Practice guideline: colorectal cancer screening and surveillance

Source: adopted and revised from the (1) American Society of Gastrointestinal Endoscopy Colon Cancer Screening and Surveillance Guideline published in 2006; and (2) American College of Gastroenterology Colon Cancer Screening Guideline published in 2009

Disclaimer:
This guideline is intended to be an educational device to provide information that may assist endoscopists in providing care to patients. This guideline is not a rule and should not be construed as establishing a legal standard of care or as encouraging, advocating, requiring, or discouraging any particular treatment. Clinical decisions in any particular case involve a complex analysis of the patient's condition and available courses of action. Therefore, clinical considerations may lead an endoscopist to take a course of action that varies from these guidelines.

Introduction
The 5-year survival rate for early-stage cancers is greater than 90%, whereas the 5-year survival rate for those diagnosed with widespread cancer is less than 10%. There is indirect evidence that most cancers develop from adenomatous polyps and that on average it takes 10 years for a < 1 cm polyp to transform into invasive CRC. Given the finding that adenomatous polyps are precursors to cancer and that polyps and early cancers are usually asymptomatic, there is a strong rationale to support screening asymptomatic individuals for early cancer detection and prevention.

Certain individuals are considered at high risk because they harbor risk factors for CRC. These risk factors include family or personal history of CRC or adenomatous polyps, personal history of inflammatory bowel disease, and familial polyposis syndromes (including familial adenomatous polyposis [FAP] and hereditary nonpolyposis colon cancer [HNPCC]. The other 70% of individuals are considered average risk.

Screening strategies for average-risk individuals
Average-risk individuals should be offered screening beginning at age 50 years. The choice of modality for CRC screening along with the associated risks and benefits must be discussed between the practitioner and the individual patient. The recent joint guideline (American Cancer Society, the US Multi-Society Task Force on Colorectal Cancer, and the American College of Radiology, American College of Gastroenterology) groups CRC screening tests into cancer prevention and cancer detection tests. Cancer prevention tests have the potential to image both cancer and polyps, whereas cancer detection tests have low sensitivity for polyps and typically lower sensitivity for cancer compared with that in cancer prevention tests (imaging tests). The ACG supports the division of screening tests into cancer prevention and cancer detection tests, but recommends a preferred cancer prevention test — colonoscopy every 10 years (Grade 1 B). Cancer detection test — annual FOBT, preferably fecal immunochemical test (FIT), to detect occult bleeding (Grade 1 B).

Preferred CRC screening recommendations
Cancer prevention tests should be offered first. The preferred CRC prevention test is colonoscopy every 10 years, beginning at age 50. (Grade 1 B)

Cancer detection test. This test should be offered to patients who decline colonoscopy or another cancer prevention test. The preferred cancer detection test is annual FIT for blood. Yearly FOBT from 2 samples of 3 consecutive stools is recommended. A single digital rectal examination for FOBT is not recommended. Colonoscopy should be done if any sample has positive results.

*Alternative CRC **prevention** tests*
Flexible sigmoidoscopy every 5 years (Grade 2 B)

*Other less preferred CRC **prevention** options:*
CT colonography every 5 years (Grade 1 C)
Double contrast Barium enema (DCBE)

Recommendations for screening when family history is positive but evaluation for HNPCC considered not indicated
• Single first-degree relative with CRC or advanced adenoma *(adenoma ≥ 1 cm in size, or with high-grade dysplasia or villous elements)* diagnosed at age ≥ 60 years
Recommended screening: screen as average risk (Grade 2 B)

• Second or third degree relative with CRC or advanced adenoma
Recommended screening: same as average risk

• Single first-degree relative with CRC or advanced adenoma diagnosed at age < 60 years or two first-degree relatives with CRC or advanced adenomas.
Recommended screening: colonoscopy every 5 years beginning at age 40 years or 10 years younger than age at diagnosis of the youngest affected relative (Grade 2 B)
(A family history of only small tubular adenomas in first-degree relatives is not considered to increase the risk of CRC).

Risk factors under consideration for more intense screening in future guidelines (smokers and obese patients)
The ACG recommends that clinicians be aware of an increased risk of CRC in cigarette smokers and obese patients. The ACG does not recommend that screening be initiated earlier in these groups at this time. However, clinicians should make special efforts to ensure that screening takes place in these groups. The ACG recommends additional study to characterize the potential benefits, harms, and cost-effectiveness of earlier screening in these groups.

FAP

• Patients with classic FAP (>100 adenomas) should be advised to pursue genetic counseling and genetic testing, if they have siblings or children who could potentially benefit from this testing (Grade 2 B)

• Patients with known FAP or who are at risk of FAP based on family history (and genetic testing has not been performed) should undergo annual flexible sigmoidoscopy or colonoscopy, as appropriate, beginning at 10-12 years until such time as colectomy is deemed by physician and patient as the best treatment (Grade 2 B)

• Patients with retained rectum after subtotal colectomy should undergo flexible sigmoidoscopy every 6 – 12 months (Grade 2 B)

• Patients with classic FAP, in whom genetic testing is negative, should undergo genetic testing for biallelic MYH mutations. Patients with 10 – 100 adenomas can be considered for genetic testing for attenuated FAP and if negative, MYH associated polyposis (Grade 2 C)

HNPCC

• Patients who meet the Bethesda criteria should undergo microsatellite instability testing of their tumor or a family member's tumor and/or tumor immune-histochemical staining for mismatch repair proteins (Grade 2 B)

• Patients with positive tests can be offered genetic testing. Those with positive genetic testing, or those at risk when genetic testing is unsuccessful in an affected proband, should undergo colonoscopy every 2 years beginning at age 20 – 25 years, until age 40 years, then annually thereafter (Grade 2 B)

Surveillance recommendations for individuals with significant personal history of colorectal neoplasia

Prior colon cancer

Surveillance recommendation: High quality clearance of remainder of the colon at or around time of resection, followed by colonoscopy at 1 y after curative resection, then at 3 y and then 5-y intervals if results are normal

Prior rectal cancer

Surveillance recommendation:

Colonoscopy: clearance of remainder of colon at or around time of resection, followed by colonoscopy at 1 y and 4 y after resection, then at 5-y intervals

Flexible sigmoidoscopy: after low anterior resection, if no pelvic radiation or no mesorectal excision every 3-6 mo for 2-3 y

Prior colonic adenomas $\leq$ 2 small tubular adenomas (< 1 cm) and only low-grade dysplasia

Surveillance recommendation: No earlier than 5 years

Advanced neoplasia or 3-10 adenomas

Surveillance recommendation: 3 years

>10 adenomas
Surveillance recommendation: within 3 years

Large sessile polyp with potentially incomplete excision
Surveillance recommendation: 2-6 mo

Negative surveillance colonoscopy
Surveillance recommendation: No earlier than 5 y

Ulcerative colitis or extensive Crohn's colitis of 8-10 y duration
Surveillance recommendation: colonoscopy every 1-2 y with systematic biopsies to detect dysplasia

Colonoscopy.

Colonoscopy is the preferred modality for CRC screening. Major advantages of colonoscopy as a screening test include that it is widely available, examines the entire colon, allows single-session diagnosis and treatment, is comfortable when carried out with sedation, and is the only test recommended at 10-year intervals. The incremental benefit of colonoscopy over sigmoidoscopy is the detection of patients with proximal colon neoplasia (particularly advanced adenomas), as well as large hyperplastic polyps that are not associated with distal neoplasia. Overall, sigmoidoscopy detects 60 – 70 % of the significant neoplasia detected by complete colonoscopy. These are important rationales for the use of colonoscopy rather than sigmoidoscopy. After a good-quality colonoscopic examination without findings of colon cancer or adenomatous polyps is performed, further screening tests (eg, FOBT) should not be done for approximately 10 years. The completeness of the examination and the quality of the preparation should be taken into account for the timing of subsequent examinations

The evidence that colonoscopy prevents incident CRCs and reduces the consequent mortality from CRC is indirect but substantial. No prospective randomized controlled trial, comparing colonoscopy with no screening, has been carried out. However in a randomized controlled trial, involving only 800 patients, in which flexible sigmoidoscopy with colonoscopy carried out for any polyp detected was compared with no screening, the screening strategy resulted in an 80 % reduction in the incidence of CRC. Additional evidence for a benefit from colonoscopy screening is extrapolated from case – control studies of sigmoidoscopy, which have shown mortality and incidence reductions of distal CRC of 60 and 80 %, respectively, in screening populations. There is also indirect evidence from fecal occult blood testing (FOBT) trials that colonoscopy reduces CRC-related mortality.

Potential disadvantages of colonoscopy as a screening method include the inconvenience of bowel preparation, the risks of sedation, the risk of perforation, the risk of not identifying neoplasms, and the cost. The risk of perforation associated with colonoscopy appears to be no more than 0.1% to 0.2%. The miss rate of colonoscopy for polyps, on the basis of studies of back-to-back colonoscopies, is 27% for adenomas $\leq$ 5 mm and 6% for lesions $\geq$10 mm.

Colonoscopy miss rates appear to be associated with the skill and technique of the endoscopist, with higher quality of withdrawal technique resulting in lower miss rates.

Although several commercial bowel preparations are available, certain principles of preparation will enhance the effectiveness of each of these commercial preparations. Best established is the principle of " splitting, " in which at least half of the preparation is given on the day of the colonoscopy. When all of the bowel preparation is given on the day before examination and the interval between the last dose of preparation and the performance of colonoscopy is prolonged, the probability of poor preparation increases dramatically, particularly in the cecum and ascending colon. Splitting can be carried out with oral dosing of either polyethylene glycol or sodium phosphate preparations. The practice guidelines of the American Society of Anesthesiologists allow ingestion of clear liquids until 2 h before sedation. Recent guidelines for an effective and safe preparation are available and have particularly emphasized the importance of aggressive hydration before and during the preparation, during the procedure, and after the procedure, especially when using oral sodium phosphate preparations.

The ACG has both endorsed and developed quality indicators for colonoscopy. A major focus of these quality indicators that bears importantly on the impact of colonoscopy at 10-year intervals, are those directed to the quality of mucosal inspection. In addition to using an appropriate technique and time for mucosal inspection, colonoscopists must have expertise in safe and effective bowel preparation. Mucosal inspection during screening colonoscopy should be meticulous. The examiner should perform a slow and obsessive examination, designed to expose all of the colonic mucosa and identify and remove the smallest and flattest adenomas and proximal colon hyperplastic polyps. Several studies have shown that colonoscopists vary dramatically in their detection rates of adenomas, and in two recent studies, colonoscopists were shown to differ substantially in their detection of large adenomas. Colonoscopists in clinical practice should measure their individual adenoma detection rates in the continuous quality improvement process. One or more adenomas should be detected in at least 25 % of men aged ≥ 50 years and 15 % of women aged ≥ 50 years. These recommendations are derived from screening colonoscopy studies. In addition, endoscopists should measure their withdrawal times by noting the time of cecal intubation and termination of the examination. These withdrawal times should average at least 6 min in normal colonoscopies, in which no biopsy or polypectomy is carried out. This recommendation is not meant to imply that every colonoscopic withdrawal must last 6 min, as some colons can be examined effectively in < 6 min. Furthermore, future research may revise the optimal mean withdrawal time that represents quality colonoscopy.

Key measures for improving the quality and cost effectiveness of colonoscopy as a CRC screening test

- Bowel preparation should be given in split doses (half of the dose is given on the day of procedure).
- Cecal intubation should be documented by description of landmarks and photography.
- All colonoscopists should document adenoma detection rates.

• Withdrawal times should average at least 6 min in intact colons, in which no biopsies or polypectomies are performed; this has greatest relevance to colonoscopists with low adenoma detection rates.
• Polyps should be removed by effective techniques, including snaring (rather than forceps methods) for all polyps >5 mm in size.
• Piecemeal resection of large sessile lesions requires close follow-up.
• In patients with complete examinations and adequate preparation, recommended screening and surveillance intervals should be followed.

FOBT.

FOBT can be performed with use of a guaiac-based test, immunochemical test, or fluorometric quantitative assay. Two samples from each of 3 consecutive stools should be tested. Patients with positive FOBT results are at increased risk of advanced neoplasia and should undergo a complete colonoscopy.

Prospective randomized trials of FOBT have demonstrated a 15% to 33% reduction in CRC related mortality when positive results were followed by colonoscopy. Dietary restrictions are recommended when the more sensitive guaiac-based tests are used; these restrictions include the avoidance of red meat and peroxidase-containing foods for 1 to 3 days before and during stool collection, to reduce false positive rates. Samples that are rehydrated or obtained by digital rectal examination have higher false-positive rates. Immunochemical tests are more specific but have reduced sensitivity than do guaiac-based tests. A recent study conducted in 13 Veteran Affairs medical centers found that the sensitivity of a single digital rectal examination FOBT for the detection of advanced colonic neoplasia is 4.9% compared with a sensitivity of 23.9% when the recommended home screening protocol was performed. The practice of a single digital rectal examination for FOBT, therefore, is considered a poor screening method for CRC and should not be performed.

Flexible sigmoidoscopy.

Case-control studies of sigmoidoscopy (mostly using rigid sigmoidoscopes) have suggested a reduction in CRC incidence in the portion of the colon examined, and an associated decreased mortality between 59% to 80%. The benefit persists for up to 10 years. The risk of colon cancer in the area beyond the reach of the sigmoidoscope does not appear to be reduced. It is estimated that the overall reduction in CRC related mortality from flexible sigmoidoscopy screening may be as high as 45% up until the age of 80 years. There are currently no published prospective trials of screening flexible sigmoidoscopy showing a decrease in CRC related mortality. In a randomized prospective study, the detection rate for advanced neoplasia was 3 times higher after screening by sigmoidoscopy than by FOBT. A recent study that used screening colonoscopy to estimate the sensitivity of sigmoidoscopy and FOBT for advanced neoplasia found that sigmoidoscopy identified only 70.3% of patients with advanced neoplasia. Several studies have demonstrated that a significant number of advanced proximal adenomas occur in the absence of distal adenomas and therefore would be missed on flexible sigmoidoscopy. In a study of 1,463 asymptomatic women undergoing colonoscopy, only 34.7%

with advanced neoplasia had distal adenomas and would have been identified on flexible sigmoidoscopy. Comparison with age-matched men from the Veterans Administration Cooperative Study showed that men were more likely to have advanced neoplasia than women (8.6% vs 4.5%). However, a higher percent of advanced neoplasia in men (66.3%) would have been detected by flexible sigmoidoscopy. These data suggest that colonoscopy has advantages over flexible sigmoidoscopy for screening of colorectal cancer in women. Likewise, because the prevalence of proximal neoplasia increases with age, colonoscopy may be better suited for screening older patients (aged > 60 years). Currently, the Multisociety Task Force on Colorectal Cancer, the American College of Gastroenterology, and the American Cancer Society all recommend that, if flexible sigmoidoscopy is used for CRC screening, it should be performed every 5 years. Several studies have demonstrated a low risk of development of adenomas and advanced neoplasms within the first 3 years of negative results from flexible sigmoidoscopy. A recent large cohort study from Kaiser Permanente showed low age-adjusted incidence rates of CRC within the first 4 years after a negative sigmoidoscopy results compared with the incidence in the general population. This study supported maintaining the time interval between screening sigmoidoscopies at 5 years.

FOBT and flexible sigmoidoscopy.

There is no evidence that the combination of annual FOBT and flexible sigmoidoscopy every 5 years reduces CRC mortality. A recent study showed that 70.3% of patients with advanced neoplasia were identified by use of sigmoidoscopy alone, and the addition of FOBT minimally increased the detection rate to 75.8%. However, a randomized trial has shown that the performance of one-time FOBT detected fewer neoplasms than did use of FOBT plus sigmoidoscopy.

Double-contrast barium enema.

Although double contrast barium enema (DCBE) offers the evaluation of the entire colon, its diagnostic sensitivity is inferior to colonoscopy and it lacks therapeutic capability. In a prospective study comparing DCBE with colonoscopy, DCBE detected 53% of adenomatous polyps 6 to 10 mm in size and 48% of those > 1 cm in size compared with colonoscopy. Another study found that the sensitivity for detecting CRC was 83% for barium enema versus 95% for colonoscopy. There are no prospective studies demonstrating the efficacy of screening DCBE in reducing CRC incidence or mortality. The addition of flexible sigmoidoscopy with DCBE is not recommended because the incremental detection rate achieved is uncertain and probably small. Currently, the U.S. Preventive Services Task Force and the American College of Gastroenterology do not support DCBE as the primary form of CRC screening, given the lack of data demonstrating its efficacy and sensitivity for identifying colonic lesions. DCBE is not recommended. If it is used, it should be performed every 5 years. Colonoscopy should be performed if the DCBE results are abnormal.

CT colonography

CT colonography, every 5 years, is endorsed as an alternative to colonoscopy every 10 years because of its recent performance in the American College of Imaging Network Trial 6664 (also

known as the National CT Colonography Trial). Results from earlier multicenter trials in the United States ranged from excellent to poor. The principle performance feature that justifies inclusion of CT colonography as a viable alternative in patients who decline colonoscopy, is that the sensitivity for polyps ≥ 1 cm in size in the most recent multicenter US trial was 90 %. In this study, 25 % of radiologists who were tested for entry into the trial but performed poorly were excluded from participation, and thus lower sensitivity might be expected in clinical practice. The CT colonography probably has a lower risk of perforation than colonoscopy in most settings, but for several reasons it is not considered the equivalent of colonoscopy as a screening strategy. First, the evidence to support an effect of endoscopic screening on prevention of incident CRC and mortality is overwhelming compared with that for CT colonography. Second, the inability to detect polyps 5 mm and smaller, which constitutes 80 % of colorectal neoplasms, and whose natural history is still not understood, necessitates performance of the test at 5- year, rather than 10-year intervals. This is likely to increase overall costs, if CT colonography is used as a primary strategy. Although management of polyps < 1 cm in size is controversial, the ACG continues to recommend that patients with polyps 6 mm or larger be referred for polypectomy, as should patients with three or more polyps of any size read with high confidence. Polyps ≤ 5 mm in size interpreted with high confidence should be described in the CT colonography report. Unfortunately, false positives are common, and the specificity for polyps ≥ 1 cm in size in the National CT Colonography Trial was only 86 % , with a positive predictive value of 23 %. Thus, colonoscopy for polyps detected on CT colonography will often require long procedures, in order to verify absence of other polyps. False positives diminish cost-effectiveness by increasing follow-up colonoscopies and repeat CT colonographies to verify false positive status. The ACG recommends that asymptomatic patients be informed of the possibility of radiation risk associated with one or repeated CT colonography studies, though the exact risk associated with radiation is unclear. The value of extracolonic findings detected by CT colonography is mixed, with substantial costs associated with incidental findings, but occasional important extracolonic findings are detected such as asymptomatic cancers and large abdominal aortic aneurysms. As a final point, the ACG is also concerned about the potential impact of CT colonography on adherence and thus on polypectomy rates. Thus, if CT colonography substantially improves adherence, it should improve polypectomy rates and thereby reduce CRC, even if only large polyps are detected and referred for colonoscopy. On the other hand, if CT colonography largely displaces patients who would otherwise be willing to undergo colonoscopy, then polypectomy rates will fall substantially, which could significantly increase the CRC incidence. Thus, for multiple reasons, and pending additional study, CT colonography should be offered to patients who decline colonoscopy.

Note: Colonography and DCBE are considered less preferred options due to absence of significant local experience / adequate data for CT colonography and the low availability of DCBE in many institutions.

Screening for high-risk individuals

FAP.

Individuals with a diagnosis of FAP have an almost 100% risk for development CRC by age 40 to 50 years. FAP is an autosomal dominant syndrome caused by mutations in the adenomatous polyposis coli (APC) gene, which phenotypically presents with > 100 adenomas throughout the colon. A variant of FAP is the attenuated form in which individuals have a variable number of adenomas (usually 20-100), a proximal distribution of adenomas, and relatively delayed onset of CRC that is approximately 10 years later than for FAP. Several germline mutations in the 30 and 50 ends of the APC gene have been identified in individuals with the attenuated form of FAP. Genetic testing accompanied by specialized counseling should be offered to patients with FAP and to family members at risk. The actual benefits and impact of genetic testing have not been studied. Testing is first performed on the affected kindred with known FAP to identify the disease-producing mutation. The current commercially available genetic test is positive in approximately 80% of patients with FAP.82 Once a mutation is identified, other individuals in the family, aged 10 years or older, should be tested for the mutation. Individuals with positive test results should be followed by annual sigmoidoscopy beginning at age 10 to 12 years. In a study of all FAP patients recorded in the Finnish Polyposis Registry, overall mortality resulting from CRC was significantly reduced in FAP patients undergoing screening sigmoidoscopy compared with those patients with a new diagnosis of CRC. When multiple adenomas are identified on screening sigmoidoscopy, colectomy is indicated. If no polyps are identified, annual sigmoidoscopy should be offered up to age 40 years and then every 3 to 5 years thereafter. Family members with negative genetic test results are assumed not to be affected; however, they can be offered sigmoidoscopy every 7 to 10 years to account for any potential error in genetic testing. If genetic testing is not available, or the affected kindred has a negative test result for a mutation, annual sigmoidoscopy should be performed in all family members beginning at age 10 to 12 years. Colonoscopy should be performed yearly in those patients with attenuated FAP beginning in the late teens or early 20s given the proximal distribution of polyps and the later onset of disease. Patients with FAP are at increased risk for upper gastrointestinal neoplasia, which is considered in a separate guideline.

HNPCC.

HNPCC is an autosomal dominant disorder characterized by the early development of colorectal cancer. In patients with HNPCC, CRC develops at a younger age (average 44 years) and tumors are predominantly located proximal to the splenic flexure. Affected patients carry a germline mutation in one of several DNA mismatch repair genes. In those cases with defective mismatch repair, approximately 90% have mutations in the MLH1 or MSH2 genes. Diagnostic clinical criteria for HNPCC have been outlined in detail elsewhere and include the Amsterdam and Bethesda classifications. These clinical criteria are highly predictive of a mismatch repair gene. Colonoscopy should be performed in all persons potentially affected with HNPCC every 1 to 2 years starting at age 20 to 25 years or 10 years younger than the age of the earliest diagnosis in the family, whichever is earlier. Beginning at age 40 years, colonoscopy should be performed annually. Patients with HNPCC are also at increased risk for development of upper gastrointestinal neoplasia, which is considered in a separate guideline.

SURVEILLANCE STRATEGIES FOR INDIVIDUALS WITH SIGNIFICANT PERSONAL HISTORY

Personal history of inflammatory bowel disease

Individuals with long-standing ulcerative colitis (UC) and extensive Crohn's colitis are at increased risk for development of dysplasia and CRC, and they should undergo colonoscopic surveillance. The risk of CRC increases with the duration and extent of colitis, family history of CRC, continuing active colitis, young age at onset of disease, presence of backwash ileitis, and personal history of primary sclerosing cholangitis. The presence of proctitis alone does not appear to increase the risk for CRC. In UC, patients with left-sided colitis or more extensive disease are at increased risk. In Crohn's colitis, those patients with extensive disease involving more than a third of the colon also have an increased risk of CRC, similar to that of patients with UC. The extent of colonic involvement should be based on both endoscopic and histologic criteria, whichever reveals more extensive disease. The role of colonoscopy in the management of inflammatory bowel disease is discussed in another guideline. Currently, there are no prospective, randomized trials evaluating the efficacy of surveillance colonoscopy in UC or Crohn's colitis. In a case-control study of patients with UC undergoing colonoscopic surveillance, there was a reduction in mortality from CRC in those patients in surveillance programs. Patients with UC or extensive Crohn's colitis (greater than one third colonic involvement) should undergo surveillance colonoscopy every 1 to 2 years beginning 8 to 10 years after disease onset. Biopsy specimens of the colon in patients with documented pancolitis should be obtained in all 4 quadrants every 10 cm from the cecum to the rectum, to obtain a minimum of 32 biopsy samples. In patients with less extensive colitis, biopsy specimens can be limited to the microscopically involved segments. The presence of high-grade dysplasia or multifocal low-grade dysplasia in flat mucosa is an indication for colectomy. The management of unifocal low-grade dysplasia is controversial as to whether colectomy should be performed. Biopsy specimens should be obtained of strictures, mass lesions, and macroscopic abnormalities other than pseudopolyps. Adenomatous- appearing polyps should be completely removed by polypectomy and biopsy specimens should be obtained from the adjacent flat mucosa to determine the presence of dysplasia. If a dysplastic polyp is identified outside an area of inflammation and there is no evidence of dysplasia in the adjacent mucosa, it can be managed as a sporadic polyp, similar to polyps in individuals without UC or Crohn's colitis. If a dysplastic polyp is in an area of active inflammation (dysplasia associated lesion or mass) and there is evidence of dysplasia in the adjacent mucosa, colectomy is indicated.

Personal history of CRC

Patients diagnosed with colorectal cancer are at risk of having synchronous lesions or for development of metachronous lesions. Synchronous colon cancers occur in 3% to 5% of patients. A complete colonoscopy should be performed at the time of CRC diagnosis to rule out synchronous mass lesions and to remove any additional adenomatous lesions. If a complete colonoscopy cannot be performed because of malignant obstruction, CT colonography, DCBE, or intraoperative colonoscopy can be performed to exclude proximal neoplasms. Otherwise,

postoperative colonoscopy within 6 months of complete surgical resection should be performed. Postoperative colonoscopy is also performed for the detection of cancer recurrence or metachronous lesions in patients with stage I-III and selected patients with stage IV cancer. Frequent, repeat colonoscopy starting at 1 year after resection of nonrectal colon cancer has not been shown to improve patient survival or increase resectability of recurrent disease. Currently, the American Cancer Society recommends colonoscopy within 1 year of curative-intent resection of CRC. The American Society of Clinical Oncology recommends colonoscopy 3 to 5 years after surgery, whereas the American Society of Colon and Rectal Surgeons recommends periodic colonoscopy at 3-year intervals. The rationale for intensive colonoscopic follow-up soon after curative resection for colon cancer is based on the recent finding that the incidence of metachronous cancers is higher in this group of patients compared with the general population and with patients with adenomatous polyps. Furthermore, the yield of surveillance colonoscopy for the detection of metachronous cancers and adenomatous polyps appears to be highest during the first 24 months after surgery. On the basis of these data, we recommend that surveillance colonoscopy be performed at 1 year after surgical resection of colon cancer. If results are normal, the next mesorectal excision reduces the rate of recurrence of locally advanced disease to 2.4% within 2 years after resection compared with 8.2% with surgery alone. Given the decreased likelihood of local cancer recurrence in patients treated with pelvic radiation, the American Society of Clinical Oncology does not recommend postoperative surveillance sigmoidoscopy in patients treated with preoperative radiation. The American Society of Colon and Rectal Surgeons recommends periodic endoscopic evaluation of the surgical anastomosis in patients who have undergone resection but does not, however, specify the preferred method or timing of the evaluation. There are no prospective trials demonstrating a significant survival benefit or improvement in resection rates of recurrent rectal cancers as a result of frequent sigmoidoscopy; however, most studies to date have been underpowered to detect a significant difference. Patients who did not receive neoadjuvant radiation therapy for locally advanced disease or those who did not undergo total mesorectal excision should undergo sigmoidoscopy every 3 to 6 months postoperatively for the first 2 or 3 years. All patients should undergo a complete colonoscopy at 1 year. The role of endoscopic ultrasound in the postoperative surveillance of rectal cancer has not been clearly defined. EUS can be useful in the detection of tumor recurrence presenting extraluminally, which can be missed by routine surveillance with digital rectal examination and sigmoidoscopy. Several studies on the use of EUS in the surveillance of patients with resected rectal cancer have demonstrated that it can accurately detect and diagnose regional recurrence; however, its impact on long-term survival is not known.

Personal history of adenomatous polyps

Colonoscopy is the recommended method of surveillance after the removal of adenomatous polyps because it has been shown to significantly reduce subsequent CRC incidence. The timing of follow-up colonoscopy should be tailored to the number, size, and pathologic findings of the adenomatous polyps removed. Patients with 1 to 2 small (< 1 cm) tubular adenomas with only low-grade dysplasia should undergo follow-up colonoscopy no earlier than 5 years later. Patients with advanced adenomatous lesions or > 3 adenomas should have repeat colonoscopy in 3 years as long as all visualized polyps were completely removed, the colonoscopy was

completed up to the cecum, and the colonic preparation was adequate. A shorter interval of follow up is recommended in those patients with numerous adenomatous (> 10) polyps and in those in whom the colonoscopy was incomplete or the preparation was inadequate. After a surveillance colonoscopy has normal results, repeat examinations should be done at 5-year intervals. Patients with large, sessile adenomatous lesions removed in a piecemeal fashion should have a repeat examination within 2 to 6 months to exclude and remove any remnant polypoid tissue.

More recently, there has also been increased recognition that the serrated polyp (including the hyperplastic polyp (HP) with its serrated morphological features) may be more than a simple clinically innocuous bystander in the process of cancer development.

These polyps appear quite distinct from traditional adenomatous polyps and may also exhibit morphological and molecular heterogeneity. Recent evidence suggests that some subtypes may pose a substantive potential risk for eventual malignant transformation. As such, it appears that this serrated pathway may represent an alternate road to development of colon cancer with potentially important implications for the "guideline approach" to screening and surveillance for colonic neoplastic lesions. A prudent approach has been suggested to include complete resection and surveillance examinations as often as the intervals defined for the more traditional adenomatous polyps but this approach is not necessarily reflective of the natural biological history of these lesions.

MANAGEMENT OF COLONIC POLYPS DURING FLEXIBLE SIGMOIDOSCOPY

The decision to perform colonoscopy after the detection of a small adenoma on flexible sigmoidoscopy is controversial and should be individualized. Colonoscopy is the preferred method of examination of the colon after a flexible sigmoidoscopy with at least one adenoma found because it allows both the detection and removal of synchronous polyps. Controversy remains regarding whether individuals with small tubular adenomas (< 1 cm) should undergo colonoscopy. Factors associated with an increased risk of proximal advanced neoplasia include age > 65 years, villous histologic findings in distal adenomas, adenomas > 1 cm, and multiple distal adenomas. Patients with any of these factors should undergo colonoscopy. Although there is some controversy as to the clinical significance of hyperplastic polyps, there does not appear to be an increased risk of proximal neoplasia or proximal advanced neoplasia in asymptomatic individuals undergoing screening. Therefore, the discovery of hyperplastic polyps on screening flexible sigmoidoscopy is not an indication for colonoscopy, with the exception of patients with a hyperplastic polyposis syndrome, which is associated with an increased risk of colorectal cancer. For small polyps < 1 cm in size encountered on flexible sigmoidoscopy, endoscopic biopsy specimens can distinguish inflammatory or hyperplastic polyps from adenomatous polyps. Biopsies of polyps > 1 cm can miss significant adenomatous elements of the lesion and, therefore, may not reliably determine the true pathology of the lesion. Patients found to have one or more polyps $\geq$ 1 cm in size on flexible sigmoidoscopy should undergo complete colonoscopy. The cold snare technique is safe for sampling small polyps. Application of cautery should be avoided in an unprepped colon because of the potential for explosion.

MANAGEMENT OF COLON POLYPS DURING COLONOSCOPY

Most polyps seen during colonoscopy can be completely removed. The safety of polypectomy has been substantiated by the low incidence of complications reported in numerous series. The endoscopist should be prepared to perform a total examination and remove all polyps found at the time of the first colonoscopy, although technical factors encountered during colonoscopy may limit completion of the procedure. Every effort should be made to avoid repetitive procedures. Although controversy still exists regarding the degree of malignant potential of polypoid lesions of the colon, current opinion is that most cancers arise in preexisting neoplastic polyps. It is impossible to tell grossly which lesions are or will become malignant. The prevalence of malignancy in a polyp rises as the size and villous component of the polyp increase. In general, all polypoid lesions $\geq$ 0.5 cm in diameter should be totally excised and recovered for histologic examination. Although the occurrence of carcinoma in a polyp < 0.5 cm is rare, it is reasonable to remove all such diminutive lesions when they are encountered during colonoscopy performed for any indication. Representative biopsy samples may be obtained when these lesions are too numerous for all of them to be removed. Large, sessile polyps have a high malignant potential and tend to have microscopic foci of residual polyp after excision. Therefore, a patient who has colonoscopic excision of these lesions should have repeat evaluation of the polyp site within 2 to 6 months to document complete removal. If residual polyp tissue is found, it should be removed if possible, and the completeness of excision checked once again within another 6-month period. If complete removal of the lesion has been verified at the first or second follow-up interval, then subsequent surveillance colonoscopy should be individualized. If a large benign-appearing sessile polyp cannot be completely or safely removed endoscopically within 1 to 3 examinations, surgical resection should be strongly considered. The management and follow-up of patients with polyps removed endoscopically found to have high-grade dysplasia or cancer are discussed in another guideline.

Grading recommendations

Grade of recommendation/ description	Benefit vs. risk and burdens	Methodological quality of supporting evidence	Implications
1A/Strong recommendation, high-quality evidence	Benefits clearly outweigh risk and burdens, or vice versa	RCTs without important limitations or overwhelming evidence from observational studies	Strong recommendation, can apply to most patients in most circumstances without reservation
1B/Strong recommendation, moderate-quality evidence	Benefits clearly outweigh risk and burdens, or vice versa	RCTs with important limitations (inconsistent results, methodological flaws, indirect, or imprecise) or exceptionally strong evidence from observational studies	Strong recommendation, can apply to most patients in most circumstances without reservation
1C/Strong recommendation, low-quality or very low-quality evidence	Benefits clearly outweigh risk and burdens, or vice versa	Observational studies or case series	Strong recommendation but may change when higher quality evidence becomes available
2A/Weak recommendation, high-quality evidence	Benefits closely balanced with risks and burden	RCTs without important limitations or overwhelming evidence from observational studies	Weak recommendation, best action may differ depending on circumstances or patients ' or societal values
2B/Weak recommendation, moderate-quality evidence	Benefits closely balanced with risks and burden	RCTs with important limitations (inconsistent results, methodological fl aws, indirect, or imprecise) or exceptionally strong evidence from observational studies	Weak recommendation, best action may differ depending on circumstances or patients ' or societal values
2C/Weak recommendation, low-quality or very low-quality evidence	Uncertainty in the estimates of benefi ts, risks, and burden; benefits, risk, and burden may be closely balanced	Observational studies or case series	Very weak recommendations; other alternatives may be equally reasonable