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Costs of colorectal cancer screening provision in CDC's colorectal cancer control program: Comparisons of colonoscopy and FOBT/FIT based screening☆

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ABSTRACT

We assess annual costs of screening provision activities implemented by 23 of the Centers for Disease Control and Prevention's Colorectal Cancer Control Program (CRCCP) grantees and report differences in costs between colonoscopy and FOBT/FIT-based screening programs. We analysed annual cost data for the first three year of the CRCCP (July 2009–June 2011) for each screening provision activity and categorized them into clinical and non-clinical screening provision activities. The largest cost components for both colonoscopy and FOBT/FIT-based programs were screening and diagnostic services, program management, and data collection and tracking. During the first 3 years of the CRCCP, the average annual clinical cost for screening and diagnostic services per person served was $1150 for colonoscopy programs, compared to $304 for FIT/FOBT-based programs. Overall, FOBT/FIT-based programs appear to have slightly higher non-clinical costs per person served (average $1018; median $838) than colonoscopy programs (average $980; median $686). Colonoscopy-based CRCCP programs have higher clinical costs than FOBT/FIT-based programs during the 3-year study timeframe (translating into fewer people screened). Non-clinical costs for both approaches are similar and substantial. Future studies of the cost-effectiveness of colorectal cancer screening initiatives should consider both clinical and non-clinical costs.

1. Introduction

Colorectal cancer (CRC) poses a significant health burden in the United States as it accounts for approximately 8 percent of all new cancer cases and nearly 9 percent of all cancer deaths annually (U.S. Cancer Statistics Working Group, 2015). The United States Preventive Services Task Force recommends CRC screening for average-risk individuals aged 50–74 years (Whitlock, Lin, Liles, Beil, & Fu, 2008) using guaiac based fecal occult blood test (FOBT), fecal immunochemical test (FIT), sigmoidoscopy or colonoscopy. FOBTs and FITs (hereafter referred to as FOBT/FIT) are recommended annually; sigmoidoscopies are recommended every five years in combination with fecal testing every three years; and colonoscopies are recommended once every ten years (National Governors Association Center for Best Practices, 2008; Rex et al., 2009; Smith et al., 2015; Winawer et al., 2003).

Despite the availability of multiple screening tests for prevention and early detection of CRC, the use of CRC screening tests remains suboptimal (Centers for Disease Control and Prevention, 2013; Sabatino, White, Thompson, & Klabunde, 2015). In an effort

Abbreviations: CAT, cost assessment tool; CCDE, core clinical data elements; CDC, centers for disease control and prevention; CRC, colorectal cancer; CRCCP, colorectal cancer control program; CRCSDP, colorectal cancer screening demonstration program; FIT, fecal immunochemical test; FOBT, fecal occult blood test.

☆ The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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to increase screening rates, the Centers for Disease Control and Prevention (CDC) established the Colorectal Cancer Control Program (CRCCP), a six-year initiative beginning in 2009. Details on the CRCCP are provided elsewhere (Tangka & Subramanian, under review). Briefly, the CRCCP funded 29 grantees with several programs choosing endoscopic tests, mostly colonoscopy, with others selecting FOBT/FIT based tests. This difference in screening modality across grantee programs provides a natural experiment to assess differences in the cost of implementing and providing CRC screening in the CRCCP using endoscopy versus FOBT/FIT based tests.

Although both FOBT/FIT and endoscopy-based screening tests are cost-effective approaches to screen for CRC (Pignone, Russell, & Wagner, 2005; Vijan et al., 2007; Zauber et al., 2007), there are some variations in guideline recommendations due to the differences in test characteristics (National Governors Association Center for Best Practices, 2008; Rex et al., 2009; Smith et al., 2015; Winawer et al., 2003). Endoscopic tests allow for prevention via identification and removal of precancerous polyps as well as the detection of cancer, while FOBT/FIT tests are much less sensitive in detecting polyps and do not allow for removal of precancerous polyps unless a follow-up colonoscopy is conducted following positive test results (Smith et al., 2015). In addition, although no guidelines have considered cost-effectiveness in developing recommendations, independent analyses have shown that under certain circumstances, the use of FOBT may provide better value than colonoscopy (Fisher, Fikry, & Troxel, 2006; Subramanian, Bobashev, & Morris, 2010). Therefore, there is an ongoing need to systematically assess potential cost differences between the CRC screening modalities.

In this study we assess the differences in clinical and non-clinical screening provision costs incurred by colonoscopy-based and FOBT/FIT-based programs during the first 3 years of the CRCCP program. No prior study has addressed potential variation in the non-clinical cost of managing and operating programs using different CRC screening modalities. Analysis of the non-clinical costs of CRCCP implementation offers real-world estimates pooled across multiple public health programs. Although the primary focus of this study is on the non-clinical programmatic costs, we also report the costs of screening and diagnostic services. The findings from this study provide an economic evidence-base to inform future program funding and resource allocation to scale up public health CRC screening programs to achieve the National Colorectal Cancer Roundtable targeted screening rate of 80% by 2018 (National Colorectal Cancer Roundtable, n.d.).

2. Methods

2.1. Conceptual framework

To systematically compare the colonoscopy and FOBT/FIT programs, we categorized cost into direct clinical, direct non-clinical, and indirect non-clinical costs. Key components of these cost categories included the following:

(1) Direct clinical services-related activities—provision of screening tests, diagnostic services (diagnostic colonoscopy after positive FOBT or FIT), and surveillance procedures (follow up procedures after polyp or cancer diagnosis for individuals requiring surveillance);
(2) Direct non-clinical screening provision activities—managing provider contracts, billing systems and other procedures, providing patient navigation and support services, providing operations support to providers for screening and diagnostic services, and ensuring appropriate treatment for complications and cancers (programs do not finance any required treatments); and
(3) Indirect non-clinical overarching activities—program management, program monitoring and evaluation, and administration.

The details on the program components and the specific activities performed by the CRCCP grantees are shown in Appendix A, Fig. A1.

2.2. Data collection process

We used a pre-tested and validated web-based cost assessment tool (CAT) to collect cost and resource use data annually from all CRCCP funded grantees during the first three years of the program (July 2009–June 2011). The CAT is based on well-established methods of collecting cost data for program evaluation; details on developing, testing and evaluating the CAT have been published previously (Drummond, Schulpher, Torrance, O'Brien, & Stoddard, 2005; Salome, French, Miller, & McLellan, 2003; Subramanian, Ekwueme, Gardner, & Trogdon, 2009). All grantees were trained to input data into the web-based CAT and were also provided with a user's guide and technical assistance to ensure standardized reporting. Grantees reported the following information annually: staff salaries, roles and percent time spent on the CRCCP; types of screening promotion and screening provision activities performed; costs of materials, contracts, and consultants; and costs of overhead and administration. We asked grantees to indicate funding amounts supporting their CRCCP from the CDC and from other sources, such as the state, as well as to provide in-kind costs regarding labor, materials, and contracts.

We collected data on direct clinical, direct non-clinical, and indirect non-clinical costs. Patient navigation was not collected as a separate activity until year 2; some year 1 patient navigation costs may have been reported under other activities but since the average start-up time to begin screening was 9 months, only a small amount of expenditure was incurred for these activities in year 1. We collected information in the CAT to allow us to separate out the proportion of these overarching activities that supported screening promotion and screening provision activities. Promotion activities and cost are summarized in a companion manuscript (Tangka et al., 2016). Each year we prepared summaries of the CAT for each grantee to review for accuracy and approve. In a few instances, programs were unable to separate costs into the specific activities and these costs are reported as 'other costs.'

In addition to the cost data, the grantees submitted detailed person-level data on screening and surveillance services provided by the grantee programs. Clinical activities funded directly by CDC were reported using the Colorectal Cancer Clinical Data Elements (CCDEs) and those funded through other sources were reported in the CAT using the same standardized definitions. The data elements include type of screening test, proportion receiving a diagnostic follow-up procedure and procedure type, polyps identified and cancers detected. Details on the CCDEs and definitions used for the data elements have been reported previously (Seeff & Rohan, 2013).

2.3. Analytic framework and approach

We present details on cost and resource use stratified by programs that provided colonoscopies versus FOBT/FIT-based testing. All the programs offered colonoscopy for diagnostic follow-up after a positive FOBT/FIT result. Several programs offered colonoscopy screening for increased risk individuals as recommended by guidelines and some programs offered stool tests as an alternative to colonoscopy (Rex et al., 2009; Smith et al., 2015). We classified colonoscopy programs as those programs that

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