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Review Article

Reducing inequities in colorectal cancer screening in North America

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Abstract

Colorectal cancer (CRC) is an important cause of mortality and morbidity in North America. Screening using a fecal occult blood test, flexible sigmoidoscopy, or colonoscopy reduces CRC mortality through the detection and treatment of precancerous polyps and early stage CRC. Although CRC screening participation has increased in recent years, large inequities still exist. Minorities, new immigrants, and those with lower levels of education or income are much less likely to be screened. This review provides an overview of the commonly used tests for CRC screening, disparities in CRC screening, and promising methods at the individual, provider, and system levels to reduce these disparities. Overall, to achieve high CRC participation rates and reduce the burden of CRC in the population, a multi-faceted approach that uses strategies at all levels to reduce CRC screening disparities is urgently required.

Keywords: Cancer, colorectal, equity, participation, screening

INTRODUCTION

Colorectal cancer (CRC) is the third most commonly diagnosed cancer and the second most common cause of cancer related deaths in Canada and the United States (US).[1,2] In 2014, an estimated 24,400 Canadians and 136,830 Americans will be diagnosed with CRC and 9300 Canadians and 50,310 Americans will die from the disease.[1,2] Most CRCs are believed to develop from precursor polyps over a period of at least 10 years.[3] Therefore, CRC is ideally suited for screening, which can detect and remove CRC precursor lesions and early stage CRC. Detection of CRCs at an early stage by screening leads to improved prognosis as compared to those detected at late stages due to symptoms and leads to significantly fewer deaths.

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Cancer screening is a key part of cancer control. Screening is the identification of an asymptomatic disease by the application of tests, examinations, or other procedures to a target population. It is a complex process that involves a pathway of activities, including identifying and inviting potential participants, informing them of what is involved, providing a screening test, investigating abnormal results, and ideally also ensuring subsequent management. CRC and cervical cancer are the only two cancers where screening also allows the detection and removal of premalignant lesions, which decreases the incidence of the disease and improves quality-of-life by providing a cure with less invasive measures.

This review provides an overview of the commonly used tests for CRC screening, disparities in CRC screening, and promising methods to reduce these disparities. Although the initial focus of CRC screening activities was to identify the benefits and then the preferable test for CRC screening, lately increasing efforts are focusing on reducing disparities in CRC screening. A reduction of disparities will be necessary to reach CRC screening goals set by the United States Center for Disease Control and Prevention (CDC) (>80% screened) and the Canadian Partnership Against Cancer (>60% with a fecal occult blood test [FOBT]).[4,5]

COLORECTAL CANCER SCREENING TESTS

The most commonly used CRC screening tests include guaiac-based FOBTs (g-FOBTs), fecal immunochemical tests (FIT), flexible sigmoidoscopy (FS), and colonoscopy. Additional most promising screening tests include computed tomographic (CT) colonography, and fecal DNA testing. CRC screening using the g-FOBT has been found to reduce mortality in several randomized controlled trials (RCT).[6-10] In 2008, a meta-analysis that included four RCTs found that biennial g-FOBT screening was associated with a 15% reduction in the relative risk of CRC mortality.[11] Long term follow-up of one of these RCTs suggests that the effect of g-FOBT screening on CRC mortality persists even 30 years after initial screening.[12] Since FIT requires only 1 day sample and no diet restriction, the acceptance among the public is much higher for FIT than for g-FOBT.[13,14] Although, several RCTs have also reported that screening with FS can lead to a reduction in CRC mortality,[15-18] the use of FS in Canada and the US continues to decline.[19,20] Though there is strong indirect evidence for the effectiveness of colonoscopy for CRC screening,[21] RCTs (the gold standard study design to assess cancer screening tests) of colonoscopy use (including comparisons of colonoscopy and FIT) for screening have been initiated recently.[22] Despite the fact that colonoscopy has become the preferred test for CRC screening in the US,[23] it is not an ideal CRC screening test as it is resource intensive, requires highly trained personnel, is somewhat invasive, and incurs an increased risk of rare, serious harms, such as bowel perforation, hemorrhage, and death.[24] Fecal DNA testing is a very promising test and may eventually replace both FIT and colonoscopy.[25] A recent, large, multicenter study reported that the fecal DNA test detected 92.3% of CRCs detected on colonoscopy, which was much more than the 73.8% detected by FIT.[26] Based on this study result, fecal DNA testing has been approved by the Food and Drug Administration in the US and is now available for usual clinical use at the Mayo Clinic. However, there are no trial data to guide frequency of fecal DNA testing which is also currently much more expensive than other stool tests. CT colonography is more sensitive than barium enema for detecting CRC and its precursor lesions[27] and has almost replaced the use of barium enemas in the North America, becoming the preferred test for those with incomplete colonoscopy.[28] However, although CT colonography can detect 90% of polyps and cancers larger than 10 mm in diameter,[29] its cost-effectiveness as the initial test for CRC screening is highly dependent upon the threshold of lesion size used for referral for colonoscopy and it can lead to invasive tests to investigate incidental benign findings.[28] Moreover, there are no nonmodeling studies demonstrating effectiveness of CT colonography in reducing CRC incidence or mortality.

Several Canadian and US guidelines recommend that most individuals between the ages of 50 and 74 should have CRC screening. For example, in 2001, the National Committee of Health Canada recommended screening for CRC using a fecal test every 2 years for individuals 50 years of age and older;[30,31] a recommendation, which has led to the implementation population based CRC screening programs in most Canadian provinces. The Canadian Association of Gastroenterology currently recommends that average risk individuals over 50 years of age be screened with a FOBT every 2 years, FS every 10 years, or colonoscopy every 10 years.[30] There are similar recommendations (published in 2008) from the United States Preventive Services Task Force (USPSTF) and the United States Multi-Society Task Force on CRC, which recommend the use of a FIT or a high-sensitive FOBT annually or biennially, FS every 5 years, or colonoscopy every 10 years for screening for CRC.[32,33] Updated guidelines from USPSTF and equivalent Canadian Task Force on Preventive Health Care are expected in 2015.

INEQUITIES IN COLORECTAL CANCER SCREENING

Despite these recommendations and clinical practice guidelines, which are based on high quality evidence of the benefits of CRC screening, many individuals remain unscreened. Estimates from 2011 suggest that the percentage of individuals in Canada that were up-to-date with CRC screening (defined as those who had a FOBT in the previous 2 years or a colonoscopy or a FS in the previous 5 years) was 43% (an increase from 38% in 2009).[34] In the US, CRC screening rates are some of the highest in the world, but it is estimated that only 59.6% of individuals in 2010 in the US were up-to-date for CRC screening.[35] Therefore, although CRC screening rates are improving in North America, participation rates are still considerably lower than those for other types of cancer.[36]

Several studies have explored CRC screening participation rates for different sub-groups of the population to better understand barriers to access and utilization of CRC screening. Inequities in CRC screening use arise from variety of individual, provider, and health care system-related barriers.[37-39] Individual-level barriers to CRC screening are often related to socioeconomic status (SES) (i.e. income and education). Inequalities in cancer screening participation by income level have been shown in several studies in countries both with and without universal health care insurance.[35,40-43] Information from the 2008 Canadian Community Health Survey showed that CRC screening rates were lower for individuals from lower-income households (25.2%) than in those from higher-income households (37.7%).[44] Individuals with lower incomes may experience a higher frequency of stressful events, have fewer social or economic resources available to help cope with stress, or have less time available to practice preventive health behaviors such as screening.[45-47]

Screening rates also differ across cultural and ethnic groups. In a review of the literature on the equity of participation in CRC screening among different ethnic populations, Javanparast *et al*. found that socio-cultural factors and cultural expectations play an important role in the acceptability, accessibility, and utilization of screening.[38] Common barriers cited include a lack of knowledge about CRC and the importance of screening, the belief that screening is not required in the absence of symptoms, concerns about embarrassment, discomfort, or test preparation, fear about the results, and a distrust of doctors.[48-56] Studies have also found that immigrants, particularly those with shorter residency in North America, are less likely to participate in preventive cancer screening.[57-59] Up-to-date CRC screening among recent immigrants to Canada is 19.2% compared with 35% for longer term immigrants and 31.7% for Canadian-born individuals.[44] Not knowing where to go for screening is particularly common among recent immigrants.[60] In addition, many recent immigrants do not speak English as their primary language and face an additional barrier in communicating with health care providers.[61-64]

Liss and Baker used the data from the 2010 Behavioral Risk Factor Surveillance System data to examine CRC screening by race and ethnicity in the US.[35] This study provides the most complete and updated analysis of racial/ethnic disparities in CRC screening and the degree to which disparities are explained by SES and access to care. Overall, large racial and ethnic disparities in CRC screening were found, including substantial differences between English-speaking and Spanish-speaking Hispanics. These disparities were only partially explained by SES and access to care and suggest that even if financial barriers are removed, disparities for Spanish-speaking Hispanics and Asians will persist unless interventions are tailored to these groups.

Colorectal cancer screening among Indigenous Peoples (American Indians and Alaska Natives in the US and First Nations [FN], Métis, and Inuit people in Canada) is particularly important since they now have a higher burden of CRC and increasing CRC mortality, strikingly in contrast to decreasing CRC mortality among other groups in North America.[65] For example, the age-standardized CRC incidence rate in Manitoba, Canada increased from 29.6/100,000 in 1984-1988 to 79.0/100,000 in 2004-2008 for FN individuals, but decreased from 68.4/100,000 in 1984-1988 to 66.8/100,000 in 2004-2008 for all other Manitobans.[66] Unfortunately, CRC screening rates have been consistently lower for Indigenous Peoples compared with other ethnic groups.[67,68] This has also been observed outside of North America: In Australia, 17% of individuals who identified themselves as Indigenous accepted an offer of FOBT use compared with 38.6% of nonindigenous people.[69]

Research on the influence of area of residence on screening participation is mixed. Some studies have found that individuals who live a rural area are less likely to be screened than individuals who live in an urban area while other studies have found no difference in CRC screening participation by geography.[38,44] Variation across studies may be due to diverse data sources and different definitions of rural and urban. Since CRC screening often requires a physician's referral in the US, barriers to screening may be actually due to disparities in access to a primary health care provider. In Canada, with universal health care and population-based CRC screening programs (which usually mail out the fecal test kits), CRC screening rates are only slightly lower in very remote (29.2%) and remote areas (27.7%) compared to urban areas (33.0%).[44]

At the provider level, a doctor's recommendation is the most consistent predictor of cancer screening behavior.[55,70-72] Having a regular health care provider, good continuity of care, and good communication with a health care provider all improve cancer screening participation.[55,73-75] A study by Seeff *et al*. in the US found that frequent physician visits in the past year was the strongest predictor of CRC screening and not receiving a physician recommendation was the most frequently stated barrier to screening.[72] Older patient age and a shorter length of time as a resident in the US have been found to be inversely related to a physician's recommendation for CRC screening.[55] A Canadian survey from 2012 found that only 32% of Canadians reported that their physician initiated a conversation about CRC screening.[76] Weiss *et al*. found that individuals in Wisconsin were more likely to be screened for CRC if their health care provider was in practice for >10 years, female, practiced internal medicine, or had a larger patient population that required CRC screening.[77] Research that has examined health care provider barriers to cervical cancer screening has found similar results.[78]

Health care system barriers include no health insurance or inadequate insurance coverage, no programs to recruit patients for screening, and inadequate monitoring for compliance with screening guidelines.[79] A lack of health insurance is strongly associated with reduced CRC screening in many studies.[75] However, a few studies have found that the provision of universal health insurance or insurance reimbursement alone did not reduce inequity in screening uptake.[80,81]

INTERVENTIONS AND STRATEGIES TO REDUCE SCREENING INEQUITY

A variety of interventions and strategies aimed at decreasing inequities in CRC screening have been implemented and evaluated.[82] At the individual level, these include client invitations and reminders, targeted and tailored interventions, small media, and mass media campaigns. Client reminders include letters or post cards that inform individuals about the need for screening. They can be delivered by mail, telephone, e-mail, or text message. Baron *et al*. reviewed seven studies that examined effectiveness of client reminders for CRC screening using the g-FOBT.[82] Overall, the median increase in participation was 11.5%. They concluded that there is strong evidence for the use of client reminders for FOBTs although information was limited for FS and colonoscopy.

Targeted or tailored reminders can be printed or verbal and address an individual's risk profile or other relevant barriers to screening. Results are mixed; some RCTs that used socio-psychologically tailored CRC screening interventions found an increase in participation[83-85] while others did not.[86-88] Most of these RCTs used self-reported screening participation rates which may have biased the results.[88] In 2014, Jerant *et al*. undertook a RCT that compared the CRC participation rate after receiving a tailored, interactive multimedia computer program to a nontailored program among a multiethnic population.[88] The CRC participation rate was confirmed using electronic and paper medical records. Although the tailored message increased screening knowledge, self-efficacy, and readiness for screening, there was no difference in screening uptake between the groups.

Small media include education materials that inform individuals about screening and motivate them to seek more information, talk to their health care provider, or make an appointment for screening.[4] The Task Force on Community Preventive Services recommends the use of small media for CRC screening using FOBT based on the results of several studies that found a median increase in participation of 12.7%.[82]

Mass media, such as television, radio, newspapers, magazines, and billboards, are used to communicate educational and motivational information about screening to a community. Mass media is often used in conjunction with other strategies and has been shown to effectively promote child safety seat use, physical activity, and adolescent tobacco use.[82] However, there is currently insufficient evidence to determine the utility of mass media for increasing FOBT, FS, or colonoscopy use for CRC screening participation as it is often combined with other strategies.[82] It has also been suggested that newer media forms such as mobile technology (phones and tablets), internet interfaces, and social media can improve screening participation, but additional research is needed to demonstrate their effectiveness.[89]

At the provider level, strategies include office system interventions such as flags to remind physicians to recommend screening, in-depth patient education or navigation, and physician incentives. Using a cluster randomized trial design in two Canadian provinces, Grunfeld *et al*. evaluated the effectiveness of a multifaceted, evidence-based, tailored practice-level intervention with a practice facilitator (PF) designed to improve chronic disease prevention and cancer screening.[90] Each PF supported two primary care team practices (eight physicians) and conducted a 1-h visit with each patient. CRC screening increased by 10.1% in the PF group and was found to be cost effective. This model supports the integration of an allied health professional specifically trained in chronic disease prevention and screening into the primary health care team. Navigators (usually nurses or community health workers) have been used in several RCTs that use colonoscopy for CRC screening with positive results.[91-95] Matching the navigator's linguistic capacities and cultural understanding with the population being served appears to be a key part of successful navigation.[96]

Since cost constraints in primary practice may influence the feasibility of implementing provider-level strategies, in 2006, Manitoba Health (the government agency responsible for health care in the province of Manitoba, Canada) implemented a Physician Integrated Network (PIN).[97] The PIN uses quality based incentive funding as one of the key mechanisms for engaging physicians to meet primary care quality indicators which include CRC screening. As of 2011, there were 12 fee-for-service family practice clinics participating in PIN representing a mix of urban and rural settings with practice sizes ranging from 5 to 25 physicians. The percentage of patients in these practices who had a g-FOBT in the past 2 years or a colonoscopy in the past 10 years increased from 25.5% in 2008 to 64.2% in 2011.[98] However, this network has focused on a limited number of prevention activities in each practice setting and it remains unclear if the benefits seen will be maintained with multiple prevention and screening activities. There is also evidence that increasing the supply of health care providers who can conduct FS and colonoscopy can also improve CRC screening.[99]

Although many of these individual and provider-level interventions are successful, their impact remains small and often does not include those groups of individuals who experience the greatest barriers to screening.[100,101] Therefore, to achieve large, sustainable effects, a system or multilevel approach has been suggested to be necessary to reach a wider population.[82,102-105] Population-based, organized approaches to CRC screening can increase CRC screening rates and are expected to reduce SES disparities in screening participation.[59,82] Although the US does not have a national CRC screening program, several organized approaches to CRC screening have been introduced in recent years. The Department of Veterans Affairs and Kaiser Permanente Northern California (KPNC) have both found that an organized approach to CRC screening can lead to participation rates of over 75%.[59,106] KPNC uses an electronic medical record to identify unscreened individuals and then sends them a FIT kit by mail. Individuals receive additional telephone calls and reminders as required. KPNC also uses chart reminders to prompt the offering of a screening test during primary care or specialist visits with orders to allow nonphysician clinical staff members to provide a FIT when indicated.

The CDC created the Colorectal Cancer Control Program (CRCCP) in 2009 which funds 25 states and four tribal organizations to promote and increase population-wide CRC screening with a focus on low income and under-served populations.[4] The CRCCP requires that its partners use the evidence-based strategies recommended by the Task Force on Community Preventive Services.[103]

In 2002, the state of Delaware implemented a comprehensive population-based CRC screening program that included coverage for screening (using colonoscopy) and treatment, patient navigation for screening and care coordination, and case management.[107] From 2001 to 2009, the percentage of black residents who had ever had a colonoscopy increased from 47.8% to 73.5% while the percentage of white residents increased from 58.9% to 74.7% effectively eliminating racial inequity in cancer screening. Importantly, during the same time period, the CRC incidence rate decreased by 34% and 26% for black and white residents respectively.

In response to low colonoscopy screening rates and significant SES disparities in screening in New York City (NYC), the NYC Department of Health and Mental Hygiene (DOHMH) implemented a similar program in 2003.[108] The DOHMH established a coalition of stakeholders, promoted colonoscopy through several health marketing campaigns for the public and the medical community, expanded the public hospital system's endoscopy capacity, and encouraged provider referral using a one-on-one pharmaceutical detail model. The media campaign focused on poor neighborhoods and populations with low screening rates. A direct endoscopy referral system and an in-hospital patient navigation program were developed to ensure that referred individuals were successfully screened. From 2003 to 2007, the percentage of individuals who had a colonoscopy increased from 41.7% to 61.7%. The racial/ethnic and sex disparities in screening observed in 2003 were eliminated although Asians, the uninsured, and individuals with lower levels of education and income were still less likely to be screened.

Most recently in the US, the Affordable Care Act (ACA) mandates that Medicaid and insurance plans cover all preventive services recommended by the USPSTF in full with no patient costs.[109] This includes CRC screening using an FOBT, FS, or colonoscopy. Unfortunately, the ACA does not include follow-up colonoscopies after a positive FOBT or FS despite the fact that the provision of follow-up testing is one of the criteria necessary for effective screening as identified by Wilson and Junger for the World Health Organization in 1968.[110,111] Therefore, there is concern that ACA may increase disparities in CRC screening by deterring individuals from performing a FOBT or FS if they cannot pay for the follow-up tests or necessary treatment.[109]

As of 2010, all Canadian provinces had announced or had started to implement organized CRC screening programs using an FOBT or FIT for individuals 50–74 years of age with colonoscopy follow-up for positive screening results.[76,112] Eleven quality indicators that range from participation rate to CRC cancer detection rate were developed nationally to measure the on-going performance of the provincial screening programs.[112] From 2009 to 2011, between 5% and 37.4% of individuals to whom a program was available had completed a FOBT or FIT.[5] Information is not yet available about whether or not the Canadian provincial programs have reduced inequities in screening participation.

CONCLUSIONS

Screening for CRC and its precursors is highly effective in reducing deaths due to CRC. However, it is clear that there is inequitable CRC screening between different groups in both Canada and the US. There is an urgent need for health care system interventions and health policies to help reduce disparities in CRC screening. Although evidence suggests that client-directed interventions are effective, population-wide screening is also required to minimize the barriers experienced by individuals that have lower levels of screening – ethnic minorities and Indigenous individuals, new immigrants, low-income populations, individuals with lower levels of education, and some rural or remote populations. Success has been demonstrated by several pilot programs in the US. Most of the system-wide strategies recognize the importance of developing partnerships with community organizations to ensure that screening information and strategies are culturally appropriate and relevant. Partnerships are necessary to help screen individuals who are considered hard-to-reach and have never been screened; this is particularly important since largest impact from CRC screening is accrued from the first screen. Overall, to address disparities, achieve high CRC participation rates, and reduce the burden of CRC in the population, strategies at all levels (patient, provider, and health care system) are required.

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