Importance of Age-Specific Insurer Perspective on Lifetime Cost Effectiveness of Colorectal Cancer Screening

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Abstract: In “Contrasting Effectiveness and Cost-Effectiveness of Colorectal Cancer (CRC) Screening under Commercial Insurance vs. Medicare”, Ladabaum et al. model different CRC screening scenarios that vary the combination of payer, perspective, screening ages, and time horizons. Fecal occult blood testing (FOBT), fecal immunochemical testing (FIT), colonoscopy and flexible sigmoidoscopy were all cost effective compared to no screening, even if initiating or stopping at age 65 years. Assuming perfect adherence, FIT and FOBT were cost saving and dominated colonoscopy. Screening between ages 50 and 64 years appeared relatively costly if only a limited time horizon was considered since the benefits accrue after age 65 years under Medicare.

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While uptake of colorectal cancer (CRC) screening has increased slowly to 63% nationwide [1], it still lags behind breast and cervical cancer screening, where rates have reached over 70% and 80%, respectively [2]. Over the last few years, fecal immunochemical testing (FIT) and multi-target stool DNA (MT-sDNA) have been recommended by the United States Preventive Services Task Force for CRC screening and approved for coverage by Medicare, based on systematic reviews and in part modeling [3]. Over this same time frame, there has been increasing confusion over insurance coverage of screening colonoscopy, especially in cases in which polyps are removed or colonoscopy is performed after a positive result on another CRC screening test [4]. Specifically, while the Affordable Care Act (ACA) aimed to increase access to CRC screening by mandating coverage without cost sharing, it did not address a provision in the Balanced Budget Act on 1997 that disallows Medicare from waiving the beneficiary's share of coverage for the cost of screening when a diagnostic procedure, such as biopsy or polypectomy, is performed [5]. Because of the failure of the ACA to address this Balanced Budget Act provision, Medicare does not have the authority to waive the coinsurance (up to 25%) for diagnostic or therapeutic procedures done in the context of screening. This cost sharing may be an insurmountable barrier for

low-income individuals without supplemental insurance and may contribute to CRC-related health disparities [6].

In evaluating insurance coverage of CRC screening, commercial payers are disincentivized to cover CRC screening services for beneficiaries through the age of 64 years, since the peak incidence of CRC is at 65–69 years of age [1], and therefore, most of the health and cost benefit from CRC screening is realized after commercial coverage ends (age ≥ 65 years). Past modeling studies have been limited by the simulation of outcomes using Medicare payment rates over a lifetime, rather than accounting for commercial rates at younger ages, even though Medicare rates are lower than commercial rates. These unresolved issues were the impetus for a newly published article in this issue of the *American Journal of Gastroenterology*, “Contrasting Effectiveness and Cost-Effectiveness of Colorectal Cancer Screening under Commercial Insurance vs. Medicare.” [7]

In this novel study, Ladabaum et al. [7] adapted a previously validated decision Markov model of CRC screening in order to model currently accepted CRC screening strategies. Essentially, they modeled six different scenarios that vary the combination of payer (i.e., commercial, Medicare), perspective (health care sector, single payer or society), ages of screening (i.e., 50–64, 65–80, 50–80 years), and time horizons (i.e., insurer specific, lifetime). In addition, they stratified findings to look at potential differences by gender. As appropriate in modeling studies, several assumptions were clearly justified by the authors, including the use of 2009 and 2015 Medicare and commercial costs (derived from the Truven MarketScan database) and accepted published rates of the effectiveness of screening modalities.

The study brings to light several important findings. Overall, whether using the more costly insurer rates or Medicare rates with a lifetime horizon, annual fecal occult blood testing (FOBT) and FIT are cost saving, and colonoscopy every 10 years and flexible sigmoidoscopy every 5 years are cost effective compared to no screening at all. In general, non-invasive strategies (i.e., FOBT and FIT) tended to be cost saving and outperformed invasive strategies (i.e., colonoscopy and flexible sigmoidoscopy). From a Medicare perspective, among individuals previously screened at age 50–64

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years under commercial insurance, continuing screening was more cost effective than stopping screening; however, even without continuing further screening under Medicare, there were still substantial health benefits and cost savings to Medicare. Initiating screening at age 65 years under Medicare in those previously unscreened was more effective and cost saving compared with not initiating screening. Lastly, from a commercial insurer perspective limited to ages 50–64 years, no screening strategy was cost saving and, as expected, each strategy was less cost effective compared to a lifetime horizon.

Sensitivity analyses demonstrated that the most influential variable on cost/quality-adjusted life year (QALY) was commercial payment rates. Test performance characteristics (e.g., varying the sensitivity of FIT for CRC, large and small polyps), complications rates, and costs of complications and CRC care did not change the results. In essence, the cost effectiveness of CRC screening is driven more by *costs* of the screening test rather than test *effectiveness*. The study also identified thresholds of costs under the lifetime commercial insurance perspective for colonoscopy to be cost effective ($\leq \$759$ for colonoscopy and $\leq \$1015$ for colonoscopy with lesion removal). This cost threshold was lower for women and higher for men because of the lower rates of adenomas in women compared to men, necessitating a lower cost per test in women.

I commend the authors on addressing this novel study area of comparing cost effectiveness between the pre- and post-Medicare phases of life. Their methodology was rigorous. They captured important nuances in care, accounting for variation in the cost of testing by site of service, use of moderate sedation and anesthesia services, and the impact of gender. Sensitivity analyses that varied cost and gender did not change results, adding further support to the cost effectiveness of CRC screening under almost all scenarios, regardless of payer.

The biggest limitation in this study is that the modeling assumes a perfect world, in which adherence to recommended testing intervals and subsequent follow-up care is 100%. FIT as a screening modality requires adequate system-level support to ensure adherence. Major barriers with opportunistic FIT include a drop off in annual testing and loss to follow-up colonoscopy in individuals who are FIT positive. The US Multi-Society Task Force on CRC outlined quality metric thresholds that need to be reached in order for FIT to be effective: completion rate of initial FIT of $\geq 60\%$, rate of returned FIT that cannot be processed of $< 5\%$, and a completion of colonoscopy when FIT is positive $\geq 80\%$ [8]. Current rates of colonoscopy after positive FIT are suboptimal, varying from 40 to 86% [9–13]. Thus, this current modeling study likely overestimates the cost effectiveness and cost savings of stool-based testing with FIT and likely FOBT. A sensitivity analysis around adherence with the different screening modalities would have been very interesting to evaluate.

Another small limitation, fairly acknowledged by the authors, is the lack on inclusion of MT-sDNA, because of the absence of primary data on commercial payments. However, prior modeling work of Ladabaum and Mannalithara [14] found both FIT and colonoscopy to be more effective and less costly than MT-sDNA every 3 years, when assuming equal participation rates for all strategies. Given the high cost of MT-sDNA (2018 Medicare

reimbursement set at \$508.87 per test) in part because it includes the cost of a patient support program to boost participation, its recommended 3-year interval, and need for colonoscopy if positive, adding MT-sDNA to this current study would not have changed the conclusions regarding the superiority of FIT when adherence is high. Dedication of resources, including navigation, to support patient participation in FIT, whether at a local or more systematic level similar to that included with MT-sDNA, would help ensure high FIT screening participation rates over time and improve the overall cost effectiveness of FIT.

Overall, the CRC screening modalities evaluated in this study (i.e., FOBT, FIT, colonoscopy, and flexible sigmoidoscopy) are cost effective compared to no screening, even if you stop at age 65 years or do not start until age 65 years. Furthermore, insurance coverage for CRC screening before age 65 years has clear downstream value and should be an important priority among commercial insurers. When considering real-world costs, colonoscopy is less cost effective compared to non-invasive approaches like FIT.

What are the implications for us as gastroenterologists? First, we need to closely examine the costs of colonoscopy and determine how to provide service as effectively as possible. We need to take into consideration pre-colonoscopy office visits, site of service, and extra costs incurred with anesthesia. If we do not think critically about getting the cost right, others will decide for us. Second, we should consider lifetime screening strategies that switch between modalities at different ages (e.g., FIT at younger ages followed by colonoscopy beginning at age 65 years). Third, comparative effectiveness trials, such as Colonoscopy vs. Fecal Immunochemical Test in Reducing Mortality From Colorectal Cancer (CONFIRM), that directly compare FIT and colonoscopy will provide real-world data, different than current model assumptions, on adherence over time and benefit in CRC mortality [15]. Since colonoscopy will cost more than FIT no matter what the scenario, colonoscopy must excel at preventing interval CRCs. We must provide high-quality screening throughout the continuum of care (i.e., adequate bowel preparation on first exam without repeating, adhering to surveillance guidelines and avoiding extra costs with unnecessary follow-up exams).

In conclusion, this well-done study lends further strong evidence that there are multiple cost-effective tests available for CRC screening and some are even cost saving (e.g., FOBT and FIT). Knowing this, it seems reasonable to shift our focus from investing in the development of more technologically rigorous CRC screening tests to promoting adherence with already existing modalities. Financial barriers, including confusing and variable co-payments and cost sharing, must be minimized. Our professional societies must continue to advocate on Capitol Hill to optimize policies around CRC screening coverage. This would be one small step toward improving CRC screening rates that likely would have giant benefits in lowering the burden of CRC in the United States.

CONFLICT OF INTEREST

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