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Clinical Costs of Colorectal Cancer Screening in 5 Federally Funded Demonstration Programs

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Abstract

BACKGROUND—The Centers for Disease Control and Prevention initiated the Colorectal Cancer Screening Demonstration Program (CRCSDP) to explore the feasibility of establishing a large-scale colorectal cancer (CRC) screening program for underserved populations in the United States. The authors of this report assessed the clinical costs incurred at each of the 5 participating sites during the demonstration period.

METHODS—By using data on payments to providers by each of the 5 CRCSDP sites, the authors estimated costs for specific clinical services and overall clinical costs for each of the 2 CRC screening methods used by the sites: colonoscopy and fecal occult blood test (FOBT).

RESULTS—Among CRCSDP clients who were at average risk for CRC and for whom complete cost data were available, 2131 were screened by FOBT, and 1888 were screened by colonoscopy. The total average clinical cost per individual screened by FOBT (including costs for screening, diagnosis, initial surveillance, office visits, and associated clinical services averaged across all individuals who received screening FOBT) ranged from $48 in Nebraska to $149 in Greater Seattle. This compared with an average clinical cost per individual for all services related to the colonoscopy screening ranging from $654 in St. Louis to $1600 in Baltimore City.

CONCLUSIONS—Variations in how sites contracted with providers and in the services provided through CRCSDP affected the cost of clinical services and the complexity of collecting cost data. Health officials may find these data useful in program planning and budgeting.

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Keywords

clinical cost; cost assessment; colorectal cancer; cancer screening program; colorectal cancer

INTRODUCTION

Colorectal cancer (CRC) is the second leading cause of cancer-related deaths among adults in the United States, and CRC mortality and survival rates vary substantially by race.[1,2] Although there is strong scientific evidence that regular screening decreases CRC incidence and mortality rates, only about two-thirds of US residents for whom screening is recommended are screened at the intervals recommended by US Preventive Services Task Force guidelines.[3] The rate of compliance with these screening guidelines is even lower (roughly 35%) among uninsured US residents.[3] Screening programs that specifically target the uninsured were proposed to help reduce disparities along racial, ethnic, and socioeconomic lines in CRC screening, incidence, and mortality rates.[4]

In 2005, to explore the feasibility of establishing a national CRC screening program for underserved US populations, the Centers for Disease Control and Prevention (CDC) established the 4-year Colorectal Cancer Screening Demonstration Program (CRCSDP) at 5 sites.[5] CRCSDP funding was provided to the Maryland Department of Health and Mental Hygiene (for Baltimore City), the Missouri Department of Health and Senior Services (for St. Louis), the Nebraska Department of Health and Human Services (for a statewide program), the Stony Brook University Medical Center (for a university-based program in Suffolk County, NY), and Public Health-Seattle & King County (for a program in Greater Seattle). Funds were provided to support both clinical (screening, surveillance, and diagnostic services) and associated services (office visits and patient navigation) activities for patients aged ≥50 years. These activities are described elsewhere in this supplement to *Cancer*.[6,7] The local programs contracted with a variety of providers and health care systems, including primary care providers (PCPs), gastroenterologists, surgeons, pathologists, gastroenterology centers, laboratories, hospitals, and community health clinics, to create provider networks required for CRC screening.[5] The CDC created a policy manual to guide overall program implementation, and each site's local program also created its own individual policy manual.[5] The policy manuals described clinical services that were reimbursable by the CDC and specified reimbursement rates (generally the same as Medicare rates) for services that were identified by Current Procedure Terminology, HealthCare Common Procedure Coding System (HCPCS), or Ambulatory Payment Classification codes.[8]

The screening tests used by each site differed. Three sites selected a combination of guaiac-based fecal occult blood test (FOBT) and colonoscopy. Nebraska selected FOBT as its primary screening test for individuals at average risk of developing CRC (for criteria, see below) and used colonoscopy for diagnosis and for screening those at above-average risk. Greater Seattle initially selected FOBT as its primary screening test for average-risk individuals but began to offer all individuals a choice of FOBT or colonoscopy for screening during the sixth month of screening. St. Louis initially used FOBT as its primary screening

test for individuals at average risk of developing CRC but changed to colonoscopy for all individuals 13 months after the start of screening because of a low response rate to FOBT screening. Because the resulting sample size was small, we do not report on FOBT screening in St. Louis. The sites in Baltimore City and Suffolk County, New York used colonoscopy as their primary screening test throughout the demonstration. Each site has been described in detail in previous articles,[5,9] and each is also described elsewhere in this supplement to *Cancer*.[6,7]

We previously reported on the cost of program startup for the 5 screening programs.[10] Program costs for each site associated with operating the CRCSDP are presented elsewhere in this supplement to *Cancer*.[11] Below, we provide a detailed description of the clinical costs of the CRCSDP from 2006 through 2009, including the cost of CRC screening by FOBT and by colonoscopy, the cost of diagnostic and surveillance colonoscopy, and the cost of CRC screening-associated office visits. For those programs that offered both FOBT and colonoscopy, we examine the costs of each method separately. Finally, we compare the average total clinical cost of FOBT screening with the average total cost of colonoscopy screening.

MATERIALS AND METHODS

The 5 sites extracted cost data for 2006 through 2009 from provider billing data and provided those data to the CDC in a standardized format using an instrument that was developed by RTI International and the CDC. These included HCPCS data on reimbursement for each category of service from the billing codes on bills that providers were required to submit for each service provided. Data included the amount charged and the amount paid for the service and the date the service was provided. When necessary, local programs also provided additional clinical cost data. For example, programs provided information on the costs of FOBT kits and laboratory services that were purchased in bulk and, thus, were not reported in the provider billing data.

Three data sets were created for the CRCSDP: clinical data, including patient characteristics and details on screening and diagnostic testing; program reimbursement data on the screening costs associated with the CRCSDP; and program-level cost data. The clinical data have been described in an earlier article, and the program-level cost data are described elsewhere in this supplement to *Cancer*.[5,10,11] A unique identifier for each individual who was screened through the CRCSDP facilitated linkage between clinical and program reimbursement data sets and helped us 1) evaluate test indication, CRC risk status, and the diagnostic cascade for all billed procedures; 2) assess the completeness of screening cost data; and 3) identify procedures for which individual-level billing data were unavailable.

We used the linked data to identify the CRC risk status at the time of the procedure for each individual screened. To facilitate a cost comparison between FOBT screening and colonoscopy screening, we limited our analysis to those who were considered to be at “average risk” for CRC, as defined by the following criteria: 1) no personal or family history of CRC or adenomas, 2) no history of inflammatory bowel disease (ulcerative colitis or

Crohn disease), and 3) no history of genetic syndromes like familial adenomatous polyposis or Lynch syndrome (previously known as hereditary nonpolyposis colorectal cancer).

The linked data also helped to distinguish follow-up tests from repeat screening tests. We identified 3 types of follow-up tests: a clearance colonoscopy, which followed a complete screening colonoscopy and was required to investigate findings from the initial colonoscopy or to complete polyp removal; a diagnostic colonoscopy, which followed a positive FOBT screen; and a surveillance colonoscopy, which was recommended for patients who had an adenoma or CRC detected at their index colonoscopy. In addition to follow-up tests, we defined a repeat colonoscopy as a second colonoscopy required because the initial colonoscopy was either incomplete (the cecum was not reached) or inadequate.

We used the date of the procedure to determine whether a test was the initial screening test, a repeat test, or a follow-up test. For patients who had billing data for multiple tests, we assumed that the earliest test was a screening test and that any later tests were follow-up or repeat tests. We used the indicator for surveillance recommendation to identify patients who received a surveillance colonoscopy after an initial screening test and attributed any test fees incurred after the date of the first test to surveillance colonoscopy.

We excluded individuals who had missing or incomplete colonoscopy cost data (whether for screening or follow-up colonoscopy) and those for whom reported colonoscopy costs were less than $200, because these costs likely reflected only partial payments. We aggregated all colonoscopy costs (including costs for bowel preparation, anesthesia, pathology, and other clinical services for each colonoscopy) to the test level so that we could compare costs across sites.

We report the actual amounts reimbursed for clinical services incurred during the demonstration period. They do not reflect costs associated with follow-up procedures that were recommended but not performed under the CRCSDP or the full costs of surveillance (because many patients for whom surveillance colonoscopy was recommended did not receive it them until after the CRCSDP ended).

RESULTS

After we applied the exclusion criteria described above, our study sample consisted of 2131 average-risk individuals who were screened with FOBT (1264 in Nebraska and 867 in Greater Seattle) and 1888 who were screened with colonoscopy (528 in Baltimore City, 227 in St. Louis, 156 in Nebraska, 714 in Suffolk County, and 263 in Greater Seattle) (Table 1). The percentage of individuals who had office visits before being screened varied widely by site and by screening method. For example, whereas none of the individuals who were screened by FOBT in Nebraska had an associated office visit, 49% of those who were screened with FOBT in Greater Seattle did have an associated office visit. Among those who were screened with colonoscopy, the percentage with an associated office visit ranged from 2% of those screened in Nebraska to 100% of those screened in Greater Seattle. No screened individuals in Suffolk County, New York, had a specific billable office visit, because providers there served patients who were referred by a PCP, and payment for the already

scheduled primary care visit was handled outside of the program.[12] In addition, the precolonoscopy visit was handled over the telephone by the lead PCP in this program, who was in close contact with the participating program gastroenterologists. This process used by Suffolk County, as described elsewhere in this supplement to *Cancer*, ensured that screened individuals met criteria for both medical and financial eligibility for the CRCSDP.[12,13]

Diagnostic colonoscopies to follow-up on a positive FOBT were performed for 3% of patients screened in Nebraska and 8% of those screened in Greater Seattle. Repeat colonoscopy because of an incomplete screening colonoscopy was required by less than 5% of patients in each of the programs. Clearance colonoscopies to investigate initial findings or to complete polyp removal were performed on a small percentage of patients in Baltimore City and Suffolk County, New York.

Among individuals who were screened with FOBT, 5% or less had positive diagnostic colonoscopy results indicating a need for surveillance colonoscopy. At most 2% of those screened by colonoscopy required surveillance colonoscopies in Baltimore City, St. Louis, and Suffolk County, New York. None of those screened with colonoscopy in Nebraska or Greater Seattle required surveillance colonoscopy.

The unit cost of screening tests, follow-up tests, and office visits all varied substantially by site and by type of screening method, as indicated in Table 2. Although the cost per FOBT screening was approximately $15 for both programs, the component costs varied between Nebraska ($3 per kit and $12 for processing) and Greater Seattle ($7 per kit and $9 for patient coordination). The average cost of an office visit associated with FOBT screening was $58 in Greater Seattle.

The average cost of a screening colonoscopy ranged from $610 in St. Louis to $1477 in Baltimore City, and the average cost of an office visit associated with a screening colonoscopy ranged from $21 in St. Louis to $123 in Greater Seattle. Although the average cost of a diagnostic colonoscopy was similar in Greater Seattle and Nebraska, the average cost of a surveillance colonoscopy in Baltimore City was more than double the cost in St. Louis. The average cost of a clearance colonoscopy (approximately $1500) is likely higher than that of a diagnostic colonoscopy at the same facilities because of higher pathology costs associated with extensive polyp removal.

The distribution of total costs among screening, diagnosis, initial surveillance (the first surveillance colonoscopy), and office visits varied among the sites and by screening test. These variations reflect differences in how each program was organized, which services were provided, and how a program paid for clinical tests and services. Among the FOBT programs, the screening test represented a small share of the total clinical cost per screened individual; whereas, in colonoscopy programs, the screening test represented the majority of total clinical cost.

The total average clinical cost per individual screened by FOBT (including costs for screening, diagnosis, initial surveillance, office visits, and associated clinical services) was $49 in Nebraska and $148 in Greater Seattle. Although the cost of screening and diagnostic tests as a share of total clinical costs in an FOBT screening program were similar in

Nebraska and Greater Seattle, the distribution of other clinical costs varied. In Nebraska, laboratory costs for developing the FOBT accounted for 25% of the total per person clinical costs. Greater Seattle did not reimburse providers for developing the test but spent a similar share on patient coordination (6%) and office visits (19%). The cost of the first surveillance colonoscopy was 6% of total per person clinical costs in Nebraska and 3% in Greater Seattle.

The average per person clinical cost related to the screening procedure in a colonoscopy screening program ranged from $654 in St. Louis to $1600 in Baltimore City. The cost of screening tests as a share of total clinical costs in a colonoscopy screening program was greater than 80% for all programs. Repeat colonoscopy (after an incomplete screening colonoscopy) generally represented a very small share of total per person clinical costs. Clearance colonoscopies (to investigate previous findings or to complete polyp removal after a completed screening colonoscopy) were performed in Baltimore City and Suffolk County, New York, and represented 3% of total per person clinical costs for each program. The share of total costs allocated to first surveillance colonoscopy, when performed, was small (less than 1%). The cost of office visits as a share of total per person clinical costs varied because of variations in the level of office visit use across sites.

DISCUSSION

The CRCSDP grantees contracted with a variety of providers to offer CRC screening using FOBT or colonoscopy. We found substantial variation by screening method and by program in the type and cost of clinical services provided and in service usage rates. Overall, we found that screening with FOBT was substantially less costly than screening by colonoscopy, both in terms of average cost per person and program-level costs. Costs also varied widely by site, however, in part because sites varied in their ability to negotiate prices, purchase in bulk, or limit reimbursement to certain aspects of screening. The percentage of program clients who had office visits and received follow-up services also varied by site. We identified the following 9 factors as possible contributors to these variations:

1. *Local provider-reimbursement regulations*: Hospital colonoscopy facilities used in the Baltimore City program were regulated by the Health Services Cost Review Commission (HSCRC); although Medicare pays the HSCRC rates, the regulated rates are higher than Medicare rates for nonregulated facilities.
2. *Ability to negotiate special rates*: Nebraska negotiated a flat fee for FOBT kits, purchased FOBT laboratory processing services in bulk, and set the maximum payment for colonoscopy at the Medicare rate. One hospital in Baltimore City negotiated a special rate that was below the HSCRC rate.
3. *Patients' contributions to the cost of clinical services*: Some patients in Nebraska contributed copayments for clinical services they received.
4. *Variations in providers' policies regarding delivery of clinical services*: For example, some providers required office visits before screening patients, whereas others did not. Providers in Suffolk County, New York served patients who were

referred by a PCP and, thus, required no office visit.[14] In addition, some providers had follow-up visits with all patients screened, some with only some patients, and some with none of their patients.

5. *Variations in the cost of living*: We did not control for these variations, because we wanted to indicate the actual clinical costs at each site. Although variations in Medicare reimbursement rates (which are tied to local cost-of-living adjustments) contributed to the cost variations we observed, they did not account for all variation.

6. *Variations in the percentage of patients advised to have follow-up tests who complied*: Because our cost estimates reflect only those costs actually incurred, they are lower than what the total costs would have been if all patients had complied with follow-up recommendations.

7. *Variations in the number of patients screened*: Some programs (eg, the FOBT screening program in St. Louis) had very small patient populations for certain screening methods, which limited our ability to accurately capture rates and costs of follow-up or surveillance colonoscopies for these programs.

8. *Variations in reimbursement policies*: For example, the Nebraska program covered the laboratory costs for processing FOBTs, whereas the Greater Seattle program did not. In other programs, it was demonstrated that factors like these led to variation in colonoscopy costs in Maryland counties outside of Baltimore City (King M, Groves C, Dwyer DM; personal communication [Cost of Colonoscopy in Maryland Local Public Health Colorectal Cancer Screening Programs, Fiscal Year 2009 Report, Cigarette Restitution Fund Program, Maryland Department of Health and Mental Hygiene, September 2010]).

9. *Variations in procedures related to the colonoscopy (polypectomy, cautery, etc) not captured in these data*: Costs for colonoscopy typically are based on the procedures performed during the colonoscopy. Although we observed differences in average costs across the categories of colonoscopies used here, these cost differences probably were driven by the different procedures performed during the colonoscopies.

The variations outlined above also affected the data collection process, which became much more complex than anticipated. Bulk payments for laboratory services for FOBT processing, for example, were not recorded with clinical billing data and, thus, had to be obtained from other accounting data. Similarly, partial payments recorded in billing data provided an incomplete picture of clinical costs and, thus, were excluded from the analysis, requiring additional effort to tease out which payments were complete. Future analysis of similar programs should account for variation in how cost data are reported.

In addition to the effects of the variations cited above, limitations to our study include the relatively small number of individuals who were screened. Finally, our ability to accurately estimate surveillance costs and to perform a comprehensive comparison of clinical costs between FOBT and colonoscopy screening programs was limited by the timeframe of the demonstration. The test intervals for FOBT and colonoscopy differ substantially, and 1

screening test occurs in a single step, whereas the other can be a 2-step process. Therefore, costs would need to be measured over a longer time horizon to make a programmatic cost comparison of clinical costs associated with FOBT and colonoscopy screening. This would allow for the ability to capture the costs associated with the annual or biannual FOBTs required for FOBT to be an effective screening test and to capture the costs associated with the diagnostic and then surveillance colonoscopies that would be generated with each additional year of annual or biannual FOBT.[15] Similarly, because surveillance is ongoing, an accurate estimate of the clinical costs associated with surveillance would require a longer time horizon.

Despite these limitations, we were able to demonstrate that resource use and the cost of clinical services varied substantially among the 5 participants in the CRCSDP; that per unit procedure costs charged by some providers were different from local Medicare rates; and that, within the 4 years of this programmatic effort, clinical costs related to colonoscopy far exceeded those related to FOBT. These findings and our estimates of the clinical costs of specific CRC screening procedures and associated services can be used to guide administrators of established CRC screening programs as they evaluate their programs and look for ways to reduce costs and to guide health officials who plan to establish new, population-based CRC screening programs.

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References

1. US Cancer Statistics Working Group. United States Cancer Statistics: 1999–2006 Incidence and Mortality Web-based Report. Atlanta, GA: Centers for Disease Control and Prevention and National Cancer Institute; 2010. Available at: www.cdc.gov/uscs [Accessed May 23, 2012]
2. Centers for Disease Control and Prevention. Use of colorectal cancer tests—United States, 2002, 2004, and 2006. MMRW Morb Mortal Wkly Rep. 2008; 57:253–258.
3. Centers for Disease Control and Prevention. Vital signs: colorectal cancer screening, incidence, and mortality—United States, 2002–2010. MMRW Morb Mortal Wkly Rep. 2011; 60:884–889.
4. Seeff LC, Nadel MR, Klabunde CN, et al. Patterns and predictors of colorectal cancer test use in the adult US population. Cancer. 2004; 100:2093–2103. [PubMed: 15139050]
5. Seeff LC, DeGroff A, Tangka F, et al. Development of a federally funded demonstration colorectal cancer screening program [serial online]. Prev Chronic Dis. 2008; 5:A64. [PubMed: 18341799]
6. Seeff LC, Royalty J, Helsel WE, et al. Clinical outcomes from the CDC's Colorectal Cancer Screening Demonstration Program. Cancer. 2013; 119(suppl 15):2820–2833. [PubMed: 23868476]
7. Boehm JE, Rohan EA, Preissle J, DeGroff A, Glover-Kudon R. Recruiting patients into the CDC's Colorectal Cancer Screening Demonstration Program: strategies and challenges across 5 sites. Cancer. 2013; 119(suppl 15):2914–2925. [PubMed: 23868486]
8. Centers for Medicare and Medicaid Services. [Accessed May 23, 2012] Healthcare Common Procedure Coding System (HCPCS). Available at: www.cms.gov
9. DeGroff A, Holden D, Goode Green S, Boehm J, Seeff LC, Tangka F. Start-up of the Colorectal Cancer Screening Demonstration Program [serial online]. Prev Chronic Dis. 2008; 5:A38. [PubMed: 18341774]

10. Tangka FK, Subramanian S, Bapat B, et al. Cost of starting colorectal cancer screening programs: results from 5 federally funded demonstration programs [serial online]. Prev Chronic Dis. 2008; 5:A47. [PubMed: 18341782]
11. Subramanian S, Tangka FKL, Hoover S, et al. Costs of planning and implementing the CDC's Colorectal Cancer Screening Demonstration Program. Cancer. 2013; 119(suppl 15):2855–2862. [PubMed: 23868480]
12. Lane DS, Messina CP, Cavanaugh MF, et al. Delivering colonoscopy screening for low-income populations in Suffolk County: strategies, outcomes and benchmarks. Cancer. 2013; 119(suppl 15):2842–2848. [PubMed: 23868478]
13. Cavanaugh MF, Lane DS, Messina CR, Anderson JC. Clinical case management and navigation for colonoscopy screening in an academic medical center. Cancer. 2013; 119(suppl 15):2894–2904. [PubMed: 23868484]
14. Lane DS, Cavanagh MF, Messina CR, Anderson JC. An academic medical center model for community colorectal cancer screening: the CDC demonstration experience. Acad Med. 2010; 85:1354–1361. [PubMed: 20453811]
15. Pignone M, Saha S, Hoerger T, et al. Cost effectiveness analyses of colorectal cancer screening: a systematic review for the US Preventive Services Task Force. Ann Intern Med. 2002; 137:96–104. [PubMed: 12118964]

TABLE 1

Clinical Services Used by Colorectal Cancer Screening Demonstration Program Participants at Average Risk for Colorectal Cancer, Overall and by Study Site[a]

	No. of Participants (%)					
Clinical Service	**Baltimore City**	**St. Louis**	**Nebraska**	**Suffolk County, NY**	**Greater Seattle**	**Total**
Screening FOBT	—	__[b]	1264 (100)		867 (100)	2131 (100)
Office visit[c]	—	—	0 (0)	—	424 (49)	424 (20)
Diagnostic colonoscopy [d]	—	—	41 (3)	—	67 (8)	108 (5)
Surveillance colonoscopy[e]	—	—	8 (0.6)	—	43 (5)	51 (2)
Screening colonoscopy[f]	528 (100)	227 (100)	156 (100)	714 (100)	263 (100)	1888 (100)
Office visit[c]	365 (69)	45 (20)	3 (2)	0 (0)	262 (100)	675 (36)
Repeat colonoscopy[g]	6 (1)	11 (4)	2 (1)	3 (0.4)	1 (0.4)	23 (1)
Clearance colonoscopy [h]	8 (2)	0 (0)	0 (0)	3 (0.4)	0 (0)	11 (0.6)
Surveillance colonoscopy[e]	9 (2)	1 (0.4)	0 (0)	11 (2)	0 (0)	21 (1)

Abbreviations: CRC, colorectal cancer; FOBT, fecal occult blood test.

[a] The CRC screening services listed are those that were provided to average-risk program participants during 2006 to 2009 for whom complete cost data were reported.

[b] These data were suppressed because of the small sample size.

[c] These were office visits before or on the day of the screening procedure.

[d] These were colonoscopies in patients who had a positive screening FOBT.

[e] These were colonoscopies in patients who had surveillance recommended after a finding of adenoma or CRC.

[f] Patients who underwent screening colonoscopy were limited to those for whose colonoscopy the Colorectal Cancer Screening Demonstration Program paid at least $200 (to exclude patients for whom only partial payments were made).

[g] These were colonoscopies after an incomplete screening colonoscopy during which the cecum was not reached.

[h] A second colonoscopy was required to investigate findings or to remove remaining polyps after a complete first colonoscopy.

TABLE 2

Average Unit Costs of Colorectal Cancer Screening Demonstration Program (CRCSDP) Clinical Tests and Related Services and Distribution of Costs Associated With Fecal Occult Blood Test Screening and With Colonoscopy Screening at Each CRCSDP Site[a]

Cost Variable	Baltimore City	St. Louis	Nebraska	Suffolk County, NY	Greater Seattle
Screening cost per test, $					
Screening FOBT: Kit	—	__[b]	3	—	7
Screening FOBT: Processing	—	—	12	—	—
Screening FOBT: Patient coordination[c]	—	—	—	—	9
Office visit: FOBT	—	—	—	—	58
Screening colonoscopy	1477	610	835	989	728
Office visit: Colonoscopy	64	21	93	-	123
Follow-up colonoscopy cost per test, $					
Clearance colonoscopy[d]	1485	—	—	1562	—
Diagnostic colonoscopy	—	—	890	—	794
Surveillance colonoscopy	1491	704	815	1054	855
Average clinical cost per individual, $[e]					
FOBT screening	—	__[b]	49	—	148
Colonoscopy screening	1600	654	842	1030	874
Distribution of screening costs, %[f]					
FOBT screening costs					
Screening test	—	__[b]	6	—	5
Test processing	—	—	25	—	—
Patient coordination	—	—	—	—	6
Office visit	—	—	—	—	19
Diagnosis	—	—	63	—	68
Initial surveillance colonoscopy	—	—	6	—	3
Colonoscopy screening costs, %					
Screening test	92	93	99	96	83
Repeat (after incomplete screen)	1	6	0.6	0.4	0.3
Office visit	3	0.6	0.2	—	16

Cost Variable	Baltimore City	St. Louis	Nebraska	Suffolk County, NY	Greater Seattle
Clearance (after complete screen)	3	—	—	3	—
Initial surveillance colonoscopy	0.7	0.2	—	0.7	—

Abbreviations: CRC, colorectal cancer; FOBT. fecal occult blood test.

[a] Listed are the average clinical costs for CRC screening, diagnosis, and initial surveillance services provided to average-risk program participants during 2006 to 2009 for whom complete cost data were reported (for patient counts, see Table 1).

[b] Data were suppressed because of the small sample size.

[c] Greater Seattle reimbursed providers for a patient coordination fee at a rate of $15 for many patients who underwent screening with FOBT. The average cost based on all patients screened by FOBT is presented here.

[d] A second colonoscopy was required after a complete screening colonoscopy to investigate findings or to complete polyp removal. A higher overall cost may result from higher pathology costs because of extensive polyp removal.

[e] These include the costs incurred by a small number of patients who followed an atypical screening cascade. These costs represent approximately 0.3% of the total costs.

[f] The share of total clinical costs for each component of a screening program is indicated, including screening, repeat, and follow-up tests and associated office visits. Totals may not sum to 100% because of rounding error.