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COMMUNITY GUIDE REVIEW

Increasing Colorectal Cancer Screening: A Systematic Economic Review of Patient Navigation Services

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Introduction: This paper presents a systematic economic review of patient navigation services to increase colorectal cancer screening and reduce disparities in colorectal cancer screening rates in vulnerable populations.

Methods: The literature search strategy included English-language studies conducted in high-income countries that were published from database inception to December 2022. Studies on patients with existing cancer or without healthcare system involvement were excluded. Data collection and analysis were completed in 2023. All monetary values reported are in 2022 U.S. dollars.

Results: The search yielded 17 studies with 16 studies from the U.S. and 1 study from France. The median intervention cost per person from 16 studies was $150 (interquartile interval=$58, $340). The median intervention cost per additional person screened from 17 studies was $663 (interquartile interval=$185; $1,730). Five estimates from 2 studies showed a median return on investment of 2.3% (interquartile interval=1.7%, 6.9%) for colonoscopy from healthcare providers' perspective. Two studies reported a cost per quality-adjusted life year of −$173 and −$1,442, indicating cost savings while increasing quality-adjusted life years. One study reported that the intervention had a cost per life-year gained of $3,231 or $12,293 translated to per quality-adjusted life year gained.

Discussion: Economic evidence demonstrates that patient navigation services aimed at increasing colorectal cancer screenings are cost-effective on the basis of a conservative threshold of $50,000 per quality-adjusted life year gained. In addition, the return on investment is favorable for patient navigation services to increase colorectal cancer screening by colonoscopy as the estimated reimbursement values for colonoscopy exceed intervention costs.
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INTRODUCTION

The health and economic burden of colorectal cancer (CRC) in the U.S. is substantial. In 2022, there were 147,931 new CRC cases, with the highest rates among non-Hispanic Black and non-Hispanic American Indian and Alaska Native people.[1] In 2023, 53,779 people died of CRC, with non-Hispanic Blacks having the highest mortality rates.[1] CRC also has the second highest treatment cost of any cancer, accounting for 11.6% of all cancer treatment costs.[2] In 2020, the cost of CRC care was $24.3 billion, comprising of $23.7 billion for medical services and $0.6 billion for prescription drugs.[2]

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In 2021, the U.S. Preventive Services Task Force reaffirmed its previous recommendation of CRC screening for adults aged 50−75 years (A recommendation) but also recommended offering screening starting at age 45 years (B recommendation).[3] Routine screening can find precancerous polyps that can be removed before they turn cancerous. It also helps to find CRC early, when treatment is most effective. About 89% of adults diagnosed with CRC at an early stage live for 5 years or more, compared with only 16% of those diagnosed with late-stage CRC.[1] On the basis of 2021 National Health Interview Survey data, the percentage of adults up to date with CRC screening in the U.S. in 2021 was 72.2% (95% CI=71.2%, 73.2%), which approached the original *Healthy People 2030* target of 74.4%.[4] However, there were wide disparities in screening rates among racial and ethnic minority populations and people with lower incomes. The screening rates were 62.6%, 60.9%, and 71.3% for American Indian/Alaska Native, Asian, and Black populations, respectively, compared with 74% for Whites. The screening rate for Hispanics was 62% compared with 73.6% for non-Hispanic populations.[4] For people from families with annual income <138% of the federal poverty level income, the up-to-date screening rate was 60.3% compared with 78.6% for those with >400% of the federal poverty level income.[4] For vulnerable populations served by the Federally Qualified Health Centers (FQHCs), CRC screening rate was only 40.2% in 2020, which was substantially lower than the overall national and statewide self-reported screening use on the basis of 2020 Behavioral Risk Factor Surveillance System data.[5,6] These screening disparities can increase the likelihood of late-stage cancer diagnoses and mortality among these vulnerable populations.[7]

Patient navigation (PN) services for CRC screening are defined as interventions provided through healthcare systems to help patients overcome barriers to accessing and completing CRC screening. These services may involve providing client reminders, reducing structural barriers (e.g., modifying administrative processes; assisting with appointment scheduling, transportation, translation, and childcare; and arranging alternative screening sites or hours), informing patients about cancer screenings, and reducing patients' out-of-pocket costs. Services are often designed to be culturally and language appropriate and may be delivered by community health workers, healthcare professionals, nurses, patient navigators, social workers, or others. For colonoscopy screening, the navigators play the additional role of educating patients about bowel preparations and helping them with the information and arrangement of financial resources to pay for the procedure.[8] The Community Preventive Services Task Force (CPSTF)[9] recommends PN services to increase CRC screening by colonoscopy, fecal occult blood test (FOBT), or fecal immunochemical test (FIT), on the basis of strong evidence of effectiveness.[10,11]

The objective of this paper was to provide a systematic review of economic evaluation studies of PN services to increase CRC screenings and reduce disparities in CRC screening rates for racial/ethnic minority populations and people with low income. The related review of economic evidence for PN to increase breast and cervical cancer screening was completed and published earlier.[12] These reviews are expected to help program implementors and public health decision makers assess the costs and economic benefits of these services and to determine their overall economic value when deciding on the efficient allocation of public health resources.

METHODS

No IRB approval was required for this review because it is based on evidence from previously published literature. Established methods for systematic economic reviews developed by the Centers for Disease Control and Prevention (CDC) and approved by the CPSTF were used to conduct this study.[13,14] The review was guided by a coordination team that included subject-matter experts from the Division of Cancer Prevention and Control at the CDC, members of the CPSTF, CPSTF liaisons, and economic review team members at the CDC's Community Guide Program.

The literature search was conducted with the following inclusion criteria: met the definition of the intervention that was used in the CPSTF effectiveness review,[10,11] implemented in historically disadvantaged populations and people with lower income reported by authors, included ≥1 economic outcome described in the research questions, conducted in a high-income country per World Bank criterion,[15] and written in English. The search was conducted in Medline, Embase, PsycINFO, Cochrane, Sociological Abstracts, CINAHL, and Scopus for papers published from database inception through December 2022. Reference lists in included studies were screened, and subject-matter experts were consulted for additional studies. Conference proceedings and studies lacking any healthcare system involvement or focused on patients with previously diagnosed cancer were excluded. The detailed search strategy is available on The Community Guide website.[10]

The analytic framework (Figure 1) lays down the pathway from the effectiveness of the intervention to the associated economic outcomes. The interventions improve patient knowledge, attitude, and skills about

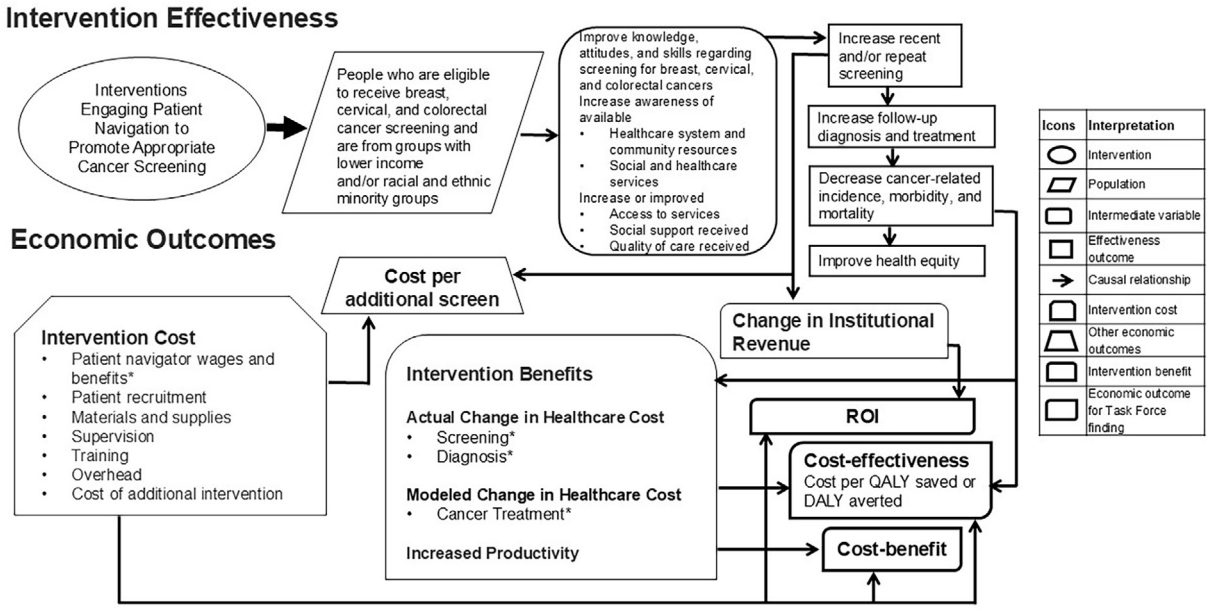

Figure 1. Analytic framework.
DALY, disability-adjusted life year; QALY, quality-adjusted life year; ROI, return on investment.

screening and available resources, leading to an increase in screening uptake. Early detection and follow-up treatment reduce cancer incidence and cancer-related morbidity and mortality. Implementing PN services requires labor and other resources, of which the navigator's wage and benefits constitute the main driver of costs. Cost per additional person screened captures the incremental cost of additional screening. Besides treatment cost savings due to earlier detection of cancer net of additional screening and diagnosis costs, intervention benefits include increased productivity. The framework conceptualizes summary economic outcomes as cost-effectiveness, cost-benefit, and return on investment (ROI). Cost-effectiveness is intervention cost net of averted healthcare cost per quality-adjusted life year (QALY) gained or disability-adjusted life year averted. Cost-benefit is the difference between benefits and cost or the benefits-to-cost ratio. An increase in colonoscopy screening also results in additional institutional revenues through reimbursements, which are postulated to increase ROI on PN services for colonoscopy screening from the healthcare providers' perspective. ROI, reported as a percentage, is defined as revenue net of intervention cost divided by intervention cost.

Three reviewers (JAR, SKC, VJ) worked in pairs and independently screened the search yield and abstracted information from the included studies. Unresolved differences were brought to the full review team to reach a majority consensus. To standardize the data, all estimates were expressed in per-person terms, and monetary values were converted to 2022 U.S. dollars using the Consumer Price Index[16] and consumption purchasing power parities from the World Bank.[17] The CPSTF economic finding required evidence for cost-effectiveness, cost-benefit, or ROI. All analyses were conducted using Microsoft Excel during June 2023 through November 2024.

Quality was assessed for each estimate reported by included studies on the basis of data collection, analysis methods and tools, types and sources of data, and other details. Two raters independently assigned and later reconciled points that indicated limitations in the quality of the estimates for intervention cost, intervention benefit, QALY, cost-benefit, and cost per QALY gained. Each estimate was scored as good, fair, or limited in (1) quality of capture, based on inclusion of components deemed to be drivers of magnitude for the estimate, and (2) quality of measurement, based on the appropriateness of analysis and methods used to derive the estimate. Details for elements considered within the quality assessment process may be found in the previously published paper[13] or the manual of economic methods on the Community Guide website.[14] The final quality score for an estimate was the lower of the quality assessed for capture and measurement. The quality score assigned to an estimate that is a combination of other estimates, such as cost-effectiveness, is the lower of the quality scores assigned to intervention cost and QALY estimates. Estimates that received a limited quality score were removed from further consideration.

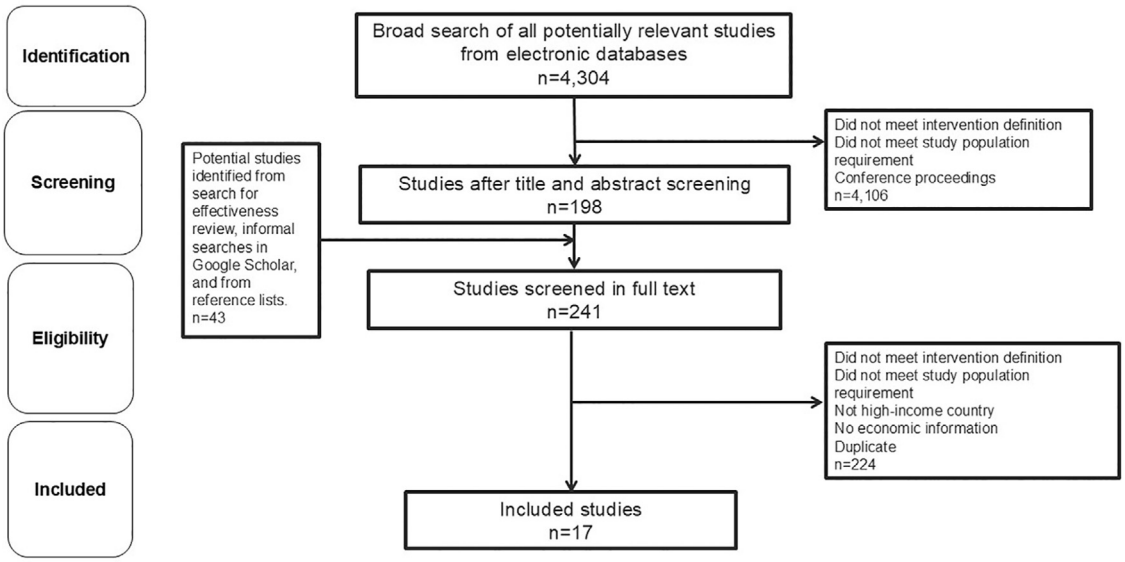

Figure 2. Search yield.

RESULTS

The search for PN services to increase cancer screening yielded 4,304 potential studies for inclusion, of which 198 underwent full-text screening (Figure 2). An additional 43 studies were identified from informal searches and the review of effectiveness. After final screening, 17 economic studies were included in the present review of PN services to increase CRC screening, with 16 studies from the U.S.[18–33] and 1 from France.[34] Among the U.S. studies, 7 were from the Northeast region,[21,24,26,28–31] and 3 studies each were from the Midwest,[18,22,25] South,[20,27,32] and West[19,23,33] regions.

Intervention and population characteristics of studies along with the economic outcomes they reported are displayed in Table 1.[18–34] Most studies were in urban areas,[18,21,23–30,32] with the remaining studies in either a mixture of rural and urban[19,20,31,33,34] or a rural setting only.[22] Screening was implemented in clinics,[18,27,31–34] health centers,[20,22,23,25,28–30] or a hospital setting.[21,24,26] The PN services were most commonly delivered by remote technology, including phone[18,19,22–27,31] or both remote and in person (i.e., clinic visits).[20,21,28,29,32–34] The PN services were utilized for different types and/or combinations of tests recommended by providers. Screening was administered as colonoscopy only,[21,23–26,31,32] colonoscopy and 1 or more additional screening test (i.e., sigmoidoscopy),[27–30,33] FIT,[18,19,22] and FOBT.[20,34]

For the type of service deliverer, more than half of the studies reported the implementer as a patient navigator.[18,19,22,23,25,26,29,30,33] Other implementers included a community health worker,[27,32] nurse,[20,31] lay health worker,[21] outreach worker,[28] social worker,[34] and both a patient navigator and a peer navigator.[24]

The most common assistance provided to reduce structural barriers was for transportation[22,24,26–32] and appointment scheduling.[23,24,27–30,32,33] Other services that decreased structural barriers included reduced administrative barriers,[19,30–32] provision of interpretation or translation services,[28–31] alternative screening hours,[31,32] or childcare.[31]

For client-oriented services, client reminder[18–22,26–29,31–34] and reduced patient out-of-pocket cost[18,21,28,30–33] were the most common. Other client-oriented services included one-on-one education,[18–21,24–28,30,32–34] group education,[23] and providing client incentives.[22] Only 1 study included provider-oriented services (e.g., provider reminder, provider assessment, and feedback).[31]

Over 60% of the participants in 10 studies[18,20,21,23–25,28,30,31,33] were female, and 1 study[32] had only male participants. Sixteen U.S. studies reported on race and ethnicity, with the largest representation for Whites (median=49.6%)[19,21,23,26,28–31,33] and Hispanic or Latino (median=47.3%),[18,19,21,23,24,26–29,31–33] followed by African American or Black (median=8.2%)[19–21,23–26,28–3133] and Asian (median=6.3%) people.[21,28–31] Only 1 study reported on American Indian populations (4.3%).[23] Studies used many different SES measures. For insurance status, 4 studies[27,31–33] reported 100% uninsured, and 2 studies[18,30] had >50% uninsured. Population income characteristics were not reported by all studies, and those that did used different measures. The populations were simply stated to be low income

Table 1. Intervention and Patient Characteristics

Study Type of screening Study design	Location	Patient navigator type Setting Interaction with patients	Patient navigation activities to reduce structural barriers	Population of focus Sample size: intervention (control)	Economic outcomes
Baker et al.,[18] FIT RCT	Chicago, Illinois, U. S.	Patient navigator Clinic - federally qualified Remote	Client reminder One-on-one education Small media	Hispanic Females (70.2%) 255 (255)	Intervention cost
Davis et al.,[20] FOBT Pre—post with control	North Louisiana, U. S.	Nurse Health center - federally qualified Remote + face to face	Client reminder Reducing patient out-of-pocket cost One-on-one education Small media	Hispanic Females (77%) Author states low income 404 (enhanced usual care 275 education 282)	Intervention cost
Davis et al.,[19] FIT Model	Oregon, U.S.	Patient navigator Simulation Remote	Reducing administrative barriers Client reminder One-on-one education Small media	Medicaid Simulated for 68,077	Intervention cost, cost per QALY gained
De Mil et al.,[34] FOBT RCT	France	Social workers Clinic community Remote + face to face	Client reminder One-on-one education Small media	Socioeconomically disadvantaged 8,105 (8,145)	Intervention cost
Elkin et al.,[21] Colonoscopy Pre—post with control	New York City, New York, U.S.	Lay health educator Hospital Remote + face to face	Client reminder Reducing patient out-of-pocket cost One-on-one education	Hispanic Females (60.3%) Less than high-school education 25,481 (18,845)	Intervention cost, ROI
Hardin et al.,[22] FIT Pre—post with control	Hazard, Kentucky, U.S.	Patient navigator Health center — federally qualified Remote	Assistance with transportation Client reminder Client incentive	Homeless, rural KITS distributed per patient 353 (184)	Intervention cost
Herman et al.,[23] Colonoscopy RCT	Phoenix, Arizona U. S.	Patient navigator Health center - federally qualified Remote	Assisting with appointment scheduling, group education	Hispanic Females (65%) Medicaid, Medicare, uninsured, low income 211 (134)	Intervention cost
Jandorf et al.,[24] Colonoscopy Pre—post	New York City, New York. U.S.	Patient navigator and peers Hospital clinic - federally qualified Remote	Assisting with appointment scheduling Assistance with transportation One-on-one education Small media	African American and Hispanic females (68%) Medicaid, Medicare, low income 604 (NA)	Intervention cost
Kim et al.,[25] Colonoscopy Pre—post with control	Chicago , Illinois, U. S.	Patient navigator Health center Remote	One-on-one education	African American Females (60%) 536 (2,713)	Intervention cost
Ladabaum et al.,[26] Colonoscopy Model	New York, New York, U.S.	Patient navigator Hospital clinic — federally qualified Remote	Assistance with transportation One-on-one education Small media	African American and Hispanic 10,000 (NA)	Intervention cost, cost per QALY gained

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Table 1. Intervention and Patient Characteristics (*continued*)

Study Type of screening Study design	Location	Patient navigator type Setting Interaction with patients	Patient navigation activities to reduce structural barriers	Population of focus Sample size: intervention (control)	Economic outcomes
Lairson et al.,[27] Colonoscopy, FIT RCT	El Paso, Texas, U.S.	CHW/Promotora Clinic community Remote	Assisting with appointment scheduling Assistance with transportation Client reminder One-on-one education Small media	Hispanic, uninsured Promotora: 148; Video+ Promotora: 159 (317)	Intervention cost
Percac-Lima et al.,[28] Colonoscopy, sigmoidoscopy, FOBT RCT	Chealsea, Massachusetts, U.S.	Outreach worker Health center Remote + face to face	Assisting with appointment scheduling Assistance with transportation Providing translation Client reminder Reducing patient out-of-pocket cost One-on-one education Small media	Low income Hispanic Females (60%) 409 (814)	Intervention cost
Percac-Lima,[29] Colonoscopy, sigmoidoscopy, colonography pre—post with control	Chealsea, Massachusetts, U.S.	Patient navigator Health center Remote + face to face	Assisting with appointment scheduling Assistance with transportation Providing translation Client reminder	Low income Hispanic 3,115 (43,905)	Intervention cost
Qian et al.,[30] Colonoscopy, FIT pre—post	New York, New York, U.S.	Patient navigator Health center - federally qualified Not reported	Reducing administrative barriers Assisting with appointment scheduling Assistance with transportation Providing translation Reducing patient out-of-pocket cost One-on-one education	Chinese American, uninsured Females (64%) 3,723 (NA)	Intervention cost
Rice et al.,[31] Colonoscopy RCT	New Hampshire, U. S.	Nurse Clinic — federally qualified Remote	Reducing administrative barriers Assistance with transportation Providing childcare Providing translation Alternative screening hours Client reminder Reducing patient out-of-pocket cost Small media Provider reminder Provider assessment and feedback	Uninsured, low income Females (62,6%) Endoscopy center 131 (75) Public health program 443 (NA)	Intervention cost, ROI

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Table 1. Intervention and Patient Characteristics (*continued*)

Study Type of screening Study design	Location	Patient navigator type Setting Interaction with patients	Patient navigation activities to reduce structural barriers	Population of focus Sample size: intervention (control)	Economic outcomes
Wilson et al.,[32] Colonoscopy Model	San Antonio, Texas, U.S.	CHW Clinic community Remote + face to face	Reducing administrative barriers Assisting with appointment scheduling Assistance with transportation Alternative screening hours Client reminder Reducing patient out-of-pocket cost One-on-one education	Hispanic Males (100%), uninsured 461 (NR)	Intervention cost, cost per QALY gained
Wolf et al.,[33] Colonoscopy, sigmoidoscopy Post only	Colorado, U.S.	Patient navigator Clinic community Remote + face to face	Assisting with appointment scheduling Client reminder Reducing patient out-of-pocket cost One-on-one education Small media	Uninsured, low income Females (62%) 13,744 (NA)	Intervention cost

CHW, community health worker; FIT, fecal immunochemical test; FOBT, fecal occult blood test; NA, not applicable; NR, not reported; QALY, quality-adjusted life year; ROI, return on investment.

without details,[20,28,29] Medicaid eligible,[19] predominantly homeless,[22] or below some percentage of the federal poverty level.[23,24,31,33] One study from France focused on low-income populations using a deprivation scale, the details of which were not provided.[34]

The median of the mean ages of participants reported in the studies was 59.3 years.[18,20,23,28–30] The median percentage of participants in the 50–64 age bracket was 75.2%, on the basis of the age distributions reported by 7 studies.[19,21,24,26,31,33,34]

Table 2[18–34] shows intervention cost, intervention cost per additional patient screened, ROI from the healthcare provider perspective, and cost-effectiveness estimates. One study provided FOBT screening cost[20]; due to the relatively small FOBT cost, this study is categorized with other studies that did not include procedure cost for estimating intervention cost.

Intervention Cost

PN wages constituted the major component of intervention cost, with some studies reporting navigators' training and supervision costs and also the cost of materials. Intervention costs sometimes included the cost of procedures that could not be extracted out. The median overall intervention cost per patient was $150 (interquartile interval [IQI]=$66, $338), on the basis of 19 estimates from 16 studies (Table 2).[18–34] Intervention cost per patient that

- included the cost of screening colonoscopy had a mean of $335, on the basis of 3 estimates from 2 studies[23,31];
- included the cost of FIT screening had a median of $80 (IQI=$43, $172), on the basis of 4 estimates from 4 studies[18,19,22,27]; and
- excluded the cost of screening procedures had a median of $128 (IQI=$70, $277), on the basis of 12 estimates from 10 studies.[20,21,24–26,28–30,32,34]

The median cost per patient for interventions that provided ≥5 services was $268 (IQI=$145, $348)[19,20,24,27–32] and $74 (IQI=$45, $150) for those providing <5 services,[18,21–23,25,26,34] indicating that cost increases with the number of services provided.

Intervention Cost per Additional Person Screened

Median overall intervention cost per additional patient screened was $663 (IQI=$202; $1,711), on the basis of 20 estimates from 17 studies (Table 2).[18–34] Median intervention cost per additional patient screened that

- included the cost of screening colonoscopy was $861 (IQI=$774; $1,196), on the basis of 4 estimates from 3 studies[23,31,33];

Table 2. Intervention Cost and Cost-effectiveness

Study Type of screening Study design	Intervention cost per patient (Quality)[a]	Procedure − cost included in estimate Intervention cost components	Intervention cost per additional patient screened (Quality)	ROI (= [revenue/intervention cost] −1 × 100) (Quality)	Cost per QALY gained (=net cost/QALY) (Quality)
Baker et al.,[18] FIT RCT	$45 (Good)	FIT Wages, materials	$56 (Good)		
Davis et al.,[20] FOBT Pre−post with control	$384 (Good)	FOBT Wages, materials	$1,702 (Good)		
Davis et al.,[19] FIT Model	$340 (Good)	FIT Wages, materials, training	$1,702 (Good)		$3,231 (=$42/0.013 life years)[b] (Fair)
De Mil et al.,[34] FOBT RCT	$58 (Good)	No Wages, materials, supervision, training	$2,228 (Good)		
Elkin et al.,[21] Colonoscopy Pre−post with control	$74 (Good)	No Wages	$536 (Good)	2.3% (= [($1,012/$989) −1]) × 100) (Good)	
Elkin et al.,[21] Colonoscopy Pre−post with control	$417 (Good)	No Wages	$2,082 (Good)	−39.1% (= [($1,012/$1,661) −1]) × 100) (Good)	
Elkin, et al.,[21] Colonoscopy Pre−post with control	$107 (Good)	No Wages	$369 (Good)	6.9% (=[($1,012/$946) −1]) × 100) (Good)	
Hardin et al.,[22] FIT Pre−post with control	$38 (Good)	FIT Wages, materials, incentives	$149 (Good)		
Herman et al.,[23] Colonoscopy RCT	$335 (Good)	Colonoscopy Wages, supervision	$799 (Good)		
Jandorf et al.,[24] Colonoscopy Pre−post	$32 (Good)	No Wages, materials, training	$211 (Good)		
Kim et al.,[25] Colonoscopy Pre−post with control	$150 (Good)	No Wages, materials, training, supervision	$176 (Good)		
Ladabaum et al.,[26] Colonoscopy Model	$35 (Good)	No Wages	$37 (Good)		Dominant[c] (= −$173/0.014) (Good)

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Table 2. Intervention Cost and Cost-effectiveness (*continued*)

Study Type of screening Study design	Intervention cost per patient (Quality)[a]	Procedure − cost included in estimate Intervention cost components	Intervention cost per additional patient screened (Quality)	ROI (= [revenue/intervention cost] −1 × 100) (Quality)	Cost per QALY gained (=net cost/QALY) (Quality)
Lairson et al.,[27] Colonoscopy, FIT RCT	$116 (Good)	FIT Wages, materials, overheads	$342 (Good)		
Percac-Lima et al.,[28] Colonoscopy, sigmoidoscopy, FOBT RCT	$241 (Good)	No Wages, training, supervision	$2,157 (Good)		
Percac-Lima et al.,[29] Colonoscopy, sigmoidoscopy, colonography pre−post with control	$233 (Good)	No NR	$885 (Good)		
Qian et al.,[30] Colonoscopy, FIT Pre−post	$98 (Good)	No Wages, materials	$143 (Good)		
Rice et al.,[31] Colonoscopy RCT	$351 (Good)	Colonoscopy Wages, materials, training	$699 (Good)	34.5% (=[$939/699 − 1] × 100) (Good)	
Rice et al.,[31] Colonoscopy RCT	$294 (Good)	Colonoscopy Wages, materials, training	$924 (Good)	1.7% (=[$939/924 − 1] × 100) (Good)	
Wilson et al.,[32] Colonoscopy Model	$502 (Good)	No Wages	$626 (Good)		Dominant[c] (= −$1,442/0310) (Good)
Wolf et al.,[33] Colonoscopy, sigmoidoscopy Post only	NR (NA)	Colonoscopy NR	$2,012 (Good)		

[a]https://www.thecommunityguide.org/pages/methods-manual.html.
[b]≤$12,293 per QALY gained.
[c]Cost savings and increased QALY gained or life years lived.
FIT, fecal immunochemical test; FOBT, fecal occult blood test; NA, not applicable; NR, not reported; QALY, quality-adjusted life year.

- included the cost of FIT screening was $245 (IQI= $126, $682), on the basis of 4 estimates from 4 studies[18,19,22,27]; and
- excluded the cost of screening procedures was $581 (IQI=$202; $1,825), on the basis of 12 estimates from 10 studies.[20,21,24–26,28–30,32,34]

The median cost per additional patient screened for interventions that provided ≥5 services was $885 (IQI= $484; $1,721)[19,20,24,27–33] and $369 (IQI=$149, $799) for those providing <5 services.[18,21–23,25,26,34]

Return on Investment

Table 2[18–34] shows the ROI reported by 2 studies.[21,31] All costs were from the healthcare provider's perspective, and the studies used actual[21] or baseline[31] Medicare reimbursement. Five estimates from the 2 studies showed a median ROI of 2.3% (IQI=1.7%, 6.9%) from colonoscopy, indicating a favorable ROI from an institutional perspective. One study calculated this outcome for 3 hospitals to be 2.3%, −39.1%, and 6.9%.[21] The hospital with negative ROI was the first to implement the patient navigator program and had substantially greater personnel costs likely related to its pioneering role in the program, with more staff and higher-paid staff initially involved in program planning and administration. The authors reported that these personnel might not have been necessary for ongoing program operation, but the hospital chose to maintain program staffing at its original level. The second study[31] examined colonoscopy outcomes and costs for a low-income, FQHC population and reported an ROI of 34.5% for navigation and colonoscopies performed by an endoscopy center and an ROI of 1.7% when the navigation intervention to increase colonoscopies was implemented through a statewide public health program.

Cost-effectiveness

Cost-effectiveness results (Table 2[18–34]) were reported as cost per QALY gained[26,32] and cost per life year gained.[19] The PN intervention was found to be dominant (versus no intervention) by 2 studies[26,32] because QALY increased and averted healthcare cost exceeded the cost of PN, indicating cost-saving. Cost per life year gained was reported by 1 study to be $3,231.[19] This value, when converted to a cost per QALY estimate, was found to be no greater than $12,293 per QALY gained, assuming the worst-case conversion factor between life year and QALY in the published literature.[32,35]

Overall, one[19] of the 3 estimates for cost per QALY gained was assessed to be fair quality, and the remaining two[26,32] were assessed to be good quality. All 3 estimates were below $50,000, a very conservative benchmark for cost-effectiveness.[36]

DISCUSSION

CRC screening involves multiple tests with different screening intervals. For example, colonoscopy screening is repeated every 10 years, and it allows screening and follow-up of positive results during the same examination. By contrast, FOBT and FIT are conducted annually and require follow-up of positive results through diagnostic colonoscopy. For the purpose of this review, all included studies must focus on colonoscopy as a primary screening tool, although navigators may also support patients with diagnostic colonoscopy for an abnormal test finding.

This systematic review finds PN services for CRC to be cost-effective on the basis of a conservative QALY threshold of $50,000. All the included studies focused on racial/ethnic minority populations and/or low-income people with no insurance or with Medicaid coverage or populations of low SES. For 2 of 3 studies, CRC screenings produced a net cost saving. In addition, the evidence indicates that there are positive ROIs from investment in colonoscopy from a healthcare provider perspective.

One study that served patients seen at FQHCs reported a favorable ROI[31] for PN intervention implemented through a statewide public health program and also within individual endoscopy centers. In this context, it is important to note the financial misalignments for FQHCs that independently undertake the critical PN services to increase CRC screening because they have to bear the costs of PN programs, whereas revenues from completed colonoscopies will benefit external endoscopy providers that are financially, legally, and administratively separate from the FQHCs. This asymmetry in economic costs and benefits has important implications for policy development, sustainability of PN programs, and equitable implementation of CRC screening strategies for vulnerable populations served by the FQHCs.

An update search was conducted during March 2025 for studies published since the search end date of the present review. An article by Fiske et al[37] found that PN increased CRC screening by 38.5% among patients at a hospital-associated safety-net clinic. The intervention involved PN for annual FIT screening followed as necessary by colonoscopy, which reduced the cost per patient screened from $946 to $72. These results are in the ballpark of results reported in this review for cost per patient for colonoscopy screening and FIT screening. Another study by Olmstead et al.[38] and colleagues modeled a similar program of screening by FIT followed by patient-

navigated colonoscopy for the state of Texas. The minimum willingness to pay ranged from $54,800 to $217,200 per additional CRC case detected for model-recommended program configurations. No other economic evaluations that met inclusion criteria were found. Importantly, no studies were found that would controvert this review's finding on cost-effectiveness.

Given the economic value of PN services in increasing cancer screening, it is necessary to support the navigators with appropriate reimbursements for the services they offer. To enhance the reach of such programs, the Centers for Medicare & Medicaid Services introduced new billing codes in January 2024 to reimburse providers for these navigation services. However, challenges remain about how to operationalize payments across various navigator roles.[39] This policy change is likely to increase the use of PN in both scale and scope. Although it is not likely to alter effectiveness of the intervention, it may result in more recent intervention cost estimates that are different from what is reported in the present review.

This systematic economic review identified some gaps in the research. What is the cost-effectiveness of PN services to increase CRC screening for population subgroups, including African Americans, who were underrepresented in this review? How does the cost-effectiveness of PN services to increase colonoscopy screening compare with that of annual FOBT/FIT screening followed by diagnostic colonoscopy? What is the cost-effectiveness of PN services to increase CRC screening for adults aged 45–49 years (following the update from U.S. Preventive Services Task Force that lowered the starting age for CRC screenings)?

Limitations

This review has some limitations. Although medians and IQIs are reported, it should be noted that the estimates came from heterogeneous interventions that varied in terms of duration, services offered, and populations served. In addition, the estimates from included studies were based on mathematical modeling studies that rely on different assumptions about inputs and parameter values.

The cost of the screening procedure such as colonoscopy was included in the estimate for intervention cost reported in several studies and could not be extracted out. Hence, these estimates for intervention cost and intervention cost per additional screen were not purely the cost of PN.

CONCLUSION

PN services to increase CRC screening are highly cost-effective, on the basis of evidence that the interventions are either cost-saving or the cost per QALY gained is far below a conservative $50,000 benchmark for cost-effectiveness. The evidence also indicates favorable ROI for colonoscopy from an institutional perspective.

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