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A Cancer Journal for Clinicians

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CA Cancer J Clin 2006;56;11-25

This information is current as of April 6, 2006

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Robert A. Smith, PhD; Vilma Cokkinides, PhD; Harmon J. Eyre, MD

ABSTRACT Each January, the American Cancer Society (ACS) publishes a summary of its recommendations for early cancer detection, including guideline updates, emerging issues that are relevant to screening for cancer, and a summary of the most current data on cancer screening rates for US adults. In 2005, there were no updates to ACS guidelines. In this issue of the journal, we summarize the guidelines, discuss recent evidence and policy changes that have implications for cancer screening, and provide an update of the most recent data pertaining to participation rates in cancer screening by age, sex, and insurance status from the Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System. (*CA Cancer J Clin* 2006;56:11–25.) © American Cancer Society, Inc., 2006.

INTRODUCTION

In 2000, the American Cancer Society (ACS) began a yearly report on its cancer detection guidelines, current issues related to screening and/or testing for the early detection of cancer, and updates on cancer screening rates.¹ These annual reports provide a regular, yearly source for ACS guidelines related to cancer screening, or guidance to the public about testing for early detection for select cancers where mass screening is not recommended. The first report also included a description of the ACS process for the development or update of a cancer screening guideline.¹

In 2001, the ACS published revisions in the early detection guidelines for colorectal cancer, endometrial cancer, and prostate cancer, and an updated narrative related to testing for early lung cancer detection.² Guidelines for cervical cancer screening were most recently updated in 2002.³ In 2003, guidelines for the early detection of breast cancer were updated, and a technology update related to colorectal cancer screening also was published, resulting in the addition to immunochemical stool blood testing to the recommendations for colorectal cancer screening.^{4,5} The annual guideline reviews, as well as the more detailed guideline updates published as stand-alone articles, are available online at <http://Caonline.AmCancerSoc.org>.

At this time, several guidelines reviews and updates are in progress. The ACS is updating recommendations for the prevention and early detection of skin cancer, and conducting technology updates for (1) breast cancer screening in women at known or suspected inherited risk for breast cancer, and (2) testing stool for colorectal cancer. Furthermore, in the coming year we will publish an update on the recommendations for postpolypectomy and postcolorectal cancer resection follow up, which was done as a collaborative review with the U.S. Multisociety Task Force on Colorectal Cancer.⁶

SCREENING FOR BREAST CANCER

ACS guidelines for breast cancer screening were last updated in 2003 (Table 1).⁴ Guidelines for the early detection of breast cancer in average risk women emphasize a process that begins after a woman is 20 years of age and consist of a combination of clinical breast examination, counseling to raise awareness of breast symptoms, and regular mammography beginning at age 40.

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TABLE 1 American Cancer Society Recommendations for the Early Detection of Cancer in Average-risk Asymptomatic People

Cancer Site	Population	Test or Procedure	Frequency
Breast	Women, aged \geq 20 years	Breast self-examination (BSE) Clinical breast examination (CBE)	Beginning in their early 20s, women should be told about the benefits and limitations of BSE. The importance of prompt reporting of any new breast symptoms to a health professional should be emphasized. Women who choose to do BSE should receive instruction and have their technique reviewed on the occasion of a periodic health examination. It is acceptable for women to choose not to do BSE or to do BSE irregularly. For women in their 20s and 30s, it is recommended that CBE be part of a periodic health examination, preferably at least every 3 years. Asymptomatic women aged 40 years and over should continue to receive a clinical breast examination as part of a periodic health examination, preferably annually.
Colorectal	Men and women, aged \geq 50 years	Mammography Fecal occult blood test (FOBT) [†] or fecal immunochemical test (FIT), or Flexible sigmoidoscopy, or Fecal occult blood test (FOBT) [†] and flexible sigmoidoscopy, [‡] or Double contrast barium enema (DCBE), or Colonoscopy	Begin annual mammography at age 40 years.* Annual, starting at age 50 years. Every 5 years, starting at age 50 years. Annual FOBT (or FIT) and flexible sigmoidoscopy every 5 years, starting at age 50 years. DCBE every 5 years, starting at age 50 years.
Prostate	Men, age \geq 50 years	Digital rectal examination (DRE) and prostate-specific antigen test (PSA)	Colonoscopy every 10 years, starting at age 50 years. The PSA test and the DRE should be offered annually, starting at age 50 years, for men who have a life expectancy of at least 10 more years. [§]
Cervix	Women, aged \geq 18 years	Pap test	Cervical cancer screening should begin approximately 3 years after a woman begins having vaginal intercourse, but no later than 21 years of age. Screening should be done every year with conventional Pap tests or every 2 years using liquid-based Pap tests. At or after age 30 years, women who have had three normal test results in a row may get screened every 2 to 3 years with cervical cytology (either conventional or liquid-based Pap test) alone, or every 3 years with an human papillomavirus DNA test plus cervical cytology. Women aged \geq 70 years who have had three or more normal Pap tests and no abnormal Pap tests in the last 10 years and women who have had a total hysterectomy may choose to stop cervical cancer screening.
Endometrial	Women, at menopause	At the time of menopause, women at average risk should be informed about risks and symptoms of endometrial cancer and strongly encouraged to report any unexpected bleeding or spotting to their physicians.	
Cancer-related checkup	Men and women, aged \geq 20 years	On the occasion of a periodic health examination, the cancer-related checkup should include examination for cancers of the thyroid, testicles, ovaries, lymph nodes, oral cavity, and skin, as well as health counseling about tobacco, sun exposure, diet and nutrition, risk factors, sexual practices, and environmental and occupational exposures.	

*Beginning at age 40 years, annual clinical breast examination should be performed prior to mammography.

[†]FOBT as it is sometimes done in physicians' offices, with the single stool sample collected on a fingertip during a digital rectal examination, is not an adequate substitute for the recommended at-home procedure of collecting two samples from three consecutive specimens. Toilet-bowl FOBT tests also are not recommended. In comparison with guaiac-based tests for the detection of occult blood, immunochemical tests are more patient-friendly, and are likely to be equal or better in sensitivity and specificity. There is no justification for repeating FOBT in response to an initial positive finding.

[‡]Flexible sigmoidoscopy together with FOBT is preferred compared with FOBT or flexible sigmoidoscopy alone.

[§]Information should be provided to men about the benefits and limitations of testing so that an informed decision about testing can be made with the clinician's assistance.

Between the ages of 20 to 39 years, women should undergo clinical breast examination every 3 years, and annually after age 40 years. This exam should take place during periodic health examinations, and provides an opportunity for health care professionals to update a woman's family history of breast cancer, discuss the importance of early breast cancer detection, discuss the importance of regular mammography after age 40 years, and answer any questions women may have about their own risk, new early detection technologies, or other matters relating to breast disease. During these discussions, health care professionals can play a key role in raising awareness about the importance of recognizing symptoms of breast cancer and developing a heightened awareness about breast changes. Although the ACS no longer recommends that all women conduct regular breast self-examination (BSE), women should be informed about the potential benefits, limitations, and harms associated with BSE. Women may then choose to do BSE regularly, occasionally, or not at all. If a woman chooses to perform periodic BSE, she can receive instructions in the technique and/or have her performance reviewed. The guidelines update in 2003 placed a strong emphasis on the health care professional's role in raising and regularly reinforcing awareness about breast cancer, early breast cancer detection, the importance of prompt reporting of any new symptoms, and most important, regular screening with mammography after age 40 years.

The ACS recommends that average-risk women should begin annual mammography at the age of 40 years. Women also should be informed about the scientific evidence demonstrating the value of detecting breast cancer before symptoms develop, and the importance of adhering to a schedule of regular mammograms. Benefits include a reduction in the risk of dying from breast cancer, less aggressive therapy, and a greater range of treatment options. Women also should be told about the limitations of mammography, specifically that mammography will not detect all breast cancers, and some breast cancers detected with mammography may still have poor prognosis. Further, women should be informed about the

potential harms associated with mammographic screening, including false positives, biopsy for abnormalities that prove to be benign, and the short period of anxiety that naturally would accompany a period where there was uncertainty about the presence of a malignancy.

There is no set age at which mammography screening should be discontinued. Rather, the ACS recommends that the decision to stop mammography screening should be individualized considering the potential benefits and risks of screening in the context of overall health status and anticipated longevity. As long as a woman is in good health and would be a candidate for breast cancer treatment, she should continue to be screened with mammography.

The 2003 update of the breast cancer screening guidelines also addressed issues related to screening high-risk groups. Although there is not sufficient data to recommend a specific surveillance strategy for high-risk women, including women younger than age 40 years at significantly elevated risk, the ACS guidelines state that women at significantly increased risk for breast cancer may benefit from earlier initiation of screening, screening at shorter intervals, and the screening with additional modalities such as ultrasound or magnetic resonance imaging.⁴ As noted above, an update of these recommendations for high risk women is currently underway.

In 2005, the first results of the Digital Mammographic Imaging Screening Trial (DMIST) were published.⁷ The goal of the study was to determine in a large prospective study whether digital technology improved diagnostic accuracy over screen film mammography. The study was conducted at 33 sites in the United States and Canada, and included 49,528 asymptomatic women who presented for screening mammography. Women who agreed to be in the study were screened for breast cancer with both digital and screen-film mammography, and the exams were interpreted independently by two radiologists. As part of the study, women were expected to return for an additional screening examination after 1 year, or if they received an examination at a nonparticipating

pating site, to have the results sent to the study coordinator.

Previous studies comparing digital mammography to screen-film mammography have not found digital mammography to be significantly more accurate than screen-film mammography in the detection of breast cancer, although there was some suggestion that digital mammography offered advantages over screen-film mammography by reducing the proportion of women recalled for further evaluation for positive findings.⁸ This advantage primarily is due to the ability of digital technology to manipulate the contrast in the image, as well as magnify areas that warranted closer evaluation. In the first report of findings from the trial, Pisano et al reported that there was no overall difference in diagnostic accuracy between digital mammography and screen-film mammography in the entire study group, but that the accuracy of digital mammography was significantly better than screen-film mammography in three distinct subgroups of women—women under the age of 50 years, premenopausal or peri-menopausal women, and women with heterogeneously dense or extremely dense breasts on mammography examination.⁸ The authors concluded that the apparent advantage evident with digital mammography likely was due to the ability to take the fullest advantage of the available contrast through digital manipulation in subgroups of women with a higher prevalence of dense breast tissue, a circumstance that makes mammography more challenging and is associated with a higher rate of errors.

While the apparent implication of these findings is that younger women and women with dense breast tissue should choose digital mammography over screen-film mammography, a change in policy related to the application to specific technologies to specific groups of women faces unique challenges. First, and perhaps foremost, is the fact that digital mammography is not widely available. Second, there likely will be interest in seeing if these results can be duplicated in additional studies. Third, given the relative scarcity of digital mammography at this time, further clarification of the advantages of digital over screen-film in

these three groups would provide greater guidance to policy makers, which are the advantages of digital over screen-film attributable mostly to age, density, or both? However, given the unique advantages of digital mammography over screen-film mammography in terms of electronic storage, teleradiology, and image manipulation, these findings suggest that both the technology and the ability to effectively use the technology is maturing and, over time, that it offer an improvement over conventional imaging for some groups of women.

SCREENING FOR CERVICAL CANCER

ACS guidelines for cervical cancer screening were last updated in 2002 (Table 1).³ The guideline reflects the current understanding of the underlying epidemiology of cervical intraepithelial neoplasia (CIN), in particular the causal role of human papillomavirus (HPV), and recommends varying surveillance strategies based on a woman's age, her screening history, and the screening and diagnostic technologies she chooses.

ACS recommends that cervical cancer screening should begin approximately 3 years after the onset of vaginal intercourse, but no later than age 21 years. Annual screening with conventional cervical cytology smears, or biennial screening using liquid-based cytology, is recommended until age 30 years. At or after age 30 years, a woman who has had three consecutive, technically satisfactory normal/negative cytology results may undergo screening every 2 to 3 years using either conventional or liquid-based cytology. Alternatively, after age 30 years, women who have the same history of normal cytology results may undergo HPV DNA testing with conventional or liquid-based cytology every 3 years. Women who chose to undergo HPV DNA testing should receive counseling and education about HPV and HPV testing. Specifically, women should be informed that: (1) a positive HPV test result does not reflect the presence of a sexually transmitted disease, but rather a sexually acquired infection; (2) almost everyone who has had sexual intercourse has been ex-

posed to HPV and that the infection is very common; and (3) HPV infection usually is not detectable or harmful. Most important, testing positive for HPV does not indicate the presence of cancer, nor will the large majority of women who test positive for an HPV infection develop advanced cervical neoplasia.

Average risk women aged 70 years and older with an intact cervix may choose to cease cervical cancer screening if they have had no abnormal/positive cytology tests within the 10-year period before age 70 years, and if there is documentation that their three most recent consecutive exams were technically satisfactory and interpreted as normal. However, screening after age 70 years is recommended for women who have not been previously screened, women for whom information about previous screening is unavailable, or for women whom past screening is unlikely.

The update of the guidelines also addressed screening for cervical cancer in women for whom additional guidance is relevant, including women at higher risk and women who have undergone hysterectomy. Women with a history of cervical cancer or in utero exposure to diethylstilbestrol (DES) should follow the same guidelines as average risk women before age 30 years, but should continue with that protocol after age 30 years. Women who are immunocompromised by organ transplantation, chemotherapy, or chronic corticosteroid treatment, or who are HIV+ should follow US Public Health Service (USPHS) and Infectious Disease Society of America (IDSA) guidelines, which state they should be tested twice during the first year after diagnosis, and annually thereafter.⁹ There is no specific age to stop screening for women with a history of cervical cancer, women with in utero exposure to DES, and women who are immunocompromised (including HIV-positive patients). Women in these risk groups should continue cervical cancer screening for as long as they are in reasonably good health and would benefit from early detection and treatment.

Screening with the Pap test is not indicated for women who have had a total hysterectomy, including removal of the cervix, for benign gynecologic disease. However, women with a history of CIN2/3, or women for whom it is not possi-

ble to document the absence of CIN2/3 before or as the indication for the hysterectomy, should continue to be screened until there is a 10-year history of no abnormal/positive cytology tests, including documentation that the three most recent consecutive tests were technically satisfactory and interpreted as normal/negative. Women with a history of in utero DES exposure and/or a history of cervical carcinoma should continue screening after hysterectomy for as long as they are in reasonably good health and do not have a life-limiting chronic condition that would rule out therapy for cervical disease. Average-risk women who have had a subtotal hysterectomy should be screened following the recommendations for average-risk women who have not undergone hysterectomy.

In the last update of the guidelines, the association between certain subtypes of HPV and cervical cancer played a large role in defining screening intervals, risk assessment, and testing methodology. For some time, research has been ongoing to develop and test a vaccine that would prevent infection with the most common high risk subtypes of HPV, specifically HPV 16/18. Earlier research in which approximately 2,400 women age 16 to 23 years were randomized to receive three doses of placebo or HPV-16 virus-like-particle vaccine and followed for a median of 17.4 months showed an incidence of persistent HPV 16 infection of 3.8 per 100 woman years in the placebo group, and 0 persistent HPV 16 infection per 100 woman years in the vaccine group, for 100% efficacy.¹⁰ More recently, at the annual meeting of the Infectious Diseases Society of America, Koutsky presented new results from a larger study (12,167 women) of an investigational vaccine against HPV16/18, two HPV subtypes believed to account for 70% of cervical cancer.¹¹ At seven months of follow up, the efficacy of the vaccine was 100% in women who had received all three doses of the vaccine. These findings foretell new directions in cervical cancer control throughout the world that will likely mean vaccination of adolescent girls and boys before exposure to high risk subtypes of HPV during normal sexual activity.

 SCREENING AND SURVEILLANCE FOR THE EARLY
 DETECTION OF ADENOMATOUS POLYPS AND
 COLORECTAL CANCER

ACS guidelines for screening and surveillance for the early detection of adenomatous polyps and colorectal cancer were updated in 2001 (Table 1), and the recommendations for stool blood testing were modified in 2003 by adding fecal immunochemical tests.^{2,5} There are a number of options for colorectal screening, which may be chosen based on individual risk, personal preference, and access. The ACS recommends that average-risk adults begin colorectal cancer screening at age 50 years, with *one* of the following options: (1) annual fecal occult blood test (FOBT) or fecal immunochemical test (FIT); (2) flexible sigmoidoscopy every 5 years; (3) annual FOBT or FIT, plus flexible sigmoidoscopy every 5 years; (4) double contrast barium enema (DCBE) every 5 years; or (5) colonoscopy every 10 years. Other tests currently are being evaluated in experimental settings, and also available to a limited degree to the public, are stool DNA testing and computed tomography exams of the colon, also referred to as virtual colonoscopy. While not recommended at this time, the ACS is carefully monitoring the accumulation of evidence related to these tests.⁵

The ACS recommends more intensive surveillance for individuals at higher risk for colorectal cancer. Individuals at higher risk for colorectal cancer include individuals with a history of adenomatous polyps, individuals with a personal history of curative-intent resection of colorectal cancer, individuals with a family history of either colorectal cancer or colorectal adenomas diagnosed in a first-degree relative before age 60 years, or individuals at significantly higher-risk due to a history of inflammatory bowel disease of significant duration, or individuals at significantly higher-risk due to a family history or genetic testing indicating the presence of one of two hereditary syndromes, such as hereditary nonpolyposis colorectal cancer (HNPCC) and familial adenomatous polyposis (FAP).² For these individuals, increased surveillance generally means a specific recommendation for colonoscopy, if

available, and may include more frequent exams and beginning exams at an earlier age.²

Recently, several research reports revealed that there is reason to be concerned about the quality of FOBT testing in the United States. In the recent comparison of stool DNA testing with FOBT, Imperiale and colleagues observed that one-time FOBT testing using the take-home method was only 13% sensitive for cancer, with poorer performance in part attributable to in-office processing of test results.¹² Further, in a study of veteran males reported earlier, Collins et al examined the performance of a single sample, in-office FOBT following digital rectal examination (DRE).¹³ The sensitivity for advanced neoplasia of a one time FOBT when done properly is very low,¹⁴ which is why there is a strong emphasis on the importance of annual testing for patients who chose to be screened for colorectal cancer with stool blood tests. Collins and colleagues observed that when procedure is done in the office following a rectal exam, the sensitivity for advanced neoplasia was only 4.9%.¹³ In an accompanying article in the same journal, Nadel et al reported on a national population-based survey of primary care providers, among which one-third reported that this was the only method of stool blood testing that they used, and an additional 41% reported using both the in-office and take home methods.¹⁵ These findings provide sobering evidence that millions of FOBTs done each year literally are worthless, and according to Sox in an accompanying editorial, provide at least indirect evidence for one reason that colorectal cancer mortality hasn't dropped more despite the volume of stool blood testing.^{15,16}

Many physicians take the opportunity to do FOBT with stool acquired during a DRE, having little confidence that the patient will complete the preferred at-home method. However, it is clear from this evidence that in-office testing for fecal occult blood not only is wasteful of time and resources, but a negative result also provides false reassurance to the patient. While convenient, one-sample FOBT for colorectal cancer screening with stool collected during a DRE is not recommended¹⁶ and has been discouraged in previous guidelines.²

Additional data from Nadel et al reveals further problems with stool blood testing, specifically that follow up of positive FOBTs commonly is inappropriate.¹⁵ Nearly one in three physicians surveyed reported repeating the FOBT if the first test was positive, and a higher percentage reported follow up with flexible sigmoidoscopy rather than colonoscopy. One third of adults in the National Health Interview Survey (NHIS) who reported having had a positive FOBT reported that they received no follow up.¹⁵

The findings on inappropriate testing with FOBT, as well as inappropriate follow up of a positive FOBT, indicate the need for a highly focused educational campaign to help clinicians understand that FOBT testing should follow manufacturer's instructions, and that positive tests should be followed up with colonoscopy.

SCREENING FOR ENDOMETRIAL CANCER

In 2001, the ACS concluded that there was insufficient evidence to recommend screening women at average risk, or somewhat increased risk, for endometrial cancer due to history of unopposed estrogen therapy, tamoxifen therapy, late menopause, nulliparity, infertility or failure to ovulate, obesity, diabetes, or hypertension.² ACS recommends that women at average and increased risk should be informed about risks and symptoms of endometrial cancer at the onset of menopause (in particular, unexpected bleeding and spotting), and should be strongly encouraged to treat these symptoms seriously and immediately report them to their physicians (Table 1). Women at very high risk for endometrial cancer due to (1) known hereditary nonpolyposis colon cancer (HNPCC)-associated genetic mutation carrier status; (2) substantial likelihood of being a mutation carrier (ie, a mutation is known to be present in the family); or (3) absence of genetic testing results in families with suspected autosomal dominant predisposition to colon cancer, should consider beginning annual testing for early endometrial cancer detection at age 35. The endometrial biopsy is still the most common technique used to obtain endometrial tis-

sue, and although other methodologies are under investigation, the evaluation of endometrial histology is still the gold standard for determining the status of the endometrium.¹⁷ High-risk women should be informed that the recommendation for screening is based on expert opinion in the absence of definitive scientific evidence, and they also should be informed about potential benefits, risks, and limitations of testing for early endometrial cancer detection.

TESTING FOR EARLY PROSTATE CANCER DETECTION

ACS guidelines for testing for early prostate cancer detection were last updated in 2001. Because the current evidence about the value of testing for early prostate cancer detection is insufficient to recommend that average-risk men undergo regular screening, the ACS recommendations emphasize the importance of shared decision making about testing.² The ACS recommends that the prostate-specific antigen (PSA) test (PSA) and DRE should be offered annually beginning at age 50 years to men who have a life expectancy of at least 10 years, and that a discussion take place about the potential benefits, limitations, and harms associated with testing (Table 1). In men for whom DRE is an obstacle to testing, PSA alone is an acceptable alternative.

In the course of deliberating about the guidelines, the ACS Advisory Committee placed strong emphasis on shared decision making between clinicians and patients, stressing that, just as a clinical policy of directly recommending testing is inappropriate, a clinical policy of not offering testing or discouraging testing in men who request early prostate cancer detection tests likewise is inappropriate. In addition, the Advisory Committee also concluded that if men ask the clinician to make the testing decision on their behalf following a discussion about benefits, limitations, and risks associated with prostate cancer testing, they should be tested.

Men at high risk, including men of sub-Saharan African descent and men with a first-

degree relative diagnosed before at a younger age (ie, < 65 years) should begin testing at age 45 years. Men at even higher risk of prostate cancer due to more than one first-degree relative diagnosed with prostate cancer before age 65 years could begin testing at age 40 years, although if PSA is less than 1.0 ng/mL, no additional testing is needed until age 45. If PSA is greater than 1.0 ng/mL but less than 2.5 ng/mL, annual testing is recommended. If PSA is 2.5 ng/mL or greater, further evaluation with biopsy should be considered. Informed decision making is no less important for men at high risk. These recommendations for testing do not obviate the need for testing decisions to be preceded by a process of informed decision making. Men at high risk should have an opportunity to learn about the potential benefits, limitations, and harms associated with testing for early detection and treatment of early-stage prostate cancer, so that they can make an informed decision with the assistance of a health care professional.

Because PSA is prostate-tissue specific and not prostate-cancer specific, there is no absolute value that is applicable to all men. The range of normal PSA levels has conventionally been considered to be between 0.0 and 4.0 ng/dL, although as Thompson and colleagues have recently shown,¹⁸ there is no cutoff level of PSA at which prostate cancer is not present, but rather a continuum of risk at all levels of PSA values. Levels of PSA less than 4.0 ng/dL, increase the sensitivity of PSA, but also significantly diminish specificity, with the accompanying attendant costs and potential harms associated with false positives.

Although there is considerable interest in the eventual publication of end results from two contemporaneous randomized trials of prostate cancer screening in the United States and Europe, resolving other challenges related to prostate cancer screening should also be a high priority.^{19,20} These include the need for tests that are more effective at measuring the degree of progressivity of prostate cancer (thus avoiding overtreatment where possible), and new approaches to therapy that reduce the risks of serious side effects.

TESTING FOR EARLY LUNG CANCER DETECTION

At present, no organization recommends testing for early lung cancer detection in asymptomatic individuals at risk for lung cancer. However, the growth in the use of spiral computed tomography (CT) to test for early lung cancer detection in former and current smokers, as well as the more common use of chest x-ray, led the ACS to update its narrative about lung cancer testing in 2001 emphasizing the importance of informed decisions among individuals at risk who seek testing.² The ACS historically has maintained that patients at high risk of lung cancer due to significant exposure to tobacco smoke or occupational exposures may decide to undergo testing for early lung cancer detection on an individual basis after consultation with their physicians.²¹

The circumstances leading to individual decision making are more challenging today because of growing evidence indicating a possible benefit from testing for early lung cancer detection with spiral CT^{22,23} and increased discussion of the potential benefits associated with early detection during media coverage of lung cancer diagnoses in well-known individuals.²⁴ Favorable findings from investigations using low-dose helical CT for testing for early lung cancer detection²⁵ led to a large prospective trial evaluating the relative efficacy of low-dose spiral CT versus chest radiography for the early detection of lung cancer in current and former smokers,²⁶ as well as direct promotion to the public of spiral CT for early lung cancer detection. The NCI estimates that the trial may produce end results that could inform policy decisions as early as 2009.

In its narrative, the ACS emphasized the importance of informed decision making for individuals who elect to be tested for early lung cancer detection, and recommend that testing should be done only in experienced centers characterized by multidisciplinary specialty groups with experience in testing, diagnosis and follow-up. Current smokers should be informed that the more immediate preventive health priority is the elimination of tobacco use altogether, because smoking cessation offers the

surest route at this time to reducing the risk of premature mortality from lung cancer.²⁷

THE CANCER-RELATED CHECKUP

Periodic encounters with clinicians for checkups offer the potential for health counseling, cancer screening, and case finding.²¹ These encounters should include the performance or referral for conventional cancer screening tests as appropriate by age and sex, as described above, but also are an opportunity for case-finding examinations of the thyroid, testicles, ovaries, lymph nodes, oral region, and skin. Also, self-examination techniques or increased awareness about signs and symptoms of skin cancer, breast cancer, or testicular cancer can be discussed. Health counseling may include guidance about smoking cessation, diet, physical activity, and shared decision making about cancer screening. Whereas in the past the ACS recommended a cancer-related checkup in a manner that implied a stand-alone exam, the recommendation now stresses that the occasion of a general periodic health examination provides a good opportunity to address examinations and counseling that could lead to early detection (Table 1).

SURVEILLANCE OF CANCER SCREENING: COLORECTAL, BREAST, CERVICAL, AND PROSTATE CANCERS

Data Sources

This section presents surveillance data on the estimated proportion (prevalence) of the adult population that undergoes specific tests for early cancer detection in the United States in accordance with ACS cancer screening guidelines (Table 2). The data source for this section is the Centers for Disease Control and Prevention's (CDC) Behavioral Risk Factor Surveillance System (BRFSS) survey conducted in 2004; this is the most recent year that the survey included a comprehensive set of questions to assess prevalence of cancer screening for colorectal, breast, cervical, and prostate cancer. The

BRFSS provides state-specific estimates of behavioral risk factors from ongoing state-wide telephone surveys of civilian, noninstitutionalized adults (ie, persons 18 years of age or older living in households with a telephone). The BRFSS is conducted annually by state health departments in collaboration with the CDC in all 50 states, the District of Columbia, and Puerto Rico. The BRFSS survey methodology includes standardized core questionnaires, complex multistage cluster sampling designs, and random-digit dialing methods to select households with telephones. Data are weighted to provide prevalence estimates representative of the state's adult population. From its inception, the focus of the BRFSS has been to establish a surveillance system for the collection of population-based health behaviors, sociodemographics, use of preventive services (ie, use of early detection tests for cancer), health care access factors (ie, health insurance coverage, having a usual source of care and a regular health care provider), and other health status determinants of the general population.²⁸ A specialized statistical software for the analysis of survey was used to compute the age-adjusted weighted prevalence estimates (and standard errors) for the United States based on the combined state-level of states participating in the BRFSS in 2004.²⁹ The 95% confidence intervals (95% CIs) were calculated using information from the standard error of the estimates. The 95% CI represents a range of possible values for the estimated prevalence. Theoretically, if the survey were to be conducted 100 times, the 95% CI would contain the true population value in 95 out of 100 samples surveyed.

It should be noted that the data in Table 2 reflect a recent assessment of screening for breast, cervical, colorectal, skin and prostate cancer based on self-reports. Because the survey does not include additional questions about the frequency of screening during a given period, these data cannot be interpreted as a measure of routine use of screening tests for these cancers. Table 2 also shows the variation in cancer screening prevalence

TABLE 2 Prevalence (%) of Recent Cancer Screening Examinations Among US Adults by Health Insurance Coverage

	Nonelderly (< 65 years)							
	US Adults		Health Insurance		No Health Insurance		Elderly (≥ 65 years) With Health Insurance	
	Prevalence (%)	95% CI	Prevalence (%)	95% CI	Prevalence (%)	95% CI	Prevalence (%)	95% CI
Colorectal cancer (adults 50 years and older)								
Either a flexible sigmoidoscopy or colonoscopy*	45.6	(45.1–46.1)	42.2	(41.5–43.0)	18.8	(17.4–20.4)	53.1	(52.4–54.0)
Fecal occult blood testing (FOBT) home kit†	19.0	(18.4–19.1)	16.5	(16.0–17.0)	9.3	(8.2–10.5)	22.6	(22.0–23.2)
FOBT or endoscopy‡	52.1	(51.6–52.6)	49.1	(48.4–49.8)	24.4	(22.8–26.2)	59.6	(58.9–60.3)
Breast cancer (women 40 years and older)								
Mammogram§	58.0	(57.5–58.5)	60.0	(59.4–60.7)	33.2	(31.3–35.1)	62.5	(61.6–63.4)
Mammogram and clinical breast exam¶	51.0	(50.4–51.4)	54.7	(54.0–55.4)	28.2	(26.4–30.1)	51.1	(50.1–52.0)
Cervical cancer (women 18 years and older)								
Pap test**	85.0	(84.4–85.1)	90.0	(89.2–90.1)	75.7	(74.3–77.0)	72.1	(71.0–73.2)
Prostate Cancer (Men 50 years and older)								
Prostate-specific antigen††	54.0	(52.9–54.6)	50.0	(48.6–51.0)	25.7	(22.8–28.7)	62.4	(61.1–63.7)
Digital rectal exam‡‡	50.5	(49.6–51.3)	49.0	(47.7–50.0)	23.0	(20.5–25.5)	57.0	(55.4–58.1)

Prevalence is weighted and age-adjusted using the 2000 Census.

*Recent sigmoidoscopy or colonoscopy test within the preceding 5 years. †Recent fecal occult blood test using a home kit test performed within the preceding year.

‡Recent fecal occult blood test using a home kit test performed within the preceding year or Recent sigmoidoscopy or colonoscopy test within the preceding 5 years.

§Women aged 40 years and older who had a mammogram in the last year.

¶Women aged 40 years and older who had a mammogram in the last year and a clinical breast exam.

**Women who had a Pap test within the preceding 3 years.

††A prostate-specific antigen test within the past year for men who have not been told they have had prostate cancer.

‡‡A digital rectal examination within the past year for men who have not been told they have had prostate cancer. Data from the Centers for Disease Control and Prevention Behavioral Risk Factor Surveillance System.¹⁸

by health insurance coverage among individuals aged 65 years and younger and those aged 65 years and older. To highlight the impact of health insurance as a determinant of use of or access to cancer screening, health insurance status for persons younger than 65 years of age was classified based on whether they had or did not have any kind of health care coverage.

COLORECTAL CANCER SCREENING

The prevalence of recent colorectal cancer screening with an endoscopy procedure (flexible sigmoidoscopy or colonoscopy) was more than twice the prevalence of screening with a FOBT in both men and women. In 2004, among adults 50 years and older, the prevalence of having an

endoscopy procedure within the past 5 years for colorectal cancer screening was 52.1% and the prevalence of having done an at-home FOBT within the past year was 19%. Overall, among adults aged 50 years and older, the prevalence of having had either a FOBT or endoscopy procedure was 52.1%. Compared with individuals with health care coverage, the uninsured nonelderly group was significantly less likely to have had a colorectal cancer screening, and the differences were more pronounced for recent endoscopy compared with recent FOBT, likely due to the higher cost of those procedures. Whereas 42.2% of adults with insurance coverage reported recent endoscopy, only 18.8% of adults without insurance reported this kind of colorectal cancer screening (Table 2). Although this comparison represents an estimate of the prevalence of adults who are current with ACS guidelines in terms of

the kind of recent testing they have undergone, the BRFSS does not distinguish between sigmoidoscopy and colonoscopy, and therefore individuals who have had colonoscopy more than 5 years but less than 10 years before the survey was conducted would not be included in the estimate. No data are available from the BRFSS to estimate use of the double-contrast barium enema, a colorectal cancer screening test that is declining in use³⁰ but still included in most guidelines.^{2,6,31}

BREAST CANCER SCREENING

In 2004, the proportion of women aged 40 years and older reporting a mammogram in the last year was 58%, whereas 51% reported having had both a mammogram and a clinical breast exam (CBE) in the last year. Uninsured women aged 40 to 64 years of age were less likely to have had a mammogram (33.2%), or both a mammogram and CBE (28.2%) in the previous year, compared to women with health insurance (Table 2).

CERVICAL CANCER SCREENING

In 2004, 85.0% of women aged 18 and older with an intact uterus reported a Pap test in the preceding 3 years. The lowest prevalence of Pap-test screening occurred among women aged 18 to 64 years of age who lacked health care coverage (75.7%) (Table 2).

TESTING FOR EARLY PROSTATE CANCER DETECTION

Questions about recent testing for early prostate cancer detection are limited to men without a prior diagnosis of prostate cancer. In 2004, the proportion of men aged 50 years and older who reported having had a PSA test during the past year was 54%, and the prevalence of men who reported having a DRE was 50.5%. Men aged 50 and 64 who lacked health care coverage were about half as likely to have had a PSA or a DRE compared with men in the same age range who had health care coverage (Table 2).

SKIN CANCER SCREENING

Saraiya and colleagues³² analyzed skin cancer screening data from the NHIS, a nationally representative sample of US adults collected by the National Center for Health Statistics in 2000. Among adults aged 18 years and older, 14.5% reported having ever had a skin cancer screening exam by a doctor. Of these, 8.0% reported having had a recent skin cancer screening exam performed by a provider. Uninsured adults were significantly less likely to have a recent skin cancer screening exam compared with insured adults (3.5% versus 9.1%).

COMMENT

We observed differences in the prevalence of cancer screening between the 2002 and 2004 BRFSS.³³ Utilization of endoscopy by adults 50 years to 64 years increased from 41% to 45.6%, whereas use of at-home FOBT declined from 22% to 19%. The proportion of women aged 40 to 64 years who reported a recent mammogram was slightly lower in 2004 compared with 2002 (58% versus 61.3%), as was the proportion of women aged 18 to 64 years reporting a recent Pap test (85% versus 88.2%). Rates of testing for early prostate cancer detection remained the same. Between 2002 and 2004, there was no change in the prevalence of cancer screening reported by individuals without health care coverage, with a prevalence approximately half the rate of those adults with health care coverage. An exception is cervical cancer screening, where rates are more similar, likely due to publicly supported reproductive health programs.

The results in this section indicate that health care access factors (ie, health insurance coverage) have an effect on the prevalence of recent use of cancer screening. Previously, we examined cancer screening in the context of self-reports of having a regular doctor and a usual source of care, two factors also shown to significantly influence utilization of preventive health care services.³³ The results presented

here on the relationship between screening and health care coverage are consistent with other studies of the determinants of health care access on the use of preventive care services, including the use of cancer screening services.^{34–45} Based on 2002 US Census statistics of health insurance coverage, 17% of Americans younger than 65 years of age were uninsured; in contrast, less than 1% of the elderly population (those 65 years and older) were uninsured.⁴⁶ More than 40 million Americans do not have a particular doctor's office, clinic, health center or other place where they usually go to seek health care or health-related advice.

Although these data highlight differences in the use of cancer screening by adults and by health insurance status, actual rates of regular screening are likely to be considerably lower among both among insured and uninsured adults due to overreporting, a phenomena common in survey research.^{47–49} A recent study by Carney et al examined the use of mammography in New Hampshire, utilizing a statewide mammography registry that captures approximately 90% of the mammograms performed in participating facilities.⁵⁰ The authors compared clinical encounter data with New Hampshire population data from the 2000 Census. Their results showed that only 64% of New Hampshire women had had a mammogram within the previous 27 months. Among the screened women, 44% were adhering to an interval within 14 months, and 21% were adhering to a 15 to 26 month interval, whereas the remaining 35% of women had one or two mammograms but did not return for another mammogram within a 27-month period. What is most relevant to this discussion is difference between the estimates Carney and colleagues derive from the facility data compared with the estimates derived from the New Hampshire BRFSS. Whereas Carney et al estimate that 64% of New Hampshire women aged 40 years and older had a mammogram in the past 26 months, the BRFSS data estimates that 82% of women aged 50 years and older have had a screening mammogram in the previous 24 months, a considerable difference not likely to be in-

fluenced significantly by different age groups in the underlying estimates, but more likely due to methodological differences that influence the validity of the estimate.⁵⁰ There is no consensus on how best to measure repeat (or routine) mammography screening to have representative estimates from population surveys; researchers recognize that these data may be limited by respondents' ability to accurately recall for a given time period the frequency of specific screenings. Moreover, similar challenges in assessing 'routine' prevalence rates or 'adherence' prevalence rates can occur with other screening behaviors according to specifications/recommendations of cancer screening guidelines.⁵¹

Consistently lower screening rates and irregular screening rates among all adults, but especially among the uninsured, have direct implications for cancer control and the quality of cancer care because lack of access to early detection tests increases the risk of a diagnosis of late-stage cancer.^{52–54} Having a usual source of care and health insurance are strong predictors of recent cancer screening because both are enabling factors, but even among individuals with health insurance and access to a regular source of care, the pattern of regular cancer screening is quite uneven for all the cancers for which cancer screening is recommended.³³ Policy measures and interventions, such as those described in the section below on the Community Guide, are needed not only to reduce disparities, but also to increase adherence with regular screening in all adults.

CANCER SCREENING STRATEGIES: COMMUNITY GUIDE SYSTEMATIC REVIEWS

The independent Task Force on Community Preventive Services, with the support of the CDC, the National Cancer Institute and a range of experts in public and private sectors, is in the process of conducting a systematic review of studies of selected population-based interventions focusing specifically on controlling cancer through screening interventions.⁵⁵ Areas of emphasis include interventions aimed at increasing breast, cervical and colorectal cancer screening and in-

interventions aimed at promoting informed decision making about cancer screening. These reviews are being conducted as part of The Guide to Community Preventive Services,⁵⁵ which addresses community-based interventions summarizing the published evidence on the effectiveness of selected interventions across a range of public health topics.

In the Community Guide's systematic review of selected population-based interventions designed to improve early cancer detection, a particular area of focus was strategies designed to improve the delivery of cancer screening for breast, cervical, and colorectal cancer in community and health care settings. Strategies address particular barriers to screening such as client-related (eg, knowledge or attitudinal) access barriers, or provider and system barriers. Within each of these larger strategies, the Task Force considers specific interventions.

Recommendations are based on the strength of the evidence of effectiveness found through a systematic review of published literature conducted by a team of experts on behalf of the Task Force. A determination that there is insufficient evidence to determine effectiveness does not mean that the intervention is ineffective, but rather indicates that additional research is needed before a recommendation can be made to invest resources in this strategy. Decision makers should consider these evidence-based recommendations in light of local needs, goals, and constraints when choosing interventions to implement. Table 3 shows interventions for which reviews have been completed.⁵⁵

The Task Force on Community Preventive Services also has conducted a systematic review of population based interventions designed to promote *informed decision making* (IDM) related to cancer screening. IDM interventions may include, but are not limited to, decision aids which are designed to help people make specific and deliberative choices among options (including electing not to have screening). IDM complements and supports *shared decision making* (SDM), which takes place within a clinical consultation but is a different processes. SDM is a process in which both the patient and clinician share information, participate in the

decision making process, and agree on a course of action.⁵⁶ IDM can occur when an individual obtains and considers information about preventive services from any source, such as the Internet, without benefit of a consultation from a clinician. Specific strategies designed to improve IDM around screening for cancer and other health risks are important because many people want to be involved in decisions about their health care and need clear information about the benefits, limitations, and potential harms associated with cancer screening. Although presenting information about cancer screening to patients may seem simple enough on the surface, much of the science related to cancer screening is complicated and difficult to communicate in a short office visit. Further, physicians may not have access to accurate or user-friendly information, may not be sufficiently familiar with the facts to provide clear guidance, or may not be aware of changes in the evidence. Also, as shown above, many adults do not have a regular source of health care, a regular doctor, or health insurance.

The Task Force's review of the literature on IDM specifically examined whether IDM interventions: (1) promote understanding of cancer screening; (2) facilitate participation in decision making about cancer screening at a level that is comfortable for individuals; and (3) encourage individuals to make cancer-screening decisions that are consistent with their preferences and values.

The review found that 11 studies met the Task Force inclusion criteria, with three of these studies providing data on more than one intervention arm.⁵⁷ Therefore, for the purposes of the review, a total of 15 independent intervention arms were identified. There was generally consistent evidence that IDM interventions improved knowledge, beliefs, risk perceptions, or a combination of these (eg, knowledge about the disease, the test or the consequences of the test, accuracy of risk perceptions, or accuracy of beliefs). There was little or no evidence about whether IDM interventions resulted in participation in decision making at a level desired by individuals, or resulted in decisions that were consistent with values and preferences.

TABLE 3 Recommendations for Client-oriented Cancer Screening Interventions

Interventions	Breast Cancer	Cervical Cancer	Colorectal Cancer
Client reminders	Strong	Strong	Sufficient
Multicomponent using media, education, and enhanced access	Strong	Strong	Insufficient
Reducing structural barriers	Strong	Insufficient	Strong
Client incentives (with reminders)	Strong	Insufficient	Insufficient
Small media	Strong	Insufficient	Insufficient
Reduced out-of-pocket expense	Sufficient	Insufficient	Insufficient
Group education	Insufficient	Insufficient	Insufficient
One-on-one education	Strong	Insufficient	Insufficient
Client incentives (alone)	Insufficient	Insufficient	Insufficient
Mass media (alone)	Insufficient	Insufficient	Insufficient

Data from the Task Force on Community Preventive Services.⁴⁵

CONCLUSION

Between the 2002 and 2004 BRFSS surveys, the prevalence of cancer screening changed very little, and actually was slightly lower for some cancers. Further, progress in colorectal cancer screening is discouragingly modest, despite strong evidence of benefit, and consensus recommendations for screening. Factors associated with low screening rates are well understood, as are enabling factors, principally the recommendation from a physician and health insurance coverage. Yet, too many adults are not receiving regular screening, and thus there is a persistent, avoidable fraction of advanced cancer diagnosed each year that could have been detected at an earlier, more treatable stage, or potentially even prevented. In a recent commentary on the United Kingdom's National Institute for Clinical Excellence, Briss remarked that the link between evidence reviews and policy are not as inherently direct

in the United States as they are in the United Kingdom.⁵⁸ Thus, for example, although the evidence strongly supports a policy that every US adult ought to have the opportunity to be included in an electronic reminder system for cancer screening, the means, capacity, and resources are not in place to support such a system, nor is it obvious which among a list of potential candidate organizations and institutions could or should support such a system. In this respect, there not only is a failure to fully deliver evidence-based clinical care, but a failure to implement evidence-based public health. Although public education and outreach to clinicians and the public contribute to increasing cancer screening, it should be increasingly evident that greater investment in systems that support cancer screening and follow up, as well as opportunities for informed and shared decision making, are needed.⁵⁹

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