in the clinic

Colorectal Cancer Screening

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Annals of Internal Medicine

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Colorectal cancer is the fourth most common type of cancer and the second leading cause of cancer death in the United States (1). Outside the United States, the impact of colorectal cancer is also immense. In terms of global incidence, it ranks third among cancers affecting women and fourth for men (2). Assuming no improvement in cancer control strategies, colorectal cancer prevalence rates will increase more rapidly than U.S. population growth during the years 2000 to 2020, largely because of population aging (3). Fortunately, ample evidence shows that screening for colorectal cancer with any of several available strategies significantly decreases colorectal cancer mortality. Because most cancer arises from adenomatous polyps, detection and removal of polyps can substantially decrease the incidence of colorectal cancer. However, many people who would benefit from colorectal cancer screening do not receive it.

Risk Factors

Who is at risk for colorectal cancer?

The lifetime risk for colorectal cancer in both men and women in the United States is approximately 6%. About 93% of diagnoses are made in patients older than 50 years, with the remaining 7% in patients 40 to 50 years of age. Colorectal cancer is rare before age 40 years. Some data suggest different relationships between age and disease incidence by sex and ethnic group, but these differences are not large (4, 5).

What factors put individuals at higher risk for colorectal cancer?

About 10% of adults in the United States have a first-degree relative with colorectal cancer. People with 1 or more first-degree relatives with the disease have a lifetime risk for colorectal cancer that is 2 to 4 times higher than that for the average population. Individual risk is increased the younger the affected relative.

A first-degree relative with adenomatous polyps also increases an individual's risk for colorectal cancer. This risk is more pronounced if the affected family member is younger than 60 at the time of polyp detection (7). Clinicians should ask about colon polyps when collecting family history data.

Several colon cancer syndromes (hereditary nonpolyposis colorectal cancer [HNPCC] and familial adenomatous polyposis [FAP]) in aggregate account for about 5% of all cases of colon cancer. Colon cancer risk in these settings exceeds 80% absent any preventive measures. Concern about such a syndrome is usually prompted by the presence of multiple cases of colorectal cancer in a family; onset of cancer before 50 years of age; and the early onset of some types of extracolonic cancer, particularly gynecologic malignancies and cancer of the stomach, biliary tree, or urinary tract (6).

A 2001 systematic review to assess familial risk for colorectal cancer showed a nearly 2-fold increase in risk in individuals with a first-degree relative with adenomatous polyps, a more than 2-fold increase in risk in individuals with colorectal cancer, and a more than 4-fold increase in risk in individuals with more than 1 first-degree relative with colorectal cancer. The relative risk was higher for individuals with relatives diagnosed with colorectal cancer before age 60 years (relative risk [RR], 2.25) than for those with relatives diagnosed at or after age 60 years (RR, 1.82) (8).

1. Jemal A, Siegel R, Ward E, et al. Cancer statistics, 2007. CA Cancer J Clin. 2007;57:43-66. [PMID: 17237035]
2. Parkin DM, Bray F, Ferlay J, et al. Global cancer statistics, 2002. CA Cancer J Clin. 2005;55:74-108. [PMID: 15761078]
3. Mariotto AB, Yabroff KR, Feuer EJ, et al. Projecting the number of patients with colorectal carcinoma by phases of care in the US: 2000-2020. Cancer Causes Control. 2006;17:1215-26. [PMID: 17111252]
4. Regula J, Rupinski M, Kraszewska E, et al. Colonoscopy in colorectal-cancer screening for detection of advanced neoplasia. N Engl J Med. 2006;355:1863-72. [PMID: 17079760]
5. Theuer CP, Wagner JL, Taylor TH, et al. Racial and ethnic colorectal cancer patterns affect the cost-effectiveness of colorectal cancer screening in the United States. Gastroenterology. 2001;120:848-56. [PMID: 11231939]
6. Losi L, Di Gregorio C, Pedroni M, et al. Molecular genetic alterations and clinical features in early-onset colorectal carcinomas and their role for the recognition of hereditary cancer syndromes. Am J Gastroenterol. 2005;100:2280-7. [PMID: 16181381]
7. Winawer SJ, Zauber AG, Gerdes H, et al. Risk of colorectal cancer in the families of patients with adenomatous polyps. National Polyp Study Workgroup. N Engl J Med. 1996;334:82-7. [PMID: 8531963]

Others common clinical situations associated with elevated risk include a history of inflammatory bowel disease or of advanced polyp formation (>3 adenomas, adenoma with a villous component or high-grade dysplasia, adenoma larger than 1 cm, or previous colorectal cancer).

Risk Factors... The lifetime risk for colorectal cancer is 6% in both men and women. The great majority of colorectal cancer diagnoses occur in people age 50 years and older, and the condition is rare before age 40. Risk increases with increasing age. Having 1 or more first-degree relatives with colorectal cancer increases a person's risk for the disease 2 to 4 times over average population risk. A family history of adenomatous polyps, particularly polyps detected before age 60 years, also increases risk. A history of advanced adenoma, inflammatory bowel disease, or previous colorectal cancer also increases colorectal cancer risk.

CLINICAL BOTTOM LINE

Prevention

Can patients reduce their risk for colorectal cancer by modifying their health behaviors or using certain drugs?

Epidemiologic studies show associations between some health behaviors and colorectal cancer, so clinicians should advise patients about the potential benefits of such behaviors in lowering colorectal cancer risk (see Box). These healthy behaviors have been associated with up to 0.5- to 2.0-fold risk reductions. However, evidence is mixed for some behaviors, including modification of fat, fruit, and vegetable intake. Individuals who are nonadherent with colorectal cancer screening are also more likely than adherent individuals to have other behavior-related risk factors for colorectal cancer (9).

Health Behaviors Possibly Associated with a Reduced Risk for Colorectal Cancer

- Moderate intake of red meat and fat (both saturated and unsaturated)
- Regular physical activity
- Maintenance of normal body weight
- Avoidance of alcohol and tobacco
- Consumption of 5 to 7 daily servings of fresh fruits and vegetables
- Adequate calcium and vitamin D

Several other micronutrients have been associated with a decreased risk for colorectal cancer, but further study is necessary before supplemental intake of these specific items should be routinely recommended. These micronutrients include calcium; vitamins A, D, and E; folate; and selenium.

In addition, there is evidence that postmenopausal estrogen, aspirin, and other nonsteroidal anti-inflammatory drugs (NSAIDs) can decrease the risk for colorectal cancer and adenomatous polyps, but the balance of benefits and harms does not favor their use for primary prevention. Prospective trials have shown that aspirin and other NSAIDs decrease recurrent polyps, but the U.S. Preventive Services Task Force recommends against the routine use of these drugs for colorectal cancer or polyp prevention in average-risk individuals (10).

Postmenopausal estrogen supplements have also been shown to reduce colorectal cancer risk, but as with aspirin and NSAIDs, the balance of benefits and harms led the U.S. Preventive Services Task Force to recommend against the use of postmenopausal estrogen for the primary prevention of colorectal cancer (11–13).

8. Johns LE, Houlston RS. A systematic review and meta-analysis of familial colorectal cancer risk. Am J Gastroenterol. 2001;96:2992-3003. [PMID: 11693338]
9. Coups EJ, Manne SL, Meropol NJ, et al. Multiple behavioral risk factors for colorectal cancer and colorectal cancer screening status. Cancer Epidemiol Biomarkers Prev. 2007;16:510-6. [PMID: 17372246]
10. Dubé C, Rostom A, Lewin G, et al.; U.S. Preventive Services Task Force. The use of aspirin for primary prevention of colorectal cancer: a systematic review prepared for the U.S. Preventive Services Task Force. Ann Intern Med. 2007;146:365-75. [PMID: 17339622]
11. Rossouw JE, Anderson GL, Prentice RL, et al.; Writing Group for the Women's Health Initiative Investigators. Risks and benefits of estrogen plus progestin in healthy postmenopausal women: principal results from the Women's Health Initiative randomized controlled trial. JAMA. 2002;288:321-33. [PMID: 12117397]
12. Hulley S, Furberg C, Barrett-Connor E, et al.; HERS Research Group. Noncardiovascular disease outcomes during 6.8 years of hormone therapy: Heart and Estrogen/progestin Replacement Study follow-up (HERS II). JAMA. 2002;288:58-66. [PMID: 12090863]
13. U.S. Preventive Services Task Force. Postmenopausal hormone replacement therapy for primary prevention of chronic conditions: recommendations and rationale. Ann Intern Med. 2002;137:834-9. [PMID: 12435221]

Prevention... Health behaviors associated with reduced risk for colorectal cancer in at least some observational studies include moderate intake of red meat and fat, regular physical exercise, maintenance of normal body weight, avoidance of tobacco and alcohol, and 5 to 7 daily servings of fresh fruits and vegetables. Insufficient evidence supports the use of micronutrient supplements for colorectal cancer prevention. Although postmenopausal estrogen, aspirin, and NSAIDs can decrease colorectal cancer risk, the balance of benefits and harms does not favor their use in primary prevention.

CLINICAL BOTTOM LINE

Screening

Does the early detection of colorectal neoplasm improve patient outcomes?

Colorectal cancer survival is closely related to the clinical and pathologic stage at diagnosis. High-quality evidence shows that survival is improved when colorectal cancer is treated at earlier stages. The 5-year survival rate for colorectal cancer is 80% to 90% when cancer is limited to the bowel wall, 60% when lymph nodes are involved, and less than 10% if metastasis has occurred at the time of diagnosis (14). Colorectal cancer detected before lymph node involvement can often be effectively treated without radiation or chemotherapy.

In addition, colorectal cancer screening not only reduces disease-associated morbidity and mortality, it can also prevent cancer occurrence by removal of precancerous polyps (15).

What modalities are effective in screening for colorectal cancer?

Available evidence supports the use of a number of different modalities as screening tests for colorectal cancer (Table 1). These include fecal occult blood testing (FOBT), flexible sigmoidoscopy, double-contrast barium enema (DCBE), and colonoscopy. However, direct evidence from randomized screening trials is available only for FOBT. Evidence for barium enema, flexible sigmoidoscopy alone, and colonoscopy is ample, but largely from observational studies rather than from trials. Newer modalities, such as DNA-based stool tests and virtual colonoscopy, show promise, but definitive evidence for their effectiveness in colorectal cancer screening is not yet available.

Fecal Occult Blood Testing

Screening average-risk individuals over the age of 50 with annual or biennial FOBT has been shown in multiple randomized trials to reduce colorectal cancer incidence and mortality rates. Annual screening results in greater reduction in mortality rate than biennial screening.

A large, long-duration trial in the United States randomly assigned 46 551 volunteers aged 50 to 80 years to 5 years of screening with either annual FOBT with a guaiac-based test, biennial FOBT, or usual care. The cumulative 13-year colorectal cancer mortality rate was 33% lower in the annual group than in the control group, whereas the biennial group had a 21% lower colorectal cancer mortality rate than the control group (16, 17).

A Danish trial randomly assigned 61 933 people aged 45 to 75 years to usual care or screening with an initial nonrehydrated, guaiac-based FOBT followed by biennial FOBT for 7 rounds of screening over 13 years. At 13 years, the colorectal cancer mortality rate was 18% lower in those screened than among controls (mortality rate ratio, 0.82 [95% CI, 0.69 to 0.97]) (18).

A population-based trial in the United Kingdom randomly assigned 152 850 people aged 45 to 74 years to either control or

14. American Cancer Society. Cancer facts and figures 2007. Atlanta: American Cancer Society; 2007.
15. Winawer SJ, Zauber AG, Ho MN, et al. Prevention of colorectal cancer by colonoscopic polypectomy. The National Polyp Study Workgroup. N Engl J Med. 1993;329:1977-81. [PMID: 8247072]
16. Mandel JS, Bond JH, Church TR, et al. Reducing mortality from colorectal cancer by screening for fecal occult blood. Minnesota Colon Cancer Control Study. N Engl J Med. 1993;328:1365-71. [PMID: 8474513]
17. Mandel JS, Church TR, Ederer F, et al. Colorectal cancer mortality: effectiveness of biennial screening for fecal occult blood. J Natl Cancer Inst. 1999;91:434-7. [PMID: 10070942]

Table 1. Advantages and Disadvantages of Available Colorectal Cancer Screening Techniques*

Test	*Frequency*	*Advantages*	*Disadvantages*
FOBT	Annual	No referral required; inexpensive; RCTs show effectiveness in decreasing colorectal cancer mortality; noninvasive	Positive tests require follow-up colonoscopy; many false positives will require follow-up endoscopy
Flexible sigmoidoscopy	Every 5 years	Quicker and less expensive than colonoscopy; less intense preparation; no sedation, so patient can go home without assistance	Does not visualize the entire colon; uncomfortable for some patients (no sedation); positive test requires follow-up colonoscopy; requires referral in some settings
Double-contrast barium enema	Every 5 years	Less expensive; no sedation, so patient can go home without assistance	Less sensitive for polyp and cancer detection than colonoscopy; uncomfortable for many patients; positive test requires follow-up colonoscopy; requires referral
Colonoscopy	Every 10 years	Visualization of entire colon and rectum; allows for biopsy and polypectomy, so screening is a 1-step process; seems cost-effective	Invasive with low but definite risks of adverse events; bowel preparation is unpleasant, but sedation makes actual test comfortable for most patients; patients cannot go home independently after test; requires referral
CT colonography	Unknown	Shorter test than colonoscopy; noninvasive; allows visualization of entire colon and rectum	Uncomfortable for many patients because of air insufflation during procedure; requires bowel preparation; performance is operator-dependent; not presently endorsed for screening; requires referral

**CT = computed tomography; FOBT = fecal occult blood test; RCT = randomized, controlled trial.*

FOBT at entry and then 3 to 6 rounds of screening every 2 years. There were 360 colorectal cancer deaths in the screened group compared with 420 in the control group (odds ratio [OR], 0.85 [CI, 0.74 to 0.98]) (19).

A population-based trial in Sweden randomly assigned 68 308 people aged 60 to 64 years to control or 2 rounds of FOBT screening at baseline and then at 16 to 24 months. Mortality data have not been published, but were made available for a meta-analysis of the 4 FOBT trials, which showed a 16% reduction in colorectal cancer death (RR, 0.84 [CI, 0.77 to 0.93]) in the screening group. In an analysis of participants who adhered to screening, the risk reduction was 23% (20).

When using FOBT to screen for colorectal cancer, it is imperative that the test is used correctly, with specimens obtained at home by the patient from each of 3 consecutive bowel movements (see Box). A single test performed during a digital

How to Use Fecal Occult Blood Testing to Screen for Colorectal Cancer

- Instruct patient to avoid red meat and more than 1 aspirin or NSAID for 3 days before and during testing
- Instruct patient to collect 2 stool samples from each of 3 consecutive bowel movements and apply to 3 cards, then return slides for development by trained personnel
- Positive FOBT is defined as 1 or more of 6 slides positive
- All positive tests should be followed by colonoscopy (not by repeat FOBT testing, even in the absence of recommended dietary restriction)
- When using a combination of FOBT and sigmoidoscopy for screening, FOBT should be done first because a positive result would lead to colonoscopy instead of flexible sigmoidoscopy.
- A single FOBT during rectal examination is inadequate.

18. Jørgensen OD, Kronborg O, Fenger C. A randomised study of screening for colorectal cancer using faecal occult blood testing: results after 13 years and seven biennial screening rounds. Gut. 2002;50:29-32. [PMID: 11772963]
19. Hardcastle JD, Chamberlain JO, Robinson MH, et al. Randomised controlled trial of faecal-occult-blood screening for colorectal cancer. Lancet. 1996;348:1472-7. [PMID: 8942775]
20. Towler BP, Irwig L, Glasziou P, et al. Screening for colorectal cancer using the faecal occult blood test, hemoccult. Cochrane Database Syst Rev. 2000:CD001216. [PMID: 10796760]

21. Collins JF, Lieberman DA, Durbin TE, et al.; Veterans Affairs Cooperative Study #380 Group. Accuracy of screening for fecal occult blood on a single stool sample obtained by digital rectal examination: a comparison with recommended sampling practice. Ann Intern Med. 2005;142:81-5. [PMID: 15657155]
22. Nadel MR, Shapiro JA, Klabunde CN, et al. A national survey of primary care physicians' methods for screening for fecal occult blood. Ann Intern Med. 2005;142:86-94. [PMID: 15657156]
23. Levi Z, Rozen P, Hazazi R, et al. A quantitative immunochemical fecal occult blood test for colorectal neoplasia. Ann Intern Med. 2007;146:244-55. [PMID: 17310048]
24. Selby JV, Friedman GD, Quesenberry CP Jr, et al. A case-control study of screening sigmoidoscopy and mortality from colorectal cancer. N Engl J Med. 1992;326:653-7. [PMID: 1736103]
25. Newcomb PA, Norfleet RG, Storer BE, et al. Screening sigmoidoscopy and colorectal cancer mortality. J Natl Cancer Inst. 1992;84:1572-5. [PMID: 1404450]
26. Müller AD, Sonnenberg A. Prevention of colorectal cancer by flexible endoscopy and polypectomy. A case-control study of 32,702 veterans. Ann Intern Med. 1995;123:904-10. [PMID: 7486484]
27. Winawer SJ, Flehinger BJ, Schottenfeld D, et al. Screening for colorectal cancer with fecal occult blood testing and sigmoidoscopy. J Natl Cancer Inst. 1993;85:1311-8. [PMID: 8340943]
28. Berry DP, Clarke P, Hardcastle JD, et al. Randomized trial of the addition of flexible sigmoidoscopy to faecal occult blood testing for colorectal neoplasia population screening. Br J Surg. 1997;84:1274-6. [PMID: 9313712]

rectal examination in the office is not adequate for screening (21). Any FOBT test with 1 or more positive slides is considered positive and warrants follow-up colonoscopy. Inadequate follow-up is frequently reported in primary care settings (22).

There is increasing evidence that immunochemical, as opposed to guaiac-based, FOBT may offer improved performance characteristics for screening. This newer technology is used like other FOBTs and does not have a substantial impact on cost (23).

Flexible Sigmoidoscopy

3 case–control studies show that screening with sigmoidoscopy every 5 years is associated with reduced colorectal cancer mortality. More definitive data are awaited from 3 ongoing trials.

A case–control study nested within a randomized trial of a health check-up that included sigmoidoscopy compared case-patients that had died of colorectal cancer with control participants who had not. For cancer within the reach of the sigmoidoscope, 8.8% of case-patients and 24.4% of control participants had a rigid sigmoidoscopy within the previous 10 years (OR for colorectal cancer, 0.41 [CI, 0.25 to 0.69]). Cancer rates were similar among case-patients and control participants for cancer beyond the reach of the sigmoidoscope (24).

Another case–control study matched 74 patients who died of colorectal cancer to 206 controls. Previous sigmoidoscopy had occurred in 10% of case-patients and 30% of control participants (OR for colorectal cancer, 0.21 [CI, 0.08 to 0.52]). The effect was limited to distal cancers (25).

In a case–control study that matched 8722 case-patients with colon cancer and 7629 case-patients with rectal cancer to control participants, case-patients with cancer were less likely to have undergone a previous endoscopic procedure (mostly flexible sigmoidoscopy) than control participants (OR for colon cancer, 0.51 [CI, 0.44 to 0.58], OR for rectal cancer, 0.55 [CI, 0.47 to 0.64]) (26).

Combined Fecal Occult Blood Testing and Flexible Sigmoidoscopy

Clinicians should consider using both FOBT and flexible sigmoidoscopy in combination, as several studies suggest that using the tests in combination may detect more cases of cancer and reduce colorectal cancer mortality rates more than either modality alone (27–29).

In a study in the Veteran's Administration system, FOBT detected 23.9% of patients with advanced neoplasia, flexible sigmoidoscopy detected 70.3%, and the tests combined detected 75.8% (30).

Double-Contrast Barium Enema

The effectiveness of DCBE as a screening test to prevent colorectal cancer mortality has been extrapolated from observational data. However, the use of DCBE has become less common, particularly in settings where endoscopic screening is available, because many patients find DCBE uncomfortable. Any abnormal DCBE result must be followed by endoscopy, leading to a multistep screening process.

In a study comparing results of colonoscopy with DCBE in the surveillance of 580 individuals with previous polyps, DCBE detected polyps in only one third of individuals found to have 1 or more adenomas on colonoscopy, indicating that DCBE cannot be considered a substitute for colonoscopy (31).

Colonoscopy

Colonoscopy permits visual examination of the entire colon and detects most cases of early-stage cancer and at least twice as many polyps as flexible sigmoidoscopy (32). A number of studies have shown increased detection of adenomas and carcinomas with colonoscopy compared with FOBT or flexible sigmoidoscopy (33–35). However, to date there are no randomized, controlled trials evaluating

the efficacy of screening colonoscopy in the primary prevention of colorectal cancer. Cohort studies suggest that colonoscopy with polypectomy reduces the incidence of colorectal cancer by 76% to 90% (15, 36–38). Because of these observational data, colonoscopy is among the recommended screening modalities for colorectal cancer.

Advantages of colonoscopy include visual examination of the entire colon and rectum and biopsy and removal of lesions at the time of screening rather than requiring referral for a second test. In addition to allowing polypectomy, colonoscopy allows for biopsy of other lesions and other interventions, such as cautery of bleeding lesions, dilatation of strictures, or injection of dye, to localize a tumor for subsequent surgical removal.

Disadvantages of colonoscopy include the need for colonic preparation, patient sedation, specialty referral, and the invasive nature of the procedure. Although the risks of colonoscopy and polypectomy are small, the procedure may result in bleeding, perforation, or other complications.

A prospective study of 502 asymptomatic patients who had colonoscopy for screening, surveillance, or follow-up of another positive screening test found that although 34% of patients reported mild complications (bloating and pain), only 6 had unexpected hospitalizations or emergency department visits within 30 days following colonoscopy. 94% of patients lost 2 or fewer days from normal activities because of the preparation for colonoscopy and recovery (39).

Virtual Colonoscopy

There is limited evidence available evaluating virtual colonoscopy (computerized tomographic [CT] colonography) as a screening tool for colorectal cancer. Numerous studies have included over 100 patients undergoing both CT colonography and colonoscopy, but have not been performed in screening populations. As compared with colonoscopy, sensitivity for detection of polyps >10 mm ranged from 70% to 96% and specificity ranged from 72% to 96% (40–44). A study involving highly trained radiologists showed that virtual colonoscopy was nearly as effective as colonoscopy in detecting polyps larger than 5 mm (45), but a subsequent community-based study showed worse performance (46).

A study compared the detection of advanced neoplasia from virtual colonoscopy in 3120 adults to conventional colonoscopy in 3163 adults and found 123 and 121 advanced neoplasms, respectively. Of patients who received virtual colonoscopy, 7.9% were referred for conventional colonoscopy for polypectomy of lesions 6 mm or larger. The total numbers of polyps removed were 561 in the virtual colonoscopy and 2434 in the conventional colonoscopy groups. Seven colonic perforations occurred in the conventional group compared with none in the virtual colonoscopy group (47).

Early studies regarding patient preference between virtual and optical colonoscopy have demonstrated mixed results. Although evidence supports the effectiveness of virtual colonoscopy in detecting colonic neoplasms, there are no studies of the effectiveness of CT colonography as a screening test in reducing mortality from colorectal cancer, and it is not yet among the tests recommended for colorectal cancer screening. Advantages are that it is noninvasive and can examine the entire colon. However, colonic preparation is required, and some patients find the procedure uncomfortable when air must be injected to distend the colon. Abnormal findings require referral for traditional colonoscopy. In addition, approximately 11% of patients will have new extracolonic abnormalities identified during

Risks Associated with Colonoscopy

- Perforation
- Bleeding
- Adverse reaction to sedation
- Fever with localized pain due to postpolypectomy coagulation syndrome
- Cardiovascular event
- Electrolyte, renal, or volume abnormalities secondary to bowel preparation

29. Rasmussen M, Kronborg O, Fenger C, et al. Possible advantages and drawbacks of adding flexible sigmoidoscopy to hemoccult-II in screening for colorectal cancer. A randomized study. Scand J Gastroenterol. 1999;34:73-8. [PMID: 10048736]
30. Lieberman DA, Weiss DG; Veterans Affairs Cooperative Study Group 380. One-time screening for colorectal cancer with combined fecal occult-blood testing and examination of the distal colon. N Engl J Med. 2001;345:555-60. [PMID: 11529208]
31. Winawer SJ, Stewart ET, Zauber AG, et al. A comparison of colonoscopy and double-contrast barium enema for surveillance after polypectomy. National Polyp Study Work Group. N Engl J Med. 2000;342:1766-72. [PMID: 10852998]
32. Atkin WS, Hart A, Edwards R, et al. Uptake, yield of neoplasia, and adverse effects of flexible sigmoidoscopy screening. Gut. 1998;42:560-5. [PMID: 9616321]
33. Reilly JM, Ballantyne GH, Fleming FX, et al. Evaluation of the occult blood test in screening for colorectal neoplasms. A prospective study using flexible endoscopy. Am Surg. 1990;56:119-23. [PMID: 2316930]
34. Johnson DA, Gurney MS, Volpe RJ, et al. A prospective study of the prevalence of colonic neoplasms in asymptomatic patients with an age-related risk. Am J Gastroenterol. 1990;85:969-74. [PMID: 2375325]

35. Lieberman DA, Weiss DG, Bond JH, et al. Use of colonoscopy to screen asymptomatic adults for colorectal cancer. Veterans Affairs Cooperative Study Group 380. N Engl J Med. 2000;343:162-8. [PMID: 10900274]
36. Thiis-Evensen E, Hoff GS, Sauar J, et al. Population-based surveillance by colonoscopy: effect on the incidence of colorectal cancer. Telemark Polyp Study I. Scand J Gastroenterol. 1999;34:414-20. [PMID: 10365903]
37. Citarda F, Tomaselli G, Capocaccia R, et al.; Italian Multicentre Study Group. Efficacy in standard clinical practice of colonoscopic polypectomy in reducing colorectal cancer incidence. Gut. 2001;48:812-5. [PMID: 11358901]
38. Lang CA, Ransohoff DF. Fecal occult blood screening for colorectal cancer. Is mortality reduced by chance selection for screening colonoscopy? JAMA. 1994;271:1011-3. [PMID: 8139058]
39. Ko CW, Riffle S, Shapiro JA, et al. Incidence of minor complications and time lost from normal activities after screening or surveillance colonoscopy. Gastrointest Endosc. 2007;65:648-56. [PMID: 17173914]
40. Fenlon HM, Nunes DP, Schroy PC 3rd, et al. A comparison of virtual and conventional colonoscopy for the detection of colorectal polyps. N Engl J Med. 1999;341:1496-503. [PMID: 10559450]
41. Fletcher JG, Johnson CD, Welch TJ, et al. Optimization of CT colonography technique: prospective trial in 180 patients. Radiology. 2000;216:704-11. [PMID: 10966698]
42. Miao YM, Amin Z, Healy J, et al. A prospective single centre study comparing computed tomography pneumocolon against colonoscopy in the detection of colorectal neoplasms. Gut. 2000;47:832-7. [PMID: 11076883]

virtual colonoscopy, and these may require investigation or intervention (48).

Emerging Colorectal Cancer Screening Techniques

Emerging technologies not recommended for general screening at present include fecal DNA testing and enhanced endoscopic technologies, such as high-magnification chromoendoscopy, spectroscopy, and optical coherence tomography (49). Carcinoembryonic antigen measurement is not appropriate for colorectal cancer screening.

How should clinicians and patients choose from the different screening modalities?

Because there is no clear evidence that one screening modality outperforms the others, clinicians and patients can choose either annual FOBT testing, sigmoidoscopy with or without FOBT every 5 years, DCBE every 5 years, or colonoscopy every 10 years.

Doctors and patients should weigh cost, convenience, availability, and patient preference when choosing a test. Table 2 summarizes the performance characteristics of screening modalities.

Is colorectal cancer screening cost-effective, and is one strategy for screening more cost-effective than others?

Screening for colorectal cancer has a cost per life-year saved that is similar to other nationally recommended screening programs. Available costing and cost-effectiveness analyses find some form of colorectal cancer screening to be cost-effective even without perfect adherence.

A 2002 systematic review of 7 cost-effectiveness analyses found that the cost-effectiveness of the commonly used screening modalities cost between $10 000 to $25 000 per year of life saved compared with no colorectal cancer screening. This review found that no single strategy consistently had the best cost-effectiveness ratio (50).

Table 2. Operating Characteristics for Colorectal Cancer Screening Tests*

Test	*Sensitivity, %*	*Specificity, %*	*Notes*
Fecal occult blood test	~50	>90	The 50% sensitivity figure is for a 1-time test, but the test is 90% sensitive when used as part of an annual screening program
Flexible sigmoidoscopy with biopsy	88–98 for large, distal adenomas or cancer	92–94 for large, distal adenomas and 92–96 for distal cancers	Only evaluates distal colon and rectum, should not be used alone to evaluate symptoms or signs, especially if a patient is over age 40
Colonoscopy with biopsy	90–97	>98	Preferred evaluation for positive screening tests and suggestive symptoms or signs, colonoscopy is considered the "gold standard" for both screening and evaluation of the colon
Double-contrast barium enema	~85	~80	Can be used if colonoscopy is not available or contraindicated
Virtual colonoscopy (CT colonography)	lesion ≤ 5 mm: 4 lesion 6–9 mm: 33 lesion ≥ 10 mm: 82	90	Awaits further study before clinical application can be generally recommended

**CT = computed tomography.*

What are the risks for individuals with a false-positive screening test result?

False-positive FOBT tests expose patients to the risk for colonoscopy. Clinicians and patients should understand that many noncancerous conditions and polyps that were not destined to progress will be discovered and treated, exposing patients to the potential adverse effects of further evaluation or therapy. These adverse effects include complications of colonoscopy and polypectomy, which apply regardless of the initial screening strategy because all positive screening tests require follow-up with colonoscopy. Factors that increase the risk for complications during colonoscopy include advanced age, strictures, severe colitis, significant dehydration, poor bowel preparation, and pelvic adhesions.

At what age should patients begin colorectal cancer screening?

Table 3 summarizes the recommended ages for initiation of colorectal cancer screening based on the patient's personal and family history. Persons with average risk should initiate screening at age 50 years. Of note, the American College of Gastroenterology suggests that colonoscopic screening for African Americans begin at age 45, because of epidemiologic data suggesting earlier onset and more proximal distribution of colorectal cancer (51). Recommendations about screening frequency in high-risk patients depend on the degree of increased risk and are generally based on consensus rather than direct evidence.

At what age should patients cease colorectal cancer screening?

The age at which to stop colorectal cancer screening is not known with certainty, but depends on life expectancy and the anticipated benefit of screening. Clinicians and patients should temper enthusiasm for screening the elderly with knowledge of average life expectancy in the United States. At age 75, the average woman can expect to live another 12.1 years and the average man can expect to live another 10.2 years. At age 85, life expectancy is 6.7 and 5.6 years, respectively. Because the benefits of early detection of colorectal cancer accrue over time, limited life expectancy reduces the potential benefits of screening. Clinicians and patients should consider the benefits and harms of screening for any individual elderly patient.

A cross-sectional study evaluated 1244 patients who underwent screening colonoscopy and found neoplasia in 13.8% of 50- to 54-year-old patients, 26.5% of 55- to 79-year-old patients, and 28.6% of 80-year-old patients. However, this study estimated that the mean extension of life expectancy among patients above 80 years of age was only 15% of that for those aged 50 to 54 years (52).

How frequently should patients repeat colorectal cancer screening?

According to available evidence and consensus, screening with FOBT should be repeated every year and DCBE or flexible sigmoidoscopy every 5 years if index examination reveals no abnormality that necessitates colonoscopic examination. If no high-risk polyps are detected during index colonoscopy, an average-risk person should have a repeated examination at 10-year intervals. There is no specific consensus regarding appropriate follow-up intervals for some common clinical situations, such as larger polyps removed in multiple

Characteristics of High-Risk Polyps

- Larger than 1 cm
- Villous lesion or high-grade dysplasia on histological examination
- 3 or more in number

43. Mendelson RM, Foster NM, Edwards JT, et al. Virtual colonoscopy compared with conventional colonoscopy: a developing technology. Med J Aust. 2000;173:472-5. [PMID: 11149303]
44. Yee J, Akerkar GA, Hung RK, et al. Colorectal neoplasia: performance characteristics of CT colonography for detection in 300 patients. Radiology. 2001;219:685-92. [PMID: 11376255]
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50. Pignone M, Saha S, Hoerger T, et al. Cost-effectiveness analyses of colorectal cancer screening: a systematic review for the U.S. Preventive Services Task Force. Ann Intern Med. 2002;137:96-104. [PMID: 12118964]

pieces or following colonoscopy with less-than-optimal laxative preparation. In these settings, shorter screening intervals are usually recommended.

In patients who have had 1 or more adenomatous polyps, colonoscopy is the recommended test for further surveillance. The histologic type, number, and size of the polyps should guide frequency of follow-up. Consensus recommendations advocate repeated colonoscopy in 5 years for patients with only 1 or 2 small (<1 cm) tubular adenomas (in the absence of more significant history); 3 years in patients with 3 to 10 adenomas or advanced lesions (>1 cm diameter, villous histologic component, or high-grade dysplasia); and sooner than 3 years depending on the completeness of the initial examination, certainty of complete polyp removal, and whether there are more than 10 polyps. Referral to a specialist is recommended if a hereditary syndrome is suspected.

Should clinicians screen people with higher-than-average risk for colorectal cancer differently from those at average-risk?

Table 3 describes risks for colorectal cancer and the corresponding screening recommendations. Some gastroenterologists screen patients with a family history of sporadic colorectal cancer in first-degree relatives every 3 years rather than every 5 years. Any family history confers some increase in risk, but the closer the relative, the higher the risk. Having 2 second-degree relatives with colon cancer is thought to confer a level of risk similar to having 1 first-degree relative with colon cancer. Individuals with 1 second- or third-degree relative with colon cancer and no personal history generally should be screened according to average-risk guidelines.

More aggressive screening strategies are recommended for very-high-risk individuals, including those with ulcerative colitis, FAP, or HNPCC. In ulcerative colitis, patients should begin surveillance colonoscopy after 8 to 10 years of disease. The objective of surveillance is to look for dysplasia or carcinoma. Once dysplasia is present, colectomy is recommended. Although the data are less robust, similar recommendations are appropriate for patients with Crohn colitis (53).

Adenomatous polyps occur throughout the bowel in FAP and precede the development of colorectal cancer. Clinicians should encourage individuals and families at risk for FAP to undergo genetic counseling and testing. Flexible sigmoidoscopy should begin at puberty in high-risk persons; once polyps are identified, colectomy is indicated, because further screening is ineffective at reducing the risk for cancer. Mutations of the APC gene on chromosome 5 can be identified in 70% of affected families. In a family where a specific mutation has been identified, family members who test negative have a general population risk for colorectal cancer (54, 55).

The age to begin screening and the frequency of colonoscopy in HNPCC kindreds are unknown, but individuals at high risk for HNPCC should be referred for genetic counseling and potential testing. Mutations in DNA mismatch repair genes can be identified in 50% of families suspected of having HNPCC. In such a family, an individual with a negative test result has a risk for colorectal cancer similar to that of the general population (56). If the individual is mutation-positive, regular colonoscopy screening is warranted.

If genetic testing cannot be done or is noninformative, individuals at high clinical risk for colon cancer are currently treated as if they are mutation-positive.

51. Agrawal S, Bhupinderjit A, Bhutani MS, et al.; Committee of Minority Affairs and Cultural Diversity, American College of Gastroenterology. Colorectal cancer in African Americans. Am J Gastroenterol. 2005;100:515-23; discussion 514. [PMID: 15743345]
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55. Mills SJ, Chapman PD, Burn J, et al. Endoscopic screening and surgery for familial adenomatous polyposis: dangerous delays. Br J Surg. 1997;84:74-7. [PMID: 9043460]
56. Syngal S. Hereditary nonpolyposis colorectal cancer: a call for attention [Editorial]. J Clin Oncol. 2000;18:2189-92. [PMID: 10829037]

Table 3. Risk for Colorectal Cancer and Screening Recommendations*

Clinical Scenario	*Approximate Lifetime Risk for Colorectal Cancer*	*Screening Recommendation*
General population risk in the United States	6%	Begin screening at age 50; the American College of Gastroenterology advocates initiation of screening at age 45 for African Americans because of epidemiologic data that shows earlier onset and more proximal disease in this population.
One first-degree relative with an adenomatous polyp diagnosed at age ≥60 years†	1.5- to 2-fold increased	Begin screening at age 40 or 10 years earlier than age at which adenomas were identified, whichever is earliest.
One first-degree relative with colon cancer diagnosed at age <60 years†	2- to 3-fold increased	Begin screening at age 40 years. If normal, repeat in 5 years.
Two or more first-degree relatives with colorectal cancer†	3- to 4-fold increased	Colonoscopy every 5 years, beginning at age 40 or 10 years younger than the earliest family diagnosis (whichever comes first).
First-degree relative with colon cancer or adenomatous polyps diagnosed at ≤50 years†	3- to 4-fold increased	Colonoscopy every 5 years beginning at age 40 or 10 years younger than the earliest family diagnosis (whichever comes first).
Personal history of ulcerative colitis, Crohn colitis	0.5% risk/year beginning 8 to 10 years after diagnosis	Begin surveillance colonoscopy every 1–2 years, starting 8–10 years after disease onset. Once dysplasia is detected, physicians should proceed to operative management.
Suspected FAP or HNPCC	In mutation-positive individuals without intervention, risk is 80% to 100% by age 60 years	For FAP, flexible sigmoidoscopy/colonoscopy at puberty. Refer to specialist for risk assessment, possible genetic testing, and follow-up or surveillance. For HNPCC, colonoscopy beginning at age 20. Repeat every 1–2 years. Refer to specialist for risk assessment, possible genetic testing, and follow-up or surveillance.
Personal history of an adenomatous polyp	Cancer risk increased, but magnitude not well-defined	Obtain colonoscopy 3 years after complete removal of high-risk polyp(s) (adenomatous polyp ≥1 cm, multiple adenomas, high-grade dysplasia, or villous features); If the initial adenoma is a single lesion <1 cm, obtain initial follow-up colonoscopy in 5 years; If first follow-up colonoscopy is negative, repeat in 5 years.
Personal history of hyperplastic polyp(s)	No increase in risk	Obtain next colonoscopy in 10 years

** Recommendations for individuals at higher-than-average risk are based largely on consensus from the organizations in the U.S. Multi-Society Task Force on Colorectal Cancer (Table 4).*

† First-degree relatives include parents, siblings, and children. Second-degree relatives include grandparents, aunts, and uncles. Third-degree relatives include great-grandparents and cousins.

‡ FAP = familial adenomatous polyposis; HNPCC = hereditary nonpolyposis colon cancer.

Screening... Patients at average risk for colorectal cancer should begin screening at age 50 with either annual FOBT, flexible sigmoidoscopy every 5 years, DCBE every 5 years, or colonoscopy every 10 years. Some advocate beginning screening at age 45 in African Americans, but data are lacking to directly support a benefit of earlier screening in this population. Evidence is also lacking to identify any strategy as optimal, so clinicians should discuss the advantages and disadvantages of the various screening techniques with patients. Virtual colonoscopy and fecal-based DNA tests are promising technologies, but not yet recommended for routine colorectal cancer screening. Patients with a family history of colorectal cancer or adenomas or a personal history of high-risk polyps or inflammatory bowel disease should begin screening earlier. Life expectancy, rather than age alone, should guide decisions about when to stop colorectal cancer screening.

CLINICAL BOTTOM LINE

57. U.S. Preventive Services Task Force. Screening for colorectal cancer: recommendation and rationale. Ann Intern Med. 2002;137:129-31. [PMID: 12118971]
58. American Academy of Family Physicians. Clinical Preventive Services. Accessed at www.aafp.org/online/en/home/clinical/exam.html on 12 December 2007.
59. Winawer S, Fletcher R, Rex D, et al.; Gastrointestinal Consortium Panel. Colorectal cancer screening and surveillance: clinical guidelines and rationale-Update based on new evidence. Gastroenterology. 2003;124:544-60. [PMID: 12557158]
60. American Cancer Society. Accessed at www.cancer.org on 12 December 2007.
61. American College of Gastroenterology. Clinical Updates. Accessed at www.acg.gi.org/physicians/clinicalupdates.asp#guidelines on 12 December 2007.
62. Davila RE, Rajan E, Baron TH, et al.; Standards of Practice Committee, American Society for Gastrointestinal Endoscopy. ASGE guideline: colorectal cancer screening and surveillance. Gastrointest Endosc. 2006;63:546-57. [PMID: 16564851]
63. Meissner HI, Breen N, Klabunde CN, et al. Patterns of colorectal cancer screening uptake among men and women in the United States. Cancer Epidemiol Biomarkers Prev. 2006;15:389-94. [PMID: 16492934]
64. Nichols S, Koch E, Lallemand RC, et al. Randomised trial of compliance with screening for colorectal cancer. Br Med J (Clin Res Ed). 1986;293:107-10. [PMID: 3089411]
65. Zapka JG, Lemon SC, Puleo E, et al. Patient education for colon cancer screening: a randomized trial of a video mailed before a physical examination. Ann Intern Med. 2004;141:683-92. [PMID: 15520425]

What measures do U.S. stakeholders use to evaluate the quality of colorectal cancer screening?

The Centers for Medicare & Medicaid Services has issued specifications for measures that make up the 2008 Physician Quality Reporting Initiative. Of these measures, 1 relates to colorectal cancer. This measure evaluates the percentage of adults 50 to 80 years of age who are under the care of a physician and underwent appropriate screening for colorectal cancer with either FOBT testing in the measurement year, flexible sigmoidoscopy or barium enema within the measurement year or the previous 4 years, or colonoscopy during the measurement year or the previous 9 years (see Box).

What do professional organizations recommend regarding colorectal cancer screening?

National organizations, such as the American Cancer Society, and most major medical and surgical societies have advocated colorectal cancer screening of the asymptomatic, average-risk population with a variety of screening tests starting at age 50. Table 4 summarizes the recommendations of various groups.

In 2002, the U.S. Preventive Services Task Force strongly recommended screening with 1 of several tests for all adults over age 50 years (57), and the American Academy of Family Practice endorses these same recommendations (58). Similar recommendations were advocated in 2003 by the U.S. Multi-Society Task Force on Colorectal Cancer (59) and in 2006 by the American Cancer Society (60). The American College of Gastroenterology advocates colonoscopy as the preferred screening modality and screening for African American patients to begin at age 45 instead of age 50 (61). The American Society of Gastrointestinal Endoscopy also advocates colonoscopy as the preferred screening modality (62).

National Committee for Quality Assurance Colorectal Cancer Screening Performance Measure

The percentage of adults who had an appropriate screening for colorectal cancer.

Numerator: Number of adult patients 50 to 80 years of age who had 1 or more screenings for colorectal cancer as defined by any 1 of the 4 following criteria:

- FOBT during the measurement year
- Flexible sigmoidoscopy during the reporting period or the previous 4 years.
- Barium enema (double or air contrast) during the reporting period or the previous 4 years.
- Colonoscopy during the reporting period or the previous 9 years.

Denominator: Patients 50 to 80 years of age during the reporting period.

Are there ways to improve adherence to colorectal cancer screening?

Many people who would benefit from colorectal cancer screening do not receive it (63). People are generally poorly informed about colorectal cancer screening and patient–physician interactions during routine visits.

A variety of strategies has been studied to increase colorectal cancer screening, including reminder systems, educational videos, and educational pamphlets, and these have had varying results (64–66). However, it appears that patients who receive a clear recommendation for cancer screening from a primary care physician are more likely to follow through with screening than

Table 4. Guidelines for Screening Average-Risk Individuals for Colorectal Cancer*

Organization and Date	*Summary of Recommendation(s)*	*Basis of Recommendation(s)*	*Notes*
U.S. Preventive Services Task Force 2002	Strongly recommends that clinicians screen all adults ≥50 years with FOBT, FSIG alone or with FOBT, DCBE, or colonoscopy.	Based on systematic review of the literature, Grade A recommendation based on fair-to-good-quality evidence	Insufficient data to determine which screening strategy is best in terms of the balance of benefits and harms or cost-effectiveness
U.S. Multi-Society Task Force on Colorectal Cancer† 2003	Recommends screening adults ≥50 years by offering options for different screening strategies: annual FOBT, FSIG every 5 years, annual FOBT plus FSIG every 5 years, colonoscopy every 10 years, DCBE every 5 years	Based on an update of evidence published after 1997 AHCPR guideline	Follow up positive tests with diagnostic colonoscopy; no rehydration for FOBT
American Cancer Society 2006	Beginning at age 50, both men and women should follow one of these 5 screening options: annual FOBT or FIT every year, FSIG every 5 years, annual FOBT or FIT and FSIG every 5 years, DCBE every 5 years, colonoscopy every 10 years	Based on research evidence and align with the U.S. Preventive Services Task Force guidelines	FOBT or FIT test should be done at home following manufacturer's recommendations and not in the doctor's office; combined testing preferred over either annual FOBT or FIT, or FSIG every 5 years, alone. No justification for repeating FOBT in response to an initial positive finding
American College of Gastroenterology 2000, 2005 update	Screen average risk individuals beginning at age 50 with colonoscopy every 10 years as the preferred screening strategy	American College of Gastroenterology panel with expertise in colorectal cancer screening considered new data to update 1997 AHCPR guideline	Alternate strategies: flexible sigmoidoscopy every 5 years with annual FOBT, DCBE every 5 years
	Screen African Americans aged 45 years and older with colonoscopy (2005)	Based on expert consensus because of high incidence of colorectal cancer and a greater prevalence of proximal lesions	
American Academy of Family Practice 2006	Strongly recommends screening men and women 50 years of age or older for colorectal cancer.	Based on 2002 U.S. Preventive Services Task Force recommendations	
American Society of Gastrointestinal Endoscopy 2006	Screen adults 50 years and older with one of the following: Annual FOBT, FSIG every 5 years, annual FOBT plus FSIG every 5 years, colonoscopy every 10 years		Advocates colonoscopy as the preferred screening strategy

** AHCPR = Agency for Health Care Policy and Research; DCBE = double-contrast barium enema; FIT = fecal immunochemical test; FOBT = fecal occult blood test; FSIG = flexible sigmoidoscopy.*

† Multi-Society Task Force included American College of Gastroenterology, American College of Physicians, American Gastroenterology Association, American Society of Gastrointestinal Endoscopy.

patients who do not receive such a message.

What information should clinicians include in discussions with patients about colorectal cancer screening?

When discussing colorectal cancer screening with patients, clinicians should inform patients that colorectal cancer is common and that screening reduces both colorectal cancer incidence, through the removal of polyps, and mortality, by identifying cancer at earlier, more treatable stages. Patients should be informed about the advantages and

66. Denberg TD, Coombes JM, Byers TE, et al. Effect of a mailed brochure on appointment-keeping for screening colonoscopy: a randomized trial. Ann Intern Med. 2006;145:895-900. [PMID: 17179058]

disadvantages of the recommended screening modalities before selecting which to use.

If colonoscopy is chosen, the clinician should inform the patient about the risks of the procedure and give careful instructions regarding the preparation so they understand that their activity on the day before the procedure will be limited by the diarrhea resulting from the preparation. Most medications, including blood pressure medications, may be taken on the day of the procedure, preferably before whatever preparation is required on that day. In general, aspirin and other NSAIDs do not need to be discontinued in the absence of a preexisting bleeding disorder However, oral iron- and bismuth-containing medications should be discontinued for several days before the procedure because they may impair visualization. Insulin and anticoagulation will require individualized adjustment. Patients should not eat of drink for a few hours before the procedure to reduce the risk for aspiration. Patients should know that they will receive sedation and will need a ride home after the procedure, but can expect to return to their usual activities the following day.

Practice Improvement... The measurement of appropriate colorectal cancer screening rates for patients 50 to 80 years of age is among the measures that the Centers for Medicare & Medicaid Services are using to evaluate the quality of care that physicians provide. Several professional organizations advocate colorectal cancer screening beginning at age 50 years and acknowledge a variety of screening modalities as adequate, although a few subspecialty societies advocate for colonoscopy as the preferred screening intervention. Despite consensus about the value of colorectal cancer screening, many patients do not receive screening. A clear message about the importance of colorectal cancer screening to patients from their physicians can increase patients' participation.

CLINICAL BOTTOM LINE

in the clinic

Tool Kit

Colorectal Cancer Screening

PIER Modules

www.pier.acponline.org

Access PIER modules on colorectal cancer, screening for colorectal cancer, and colonoscopy.

Quality Measures

pier.acponline.org/qualitym/prv.html

Access the PIER Quality Measure Tool, designed to link newly developed quality measures issued by the Ambulatory Quality Alliance and the Physician Quality Improvement QA Alliance and CMS's Physician Quality Reporting Initiative program to administrative criteria for each measure and readily available clinical guidance to help improve care.

www.cms.hhs.gov/PQRI

Access information on the Centers for Medicare and Medicaid Services 2008 Quality Reporting Initiative.

Patient Information

www.annals.org/intheclinic/tools

Download copies of the Patient Information sheet that appears on the following page for duplication and distribution to your patients.

Educational Slide Presentation

media.acponline.org/acponline/handouts2007/mtp028.pdf

View slides from a presentation on colorectal cancer screening delivered at ACP's Internal Medicine 2007 meeting.

WHAT YOU SHOULD KNOW ABOUT COLORECTAL CANCER SCREENING

Colorectal cancer is cancer of the colon (large intestine) or rectum (end of the large intestine). It is one of the most common types of cancer in both men and women.

Surgery can cure colorectal cancer if it is found early. Cancers found later may not be curable.

Screening checks for cancer in people who have no cancer symptoms. Colorectal cancer screening helps patients by:

1) finding and removing non**cancer** growths (polyps) before they become **cancer**

2) finding **cancer** early, when it can be cured.

Adults should begin colorectal cancer screening at age 50 years. People with family members with colorectal cancer should ask their doctors if they should be screened before age 50.

Tests used to screen for colorectal cancer

Test (Frequency)	*What is it?*	*Advantages*	*Disadvantages*
Fecal occult blood test (every year)	Uses a chemical to test for blood in stool	Inexpensive; Samples taken at home, then sent to laboratory	Many things besides colorectal cancer cause blood in stool; Any positive test needs follow-up colonoscopy
Barium enema (every 5 years)	X-rays of the abdomen after an enema that contains barium	No sedation	Any positive test needs follow-up colonoscopy; Can cause discomfort
Flexible sigmoidoscopy (every 5 years)	Doctor looks into the rectum and lower colon through a short, flexible tube-shaped instrument	No sedation; Does not need to be done by a specialist	Only looks at the lower one third of the colon, can miss cancers higher up; Any positive test needs follow-up colonoscopy; Requires a laxative to clean out the colon
Colonoscopy (every 10 years)	Doctor looks into the entire rectum and colon through a long, flexible tube-shaped instrument	Can take samples of the colon (biopsies) and remove polyps during the procedure; Examines the entire colon	Requires patient to see a specialist; Sedation needed; Complications rare, but can be serious; Requires a laxative to clean out the colon before test
Virtual colonoscopy (best frequency unknown)	Computerized X-rays of the colon	Examines whole colon; Sedation not needed	Cannot take samples during this test; Any positive test needs follow-up colonoscopy; Requires a laxative to clean out the colon before the test

Web Sites with Good Information about Colorectal Cancer Screening

American Cancer Society
www.cancer.org/docroot/LRN/LRN_0.asp?dt=10

Centers for Disease Control
www.cdc.gov/cancer/colorectal/sfl/

National Cancer Institute
www.cancer.gov/cancertopics/factsheet/Detection/colorectal-screening

Patient Information

CME Questions

MKSAP
MEDICAL KNOWLEDGE Self-Assessment Program

1. A 32-year-old man comes for an annual health maintenance visit. His mother was diagnosed with colorectal cancer at 55 years of age. The patient reports no rectal bleeding or other symptoms. Medical history is noncontributory except for hypercholesterolemia. Physical examination is normal.

   When should this patient first undergo colorectal cancer screening?

   A. Now
   B. At age 40 years
   C. At age 45 years
   D. At age 50 years

2. A 45-year-old white female business executive comes for routine physical examination. She is asymptomatic, has no significant medical history, and takes no medications. Her father developed colorectal cancer at 63 years of age. Physical examination is normal, and a stool specimen obtained during digital rectal examination is negative for occult blood.

   Which of the following statements is correct regarding colorectal cancer screening for this patient?

   A. Screening can be deferred until she is 50 years of age
   B. Screening should be done now because of her family history of colorectal cancer
   C. Genetic testing is indicated because her father had colorectal cancer
   D. She is not at increased risk of colon cancer because of her sex and ethnicity

3. A 34-year-old man is seen for a routine evaluation. At age 16, he was diagnosed with ulcerative colitis with involvement of the entire colon. Following medical treatment for 1 year, he had complete remission and has been in remission ever since. The patient has 1 or 2 normal bowel movements each day without evidence of hematochezia. He last saw a physician for a college physical examination at age 18. One of the patient's uncles also has ulcerative colitis. Physical examination is normal. His abdomen is soft and nontender, and a stool specimen is negative for occult blood. Hemoglobin and erythrocyte sedimentation rate are normal. The patient asks whether he should be screened for colon cancer.

   Which of the following is the optimal recommendation for colon cancer screening for this patient?

   A. No additional studies now; schedule yearly rectal examination, fecal occult blood testing, and flexible sigmoidoscopy every 3 to 5 years beginning at age 45 or 50
   B. Flexible sigmoidoscopy now to assess the presence of active inflammation; if negative, perform screening colonoscopy at age 45 or 50
   C. Colonoscopy now to assess the presence of active inflammation; if negative, repeat colonoscopy at age 45 or 50
   D. Colonoscopy now with extensive biopsies for dysplasia; if negative, repeat colonoscopy with extensive biopsies at age 45 or 50
   E. Colonoscopy now with extensive biopsies for dysplasia; if negative, repeat colonoscopy with extensive biopsies every 1 to 2 years

4. A 65-year-old woman underwent initial colonoscopy 1 month ago for colorectal cancer screening. A 6-mm tubular adenoma of the sigmoid colon was found and removed during the examination. The patient has no family history of colorectal cancer.

   Which of the following is the most appropriate recommendation for colorectal cancer surveillance for this patient?

   A. Repeat colonoscopy in 1 year
   B. Repeat colonoscopy in 3 years
   C. Repeat colonoscopy in 5 years
   D. Flexible sigmoidoscopy in 5 years
   E. Virtual colonoscopy (CT colonography) in 5 years

5. A 74-year-old woman has been deferring colon cancer screening because she is afraid to undergo colonoscopy. She learned of a new technique called virtual colonoscopy, which she thinks may be more tolerable, and asks you about the relative merits of this procedure.

   Which of the following statements is true regarding virtual colonoscopy?

   A. It is a noninvasive procedure that images the colon using ultrasound
   B. It is more acceptable to patients because it does not require any bowel preparation
   C. It detects colorectal cancers and large adenomas quite well, but may miss small polyps
   D. Its sensitivity and specificity for detecting colon cancers and polyps is similar to that of conventional colonoscopy
   E. It does not require any instrumentation of the bowel

6. A 50-year-old man comes for an annual health maintenance visit. He feels well and medical history is unremarkable. There is no family history of colorectal cancer. Physical examination and routine laboratory studies are normal.

   Which of the following is the most appropriate recommendation for colorectal cancer screening for this patient?

   A. Fecal occult blood testing now; repeat every 2 to 3 years
   B. Flexible sigmoidoscopy now; repeat every 2 to 3 years
   C. Barium enema examination now; repeat every 2 to 3 years
   D. Colonoscopy now; repeat every 10 years
   E. Virtual colonoscopy (CT colonography) now; repeat every 10 years

Questions are largely from the ACP's Medical Knowledge Self-Assessment Program (MKSAP). Go to www.annals.org/intheclinic/ to obtain up to 1.5 CME credits, to view explanations for correct answers, or to purchase the complete MKSAP program.