2006; 63(4):546–57. [PubMed: 16564851]
16. Nadel MR, Shapiro JA, Klabunde CN, et al. A national survey of primary care physicians' methods for screening for fecal occult blood. Ann Intern Med. 2005; 142:86–94. [PubMed: 15657156]
17. Thornton JG, Morris AM, Thornton JD, et al. Racial variation in colorectal polyp and tumor location. J Natl Med Assoc. Jul; 2007 99(7):723–728. [PubMed: 17668638]
18. Blot, WJ. The Southern Community Cohort Study: Investigating Health Disparities. Paper presented at: Symposium on Cancer Disparities; March 12–13, 2009; Charleston, SC.
19. McAlearney AS, Reeves KW, Dickinson SL, Kelly KM, Tatum C, Katz ML, et al. Racial differences in colorectal cancer screening practices and knowledge within a low-income population. Cancer. 2008; 112(2):391–8. [PubMed: 18041073]
20. Xirasagar S, Hurley T, Sros L, Hebert JR. Quality and Safety of Screening Colonoscopies Performed by Primary Care Physicians with Standby Specialist Support. Medical Care. 2010; 48(8):703–709. [PubMed: 20613663]
21. Meissner HI, Yabroff KR, Dodd KW, Leader AE, Ballard-Barbash R, Berrigan D. Are patterns of health behavior associated with cancer screening? Am J Health Promot. 2009; 23(3):168–75. [PubMed: 19149421]
22. Moy E, Bartman BA. Physician race and care of minority and medically indigent patients. JAMA. May 17; 1995 273(19):1515–20. [PubMed: 7739078]
23. Komaromy M, Grumbach K, Drake M, et al. The role of black and Hispanic physicians in providing health care for underserved populations. N Engl J Med. May 16; 1996 334(20):1305–1310. [PubMed: 8609949]
24. Ostbye T, Yarnall KS, Krause KM, Pollak KL, Gradison M, Michener JL. Is there time for management of patients with chronic diseases in primary care? Ann Fam Med. 2005; 3:209–14. [PubMed: 15928223]

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25. Crawley LM, Ahn DK, Winkleby MA. Perceived medical discrimination and cancer screening behaviors of racial and ethnic minority adults. Cancer Epidemiol Biomarkers Prev. 2008; 17(8): 1937–44. [PubMed: 18687583]
26. Gao G, Burke N, Somkin CP, Pasick R. Considering Culture in physician-patient communication during colorectal cancer screening. Qualitative Health Research. 2009; 19(6):778–789. [PubMed: 19363141]
27. Geiger TM, Miedema BW, Geana MV, Thaler K, Rangnekar NJ, Cameron GT. Improving rates for screening colonoscopy: Analysis of the health information national trends survey (HINTS I) data. Surg Endosc. 2008; 22(2):527–33. [PubMed: 18074184]
28. Klabunde CN, Vernon SW, Nadel MR, Breen N, Seeff LC, Brown ML. Barriers to colorectal cancer screening: a comparison of reports from primary care physicians and average-risk adults. Med Care. 2005; 43(9):939–44. [PubMed: 16116360]
29. McGregor SE, Hilsden RJ, Li FX, Bryant HE, Murray A. Low uptake of colorectal cancer screening 3 yr after release of national recommendations for screening. Am J Gastroenterol. 2007; 102(8):1727–35. [PubMed: 17437502]
30. Klabunde CN, Schenck AP, Davis WW. Barriers to colorectal cancer screening among Medicare consumers. Am J Prev Med. 2006; 30(4):313–9. [PubMed: 16530618]
31. Doubeni CA, Laiyemo AO, Reed G, Field TS, Fletcher RH. Socioeconomic and Racial Patterns of Colorectal Cancer Screening Among Medicare Enrollees in 2000 to 2005. Cancer Epidemiol Biomarkers Prev. 2009; 18(8):1–6. [PubMed: 19124474]
32. Lane DS, Messina CR, Cavanagh MF, et al. A provider intervention to improve colorectal cancer screening in county health centers. Med Care. Sep; 2008 46(9):S109–S116. [PubMed: 18725822]
33. Carcaise-Edinboro P, Bradley CJ. Influence of patient-provider communication on colorectal cancer screening. Med Care. Jul; 2008 46(7):738–745. [PubMed: 18580394]
34. Nerenz DR. Health care organizations’ use of race/ethnicity data to address quality disparities - Many of these projects have worked, but there is still much room for improvement. Health Affairs. Mar–Apr; 2005 24(2):409–416. [PubMed: 15757924]
35. Grant Makers in Health. Issue Brief No. 5. Washington D.C: 2000. Strategies for reducing racial and ethnic disparities in health; p. 1-31.
36. Gross CP, Andersen MS, Krumholz HM, et al. Relation between Medicare screening reimbursement and stage at diagnosis for older patients with colon cancer. JAMA. Dec; 2006 296(23):2815–2822. [PubMed: 17179458]
37. Seeff LC, Manninen DL, Dong FB, et al. Is there endoscopic capacity to provide colorectal cancer screening to the unscreened population in the United States?[see comment]. Gastroenterology. Dec; 2004 127(6):1661–1669. [PubMed: 15578502]
38. Seeff, L. South Carolina survey of endoscopic capacity. Final report. Seattle, WA: Battelle, Centers for Public Health Research and Evaluation; 2006.
39. Fenton JJ, Tancredi DJ, Green P, Franks P, Baldwin LM. Persistence Racial and Ethnic Disparities in Persistent racial and ethnic disparities in up-to-date colorectal cancer testing in Medicare enrollees. J Am Geriatr Soc. 2009; 57(3):412–8. [PubMed: 19175435]
40. Brounts LR, Lehmann DO, Lesperance KE, et al. Improved rates of colorectal cancer screening in an equal access population. Am J Surg. 2008; 197(5):609–613. [PubMed: 19306971]
41. Wolf MS, Satterlee M, Calhoun EA, Skripkauskas S, Fulwiler D, Diamond-Shapiro L, et al. Colorectal cancer screening among the medically underserved. J Health Care Poor Underserved. 2006; 17(1):47–54. [PubMed: 16520508]
42. Hao Y, Jemal A, Zhang X, Ward EM. Trends in colorectal cancer incidence rates by age, race/ ethnicity, and indices of access to medical care, 1995–2004 (United States). Cancer Causes & Control. 2009; 20(10):1855–1863. [PubMed: 19543799]
43. Manfredi C, Czaja R, Freels S, et al. Prescribe for health: Improving cancer screening in physician practices serving low-income and minority populations. Arch Fam Med. 1998; 7(4):329–37. [PubMed: 9682686]
44. [Accessed June 16, 2009, 2009] American Cancer Society Guidelines for the Early Detection of Cancer. http://www.cancer.org/docroot/ped/content/ped_2_3x_acs_cancer_detection_guidelines_36.asp

45. US Preventive Services Task Force. Screening for colorectal cancer. USPSTF recommendation statement. Ann Intern Med. 2008; 149(9):627–37. [PubMed: 18838716]

46. Park D, Ryu S, Kim Y, et al. Comparison of guiaic-based and quantitative immunochemical fecal occult blood test in a population at average risk undergoing colorectal cancer screening. Am J Gastroenterol. 2010 advance online publication, May 25 2010. 10.1038/ajg.2010.179

47. Zimmerman, RK.; Nowalk, MP.; Tabbarah, M.; Grufferman, S. Predictors of colorectal cancer screening in diverse primary care practices; BMC Health Services Research. 2006. p. 116http://www.biomedcentral.com/1472-6963/6/116

48. Kronborg O, Fenger C, Olsen J, et al. Randomized study of screening for colorectal cancer with fecal occult blood test. Lancet. 1996; 348:1467–71. [PubMed: 8942774]

49. Mandel JS, Church TR, Ederer F, et al. Colorectal cancer mortality effectiveness of biennial screening for fecal occult blood. J Natl Cancer Inst. 1999; 91:434–7. [PubMed: 10070942]

50. Pabby A, et al. Flexible sigmoidoscopy for colorectal cancer screening. Dig Dis Sci. 2005; 50(11): 2147–52. [PubMed: 16240230]

51. Papaggrigoriadis S, Arunkumar I, Koreli A, Koreli A, Corbett WA. Evaluation of flexible sigmoidoscopy as an investigation for “left sided” colorectal symptoms. Postgrad Med J. 2004; 80:522–5.

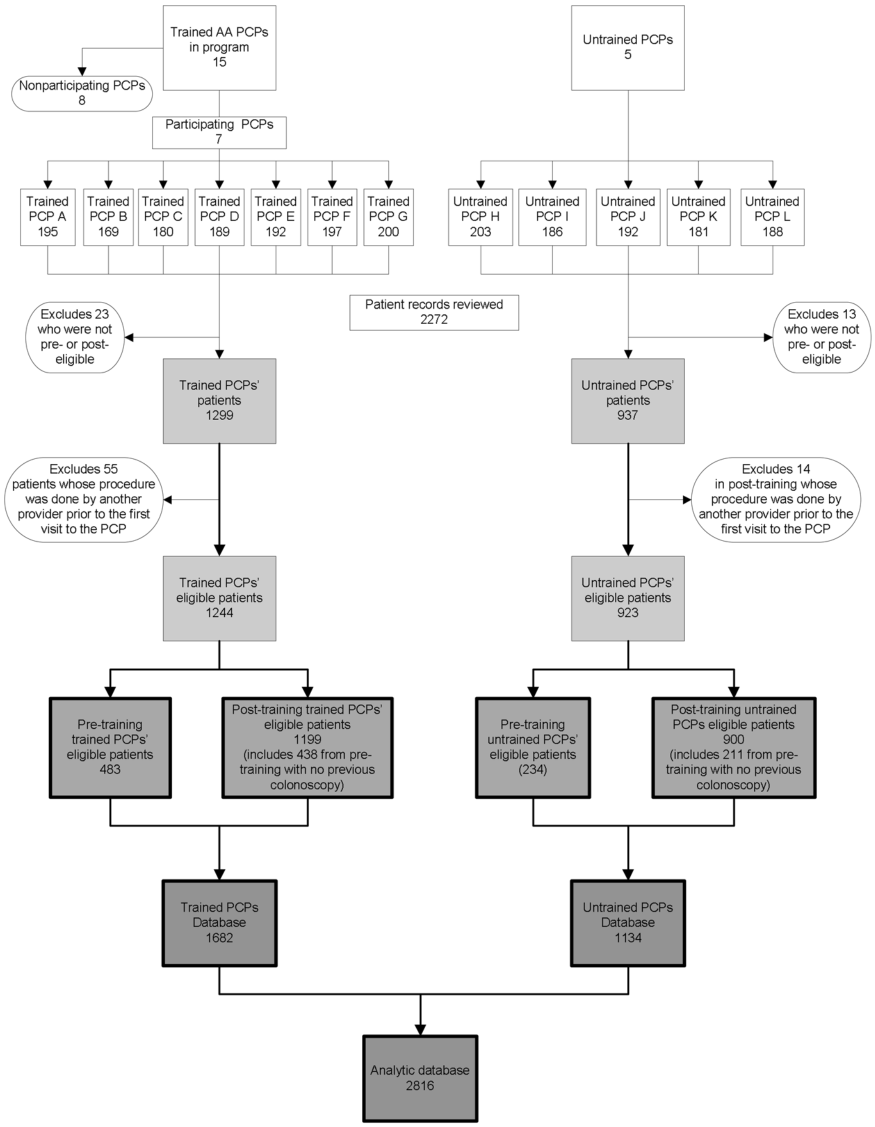

Fig 1.

Sample physicians and patients by inclusion/exclusion criteria, and patients' colonoscopy-eligible status in the pre and post training periods

Table 1

Demographic characteristics of patients who were colonoscopy-eligible in the pre- and post-training periods (Sampled patients=1244 of trained PCPs, 923 of untrained PCPs; See Figure 1).

	Pre-training period		Post-training period	
	Trained PCP	**Untrained PCP**	**Trained PCP**	**Untrained PCP**
No. of colonoscopy-eligible patients	483	234	1183	900
Age*	63.7	62.3	63.4	63.3
Age:				
50–54	99 (21%)	57 (24%)	270 (23%)	209 (23%)
55–64	181 (37%)	87 (37%)	440 (37%)	342 (38%)
65–74	127 (26%)	59 (25%)	288 (24%)	200 (22%)
75+	76 (16%)	31 (13%0	201 (16%)	149 (17%)
Gender:				
Male	166 (37%)	86 (41%)	438 (39%)	263 (31%)
Female	285 (63%)	124 (59%)	673 (61%)	574 (69%)§
Race:				
African American	380 (89%)	183 (91%)	919 (91%)	504 (63%)
Whites/other†	46 (11%)	19 (9%)	89 (9%)	297 (37%)¶
Major Insurance:				
Medicaid	27 (6%)	2 (1%)	65 (6%)	30 (4%)
Medicare	194 (44%)	95 (45%)	398 (36%)	258 (31%)
Private/VA‡	205 (46%)	113 (53%)	595 (53%)	509 (62%)
Uninsured	18 (4%)	3 (1%)*	62 (6%)*	27 (3%)§

*Mean age is the interval between the patient's date of birth and the PCP's training start date for the Pre-training period group, and the survey date for the post-training period.

†Whites/other includes 2.3% Hispanics and 1.4% other.

‡Private includes 5% other insurance type such as Veterans Administration.

§$p < 0.05$, and

¶$p < 0.0001$ for the Chi Square or Fisher's exact test of homogeneity comparing characteristics of patients of trained vs. untrained physicians within each period.

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Table 2

Colonoscopy completion rates in the pre and post training periods among trained versus untrained physicians' patients, by gender, race and insurance status*

	Pre-training period		Post-training period	
Patient demographics	**Trained PCPs**	**Untrained PCPs**	**Trained PCPs**	**Untrained PCPs**
All eligibles	45/483 (9.3%)	23/234 (9.8%)	579/1199 (48.3%)	266/900 (29.6%)¶
Gender				
Male	14/166 (8.4%)	11/86 (12.8%)	218/438 (49.8%)	89/263 (33.8%)¶
Female	29/285 (10.2%)	8/124 (6.5%)§	321/673 (47.7%)	153/574 (26.7%)¶
Race				
African American	33/380 (8.9%)	19/183 (10.4%)	485/919 (52.8%)	195/504 (38.7%)¶
Whites/other†	8/44 (18.2%)	2/15 (13.3%)	21/84 (25.0%)	29/219 (13.2%)§
Insurance Status				
Medicaid	1/27 (3.7%)	0/2 (0.0%)	31/65 (47.7%)	2/28 (6.7%)¶
Medicare	27/194 (13.9%)	11/95 (11.6%)	196/398 (49.3%)	78/258 (30.2%)¶
Private/VA‡	17/205 (8.3%)	10/113 (8.9%)	313/595 (52.6%)	161/509 (31.6%)¶
Uninsured	0/18 (0.0%)	0/3 (0.0%)	8/62 (12.9%)	3/27 (11.1%)

* Patient sample sizes are different for each variable due to missing data. Patient samples available are as follows: All eligibles, n=2832; gender, n=2625, males=955, females=1670; race, n=2360, AA=1993, Whites/other=367; insurance, n=2617, Medicaid=128, Medicare=948, Private=1431, uninsured=110. These samples, categorized by training status of their PCP, are assigned to the pre-and post training periods as per the defined inclusion criteria.

† European American/other includes 2.3% Hispanics and 1.4% other.

‡ Private includes 5% other insurance type such as Veterans Administration.

§ $p < 0.05$, and

¶ $p < 0.001$ for the Chi Square or Fisher's exact test of independence comparing colonoscopy rates between trained and untrained PCP patients within the stratum of training phase and patient characteristic

Table 3

Adjusted colonoscopy odds of trained vs. untrained PCP patients, during the pre-training and post-training periods

	Pre-training Period	Post-training Period
Variables*	**Colonoscopy Odds OR (95% CI)**	**Colonoscopy Odds OR (95% CI)**
PCP training status (Yes vs. No)	1.12 (0.58, 2.17)	1.66 (1.30, 2.13) §
Age 50–54	0.42 (0.15, 1.14)	1.19 (0.81, 1.74)
Age 55–64	0.51 (0.22 1.18)	2.02 (1.43, 2.85) ‡
Age 65–74	0.82 (0.36, 1.89)	1.93 (1.33, 2.79) ‡
Gender	0.90 (0.49, 1.66)	0.80 (0.64, 1.02)
Race	1.26 (0.45, 3.56)	5.03 (3.48, 7.28) §
Health insurance (no vs. yes)	-†	0.22 (0.10, 0.46) §
Duration of being PCP's patient <3 years	2.05 (0.96, 4.37)	1.63 (1.23, 2.16) §
Duration of being PCP's patient ≥3 and ≤10 years	1.50 (0.73, 3.11)	0.64 (0.48, 0.85)

*Referent categories are: age ≥75 years; gender female; race Whites; health insurance – yes; and duration of being this PCP's patient >10 years.

†The "Pre-training period" model did not include "insurance status" because of a zero colonoscopy rate among the uninsured in the pre period and the resulting model instability.

‡p=<0.01;

§p=<0.0001

Table 4

Source of colonoscopy service, PCP or specialist for patients of trained PCPs, post training, by patient characteristics.

Patient characteristic	PCP performed	Specialist performed
Race/ethnicity		
African American	354 (78.5%)	97 (21.5%)
Whites	17 (81.0%)	4 (19.1%)
Gender		
Male	170 (82.9%)	35 (17.1%)
Female	223 (75.6%)	72 (24.4%)*
Insurance		
Medicaid	23 (79.3%)	6 (20.7%)†
Medicare	145 (79.2%)	38 (20.8%)†
Private	229 (78.2%)	64 (21.8%)†
Uninsured	4 (80.0%)	1 (20.0%)

*$p \leq 0.05$ for the Chi Square test of independence comparing the males and females among specialist-performed colonoscopy.

†$p \leq 0.001$ for the Chi Square test of independence comparing PCP vs. specialist-performed colonoscopy.