Colorectal cancer remains a serious health problem in the United States. The American Cancer Society (ACS) (2004) estimates 106,370 new cases of colon cancer and 40,570 new cases of rectal cancer annually. Furthermore, the ACS estimates that 56,730 people die from colorectal cancer annually (ACS). It is the third-leading cancer diagnosis and cause of cancer mortality in men and women.

Without intervention, about 5.6% of Americans will develop colorectal cancer during their lives (ACS, 2004). When colorectal cancer is diagnosed at the localized stage, the five-year survival rate is 90%, but only 37% of cases are diagnosed at the localized stage.

About 75% of people who develop colorectal cancer are considered to be at average risk. People at higher risk include those with a family history of colorectal cancer or a personal history of irritable bowel syndrome. Those at very high risk include people with a known mutation for familial adenomatous polyposis or hereditary nonpolyposis colorectal cancer. Screening guidelines for such individuals are much more rigorous than those described in this article for people of average risk.

Colorectal cancer is thought to arise from polyps in the colon. Data from the National Polyp Study demonstrated that an adenoma progresses to cancer in as long as 10 years (Winawer, 2001). Understanding this concept is crucial because it illustrates the length of time when prevention and early detection methods can interrupt the development of cancer. Therefore, the same methods used to detect colorectal cancer can be used to identify and remove polyps and ultimately prevent colorectal cancer from occurring.

Despite the widespread availability of effective screening tests, colorectal cancer screening lags behind screening for other cancers, such as breast and cervical cancer. About 50% of adults aged 50 years and older have had fecal occult blood testing (FOBT), lower endoscopy, or both in the last five years (Tiwari et al., 2004). Medicare coverage expanded in 1998 to include colorectal cancer screening, as do most commercial health plans. This has removed a significant barrier to colorectal cancer screening.

Less-than-optimal participation in screening might stem from confusion by the public and healthcare professionals regarding what constitutes appropriate screening. Much controversy is associated with colorectal cancer screening. Table 1 provides a comparison of screening guidelines from professional organizations. Most groups agree that screening should begin at age 50 in adults at average risk for developing colorectal cancer. Although the incidence of colorectal cancer is low at age 50, about 25% of adults will have adenomatous polyps (Smith et al., 2001). Thus, the underlying rationale for beginning screening at age 50 is based on the potential to detect and remove precursor lesions and polyps.

Fecal Occult Blood Testing

FOBT refers to collecting and testing six samples (two each day) from three consecutive stools collected at home. Patients often are instructed to avoid red meat, fresh fruits and vegetables, vitamin C, iron, and nonsteroidal anti-inflammatory drugs for three days before FOBT and during sample collection. These substances may interfere with the accuracy of the test.

FOBT requires cooperation from patients. A single test of a stool sample during digital rectal examination (DRE) is not an adequate substitute for FOBT because colonic neoplasms often bleed intermittently or because blood is not present throughout the entire stool.

The specificity of FOBT in finding neoplastic lesions ranges from 23.9%–50%. The test seems to be slightly more sensitive, with a range of 35.6%–41% (Lieberman & Weiss, 2001). Serial screening with FOBT has the potential to reduce colorectal cancer mortality from 33% to 15% (Walsh & Terdiman, 2003). The biggest disadvantage of FOBT is that it fails to detect many polyps and some cancers. Similarly, most people who test positively do not have colorectal cancer and thus undergo additional and often unnecessary testing and costs.

FOBT often is limited by low participation rates. One reason that patients choose not to complete and return the FOBT cards is that they have difficulty following the dietary restrictions and dislike collecting stool samples.

Controversy also exists regarding how to perform the test. A rehydration procedure enhances the sensitivity of the test at the expense of specificity. Rehydration is accomplished by adding a few drops of water to the stool samples before adding the reagent.
Asymptomatic people with no personal history of ulcerative colitis, polyps, or colorectal cancer.

Men and women 50 years of age and older.

People 50–80 years old with no history of polyps or colorectal cancer and no family history of colorectal cancer in one first-degree relative diagnosed before age 65 or two first-degree relatives diagnosed at any age.

Adults 50 years of age and older; recommendations should be discussed. Age to stop screening is not identified.

Rate of cancer detection, deaths from colorectal cancer, compliance, feasibility, and accuracy.

Accuracy and reliability of screening, effect of screening on incidence and mortality, adverse effects of screening tests, and cost effectiveness.

Incidence and mortality rates from colorectal cancer, cost effectiveness of screening measures, adverse effects of screening measures, and sensitivity and specificity of screening tests.

Not stated.

Recommended. Concerns exist about high false-positive rates, and a specific diet should be followed. An estimated 1,000 people must be screened for 10 years to prevent one death from colorectal cancer.

Recommended annu-ally beginning at age 50. Three consecutive stool samples are recommended. Rehydration increases sensitivity but substantially increases the number of false-positive tests.

Recommended. Three FOBT test slides annually. Slide rehydration is not recommended.

Recommended annually beginning at age 50.

Recommended annually beginning at age 50.

Flexible sigmoidoscopy can be included in periodic health examination of people older than 50. Insufficient evidence exists to include or exclude colonoscopy.

Clinicians should discuss benefits and risks of each type of screening. Age to stop screening is not identified.

**TABLE 1. COMPARISON OF GUIDELINES FOR COLORECTAL CANCER SCREENING**

<table>
<thead>
<tr>
<th>AGENCY (SOURCE)</th>
<th>INTENDED USERS</th>
<th>TARGET POPULATION</th>
<th>OUTCOMES CONSIDERED</th>
<th>COST ANALYSIS</th>
<th>FOBT RECOMMENDATION</th>
<th>DRE RECOMMENDATION</th>
<th>ENDOSCOPY RECOMMENDATION</th>
<th>OTHER RECOMMENDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canadian Task Force on Preventive Health Care (Canadian Task Force on Preventive Health Care, 2001)</td>
<td>Advanced practice nurses, allied health personnel, nurses, physician’s assistants, and students</td>
<td>Asymptomatic people with no personal history of ulcerative colitis, polyps, or colorectal cancer</td>
<td>Rate of cancer detection, deaths from colorectal cancer, compliance, feasibility, and accuracy</td>
<td>None</td>
<td>Recommended. Concerns exist about high false-positive rates, and a specific diet should be followed. An estimated 1,000 people must be screened for 10 years to prevent one death from colorectal cancer.</td>
<td>None</td>
<td>Flexible sigmoidoscopy can be included in periodic health examination of people older than 50. Insufficient evidence exists to include or exclude colonoscopy.</td>
<td>None</td>
</tr>
<tr>
<td>U.S. Preventive Services Task Force (USPSTF) (USPSTF, 2002)</td>
<td>Advanced practice nurses, allied health personnel, healthcare providers, nurses, physician’s assistants, and physicians</td>
<td>Men and women 50 years of age and older</td>
<td>Accuracy and reliability of screening, effect of screening on incidence and mortality, adverse effects of screening tests, and cost effectiveness</td>
<td>Yes</td>
<td>Recommended annually beginning at age 50. Three consecutive stool samples are recommended. Rehydration increases sensitivity but substantially increases the number of false-positive tests.</td>
<td>Not recommended</td>
<td>Flexible sigmoidoscopy every five years beginning at age 50</td>
<td>Clinicians should discuss benefits and risks of each type of screening. Age to stop screening is not identified.</td>
</tr>
<tr>
<td>Institute for Clinical Systems Improvement (ICSI) (ICSI, 2003)</td>
<td>Advanced practice nurses, allied health personnel, healthcare providers, health plans, hospitals, nurses, physician’s assistants, and physicians</td>
<td>People 50–80 years old with no history of polyps or colorectal cancer and no family history of colorectal cancer in one first-degree relative diagnosed before age 65 or two first-degree relatives diagnosed at any age</td>
<td>Incidence and mortality rates from colorectal cancer, cost effectiveness of screening measures, adverse effects of screening measures, and sensitivity and specificity of screening tests</td>
<td>Yes</td>
<td>Recommended. Three FOBT test slides annually. Slide rehydration is not recommended.</td>
<td>May be performed prior to flexible sigmoidoscopy</td>
<td>Flexible sigmoidoscopy every five years beginning at age 50 to age 80. Colonoscopy may be performed every 5–10 years instead. Double contrast barium enema may be offered.</td>
<td>Guidelines to evaluate examination adequacy are given.</td>
</tr>
<tr>
<td>American Society of Colon and Rectal Surgeons (American</td>
<td>Physicians</td>
<td>Adults 50 years of age and older; recommendations should be</td>
<td>Not stated</td>
<td>Yes</td>
<td>Recommended annually beginning at age 50</td>
<td>Recommended annually beginning at age 50</td>
<td>Flexible sigmoidoscopy every five years</td>
<td>None</td>
</tr>
</tbody>
</table>

(Continued on next page)
<table>
<thead>
<tr>
<th>Agency (Source)</th>
<th>Intended Users</th>
<th>Target Population</th>
<th>Outcomes Considered</th>
<th>Cost Analysis</th>
<th>FOBT Recommendation</th>
<th>DRE Recommendation</th>
<th>Endoscopy Recommendation</th>
<th>Other Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Society of Colon and Rectal Surgeons, 1999)</td>
<td>Advanced practice nurses, allied health personnel, healthcare providers, health plans, hospitals, managed care, nurses, patients, physician’s assistants, and physicians</td>
<td>Adults at average risk: people 50 years of age and older who are not otherwise defined as being at high risk.</td>
<td>Colorectal cancer incidence, morbidity, and mortality; and sensitivity and specificity of emerging technologies</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>American Cancer Society (Smith et al., 2003)</td>
<td>Physicians</td>
<td>Adults who are asymptomatic and not known to be at any increased risk</td>
<td>None stated</td>
<td>None</td>
<td>None</td>
<td>Yes</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>American Academy of Family Physicians (American Academy of Family Physicians, 2003)</td>
<td>Physicians</td>
<td>People in the United States at average risk for colorectal cancer age 50 and older</td>
<td>Rates of screening, morbidity and mortality of colorectal cancer, sensitivity and specificity, and cost effectiveness</td>
<td>Yes</td>
<td>Yes</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>American College of Gastroenterology (Winawer et al., 2003)</td>
<td>Health plans, hospitals, physicians, and utilization management</td>
<td>Patients with colorectal cancer</td>
<td>Use of radiologic examinations in differential diagnosis and screening</td>
<td>Yes</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

DRE—digital rectal examination; FOBT—fecal occult blood test
Flexible Sigmoidoscopy

Flexible sigmoidoscopy involves insertion of a 60 cm endoscope to allow direct visual examination of the distal portion of the colon. The study requires satisfactory cleansing of the descending and sigmoid colon and rectum. This usually requires a clear liquid diet for 24 hours and, the evening before, one to two saline enemas. An advantage is that no sedation is required; the test can be performed in an office and takes only about 10 minutes. Patients experience some discomfort. The risk of perforation is estimated to be 0.004% (Walsh & Terdiman, 2003).

No large randomized clinical trials have demonstrated effectiveness of flexible sigmoidoscopy in reducing mortality from colorectal cancer. The major evidence that supports the use of this screening modality comes from retrospective reviews (Walsh & Terdiman, 2003). The recommended interval for screening is shortened to five years because the procedure generally is not performed by specialists and the range of practitioner expertise is variable, bowel preparation often is less than optimal, and no sedation is used, so patient discomfort or spasm may interfere with completeness of the test (Smith et al., 2001).

Screening flexible sigmoidoscopy is estimated to reduce colorectal cancer mortality by two-thirds for lesions in the reach of the sigmoidoscope. The biggest limitation of flexible sigmoidoscopy is that no visualization exists for two-thirds of the colon. For those in whom a polyp is detected, colonoscopy is necessary to examine the entire colon and remove the polyp.

Colonoscopy

Colonoscopy involves the insertion of a 160 cm endoscope that allows direct visualization of the entire colon. Ideally, the examination should extend to the cecum. It usually is performed by a gastroenterologist or a surgeon and requires extensive training. The day prior to the procedure, patients must be on a clear liquid diet and then consume some form of low-volume sodium phosphate purge or high-volume polyethylene glycol purge. Sedation is administered, so patients must arrange for transportation and generally cannot work that day. The examination takes about 30 minutes, and recovery time is two to three hours.

The biggest benefit of colonoscopy is that it allows for the detection and simultaneous removal of polyps and biopsy of cancer throughout the colon. Even though colonoscopy can miss malignant neoplasms, it is considered the most sensitive of the screening methods. However, colonoscopy involves greater cost, risk, and inconvenience to patients than other screening tests.

Double Contrast Barium Enema

Double contrast barium enema (DCBE) is a radiologic examination of the entire colon that requires the instillation of barium and air to define the contour of the colon. DCBE is less sensitive than colonoscopy, especially for identifying small adenomas less than 1 cm. Patient preparation is similar to that of colonoscopy, but no sedation is required. The procedure takes 30–60 minutes. The rate of serious complications is estimated to be 1 in 10,000 examinations (Walsh & Terdiman, 2003). The sensitivity for polyps 1 cm and larger is 50%. Any abnormality must be followed up with colonoscopy.

Digital Rectal Examination

DRE refers to palpation of the anus and lower rectum with a gloved finger. It is a useful method of identifying masses but has poor sensitivity for detecting colorectal cancer because of limited reach. It should be performed prior to insertion of an endoscope.

New Screening Methods

Computed tomography (CT) colonography or virtual colonoscopy is a procedure that allows imaging of the colorectum using computer programming to combine multiple helical CT scans. This provides two- and three-dimensional images of the colon. It takes less than five minutes to complete. Preparation is similar to that for colonoscopy. Carbon dioxide must be insufflated through a rectal tube to distend the colon to enhance imaging. After the examination, a radiologist examines the images, which takes 20–40 minutes. If an abnormality is detected, a patient should be referred immediately for colonoscopy.

Results from early studies demonstrate that the accuracy of CT colonography is comparable to that of conventional colonoscopy for the detection of polyps greater than 10 mm. The early studies were completed by highly trained radiologists on patients at high risk for colorectal cancer who were more likely to have occult disease. Generalizability is not clear. The false-positive rate is estimated to be about 15% and is related to retained stool; diverticular disease, which makes areas of the colon poorly distensible; and thick folds mistaken for lesions (Levin, Brooks, Smith, & Stone, 2003). Currently, a lack of standards exists for performance, training, and reading of scans. CT colonography is not therapeutic, and polyps cannot be removed during the procedure. Cost is another limitation because it may be higher than the cost of conventional colonoscopy.

Immunochromosomal stool screening is a potential emerging screening technology. The tests employ a complex reaction that uses monoclonal and polyclonal antibodies to detect the intact globin protein portion of human hemoglobin. These tests do not require dietary restrictions because they will not react with nonhuman hemoglobin or uncooked fruits and vegetables that contain peroxidase and may react with guaiac (Levin et al., 2003). The sensitivity is estimated to be 87% for adenomas greater than 10 mm.

Molecular stool screening refers to a method of detecting mutations associated with colorectal neoplasia in the DNA of stool samples. Colorectal epithelial DNA can be extracted from stool samples and amplified, allowing for the detection of mutations. The test is reported to have a sensitivity of 71%–91% for cancer and 82% for adenoma and a specificity of 93%.

Implications for Nursing

Technology and recommendations for the early detection of colorectal cancer continue to evolve. Nurses must stay informed of these changes so that they can interpret findings to patients in understandable terms. At present, most agencies provide recommendations, although controversy exists regarding their guidelines for FOBT, flexible sigmoidoscopy, and colonoscopy. Although public and research interest in CT colonography, immunochromosomal stool screening, and molecular stool screening exists, most organizations have not formally recommended widespread use of these modalities. Patients need to be instructed on the rationale for these recommendations and the limitations of these tests. Nurses can stay informed about changes in guidelines at the National Guideline Clearinghouse, available at www.guideline.gov.
In many cases, guidelines must be modified if risk factor assessment suggests an elevated risk or an abnormality is detected during clinical examination. Clearly, the risks, benefits, and limitations of each screening test must be discussed so that patients can make informed decisions about what is best in their own unique situations.

Most of the guidelines do not discuss when to stop screening. Again, nurses must apply clinical judgment and consider the overall health of patients when making recommendations.

Most importantly, nurses need to remember that often the single most important thing they can do is just to recommend screening. Recommendation and education about the effectiveness of colorectal cancer screening and the fact that all people aged 50 and older are at risk for colon cancer may be the most effective ways to increase participation in colorectal cancer screening. Ultimately, this will decrease the morbidity and mortality associated with the disease.

Author Contact: Suzanne M. Mahon, RN, DNSc, AOCN®, APNG, can be reached at mahonsm@slu.edu, with copy to editor at CJONeditor@jsobel.com.

References