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Effect of a patient navigator program on the volume and quality of colonoscopy

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Abstract

Background and Goals—To increase colorectal cancer screening among urban minorities, New York Presbyterian Hospital/Columbia University, with support from the New York City Department of Health and the Citywide Colon Cancer Control Coalition (C5), instituted a patient navigation and direct endoscopic referral system. We assessed the effect of this program on the volume of colonoscopy in this institution, which caters to a socioeconomically diverse patient population.

Study—We compared colonoscopy volume during the first year of the navigator program to the volume during the year prior to this program. We stratified on Medicaid status to assess the secular trend of screening rates. To assess quality during this period, we measured cecal intubation rates, preparation quality, and adenoma detection rates (ADR).

Results—Of the 749 patients assessed by patient navigators 678 (91%) underwent colonoscopy. Colonoscopy volume among Medicaid outpatients increased by 56% (957 to 1,489). Adenoma detection was 27% and the cecal intubation rate was 97%. Comparing navigated patients to non-navigated Medicaid outpatients, preparation quality was superior (34% versus 40% suboptimal, $p=0.0282$), though preparation quality remained inferior to that of private patients (20% suboptimal, $p<0.0001$).

Conclusions—Volume of colonoscopy increased, coinciding with the onset of the patient navigation program. This increase was nearly entirely due to a rise in colonoscopies among Medicaid outpatients, the principal focus of the navigator program. This increase in quantity was accomplished while maintaining an overall high level of quality as measured by cecal intubation rates and adenoma detection, although preparation quality requires further efforts at improvement.

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Keywords

Colonoscopy; colorectal neoplasms; urban health

INTRODUCTION

Colorectal cancer is a common cancer, diagnosed in more than 140,000 patients in the United States annually, and it is associated with substantial morbidity and mortality.¹ Screening for colorectal cancer can result in decreased colorectal cancer mortality due to early detection, but can also cause a decrease in colorectal cancer incidence by virtue of the removal of premalignant adenomas during colonoscopy.²

Despite the potential public health benefits of screening colonoscopy, adoption of this screening test by patients has been far from universal; in one recent national survey, nearly 40% of eligible candidates had not undergone colorectal cancer screening.³ Currently, black patients are diagnosed at a later stage than white patients,⁴ and socioeconomic disparities persist with regards to mortality rates.^{5, 6} However, in New York City, colonoscopy screening rates among black, white and Hispanic individuals are now virtually identical.⁷ Programs that can sustain this achievement are critical.

In an effort to raise screening rates and to achieve sustained success in eliminating racial disparities in colorectal cancer screening, the New York City Department of Health and Mental Hygiene, in conjunction with the Citywide Colon Cancer Control Coalition (C5), instituted a patient navigator program, in which community health liaisons were trained to guide candidates through screening colonoscopy using a newly developed direct endoscopy referral system. The referral system, reserved exclusively for participants in the navigator program, allowed patients who were amenable to screening colonoscopy to be referred directly by their primary care provider, bypassing a pre-procedure clinic consultation with a gastroenterologist.

Originally developed to address racial and socioeconomic disparities in breast cancer outcomes, patient navigators have been employed more recently in the field of colorectal cancer screening.⁸ Previous evaluations of patient navigator programs⁹⁻¹⁴ have indicated that such programs increase the probability that candidates will complete colonoscopy. One prior study, conducted at a public hospital, found that the navigator program coincided with an overall increase in the volume of colonoscopies performed at its institution.¹³ We aimed to evaluate the first full year of the implementation of the patient navigator program at our medical center, which caters to an ethnically and socioeconomically diverse patient population. Our primary question was: what effect has the navigator program had on screening rates in our institution? Additionally, we set out to evaluate quality metrics (bowel preparation quality, cecal intubation rates, and adenoma detection) so as to evaluate whether quality was maintained in the face of an increase in colonoscopy quantity.

MATERIALS AND METHODS

Setting and Patients

Columbia University Medical Center is a large tertiary care center affiliated with a major medical school, located in upper Manhattan. The medical center serves an ethnically and socioeconomically diverse population, including those residing in the immediate vicinity in Washington Heights, many of whom are Hispanics of Dominican descent. Patients undergoing colonoscopy include those who are followed by private physicians and those who attend the gastroenterology clinic, in which a fellow manages the patient under the

supervision of an attending gastroenterologist. Fellows also participate in the care of private patients if the situation is of particular educational interest.

Eligible patients were identified by primary care providers at the general medical clinic, gynecologic clinic, and the clinic serving persons infected with the Human Immunodeficiency Virus. Providers were given an endoscopy referral form to complete, which included current guidelines regarding eligibility for screening colonoscopy, and requested information regarding comorbid conditions and medications so as to assess for suitability for direct endoscopy referral. Relative contraindications to direct endoscopic referral as outlined on the form are enumerated in Table 1. Patients with one or more relative contraindication were considered for direct referral at the discretion of the medical director of the navigator program (RR). Patients requiring the participation of anesthesiologist or propofol administration for the colonoscopy were not included in the direct referral program, and were instead referred to the gastroenterology clinic.

Navigation

Two patient navigators underwent training the medical director to ascertain appropriateness for direct referral. These navigators were present onsite at the referring clinics, reviewed each referral as it was submitted, and immediately met with appropriate candidates to review the risks and benefits of colonoscopy. Amenable patients were then given a date for colonoscopy and written instructions regarding the preparation, as well as a prescription for the purgative.

Preparations consisted exclusively of 4 liters of a polyethylene glycol-based purgative. For colonoscopies scheduled in the morning, navigators instructed patients to ingest the entire purgative during the evening prior to colonoscopy. For colonoscopies scheduled in the afternoon, the dosing schedule of the purgative was left to the individual gastroenterologist's discretion; patients were either instructed to ingest the entire purgative during the evening prior to the colonoscopy, or, if the provider preferred, to ingest half of the purgative on the evening prior to the examination and the remainder of the purgative on the morning of the colonoscopy. Patients were advised to limit their diet to clear liquids on the day prior to the colonoscopy.

Two days prior to the scheduled colonoscopy, navigators telephoned patients reminding them of their appointment. On the day of the colonoscopy, the navigator met the patient again at the endoscopy suite's pre-procedure area to address any additional concerns. The gastroenterologist then met the patient in the procedure room, reviewed the risks and benefits of the procedure, and obtained the patient's formal consent. Fellows participated in a weekly endoscopy session reserved exclusively for patients undergoing navigator-facilitated colonoscopy. Navigators also scheduled colonoscopies outside of this reserved session; these examinations were performed by attending gastroenterologists without the participation of a fellow. All navigator-facilitated colonoscopies were performed using moderate sedation, with a combination of fentanyl and midazolam.

Navigators provided verbal and written results of the colonoscopy, including findings and recommendations for follow-up, to the patient prior to discharge. If an early repeat colonoscopy or office visit was recommended, the navigator then telephoned the patient within one week following the colonoscopy to confirm the plan for follow-up.

Analysis

The aim of the study was to assess the impact of the navigator program using both quantitative and qualitative metrics. To measure the effect of the program on the number of colonoscopies performed at our medical center, we compared the total number of

colonoscopies performed during the first 12 months of the navigator program to the total number performed during the 12 months preceding the start of the program. To ascertain whether the navigator program was increasing screening rates in the target population, as opposed to merely providing another route to colonoscopy for those patients who were bound to undergo screening regardless of the program, we performed a stratified quantification of colonoscopies by Medicaid status and by indication. We compared the change in colonoscopy quantities among Medicaid outpatients (the targeted population for the navigator program) to the change among non-Medicaid (hereafter termed “private”) outpatients during the same time periods.

For analysis of quality measures, we collected the depth of insertion and preparation quality of all colonoscopies performed during this time period. Preparation quality was recorded by endoscopists using a computer drop-down menu that allowed for either a four point scale (Excellent, Good, Fair, Poor), or a choice of two different dichotomous scales (Satisfactory/Unsatisfactory or Adequate/Inadequate). For analysis of preparation quality, we considered two definitions of an undesirable outcome: poor (including Poor, Inadequate, or Unsatisfactory) or suboptimal (including these same ratings but also including Fair). When analyzing navigation as a predictor of preparation quality, we limited the time frame to the 12 month period when patient navigation was ongoing; the 12 months preceding this period were excluded from the analysis of preparation quality due to a secular trend noted of declining preparation quality among non-navigated Medicaid outpatients compared to this prior period. We employed multivariate logistic regression to assess predictor variables, including patient navigation, of suboptimal or poor preparation in this cohort.

Findings were reviewed for all patients undergoing navigator-facilitated colonoscopy. Adenomas were confirmed via review of pathology records. Sizes of adenomas were ascertained via the endoscopist’s estimate (using biopsy forceps width as a reference); if this size estimate was not provided, the largest diameter noted in the histopathologic report was used. Lesions located proximal to the splenic flexure were classified as proximal; all other lesions were classified as distal. We employed multivariate logistic regression to assess for predictors of the presence of ≥ 1 adenoma among patients undergoing navigator-facilitated colonoscopy.

Comparisons of proportions and means were performed using chi square, student t test, and one way ANOVA. A p value ≤ 0.05 was considered significant. Statistical analysis was performed using SAS version 9.1.3 (Cary, NC). This analysis was approved by the Medical Center’s Institutional Review Board (approval date May 18, 2009).

RESULTS

Colonoscopy volume

The number of colonoscopies performed at the Medical Center increased from 5,081 in the 12 month period preceding the onset of the patient navigator program to 5,637 in the first 12 months following establishment of the program, an increase of 11% (Table 2). Stratification by Medicaid status demonstrates that this overall increase in volume was driven by a 56% increase in the number of colonoscopies performed on outpatients with Medicaid, the principal target of the navigator program. In contrast, the number of colonoscopies performed on private outpatients increased by less than 1%. When limiting the analysis to colonoscopies done for screening purposes (Table 2), the quantity increased by 54% among outpatients with Medicaid and decreased by 5% among private outpatients.

A monthly accounting of colonoscopies performed on outpatients with Medicaid is illustrated in Figure 1. As demonstrated in the figure, the number of colonoscopies

performed during the navigator period represents a consistent and sustained increase across the twelve month period. The month during this period with the lowest number of colonoscopies (January 2009) still exceeded the quantity performed during the pre-navigator period in every month except one (March 2008).

Demographics and clinical features

During the first 12 months of the program's implementation, 749 patients met with the navigators and were scheduled for colonoscopy; of these patients, 678 (91%) underwent colonoscopy (Table 3). Of the 678 patients who underwent navigator-facilitated colonoscopy, 590 (87%) were insured by Medicaid, with the remainder insured by Medicare or private insurance. Self-reported ethnicity was available for 357 patients, 53% of the cohort. Of the 357 patients, 39 (11%) were white, 85 (24%) were black, and 233 (65%) were Hispanic. Males comprised 41% of the navigated cohort. The mean age of the navigated patients was 60.4 years, which was not significantly different from the mean age of non-navigated Medicaid outpatients (60.9) or that of private patients (60.6, $p=0.6066$). Compared to these two latter groups, navigated patients were more likely to be undergoing colonoscopy for screening, as opposed to diagnostic purposes, and a higher proportion of navigated patients were considered average risk for colorectal neoplasia (78%) compared to non-navigated Medicaid outpatients (49%) or private outpatients (35%) during this period. A fellow participated in 28% of navigated colonoscopies, compared to 50% of colonoscopies on non-navigated Medicaid outpatients, and 4% of private outpatients.

Quality measures

The cecum was reached in 97% of navigated colonoscopies, the same percentage as that for private outpatients, but a higher percentage than non-navigated Medicaid outpatients (94%). Preparation quality was recorded in 649 of 678 patients (96%), which was significantly higher than the recorded rate among non-navigated Medicaid outpatients (92%) and private patients (91%).

We restricted the analysis of preparation quality to the 12 month period since the inception of the navigator program, as we observed a secular trend of decreasing preparation quality among non-navigated Medicaid outpatients when comparing the pre-navigator period to the navigator period; among this group, a suboptimal preparation occurred in 35% of colonoscopies during the pre-navigator period and 40% of colonoscopies during the navigator period ($p=0.0288$).

During the first 12 month period since the inception of the navigator program, 34% of navigated patients had a suboptimal preparation, as defined as a preparation characterized as fair or poor (Table 4). Although this was significantly lower than the suboptimal preparation rate of non-navigated Medicaid outpatients during this period (40%, $p=0.0282$), it remained far greater than the suboptimal preparation rate of private outpatients (20%, $p<0.0001$). Similarly, when considering only the proportion of preparations classified as poor, navigated patients had a lower proportion (7%) than non-navigated Medicaid outpatients (15%, $p<0.0001$), but remained higher than the poor preparation proportion of private outpatients (4%, $p=0.0007$).

We conducted a multivariate analysis to assess patient navigation as predictive of suboptimal preparation among Medicaid outpatients during the 12 month period since the inception of the navigator program (Table 5). Among Medicaid outpatients, navigation remained associated with a decreased odds of suboptimal preparation after adjusting for patient age, gender, or time of day that the colonoscopy was performed (OR 0.75 95% 0.60-0.94). The multivariate analysis was repeated with the outcome of poor, as opposed to

suboptimal, preparation (Table 5); the protective association of navigation was more pronounced in this subsequent analysis (OR 0.41 95% CI 0.28-0.59).

Neoplasia detection

Neoplastic findings of all navigated patients are outlined in Table 6. Of the 678 patients undergoing colonoscopy, one or more adenoma was found in 180 (27%). Adenoma prevalence was greater in men (34%) than women (22%, $p=0.0008$). Among patients with adenomas, men were more likely than women to have 3 or more adenomas ($p=0.0041$). There were no significant differences between men and women in the relative distribution of adenoma size, histology, and location. Although men had a higher prevalence of advanced adenoma (11%) than women (6%), the difference did not reach statistical significance ($p=0.4029$).

The results of the multivariate analysis of predictors of adenoma presence are provided in Table 7. The presence of a fellow, which was previously shown to be associated with increased adenoma detection,¹⁵ demonstrated a similar association in this cohort, but did not meet statistical significance (multivariate OR 1.42 95% CI 0.96-2.12). Variables that remained significant in this model included age (OR per year 1.04 95% CI 1.01-1.06), and male gender (OR 1.76 95% CI 1.25-2.54).

DISCUSSION

In this analysis of the first year of a patient navigator program at our institution, the total number of colonoscopies increased by 11%; this change was driven by a large increase in colonoscopies performed on Medicaid outpatients, the principal target of the navigator program. In this subgroup, the quantity of colonoscopies increased by 56%. Although the effect of patient navigation on quality indicators may be expected to be limited to preparation quality, we analyzed cecal intubation rates and adenoma detection so as to assess whether the navigator program affected quality metrics simply by virtue of the attendant increase in colonoscopy quantity. Analysis of these quality outcomes demonstrates that this increase in quantity was achieved without sacrificing quality.

Our findings regarding the efficacy of the patient navigation program are congruent with previously published studies of patient navigation. Two randomized trials, which included a total of 72 navigated patients, demonstrated that patients randomized to a patient navigator (as opposed to usual care) had greater colonoscopy completion rates and higher overall colorectal cancer screening rates.^{10, 11} A larger randomized trial, in which 409 patients were randomized to navigation, resulted in successful screening rates of 27% compared to 11% of controls.¹⁴ The results of that trial, however, may not be generalizable to our population, as only 3% of the population had Medicaid, as opposed to 87% of the navigated patients in the present study.

In an observational study of a navigator program instituted at a public hospital by Nash, et al, patient navigation was associated with a decrease in missed appointments and an increase in overall volume similar to the increase in the Medicaid outpatients in our analysis.¹³ However, in that study, the institution of the navigator program and direct referral program occurred during the same period as the implementation of major capacity enhancements to the endoscopy suite, making it impossible to ascertain to what extent the navigator program itself contributed to the increase in volume. In our study, no such changes occurred during the analyzed period, and the heterogeneous nature of our patient population allowed for a functional control group in the volume analysis, i.e. the private outpatients. Among private outpatients, colonoscopy volume increased by <1%, strongly suggesting that the increase in

volume among Medicaid outpatients was solely an effect of the navigator program, as opposed to a secular trend in screening rates.

Our study represents the largest published sample of patients undergoing navigator-facilitated colonoscopy to date. During a marked increase in procedure volume, as observed among outpatients with Medicaid in this analysis, maintenance of quality standards is imperative so as to maximize the public health benefit of this intervention. As such, we sought to measure quality metrics including cecal intubation rate, preparation quality, and adenoma detection rate, and compare these measures to established quality standards. The cecal intubation rate of 97% among navigated patients exceeds the benchmark of 95%, and the adenoma detection of 33% among men and 22% among women exceed the benchmark standards of 25% among men and 15% among women.¹⁶

The prevalence of adenomas among navigated patients in this analysis exceeds that reported in previously published studies of navigator-facilitated colonoscopy, though the prevalence of carcinoma is similar. In a study by Chen, et al, in which 353 patients underwent colonoscopy with the aid of a navigator, ≥ 1 adenoma was found in 58 patients (16%), including 14 males (22.5%) and 44 females (15%); adenocarcinoma was present in two patients (0.6%).⁹ Likewise, in the study by Nash, et al at the public hospital, the total neoplasia detection rate during the navigator period was 15%.¹³ The patient demographics in these two studies with regard to the age and gender distribution are similar to those of the present study. Moreover, the prevalence of adenomas among navigated patients is higher than the adenoma prevalence measured at our institution in the time period preceding the onset of the navigator program: 29% for males and 15% for females. An explanation of the higher adenoma rate observed in our navigated cohort is elusive, and might be related to incompletely measured differences in baseline risk, including racial and ethnic makeup, in addition to possible differences in operator technique. Since this analysis was limited to the first year of the navigator program, it is possible that the patients who underwent colonoscopy represent a higher risk group that was eager to undergo screening once a new route was established; however, this does not appear to be the case based on family history or “alarm” symptoms as documented in the colonoscopy report. Monitoring the adenoma detection rates in the subsequent years of this program will reveal whether the currently-observed adenoma prevalence is representative of the target population as a whole.

With regards to preparation quality, quality guidelines indicate that this important parameter should be recorded in all colonoscopy reports.¹⁶ In our analysis, this was recorded in 96% of patients undergoing navigator-facilitated colonoscopy, which was significantly greater than that noted in non-navigated Medicaid outpatients and private outpatients.

Our findings regarding preparation quality among patients undergoing navigator-assisted colonoscopy reveal a modest and statistically significant improvement in preparation quality compared to non-navigated Medicaid outpatients. This improvement is observed in two analyses, whether defining the undesired outcome as suboptimal (defined as fair/poor) or poor. However, the overall quality of preparation, while superior to that of non-navigated Medicaid outpatients, was far inferior to that of private patients. We have previously reported the high rates of suboptimal preparation quality among Medicaid patients in our institution,¹⁷ and it appears that the navigator program appears to only partially alleviate this disparity, with a large difference remaining between these patients and private patients. The reasons for this disparity are unknown, but appear to be independent of age, ethnicity, indication, and time of the colonoscopy.¹⁷

The modest improvement in preparation quality observed among navigated patients is further tempered by the fact that there was a secular trend of declining preparation quality

among non-navigated Medicaid outpatients comparing the pre-navigator period to the navigator period. This is to be expected, as patients in the navigator period whose comorbid illnesses precluded navigation may be expected to have inferior preparation quality due to these very comorbidities.¹⁸ Thus, there exists the possibility that the improvement observed among navigated patients represents selection bias, in which the Medicaid outpatients who were bound to have superior bowel preparations underwent navigation; this would result in improved preparation rates in the navigated group and a decline in preparation quality in the non-navigated Medicaid outpatient group, as is observed.

In a prior study which reported the preparation qualities among patients in a navigator program,⁹ the proportion of patients with inadequate preparation was 5%, similar to the 7% poor preparation rate observed among navigated patients in our study. There was no formal comparison to a control group with regard to preparation quality in the study by Chen, et al, but the authors reported that the historic inadequate preparation rate was 12%. Our results suggest that, at our institution, the preparation quality of patients undergoing navigator-facilitated colonoscopy remains inferior to that of private patients, and future efforts will focus on identifying barriers to optimal preparation in this patient population.

Our study has a number of limitations. As a single institution study, the generalizability of our findings is uncertain; the effectiveness on a patient navigation program is likely to be critically dependent on the performance of the individual navigators. However, this study, seen in the context of previously performed studies of patient navigation,¹¹⁻¹⁴ supports the notion that patient navigation can result in increased screening rates among urban minorities, while maintaining key quality measures. As the patient navigator program was instituted in conjunction with a direct endoscopy referral service, the relative contribution of these two innovations to the overall result is unknown. Information regarding neoplastic findings in this analysis was limited to those patients who underwent navigation. This was due to the labor intensive process of manually reviewing histopathologic records. However, the purpose of calculating adenoma prevalence in all navigator-facilitated colonoscopies was to assess how the adenoma detection rate compared to established quality benchmarks as well as the previously-measured overall adenoma prevalence in our institution, which was accomplished using the data collected.

Our findings regarding preparation quality are limited by the possibility of selection bias, as described above. Moreover, preparation quality was assessed by individual operators and there was no standardization of preparation quality definitions between operators. To partially mitigate this latter limitation, we repeated the analysis of preparation quality so as to include a general definition ("suboptimal") as well as a more restrictive definition ("poor"). The protective effect of patient navigation remained, and appeared to be strengthened when using the more restrictive definition.

In conclusion, in this largest reported cohort of navigator-facilitated colonoscopy to date, the introduction of a patient navigator/direct endoscopic referral program was associated with an increase in volume of colonoscopy among outpatients with Medicaid, the principal target of the navigator program. This increase occurred despite an overall minimal secular change in volume compared to the year prior to the introduction of the program. During this increase in screening quantity, quality measures were maintained and, in the case of cecal intubation rate and adenoma detection, exceeded guideline-established quality benchmarks. Future studies should investigate the long-term effect of navigator programs on colonoscopy quantity and quality. Future studies should also identify the causes of, and devise strategies to prevent, suboptimal bowel preparation in this population.

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Figure 1. Monthly number of colonoscopies performed on Medicaid outpatients during the 24 month period. The navigator program commenced in June 2008.

Table 1

Relative contraindications to navigator-facilitated direct endoscopic referral service:

Age > 75 years
Under treatment for heart failure or valve-related concerns
Under treatment for kidney disease
Under treatment for emphysema
On anti-platelet or anticoagulation medication that cannot safely be stopped for one week
Under active treatment for a recent episode of diverticulitis
Pregnant or possibly pregnant
History of heme positive stool, hematochezia, or iron deficiency anemia
Presence of a pacemaker or automated implantable cardioverter/defibrillator
History of inflammatory bowel disease
History of severe cardiac/pulmonary/renal/hepatic disease
History of endocarditis, rheumatic fever, or intravascular prosthesis
History of difficult, incomplete, or poorly prepped colonoscopy
History of difficulty with previous sedation/anesthesia
History of sleep apnea

Table 2

Number of colonoscopies performed at Columbia University Medical Center during the 12 months preceding the patient navigator program and the first 12 months following establishment of the program.

	Pre-navigator period	Navigator period	Change
Total number of colonoscopies	5081	5637	+ 11%
Medicaid outpatients	957	1489	+ 56%
Non-Medicaid outpatients	3712	3741	+ 0.8%
Inpatients	412	407	- 1%
Number of screening* colonoscopies	3118	3362	+ 8%
Medicaid outpatients	675	1038	+ 54%
Non-Medicaid outpatients	2388	2280	- 5%
Inpatients	55	44	- 20%

* Included in the screening category: average-risk screening, surveillance of adenomas, and a family history of adenomas or colorectal cancer.

Table 3

Demographics, clinical features, and quality measures of outpatients undergoing colonoscopy during the study period.

	Navigated patients (n=678)	Non-navigated Medicaid patients (n=1856)	Private patients (n=7365)	p value
Age				<0.0001
<50	27 (4)	243 (13)	1256 (17)	
50-59	313 (46)	615 (33)	2155 (29)	
60-69	228 (34)	544 (29)	2007 (27)	
70-79	102 (15)	355 (19)	1362 (18)	
≥ 80	8 (1)	99 (5)	585 (8)	
Gender				<0.0001
Male	277 (41)	687 (37)	3247 (44)	
Female	401 (59)	1169 (63)	4118 (56)	
Indication				<0.0001
Avg risk screening	530 (78)	901 (49)	2609 (35)	
History of adenoma	45 (7)	253 (14)	1457 (20)	
Family history	25 (4)	37 (2)	524 (7)	
Diagnostic/other	78 (12)	665 (36)	2775 (38)	
Fellow participation				<0.0001
Yes	188 (28)	928 (50)	305 (4)	
No	490(72)	928 (50)	7060 (96)	
Depth of insertion				<0.0001
Cecum/ileum	659 (97)	1743 (94)	7145 (97)	
Did not reach cecum	19 (3)	109 (6)	214 (3)	
Not stated	0	4 (0)	6 (0)	
Preparation quality				<0.0001
Recorded	649 (96)	1716 (92)	6715 (91)	
Not recorded	29 (4)	140 (8)	650 (9)	

Table 4

Preparation quality of navigated patients, non-navigated, Medicaid patients, and private patients during a 12 month period.

	Navigated patients (n=649)	Non-navigated Medicaid patients (n=822)	Private patients (n=3323)	p value
Preparation quality (%)				<0.0001
Fair/poor	222 (34)	327 (40)	670 (20)	
Poor	48 (7)	123 (15)	140 (4)	

Table 5

Multivariate analysis of patient navigation as predictive of suboptimal or poor bowel preparation among Medicaid outpatients during a 12 month period.

	Odds Ratio for suboptimal (95% CI)	Odds ratio for poor (95% CI)
Navigated	0.75 (0.60-0.94)	0.41 (0.28-0.59)
Age	1.0 (0.99-1.01)	1.0 (0.98-1.01)
Gender (male)	1.17 (0.94-1.46)	1.23 (0.88-1.72)
Afternoon colonoscopy	1.58 (1.26-1.99)	2.23 (1.54-3.25)

Table 6

Adenoma findings in patients undergoing navigator-facilitated colonoscopy

	Male (n=277)	Female (n=401)	Overall (n=678)	p value
One or more adenoma	93 (34)	87 (22)	180 (27)	0.0006
Location				0.8453
Distal only	30 (11)	26 (6)	56 (8)	
Proximal only	54 (19)	54 (13)	108 (16)	
Proximal and distal	9 (3)	7 (2)	16 (2)	
Number of adenomas				0.0041
1	65 (23)	68 (17)	133 (20)	
2	17 (6)	19 (5)	36 (5)	
≥3	11 (4)	0	11 (2)	
Size of largest adenoma (mm)				0.7032
≤5	37 (13)	33 (8)	70 (10)	
5-9	30 (11)	33 (8)	63 (9)	
≥10	26 (9)	21 (5)	47 (7)	
Histology				0.2942
Tubular	78 (28)	79 (20)	157 (23)	
Tubulovillous	9 (3)	2 (0.5)	11 (2)	
High grade dysplasia	3 (1)	3 (0.7)	6 (1)	
Sessile serrated adenoma	1 (0.4)	2 (0.5)	3 (0.4)	
Adenocarcinoma	2 (0.7)	1 (0.2)	3 (0.4)	
Advanced adenoma	31 (11)	24 (6)	55 (8)	0.4029

Table 7

Multivariate analysis of predictors of the presence of ≥ 1 adenoma among patients undergoing navigator-facilitated colonoscopy

	Odd Ratio (95% CI)
Age	1.04 (1.01-1.06)
Gender (male)	1.76 (1.25-2.54)
Indication:	
Average risk screening	[Baseline]
History of adenoma	1.83 (0.94-3.57)
Family history	1.49 (0.59-3.76)
Diagnostic/other	0.91 (0.50-1.69)
Fellow present	1.42 (0.96-2.12)
Preparation suboptimal	0.98 (0.67-1.43)