

CHAPTER 1

Cancer Prevention, Screening, and Early Detection

Heather Greene, MSN, RN, FNP, AOCNP®

Introduction

In 2015, an estimated 1,658,370 new cases of cancer are expected to be diagnosed in the United States, and 589,430 cancer deaths are expected (American Cancer Society [ACS], 2015). One-quarter to one-third of these cancer deaths will be related to tobacco use, poor nutrition, physical inactivity, and obesity (World Cancer Research Fund & American Institute for Cancer Research, 2009). All cancer deaths related to tobacco and alcohol abuse are entirely preventable. Additionally, any of the more than two million new cases of skin cancer diagnosed annually could be prevented by avoiding overexposure to ultraviolet light. Cancers related to viral or bacterial infections, such as the hepatitis B virus, human papillomavirus (HPV), HIV, and *Helicobacter*, also can be prevented through lifestyle changes and use of vaccines or antibiotics (ACS, 2015).

In addition to avoidance of risk factors, routine use of screening modalities can aid in prevention and early detection of cancer. Screening tests for cancers of the colon, rectum, and cervix can help prevent cancer by enabling removal of precancerous growths. In addition to reducing incidence, greater use of screening tests could decrease deaths related to breast, colorectal, and cervical cancers (ACS, 2015). Despite this, even mammography use has not increased since 2010. Half of all new cases of cancer are considered preventable or could be detected at an earlier stage (ACS, 2015).

Role of the Advanced Practice Nurse

Oncology advanced practice nurses (APNs) are in a unique position to educate their patients and the public regarding recommended cancer risk reduction and screening guide-

lines. The scope of practice for nurse practitioners includes an emphasis on health promotion and disease prevention (American Association of Nurse Practitioners, 2013). Therefore, cancer prevention and early detection are clearly responsibilities of the oncology APN.

In the Oncology Nursing Society's *Scope and Standards of Oncology Nursing Practice: Generalist and Advanced Practice* (Brant & Wickham, 2013), oncology APNs are encouraged to receive educational preparation in the principles of cancer prevention and early detection. Oncology specialty certification examinations (such as the advanced oncology certified nurse practitioner [AOCNP®] and advanced oncology certified clinical nurse specialist [AOCNS®] examinations) cover this topic. In accordance with their state's scope of practice, nurse practice act, and requirements for educational preparation, oncology APNs must be able to assess, evaluate, and interpret cancer risk assessments and recommend appropriate strategies related to cancer prevention and screening. All oncology nurses must be able to provide culturally sensitive cancer prevention and early detection services and participate in the development of resources that focus on wellness and primary prevention throughout the life span. Research on cancer prevention and early detection requires integration into current practice.

Cancer Risk Assessment

Cancer risk assessment is a vital part of the oncology APN's role in cancer prevention and early detection. To provide accurate counseling on cancer risk reduction strategies (e.g., tobacco cessation, lifestyle modifications, dietary changes, chemoprevention agents), cancer screening recommendations, and genetic testing (if appropriate), oncology APNs must first perform a comprehensive risk assessment. A cancer risk assessment is an individualized evaluation of a patient's risk for cancer based on a variety of both intrinsic and extrinsic factors and begins with a detailed history. This includes thorough past medical, social, obstetric/gynecologic, and surgical histories and documentation of recent age-appropriate screening tests, or lack thereof. Family history is a critical part of cancer risk assessment and includes at least a three-generation pedigree, particularly if a hereditary cancer syndrome is suspected (see Chapter 2). Medication history (such as hormone use), dietary history, level of physical activity, environmental exposures, history of tobacco and alcohol use, and other lifestyle choices also are important factors to assess when determining cancer risk. A thorough physical examination concludes the cancer risk assessment and includes a breast, pelvic or testicular, and rectal examination.

Multiple cancer risk assessment tools and models are available to help APNs convey this risk to patients, such as the Gail model, Tyrer-Cuzick model, and BRCAPRO for breast cancer risk (Quante, Whittemore, Shriver, Strauch, & Terry, 2012; Warner, 2011) and the MMRpro model for hereditary colon cancer risk (Greco, 2007). Each of these tools has its strengths and weaknesses. The Gail model is the most commonly used general breast cancer risk assessment tool and is used to estimate a woman's five-year risk and overall lifetime risk for breast cancer. Scores are calculated based on a variety of risk factors, including age, age at menarche, age at first live birth, race, number of first-degree relatives with breast cancer, and number of previous breast biopsies. The score is based on a comparison to that of a woman of average risk and of the same race and age, with elevated risk considered greater than 1.7%. However, this model fails to take into account the age at breast cancer diagnosis in affected family members, history of bilateral breast cancer, second-degree relatives affected with breast cancer, and history of ovarian cancer or lobular carcinoma in situ (Quante et al., 2012; Warner, 2011).

The National Cancer Institute (NCI) has several cancer risk assessment tools available online, most prominently those for breast (www.cancer.gov/bcrisktool) and colon cancer

(www.cancer.gov/colorectalcancerrisk) risk assessment. All of these models are best used in conjunction with an individualized, comprehensive cancer risk assessment by the APN to best estimate and counsel patients on their overall cancer risk and on interventions to decrease that risk.

Primary Prevention and Risk Reduction

Cancer prevention is achieved through primary, secondary, and tertiary methods. Primary cancer prevention consists of interventions aimed at keeping the carcinogenic process from beginning. Examples include smoking cessation interventions and chemoprophylaxis in women at high risk for breast cancer. Secondary cancer prevention is the discovery of cancerous or precancerous conditions while still in their earliest stage, when the disease is most likely to be treated successfully (Spratt, 1981). Examples include mammography to detect and remove premalignant changes in the breast and colonoscopy to remove polyps in the colon. Tertiary cancer prevention is applied to those individuals who have already been diagnosed with a malignancy with the intent of keeping the original disease in remission as long as possible.

Tobacco Use

Smoking has long been established as a detriment to overall health. As early as 1928, studies have referred to smoking and its association with cancer (Lombard & Doering, 1928). Research culminated with the 1964 U.S. Department of Health, Education, and Welfare's Surgeon General's report, which concluded that smoking was the major cause of lung cancer and was associated with oral and laryngeal cancers in men. Since then, thousands of additional studies and subsequent reports of the Surgeon General have confirmed tobacco's detrimental health effects. More than 4,000 chemicals have been identified in tobacco products and tobacco smoke, 55 of which are identified as carcinogens by the International Agency for Research on Cancer. These carcinogens may induce genetic mutations and ultimately lead to cancer development. In 2015, nearly 171,000 deaths will be attributable to tobacco (ACS, 2015). Tobacco use is considered a contributing or causative agent in a multitude of malignancies, including lung, nasal cavity, larynx, pharynx, esophagus, stomach, colon, rectum, liver, pancreas, kidney, bladder, uterine cervix, ovary (mucinous), and myeloid leukemia (ACS, 2015; Centers for Disease Control and Prevention [CDC], 2004). Smoking is thought to cause up to 90% of lung cancers and is the leading cause of preventable cancer-related and non-cancer-related deaths in the United States (ACS, 2015). Lung cancer is estimated to be diagnosed in close to 221,200 Americans in 2015, of which approximately 158,040 will die, encompassing nearly 30% of all cancer deaths (ACS, 2015).

Tobacco abuse and addiction is perhaps one of the greatest public health concerns of our time, particularly as cancer is concerned. According to CDC's National Health Interview Survey, cigarette smoking prevalence in U.S. adults declined between 2005 and 2011 from 20.9% to 19%. In addition, heavy smoking declined significantly during this time, reflecting long-term historical trends toward lower cigarette consumption in smokers (CDC, 2012a). Most adult smokers today began smoking in their youth. According to the 2011 National Youth Tobacco Survey, about 23.2% of high school students reported current use of any tobacco product (CDC, 2012b). Data from the Youth Risk Behavior Survey showed that in 2011, 18.1% of high school students reported current cigarette smoking (smoking on at least one day in the past 30 days), and 6.4% reported frequent smoking (smoking on 20 or more days in the past

30 days) (CDC, 2012b). Results from that survey also showed a 40% decline in cigarette smoking prevalence in high school students between 1997 and 2003 (from 36.4% to 22%) (CDC, 2012b). However, between 2003 and 2011, the percentage decline was about half as much, showing an 18% drop, from 22% to 18.1% (Eaton et al., 2012).

Primary prevention measures for tobacco-related cancers and tobacco deterrent programs must be aimed at children and adolescents. Recent research shows that adolescents are three times more sensitive to tobacco advertising than adults and are more likely to be influenced to smoke by advertisements for cigarettes than by peer pressure (Campaign for Tobacco-Free Kids, 2014). Tobacco prevention efforts include increased tobacco prices and taxes, public smoking restrictions, and anti-tobacco advertisements. For example, since the state of California implemented a comprehensive tobacco control program, a documented drop has occurred in adolescent smoking initiation. This program, which included excise tax increases, also resulted in greater reductions in cigarette smoking among smokers age 35 or older and cessation rates among adult smokers age 35 or younger, compared to states without such measures (Messer & Pierce, 2010). Furthermore, compared to other parts of the country, lung cancer incidence is declining faster in the Western states, including California (CDC, 2011).

Smoking Cessation

Despite the known consequences of tobacco use on health and society and the proven benefits of smoking cessation (see Table 1-1), most clinicians fail to identify and counsel patients on this topic (Fiore et al., 2008). Reasons for this include inability to quickly identify current tobacco users and a knowledge deficit about what treatments are effective, how they are delivered, and the associated side effects of treatment. Time constraints and lack of institutional support for tobacco cessation counseling also may contribute to the fact that only 21% of clinic visits with current smokers included smoking cessation counseling (Fiore et al., 2008).

Clinicians can identify current tobacco users by asking all patients at every visit about their smoking status and whether they are interested in quitting. It also may be beneficial to document tobacco use as an additional vital sign in the medical record. It is estimated that up to 70% of current smokers want to quit, but more than a third of those are never asked about their smoking status or desire to quit (Fiore et al., 2008). Even if patients have attempted cessation in the past and failed, several attempts are common before long-term abstinence is achieved (Fiore et al., 2008).

The U.S. Department of Health and Human Services' *Treating Tobacco Use and Dependence* clinical practice guideline (Fiore et al., 2008) thoroughly outlines instructions for clinicians to use in identifying and treating nicotine dependence. The first step in treating tobacco dependence is identifying tobacco users. The "5 A's" outlined in this guideline can be useful in guiding patients through this process: *Ask* about tobacco use at every visit. Once identified, *advise* tobacco users to quit. Next, *assess* whether the patient is ready to make a quit attempt. Smokers can be categorized into one of two groups—those who are interested in making a quit attempt and those who are not. APNs can then *assist* patients in tobacco cessation either at the current visit or, for those unwilling to quit, with a brief intervention to assist cessation at future visits. Lastly, *arrange* follow-up after the quit attempt or to discuss tobacco cessation again at another visit. These steps are outlined in Table 1-2 (Fiore et al., 2008).

Often, inadequate knowledge of tobacco cessation therapy inhibits clinicians' ability to assist patients in their quit attempt (Barr, Houston-Miller, Hasan, & Makinson, 2013). Successful smoking cessation interventions contain two components: behavioral counseling and pharmacotherapy. The combined use of these approaches has been shown to improve smoking cessation rates (Fiore et al., 2008; Harrill-Smith, Moffitt, & Goldstein, 2013). Most studies esti-

Table 1-1. Health Benefits of Smoking Cessation

Elapsed Time After Smoking Cessation	Health Benefits
2 weeks–3 months	Circulation, skin tone, oral hygiene, and pulmonary function improve.
1–9 months	Ciliary function in the lungs is restored.
12 months	Risk for coronary heart disease is reduced by 50% compared to persistent smokers.
5–15 years	Risk of stroke is decreased to that of nonsmokers.
10 years	Risk of death from lung cancer is reduced by 50% compared to persistent smokers.
15 years	Risk of coronary heart disease is reduced to that of nonsmokers.

Note. Based on information from Fiore et al., 2008.

Table 1-2. The 5 A's of Smoking Cessation Counseling

“A”	Intervention
Ask	Ask about the tobacco status of every patient at every visit.
Advise	Advise tobacco users to quit in a strong, clear, and personalized manner.
Assess	Assess patients' readiness to quit.
Assist	Assist patients who are willing to quit with individualized counseling and pharmacotherapy. Assist patients who are unwilling to quit with a brief intervention to assist future cessation.
Arrange	Arrange follow-up within one week of the stated quit date for patients who are willing to quit. Arrange to discuss tobacco use again at the next visit for patients who are unwilling to quit.

Note. Based on information from Fiore et al., 2008.

mate successful smoking cessation rates to be 40%–60% using this combination. This drops to 25%–30% after one year, but it is still higher than the less than 10% of smokers who attain long-term abstinence on their own (Fiore et al., 2008).

Behavioral counseling begins by identifying triggers and stressors unique to each individual smoker. These can be moods, feelings, places, or activities. Some of the most common stressors and triggers include feeling stressed or depressed, talking on the phone or watching television, drinking alcohol or coffee, driving, finishing a meal, managing work and family issues, taking a work break, being with other smokers or seeing someone else smoke, cooling off after a fight, feeling lonely, and having sex (Fiore et al., 2008). Making patients aware of their triggers is a valuable method of assisting them to stay in control. Once the patient-specific triggers and stressors have been identified, teaching patients to cope involves avoiding these triggering situations and replacing old habits with new ones (Fiore et al., 2008).

Nurses should advise all tobacco users to quit smoking at every encounter (Fiore et al., 2008; Quinn et al., 2009). Even if individuals are uninterested in making a quit attempt at that particular time, discussing the process, benefits, and perceived barriers to smoking cessation

can propel them closer to seriously contemplating quitting. For tobacco users who are not willing to attempt cessation, APNs can offer motivational support using the “5 R’s” listed in Table 1-3 (Fiore et al., 2008). These steps allow patients to identify the relevance of smoking cessation and assist in identifying the risks, rewards, and barriers of smoking cessation as it pertains to them personally.

In addition to behavioral counseling, pharmacotherapy may benefit all smokers ready to make a quit attempt (with the exception of certain populations, such as adolescents, those with specific medical contraindications, and pregnant women) (Chaney & Sheriff, 2012; Fiore et al., 2008; Harrill-Smith et al., 2013). Currently, seven U.S. Food and Drug Administration (FDA)-approved first-line therapies are available: five types of nicotine replacement therapy (NRT) (transdermal, oral lozenges, gum, nasal spray, and oral inhaler) and two non-nicotine medications, bupropion sustained-release (SR) and varenicline (Chaney & Sheriff, 2012; Fiore et al., 2008). Studies show that NRT with or without the use of other FDA-approved medications increases smoking cessation success (Chaney & Sheriff, 2012; Fiore et al., 2008; Harrill-Smith et al., 2013). Studies have shown a twofold increase in cessation rates with NRT alone over placebo (Fiore et al., 2008). Most forms of NRT are easy to use and available over the counter, with prices equivalent to or less than cigarettes, depending on the patient’s habit. Pharmacotherapy dosing, common side effects, contraindications, and costs are listed in Table 1-4. As noted in this table, the most common side effect of NRT is local irritation of the involved surface (mouth, nose, skin), and caution is advised in patients immediately post-myocardial infarction or with other serious cardiovascular events.

A newer form of NRT not listed in this table is the electronic cigarette, or e-cigarette. The use of e-cigarettes in smoking cessation is not entirely clear at this point, and more research is needed to evaluate its place in this arena. However, early studies are suggesting cessation rates similar to nicotine patches and few adverse effects (Bullen et al., 2013).

Whether through routine office visits or in clinics designed specifically for smoking cessation therapy, the role of the APN in smoking cessation interventions is critical (Barr et al., 2013). In addition to using the Department of Health and Human Services clinical practice guideline, APNs can take other steps to improve smoking cessation awareness and therapy.

Table 1-3. The 5 R’s of Smoking Cessation Counseling

“R”	Intervention
Relevance	Encourage personal relevance of smoking cessation (i.e., health status, impact on family members, economic impact).
Risks	Ask patients to identify risks of continued tobacco use that are pertinent to them, including those that are acute (shortness of breath), chronic (cancer, chronic obstructive pulmonary disease), and environmental (cancers and lung diseases in their spouse and children).
Rewards	Ask patients to identify potential rewards of smoking cessation, both immediate and long term (e.g., improved overall health for individual and family, money saved).
Roadblocks	Ask patients to identify potential or actual barriers to smoking cessation (e.g., withdrawal symptoms, weight gain).
Repetition	Repeat the 5 R’s at every encounter with patients. Also, repeated attempts at smoking cessation are common among smokers.

Note. Based on information from Fiore et al., 2008.

Table 1-4. First-Line Therapy for Treating Tobacco Abuse

Drug	Dose	Common Side Effects	Precautions/Contraindications	Cost
Bupropion SR	Start 1–2 weeks before quit date at a dose of 150 mg daily for 3 days, then BID for up to 7–12 weeks (can consider up to 6 months after quitting)	Insomnia, dry mouth	Contraindicated in patients with history of seizure or eating disorder Pregnancy class C	Prescription; ~\$3.33/day
Nicotine gum	2 mg (< 25 cig/day); 4 mg (≥ 25 cig/day) Use at least one piece every 1–2 hours for first 6 weeks; use up to 12 weeks; do not exceed 24 pieces/day.	Dyspepsia, mouth soreness, hiccups, jaw ache	Caution is advised among patients immediately post–myocardial infarction (MI) (2 weeks) or with serious arrhythmias or unstable chest pain. Dentures may prohibit proper use; patients should avoid eating or drinking 15 minutes prior to and during use. Pregnancy class D	Over the counter; 2 mg: ~\$48/box of 100–170 pieces; 4 mg: ~\$63/box of 100–110 pieces
Nicotine inhaler	6–16 cartridges/day for 6 months, tapering over last 3 months	Mouth or throat irritation, cough, rhinitis	Caution is advised among patients immediately post-MI (2 weeks) or with serious arrhythmias or unstable chest pain. Patients should avoid eating or drinking 15 minutes prior to and during use. Pregnancy class D	Prescription; ~\$196/box of 168 cartridges
Nicotine lozenges	2 mg (patients smoking first cigarette > 30 minutes after waking); 4 mg (patients smoking < 30 minutes after waking) Use at least 9 lozenges/day for first 6 weeks and continue up to 12 weeks; do not exceed 20 lozenges/day.	Mouth irritation, hiccups, nausea, dyspepsia	Patients should not chew or swallow lozenges. Caution is advised among patients immediately post-MI (2 weeks), with serious arrhythmias or unstable chest pain Patients should avoid eating or drinking 15 minutes prior to and during use.	Over the counter; 2 mg: ~\$34/box of 72 lozenges; 4 mg: ~\$39/box of 72 lozenges

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Table 1-4. First-Line Therapy for Treating Tobacco Abuse (Continued)

Drug	Dose	Common Side Effects	Precautions/Contraindications	Cost
Nicotine nasal spray	Initially 1–2 doses/hour and minimum of 8 doses/day; no more than 40 doses/day for 3–6 months	Nasal irritation	Caution is advised among patients immediately post-MI (2 weeks) or with serious arrhythmias or unstable chest pain. Pregnancy class D	Prescription; ~\$49/bottle
Nicotine patch	Step-down dosing: 21 mg/24 hours for 4 weeks, then 14 mg/24 hours for 2 weeks, then 7 mg/24 hours for 2 weeks Single-patch dosing: 22 mg/24 hours (heavy smokers); 11 mg/24 hours (light smokers)	Local skin irritation	Caution is advised among patients immediately post-MI (2 weeks) or with serious arrhythmias or unstable chest pain. Pregnancy class D	Prescription or over the counter; 1 box of any dose ranges from \$37–\$48
Varenicline	0.5 mg once a day for 3 days, then BID for 4 days, then 1 mg BID for total of 12 weeks	Insomnia, nausea	Caution is advised in patients with creatinine clearance < 30 ml/min. Monitor for changes in mood or behavior in all patients, and consider psychiatric history before use. Pregnancy class D	Prescription; ~\$130 for a 30-day supply

Note. Based on information from Chaney & Sheriff, 2012; Fiore et al., 2008.

For instance, studies have shown that longer, more intensive and individualized interventions result in higher abstinence rates, up to 40% in some cases (Chaney & Sheriff, 2012; Fiore et al., 2008). APNs can have patients set a quit date and sign a smoking cessation contract to facilitate ongoing commitment to their quit attempt. The Fagerström Test for Nicotine Dependence (Heatherton, Kozlowski, Frecker, & Fagerström, 1991) is a tool used to identify levels of nicotine dependence and thus gear the intensity of interventions accordingly. Oncology APNs are in a unique position to guide patients along the continuum of nicotine dependence—from identifying tobacco users to providing behavioral counseling and pharmacotherapy and aiding in relapse prevention or treatment.

Sun Exposure

Overexposure to ultraviolet radiation (UVR) is the greatest risk factor for all types of skin cancer, including melanoma and basal and squamous cell cancers. Most skin cancers are highly

treatable, but the most deadly form of skin cancer, melanoma, is rising (ACS, 2015). More than 73,000 will be diagnosed in 2015, and close to 10,000 will die (ACS, 2015).

UVR is a known carcinogen, and two types can affect the skin—UVA and UVB. UVA rays penetrate deeper layers of the skin and are responsible for premature aging effects on the skin, whereas UVB rays mainly affect the epidermis and are the primary cause of sunburn (Brannon, n.d.; U.S. Environmental Protection Agency [EPA], 2006). UVB rays vary depending on the season and time of day. Engaging in regular activities to decrease exposure and protect the skin from UVR can significantly reduce the risk of skin cancer (ACS, 2013b). Primary prevention of skin cancer includes avoiding UVR as much as possible. ACS (2013b) recommends avoiding exposure to direct sunlight from 10 am to 4 pm, when UV rays are known to be most intense. Avoiding artificial sources of UVR, such as tanning beds, also is crucial in reducing the risk of skin cancer (ACS, 2013b). The International Agency for Research on Cancer Working Group on Artificial Ultraviolet Light and Skin Cancer (2007) listed these types of UVR-emitting devices as carcinogenic to humans, noting that melanoma risk was increased by 75% in those who used tanning beds as young adults (Cust et al., 2011).

In addition to minimizing sun exposure, other protective behaviors include protecting the skin with proper clothing and sunscreen. ACS (2013b) recommends the following four sun protective measures.

- Slip on a shirt.
- Slop on sunscreen.
- Slap on a hat.
- Wrap on sunglasses.

Wearing hats with wide brims, shirts and pants that adequately cover the extremities, and sunglasses to protect the eyes and covering exposed skin with sunscreen with a sun protection factor (SPF) of 15 or higher are all pertinent sun protective behaviors (ACS, 2013b, 2015). Broad-spectrum sunscreens contain ingredients that block or absorb both UVA and UVB rays with chemicals such as avobenzone, titanium dioxide, and zinc oxide (ACS, 2013b; Brannon, n.d.; U.S. EPA, 2006). FDA requires that all sunscreens contain an SPF, which correlates to the level of protection from UVB rays. For example, a sunscreen with an SPF of 15 protects against 93% of the sun's UVB rays, and every 15 minutes of wearing sunscreen with an SPF of 15 is equivalent to one minute of UVB exposure without sunscreen (ACS, 2013b; U.S. EPA, 2006).

In general, approximately 1 oz of sunscreen should be used to cover all exposed areas of skin, enough to form a thin film when first applied (ACS, 2013b; Brannon, n.d.). Sunscreen should be applied 30 minutes before exposure to the sun and reapplied every two hours and again after swimming, sweating, or toweling off (ACS, 2013b; Brannon, n.d.; U.S. EPA, 2006). Sunscreens labeled *water resistant* maintain their SPF for 40 minutes of water immersion, and those that are *very water resistant* maintain their SPF for 80 minutes (ACS, 2013b; U.S. EPA, 2006), but both need routine reapplication. Sunscreen should be applied before makeup. When used in combination with insect repellent, sunscreen with a higher SPF should be applied because repellents can reduce sunscreen's effectiveness by up to one-third (ACS, 2013b; Brannon, n.d.).

Diet and Exercise

The combination of obesity, physical inactivity, and poor nutrition is the second major risk factor for cancer behind tobacco use (ACS, 2015). Obesity is linked with a higher risk of cancer of the esophagus, pancreas, colon and rectum, breast (postmenopausal), endometrium, kidney, thyroid, gallbladder, liver, cervix, and ovaries (ACS, 2015; NCI, 2012). According to NCI (2012) Surveillance, Epidemiology, and End Results data, the percentage of cases attributed to

obesity was as high as 40% in some cancers, such as esophageal and endometrial. Obesity is linked to 14%–20% of all cancer deaths in the United States (Kushi et al., 2012).

Obesity increases the risk for cancer in several possible ways. For example, excess amounts of estrogen are stored in fat cells, increasing the risk for female malignancies such as breast and endometrial cancers. Additionally, obesity increases levels of insulin and insulin-like growth factor-1, which may promote the development of certain tumors by inhibiting programmed cell death. Fat cells may also have direct and indirect effects on other tumor growth regulators, including mammalian target of rapamycin and adenosine monophosphate–activated protein kinase (NCI, 2012).

While obesity levels in the United States are staggering, with two-thirds of Americans overweight or obese (body mass index greater than 25) (ACS, 2015; NCI, 2012), less than one-quarter exercise or eat enough fruits or vegetables to be in accordance with ACS's guidelines on nutrition and physical activity for cancer prevention (Kushi et al., 2012). Most of the calories consumed by Americans come from foods high in fat, sugar, and refined carbohydrates. In 2011, only 20% of adults reported engaging in moderate or vigorous levels of physical activity, and only 15% ate three or more servings of vegetables. Increased intake of fruits and vegetables (nonstarchy) is associated with a lower risk of lung, esophageal, gastric, and colorectal cancers (ACS, 2015).

Physical activity can reduce the risk of several types of cancer, including breast, colon, endometrial, and prostate, and also can promote healthy body weight by matching energy output with caloric input (ACS, 2015). Examples of moderate everyday exercise include walking, dancing, and yoga. More vigorous activities include jogging or running, martial arts, and swimming. Moderate-intensity sports include baseball, volleyball, and golf, whereas soccer, basketball, and racquetball are considered vigorous activities. Even workplace activities can be sources of exercise, such as farming and custodial work. Forms of heavy manual labor, such as forestry, construction work, and firefighting, are considered vigorous activities (ACS, 2015).

Recommendations for diet and exercise to promote physical activity and combat obesity are outlined in Table 1-5. In general, to maintain lean body weight, people should engage in regular physical activity and limited consumption of high-calorie foods and drinks. For cancer prevention, recommendations include limiting intake of processed and/or red meats and alcohol, consuming at least 2.5 cups of vegetables and fruits per day, and choosing whole grains over refined grains (ACS, 2015).

Chemoprevention

Chemoprevention is defined as the use of natural, synthetic, or biologic agents to reverse, suppress, or prevent carcinogenic progression (NCI, 2014a). A variety of agents are being studied, and some have been approved for the prevention of prostate, colon, and breast cancer. However, certain risks are associated with chemopreventive drugs, such as unwanted side effects and the potential to cause more harm or even higher rates of malignancy, which occurred with the Alpha-Tocopherol, Beta-Carotene Cancer Prevention (ATBC) Trial and the Beta-Carotene and Retinol Efficacy Trial (CARET) (NCI, 2003). In these two studies, no benefit was seen from supplements in men at high risk for lung cancer. In fact, in participants taking beta-carotene in the ATBC Trial, 18% more lung cancers were diagnosed, and 8% more deaths occurred. In CARET, 28% more lung cancers were diagnosed, and 17% more deaths occurred in participants taking beta-carotene and vitamin A than in those taking placebos (Clark et al., 1996; Heinonen et al., 1998).

Oncology APNs play an important role in chemoprevention, either through risk assessments that lead to identification of potential candidates for chemopreventive agents, referral

Table 1-5. Guidelines on Nutrition and Physical Activity for Cancer Prevention

Topic	Recommendations
Diet	<p>Consume a healthy diet with an emphasis on plant sources.</p> <ul style="list-style-type: none"> • Consume foods and beverages in smaller portion sizes to help maintain healthy weight. • Consume whole grain rather than refined grain foods. • Consume at least 2.5 cups of fruits and vegetables/day. • Limit intake of processed and red meats. • Limit alcohol consumption to less than 1 drink/day for women and less than 2 drinks/day for men.
Exercise	<p>Adopt a physically active lifestyle.</p> <ul style="list-style-type: none"> • Adults: Engage in at least 150 minutes of moderate-intensity activity or 75 minutes of vigorous activity per week. • Children and adolescents: Engage in at least 60 minutes of moderate-intensity or vigorous activity every day with vigorous activity at least 3 days/week. • Limit sedentary activities such as watching television or other screen-related activities (e.g., computers, video games).
Weight	<p>Achieve and maintain a healthy weight throughout life.</p> <ul style="list-style-type: none"> • Maintain a lean body weight. • Avoid excess weight gain at all ages. • Even small amounts of weight loss can be beneficial in those who are overweight or obese.

Note. Based on information from American Cancer Society, 2015.

to appropriate clinical trials, or referral to qualified colleagues for further evaluation and management. Certain oncology APNs have subspecialized in the area of risk assessment, genetic counseling, and chemoprevention and are excellent sources of referral or collaboration (Swiderski, 2011; Vogel, 2003).

Tamoxifen and Raloxifene

In 1998, FDA approved tamoxifen, a selective estrogen receptor modulator (SERM), for the prevention of invasive breast cancer after results from the Breast Cancer Prevention Trial showed a 49% reduction in invasive breast cancer in more than 13,000 high-risk pre- and postmenopausal women (Fisher et al., 2005). Tamoxifen was approved for the prevention of invasive breast cancer for women with a history of noninvasive breast cancer (ductal carcinoma in situ and lobular carcinoma in situ) (Fisher et al., 2005). It is most effective in preventing estrogen receptor–positive breast cancers. Women who benefited most were those with a known genetic predisposition for *BRCA1/2* mutation, history of lobular carcinoma in situ, or atypical ductal hyperplasia (Fisher et al., 2005). Additional benefits yielded from the study included a 29% decrease in the risk of osteoporotic bone fractures in women aged 50 and older and a 53% decrease in women younger than 50 (Fisher et al., 2005). Risks associated with tamoxifen use include a higher incidence of thromboembolic events and endometrial cancer (Fisher et al., 2005). Because of these and other risks, the use of tamoxifen is individualized.

Results from the National Surgical Adjuvant Breast and Bowel Project Study of Tamoxifen and Raloxifene revealed that raloxifene, a second-generation SERM, has similar effects as tamoxifen in reducing invasive breast cancer in high-risk, postmenopausal women (Vogel et al., 2006). Additionally, fewer cases of uterine cancer, thromboembolic events, and cataracts were seen with raloxifene. Raloxifene was associated with an insignificantly higher number of

patients with noninvasive breast cancer compared to tamoxifen (Vogel et al., 2006). Raloxifene is approved for breast cancer risk reduction in postmenopausal women at high risk for invasive breast cancer. While these drugs only prevent estrogen-driven breast cancer, studies are underway that are aimed at prevention of HER2-positive and triple-negative breast cancer—breast cancer that does not express estrogen, progesterone, or HER2 receptors (den Hollander, Savage, & Brown, 2013).

Celecoxib

Aspirin and nonsteroidal anti-inflammatory drugs (NSAIDs) have shown activity in the treatment and prevention of colon cancer; however, their gastrointestinal side effects have limited their applicability (Cuzick et al., 2009). Newer NSAIDs, such as celecoxib, selectively inhibit cyclooxygenase-2 (COX-2), a catalytic enzyme in prostaglandin synthesis that is induced in inflammatory conditions, including those involved with tumor proliferation. COX-2 is not normally found in the epithelium of the colon but is overexpressed in a majority of adenocarcinomas and less so in adenomatous polyps of the colon (Bertagnolli et al., 2006). Celecoxib, at 400 mg BID, has received approval from FDA for the prevention of adenomatous polyps in patients with familial adenomatous polyposis, a hereditary colon cancer syndrome associated with hundreds of thousands of colon polyps and a 100% risk of colorectal cancer if untreated. Celecoxib is not approved for chemoprevention in the general public (Bertagnolli et al., 2006).

Human Papillomavirus Vaccines

Three FDA-approved vaccines are available for the prevention of cervical cancer, precancerous or dysplastic cervical and vaginal lesions, and genital warts associated with HPV. Gardasil® (human papillomavirus quadrivalent [types 6, 11, 16, and 18] vaccine, recombinant) received approval in 2006 and protects against HPV types 6, 11, 16, and 18 (U.S. FDA, 2006). This was the first vaccine approved for cervical cancer prevention, and in clinical trials it showed nearly 100% effectiveness in preventing precancerous cervical, vaginal, and vulvar lesions and genital warts caused by HPV in women who had not yet been infected (U.S. FDA, 2006). In 2014, a newer version of the vaccine, Gardasil® 9, was approved for five additional subtypes of HPV (for a total of nine). Its indications and uses are similar to the original vaccine. However, Gardasil is approved for use in females ages 9–26 and also has an indication for prevention of anal cancer and genital warts in males in the same age group, whereas Gardasil 9 has a similar indication for females but is only approved for use in males ages 9–18 (U.S. FDA 2006, 2015). Another vaccine, Cervarix® (HPV bivalent [types 16 and 18] vaccine, recombinant), received approval in early 2009 and protects against HPV types 16 and 18 only (U.S. FDA, 2009) and is approved for use in females ages 9–25 only. All of these vaccines should be given before a patient is sexually active to be most effective (ACS, 2015; U.S. FDA, 2015). These vaccines are not approved to treat cervical or anal cancer and are not intended to replace cervical cancer screening.

Secondary Prevention and Screening

According to NCI (2014b), screening for cancer in the general population refers to detecting cancer when no apparent symptoms are present, with an overall goal of decreasing cancer-related morbidity and mortality. Estimates of early deaths that have the potential to be avoided through the use of screening tests vary from 3% to 35%. For almost all types of cancer,

improved outcomes are seen when treatment is initiated at the earliest stage possible, hence the importance of early detection. For cancer screening to be effective, screening tests must meet two criteria. First, the screening test must be able to detect cancer at an earlier stage than if it were detected as a result of symptom development. Second, evidence must support that treatment given at an earlier stage results in improved outcomes (NCI, 2014b). The sensitivity and specificity of all screening tests must be considered. *Sensitivity* refers to the proportion of people with cancer that are found to have a positive test—a higher sensitivity means fewer false-negative results. Conversely, *specificity* refers to the proportion of people without cancer that have negative results (NCI, n.d.); in other words, the higher the specificity, the fewer false-positive results. Potential harms from screening tests also must be weighed against potential benefits. Some screening tests are invasive, such as colonoscopy for colon cancer, and carry risks associated with any invasive procedure, including some serious if not life-threatening complications (such as bowel perforation with colonoscopy). Other potential harms include the emotional anxiety associated with false-positive results and the dangers of missing an early malignancy with false-negative test results (NCI, 2014b). The financial cost of different screening tests varies widely.

Multiple organizations have published screening guidelines for a variety of malignancies, both for average-risk and high-risk populations. Oncology APNs must have an understanding of each organization's guidelines and appreciate the differences among them. In general, consensus exists among screening recommendations for the most common malignancies, including breast, cervical, colorectal, lung, and prostate cancer. Variances in screening intervals and ages for screening initiation and cessation vary from minute to major differences. The recommended routine screening guidelines from ACS, the National Comprehensive Cancer Network® (NCCN®), and the U.S. Preventive Services Task Force (USPSTF) are outlined in Table 1-6.

Breast Cancer

Breast cancer is the most common female malignancy and the second most common cause of cancer death in women. In 2015, an estimated 234,190 new cases of breast cancer are expected to be diagnosed. The lifetime risk of developing breast cancer in an average-risk woman is one in eight. This risk increases with age, and the disease occurs most commonly in women; however, approximately 2,350 cases of breast cancer are expected to be diagnosed in men in 2015. The five-year survival rate for localized breast cancer is 98%, hence the importance of early diagnosis and treatment (ACS, 2015).

Risk factors for breast cancer are generally well known and linked to genetic, reproductive, and lifestyle factors. Modifiable risk factors include weight gain after age 18, postmenopausal obesity, menopausal hormone replacement therapy, physical inactivity, and alcohol consumption. Nonmodifiable risk factors and medical conditions that increase risk for breast cancer include high breast tissue density, high bone mineral density, breast biopsy positive for hyperplasia, high-dose radiation therapy to the chest (such as mantle radiation for Hodgkin lymphoma), early menarche, late menopause, nulliparity, primiparity after age 30, family history of breast cancer (particularly one or more first-degree relative), and *BRCA1* or *BRCA2* deleterious mutations (ACS, 2015).

In 2015, more than 40,000 women will die from breast cancer. Breast cancer screening has been shown to decrease mortality from breast cancer (ACS, 2015). As listed in Table 1-6, the general consensus for breast cancer screening in average-risk women includes counseling regarding breast awareness, clinical breast examination (CBE) beginning at various ages and continued at various intervals, and annual mammography beginning at age 40 (ACS, 2013a; NCCN, 2014a). Most organizations no longer specifically recommend a breast self-

Table 1-6. Selected Cancer Screening Recommendations for Average-Risk Population

Organization	Breast Cancer	Cervical Cancer	Colorectal Cancer	Lung Cancer	Prostate Cancer
National Comprehensive Cancer Network work	<p>Women aged 25–39:</p> <ul style="list-style-type: none"> • CBE every 1–3 years and breast awareness <p>Women aged ≥ 40:</p> <ul style="list-style-type: none"> • Annual MMG • Annual CBE and breast awareness 	<p>Women aged 21–29:</p> <ul style="list-style-type: none"> • Pap test every 3 years • No HPV testing <p>Women aged 30–65:</p> <ul style="list-style-type: none"> • Pap test and HPV testing every 5 years (preferred) OR Pap test alone every 3 years <p>Women > age 65:</p> <ul style="list-style-type: none"> • No screening if there is no history of CIN2+ in the past 20 years OR 3 consecutive negative Pap tests (or 2 consecutive Pap and HPV co-tests) in the last 10 years and the most recent test within the last 5 years <p>No screening at any age for women with a history of total hysterectomy and no history of CIN2+</p>	<p>Men and women aged ≥ 50 (with no history of inflammatory bowel disease and no personal or family history of adenoma or colon cancer):</p> <ul style="list-style-type: none"> • Colonoscopy every 10 years (preferred) OR • FOBT or FIT annually AND flexible sigmoidoscopy every 5 years OR • Flexible sigmoidoscopy every 5 years 	<p>Men and women aged 55–74, current or former smokers AND ≥ 30 pack-year smoking history AND smoking cessation < 15 years, AND</p> <p>Men and women aged ≥ 50, current or former smokers AND ≥ 20-pack-year smoking history AND one additional risk factor other than secondhand smoke exposure (radon, occupational exposure, personal or family history of cancer, COPD, or pulmonary fibrosis)</p> <ul style="list-style-type: none"> • Baseline LDCT and for at least 2 years and until no longer eligible for treatment <p>No routine lung cancer screening for low- or moderate-risk patients</p>	<p>Men aged ≥ 40:</p> <ul style="list-style-type: none"> • Risk-benefit discussion about baseline PSA testing and DRE

(Continued on next page)

Table 1-6. Selected Cancer Screening Recommendations for Average-Risk Population (Continued)

Organization	Breast Cancer	Cervical Cancer	Colorectal Cancer	Lung Cancer	Prostate Cancer
American Cancer Society	<p>Women aged 20–39:</p> <ul style="list-style-type: none"> • BSE (optional) • CBE at least every 3 years <p>Women aged ≥ 40:</p> <ul style="list-style-type: none"> • BSE (optional) • CBE annually • MMG annually 	<p>Women aged 21–29:</p> <ul style="list-style-type: none"> • Pap test (conventional or liquid-based) every 3 years <p>Women aged 30–65:</p> <ul style="list-style-type: none"> • Pap and HPV DNA test every 5 years OR Pap alone every 3 years <p>Women aged > 65:</p> <ul style="list-style-type: none"> • No screening if ≥ 3 negative Pap tests or ≥ 2 negative HPV and Pap co-tests within the last 10 years (and the most recent occurring within the last 5 years) <p>No screening for women with a history of total hysterectomy</p>	<p>Men and women starting at age 50:</p> <ul style="list-style-type: none"> • FOBT or FIT annually OR • Flexible sigmoidoscopy every 5 years OR • DCBE every 5 years OR • Colonoscopy every 10 years • CT colonography every 5 years 	<p>Men and women aged 55–74, current or former smokers (quit < 15 years ago), in good health, and ≥ 30 pack-year smoking history:</p> <ul style="list-style-type: none"> • Discussion with health-care provider about screening with low-dose helical chest CT scan 	<p>Men aged ≥ 50 with at least 10-year life expectancy:</p> <ul style="list-style-type: none"> • Consideration of DRE and PSA after informed clinical decision making process with healthcare provider

(Continued on next page)

Table 1-6. Selected Cancer Screening Recommendations for Average-Risk Population (Continued)

Organization	Breast Cancer	Cervical Cancer	Colorectal Cancer	Lung Cancer	Prostate Cancer
U.S. Preventive Services Task Force	<p>Women aged 40–49:</p> <ul style="list-style-type: none"> Individualized discussion and consideration of biennial MMG <p>Women aged 50–74:</p> <ul style="list-style-type: none"> MMG every 2 years <p>Women aged ≥ 75:</p> <ul style="list-style-type: none"> No recommendation for MMG <p>Women with dense breasts:</p> <ul style="list-style-type: none"> Insufficient evidence to recommend adjunctive screening with other methods <p>BSE not recommended for any age group, and no recommendation for CBE</p>	<p>Women aged 21–65:</p> <ul style="list-style-type: none"> Pap test every 3 years or every 5 years with HPV co-testing <p>Women aged > 65:</p> <ul style="list-style-type: none"> May opt to discontinue screening if 3 consecutive negative Pap tests or 2 negative consecutive Pap tests with HPV co-testing within the previous 10 years (and the most recent test within previous 5 years) <p>No screening for women with a history of hysterectomy (with removal of cervix) and no history of CIN2 or 3</p>	<p>Men and women aged 50–75:</p> <ul style="list-style-type: none"> Routine screening with use of FOBT, flexible sigmoidoscopy, and colonoscopy (no specific intervals given) <p>Men and women aged 76–85:</p> <ul style="list-style-type: none"> Clinical considerations may warrant individualized screening; otherwise, routine screening not recommended <p>Men and women aged > 85:</p> <ul style="list-style-type: none"> Routine screening not recommended <p>No recommendation on fecal DNA testing or CT colonography</p>	<p>Men and women of any age:</p> <ul style="list-style-type: none"> No recommendation for routine screening with chest x-ray, LDC.T, or sputum cytology 	<p>Men of any age:</p> <ul style="list-style-type: none"> Recommends against PSA-based screening

BSE—breast self-examination; CBE—clinical breast exam; CIN—cervical intraepithelial neoplasia; COPD—chronic obstructive pulmonary disease; CT—computed tomography; DCBE—double-contrast barium enema; DRE—digital rectal examination; FIT—fecal immunochemical test; FOBT—fecal occult blood test; HPV—human papillomavirus; LDCT—low-dose computed tomography; MMG—mammogram; PSA—prostate-specific antigen

Note. Based on information from American Cancer Society, 2013a, 2015; National Comprehensive Cancer Network, 2014a, 2014b, 2014c, 2015a, 2015b; Saslow et al., 2012; U.S. Preventive Services Task Force, 2008, 2009, 2012a, 2012b, 2013, 2016.

examination but rather breast awareness with an emphasis on reporting any changes in the breasts immediately to a healthcare provider. Breastcancer.org (2014) offers an easy, patient-friendly guide to breast self-examination. Premenopausal women may find breast examination to be most effective at the end of menses (NCCN, 2015a). When performing a CBE, clinicians should inspect and palpate women's breasts in upright and supine positions, documenting any changes in breast color, symmetry, and thickness or the presence of masses (Grethlein, 2013).

However, ongoing controversy exists regarding the sensitivity and cost-effectiveness of mammography in women between ages 40 and 50. In 2009, USPSTF recommended against screening mammography in women younger than age 50. According to USPSTF, the overall reduced mortality from breast cancer with biennial screening mammography was greatest in women ages 50–59. In younger women, those ages 40–49, the relative risk reduction was lower, and USPSTF felt that little additional benefit was attained. Thus, its recommendation was to start mammography at age 50 and then continue only every two years. The task force's data projected that biennial screening achieved 70%–99% of the benefit of annual screening and with fewer harms. Most other organizations have not changed their recommendations for breast cancer screening because they felt that the data from USPSTF overemphasized the harms of mammography (Smith, Cokkinides, Brooks, Saslow, & Brawley, 2010).

As with all screening tests, mammography has risks and benefits. Risks include false-positive results, potentially leading to more testing and invasive procedures such as biopsy. False negatives are also a concern, as not all breast cancers are detected with mammography. Mammographic sensitivity reaches up to 96% but is lower in women aged 40–49 and those with denser breasts (Smith et al., 2011). According to the Digital Mammographic Imaging Screening Trial, digital mammography proved to be more accurate than film mammography in women with dense breasts who were younger than 50 years of age and who were pre- or perimenopausal (ACS, 2015).

Magnetic resonance imaging (MRI) may be superior to mammography in high-risk women (ACS, 2013a; Warner, 2011). Several studies using MRI screening in high-risk populations are ongoing, but MRI screening has not yet been found to reduce mortality in any group of women. ACS and NCCN recommend annual breast screening with MRI as an adjunct to mammography in women at high risk for breast cancer. This includes women with a 20%–25% or greater lifetime risk of developing breast cancer, *BRCA1* or *BRCA2* mutation carriers, women with a first-degree family member with *BRCA1* or *BRCA2* mutation, and women with Li-Fraumeni (p53 mutation) or Cowden syndromes (*PTEN* mutation), significant family history of breast or ovarian cancer, or history of mantle radiation therapy associated with treatment for Hodgkin lymphoma (NCCN, 2014a; Saslow et al., 2007).

Cervical Cancer

Cervical cancer is the third most common female gynecologic cancer. Since the introduction of the Pap test more than 50 years ago, cervical cancer incidence and mortality rates have declined steadily (ACS, 2015). In 2015, approximately 12,900 new cases of cervical cancer are expected to be diagnosed, and 4,100 deaths from the disease are estimated to occur. When detected early, localized cervical cancer is one of the most successfully treated cancers, boasting a five-year survival rate of 91% (ACS, 2015).

The most significant risk factor for cervical cancer is HPV infection. HPV, a sexually transmitted infection, is the most common cause of and greatest risk factor for premalignant and malignant cervical lesions (ACS, 2015). More than 200 types of HPV have been identified, 20 of which have been associated with cancer. Benign cervical lesions (genital warts and cervical intraepithelial neoplasia) are most commonly associated with HPV types 6, 11, 42, 43, and 44.

HPV strains 16 and 18 are most commonly associated with cervical cancer and are targeted by the HPV vaccines Gardasil, Gardasil 9, and Cervarix (Dunne et al., 2007; U.S. FDA, 2009, 2015). An estimated 26.8% of women aged 14–59 are infected with HPV, according to data from the National Health and Nutrition Examination Survey. HPV infection was highest in women aged 20–24, and 15.2% of women overall were infected with high-risk strains 16 and 18 (Dunne et al., 2007). Additionally, other risk factors for cervical cancer include those related to sexual history and gynecologic history, smoking, and immunosuppression (ACS, 2015).

Routine screening recommendations for cervical cancer are outlined in Table 1-6. Recommendations generally include initiation of Pap test alone by age 21. By age 30, co-testing with Pap and HPV testing every five years is preferred over Pap testing alone every three years. Annual screening with any test in any age group is not recommended (ACS, 2013a; Saslow et al., 2012).

Colorectal Cancer

Colorectal cancer is both the third most common cancer and the third leading cause of cancer death in the United States. In 2015, an estimated 132,700 new cases of colorectal cancer are expected to be diagnosed, with 49,700 deaths expected to occur (ACS, 2015). Colorectal cancer incidence and mortality rates have been declining over the past 20 years, mainly as a result of increased use of early detection and screening tests (Hagggar & Boushey, 2009).

When colorectal cancer is detected early, the five-year survival rate is 90%. However, less than half of colorectal cancers are diagnosed this early. As with most malignancies, a more advanced stage at diagnosis is associated with decreased survival. The five-year survival rate for locally advanced colorectal cancer (involvement of regional lymph nodes) is 70%, and those with distant metastases have even poorer outcomes, with only a 12% five-year survival (ACS, 2015).

Several known risk factors exist for colorectal cancer, although up to 70% of cases have no identifiable risk factors (Hagggar & Boushey, 2009). The most common risk factor for the development of colorectal cancer is age, with more than 90% of cases found in those older than age 50 (ACS, 2015). Other risk factors include lifestyle factors, such as physical inactivity, obesity, alcohol intake, type 2 diabetes, smoking, and diets high in red meat and low in fiber, fruits, and vegetables (ACS, 2015). Other conditions of the colon, such as inflammatory bowel disease, colon adenomas, and a genetic predisposition or hereditary polyposis syndrome, increase the risk of colorectal cancer (see Table 1-7) (ACS, 2015; Hagggar & Boushey, 2009). Conversely, protective factors include diets high in calcium, higher serum vitamin D levels, and regular use of aspirin or other NSAIDs (ACS, 2015).

The purpose of screening for colorectal cancer is to identify adenomatous or precancerous polyps and remove them before they progress to malignancy, thereby resulting in decreased mortality and better outcomes. Polypectomy and subsequent surveillance with colonoscopy can reduce colorectal cancer incidence by 90% (Hagggar & Boushey, 2009). Guidelines for screening average-risk populations (age 50 or older, no history of adenoma or inflammatory bowel disease, and negative family history) are outlined in Table 1-6. In general, recommendations include screening beginning at age 50 and include either annual fecal occult blood test (FOBT) or fecal immunochemical testing (FIT), sigmoidoscopy every five years, annual FOBT or FIT in combination with sigmoidoscopy every five years, or a full colonoscopy every 10 years (ACS, 2013a; NCCN, 2014b).

Lung Cancer

Lung cancer is the most fatal malignancy and the second most commonly occurring cancer in both men and women. In 2015, an approximate 221,200 new cases and 158,040 deaths are

Table 1-7. Diseases of the Colon and Colorectal Cancer Risk

Risk Factor	Risk of Colorectal Cancer (CRC)
Ulcerative colitis	<ul style="list-style-type: none"> • Causes 1% of all cases of CRC • Increases with age at onset, extent of disease, and duration of active disease • Cumulative risk is 3% at 15 years, 5% at 20 years, and 9% at 25 years.
Crohn disease	<ul style="list-style-type: none"> • Twofold increased risk of CRC
Polyps	<ul style="list-style-type: none"> • 70% of polyps are adenomatous or neoplastic: 75%–85% tubular adenomas (lowest risk), 10%–25% tubulovillous adenomas (intermediate risk), ≤ 5% villous adenomas (highest risk) • > 1 cm in size: 2–4-fold increased risk of CRC • Multiple polyps: 5–7-fold increased risk • Time to malignant progression: 3.5 years for severely dysplastic polyps and 11.5 years for mild atypia
Family history of CRC	<ul style="list-style-type: none"> • One first-degree relative: Relative risk increased to 1.72 • Two first-degree relatives: Relative risk increased to 2.75
Hereditary nonpolyposis colorectal cancer	<p>Lynch syndromes</p> <ul style="list-style-type: none"> • Lynch I (colonic syndrome) <ul style="list-style-type: none"> – Autosomal dominant trait associated with proximal mucinous or poorly differentiated synchronous or metachronous colonic tumors – Usual development of CRC by age 50; 75% overall lifetime risk • Lynch II <ul style="list-style-type: none"> – Associated with extracolonic tumors in the ovaries, endometrium, stomach, small intestine, and genitourinary and hepatobiliary tracts
Familial adenomatous polyposis	<ul style="list-style-type: none"> • Autosomal dominant inherited syndrome (germ-line mutation in adenomatous polyposis coli gene on chromosome 5q21) consisting of hundreds of colonic polyps developed by late adolescence • 100% lifetime risk of developing CRC

Note. Based on information from American Cancer Society, 2015; Haggar & Boushey, 2009.

to be expected. Cigarette smoking is the main risk factor in lung cancer development, with risk increasing based on duration and quantity smoked (expressed in pack-years). Additional risk factors include radon exposure and other occupational or environmental exposures, including secondhand smoke (ACS, 2015).

Only 15% of lung cancers are diagnosed at an early stage, where the five-year survival rate is 54% (ACS, 2015). Until recently, no routine screening for lung cancer had shown effectiveness in reducing lung cancer deaths. In 2011, results from the National Lung Screening Trial were published, citing a 20% reduction in lung cancer deaths with annual low-dose computed tomography (LDCT) in smokers with at least a 30 pack-year smoking history (one pack per day for 30 years) (National Lung Screening Trial Research Team, 2011). Since then, ACS and NCCN have updated their lung cancer screening guidelines (see Table 1-6). ACS (2013a) and NCCN (2015b) recommend screening for lung cancer with annual LDCT in patients ages 55–74 who are current or former smokers (greater than or equal to 30 pack years) and are otherwise in good health. NCCN guidelines also include screening recommendations for those who smoke less but have additional risk fac-

tors. It is noted that smoking cessation counseling should not be eliminated in lieu of lung cancer screening.

Prostate Cancer

Prostate cancer is the most commonly diagnosed cancer in men and the second leading cause of cancer-related death in men in the United States. In 2015, close to 220,800 new cases of prostate cancer will be diagnosed, and 27,540 deaths are expected to occur. The most common risk factor for prostate cancer is age, with 97% of prostate cancer diagnosed in men older than age 50. African American men have a higher incidence and mortality from prostate cancer compared to Caucasian men (ACS, 2015).

The majority (93%) of prostate cancers are diagnosed in an early stage, and the five-year survival rate for localized disease approaches 100%. However, the data surrounding regular screening for prostate cancer with prostate-specific antigen (PSA) have become a controversial issue over the past several years (ACS, 2015). The issue is that although PSA screening clearly detects prostate cancer in its earliest stage, it is largely debatable as to whether screening asymptomatic men with PSA testing reduces mortality. Studies have documented that more than half of the prostate cancers diagnosed early with PSA screening are low risk and would likely never have caused clinically significant problems. Thus, routine screening may lead to overdiagnosis and overtreatment in a large part of the screened population. This was noted in the large U.S. randomized Prostate, Lung, Colorectal and Ovarian Cancer Screening Trial: the early detection of low-risk disease may ultimately result in increased morbidity and diminished quality of life if these men are treated with aggressive therapy (Crowell, Kramer, & Crawford, 2011).

Another issue is the reliability of the PSA test itself. Data suggest that although one out of every three prostate biopsies is positive because of an elevated PSA, two out of three are not (high false-positive results). Additionally, it is suggested that one in seven men with a normal PSA have prostate cancer (high false-negative results) (Smith et al., 2011). PSA results may be low with very aggressive prostate cancer, and benign conditions such as prostatitis can result in markedly elevated levels (Hoffman, 2011). Research is ongoing to find newer biologic markers for screening, different screening modalities, and initiation and interval of screening, with the aim to detect those high-risk prostate cancers and reduce unnecessary testing and treatment of men with low risk of mortality from the disease (ACS, 2015; Hoffman, 2011).

Most experts agree that individualized risk assessments and evaluation for screening should be determined by the patient and provider (ACS, 2015). Screening guidelines for average-risk men are outlined in Table 1-6 and generally consist of initiating PSA screening between ages 40 and 50 with discussion regarding risk-benefit ratio. In keeping with controversial results surrounding PSA testing, USPSTF (2012b) specifically recommends against screening with PSA for any man at any time.

Skin Cancer

In 2015, an estimated 73,870 cases of malignant melanoma are expected to be diagnosed. This is in addition to the millions of nonmelanoma skin cancers diagnosed each year, such as basal and squamous cell skin cancers. These are difficult to accurately account for because they are not reported to tumor registries. Nonmelanoma skin cancers are mostly highly curable, but melanoma, which accounts for less than 2% of skin cancers, has the highest mortality rate. In 2015, an expected 9,940 people will die from melanoma (ACS, 2015).

Most cases of skin cancer are caused by unprotected or excessive exposure of the skin to UVR (ACS, 2015). UVR exposure can come from natural sources or artificial sources, such as tanning beds, and both result in skin damage ranging from wrinkling and premature aging to skin cancer (ACS, 2015). Risk factors for melanoma and nonmelanoma skin cancers differ. The greatest risk factors for melanoma include a personal or family history of melanoma and the presence of multiple atypical nevi (greater than 50). Risk factors for all skin cancers, including nonmelanoma skin cancers, include lighter skin tone (lifetime risk of melanoma is 25 times higher among Caucasians compared to African Americans), high sun sensitivity (e.g., having difficulty tanning or easily sunburning, red or blond hair, previous sunburns), immunosuppression, and previous history of skin cancer (ACS, 2015).

Melanoma is highly curable if treated early, with a 98% five-year survival rate. Melanoma is more likely to metastasize than other skin cancers, and the five-year survival rate drops to 16% for late-stage disease (ACS, 2015). The most effective way to detect skin cancer early, including melanoma, is to recognize new or changing skin lesions. The ABCD rule—**as**ymmetry, **b**order, **c**olor, and **d**iameter—is an easy, patient-friendly tool to help remember the warning signs for suspicious skin lesions or melanoma (see Figure 1-1).

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- **A** is for **Asymmetry**: One half of the mole does not match the other half.
 - **B** is for **Border** irregularity: The edges of the mole are irregular, blurred, jagged, or notched.
 - **C** is for **Color**: The color of the mole is not uniform, with varying degrees of tan, brown, or black.
 - **D** is for **Diameter**: The diameter of the mole is greater than 6 mm, or the size of a pencil eraser.
-

Figure 1-1. ABCD Rule for Melanoma

Note. Based on information from American Cancer Society, 2015.

Other Cancers

Although established screening tests and guidelines exist for several cancers, the majority of malignancies do not have screening recommendations, as insufficient evidence exists to suggest that screening would affect mortality rates. No standard screening tests are recommended for cancers of the kidney, pancreas, thyroid, or urinary bladder. For cancers of the liver and ovary, no screening tests are recommended for average-risk individuals, but those at high risk for these cancers are often screened despite no proven reduction in mortality. As such, no standard screening testing is recommended for women at average risk for endometrial cancer, but those with known or suspected Lynch syndrome should have annual screening with endometrial biopsy or transvaginal ultrasound beginning at age 35 (ACS, 2015). More research is needed in identifying beneficial screening modalities and recommendations for these and other malignancies. The National Institutes of Health lists almost 1,000 clinical trials across the United States that are actively recruiting for cancer screening trial participants.

Implications for Oncology Advanced Practice Nurses

The role of oncology APNs encompasses cancer risk reduction, screening, and early detection. Oncology APNs are able to assess, evaluate, and interpret cancer risk assessments and recommend appropriate interventions. Familiarity with known risk factors for various cancers alerts APNs to patients who would benefit from evidence-based interventions to reduce can-

cer risk. Guidelines are available to guide APN interventions. Strategies are modified based on individual characteristics, population risk variances, and cultural diversities. It is imperative that oncology APNs master these topics to provide comprehensive, thorough oncology care that begins with risk assessment to reach the goal of cancer prevention.

Conclusion

Cancer prevention and early detection are integral parts of the cancer care continuum. Ideally, primary cancer prevention in the form of risk reduction is the best way to decrease morbidity and mortality related to cancer. Certain populations are considered to be at high risk for some malignancies, and the screening and management of these populations differs from that of the general population. Risk models are available to assist APNs in assessment for certain cancers. Evidence-based pharmacologic, nonpharmacologic, and behavioral interventions are available. Education of both individuals and populations is crucial. Education encompasses information about exercise, dietary habits, sun protection, smoking cessation, and recommended screening practices. Early detection achieved by adhering to routine screening guidelines facilitates diagnosis at the earliest stage, when the cancer is most likely to be treated successfully and is associated with the best patient outcomes. Oncology APNs have the opportunity and obligation to offer risk-reduction care and appropriate screening to both individual patients and populations.

Case Study

A.K. is a 55-year-old African American woman seen in the oncology clinic by the oncology APN for follow-up care for anemia. A.K. states that she receives health care at a walk-in clinic only when she is ill and that she had previously been out of work for some time and had not had insurance to cover routine medical care until recently. Review of her family history confirms colon cancer in her 70-year-old mother, diagnosed at age 65. Her 73-year-old father has heart disease and hypertension and was diagnosed with prostate cancer at age 72. She has two brothers, who also have hypertension. She is married and has no children or any pregnancies. She smokes less than one half pack of cigarettes per day for 15 years and is interested in quitting but admits she needs help. She denies alcohol use. A.K. works 40–50 hours a week, does not engage in regular exercise, and eats fast food frequently.

Her review of systems is negative except for fatigue and intermittent arthralgia with a previous history of osteoarthritis, for which she takes occasional acetaminophen. She is postmenopausal; her last menstrual cycle was more than two years ago. Other past medical and surgical history is negative. The physical examination (including CBE, pelvic examination, and Pap/HPV test) is also negative, vital signs are stable, and no gross abnormalities are apparent on examination except for moderate obesity and pale oral mucosal membranes.

1. What risk factors for malignancy can be identified based on this history?
 - Her risks for cancer include tobacco use, sedentary lifestyle, obesity, and poor nutrition. She is nulliparous and has one first-degree relative with a history of colon cancer. Her father's recent diagnosis of prostate cancer at age 72 is noted but does not necessarily affect A.K.'s risk factors at this point.
2. What screening tests does A.K. need, and what cancer risk-reduction strategies can the oncology APN discuss with A.K.?
 - As A.K. has not received routine medical care in several years, she has neglected the recommended cancer screening tests. Recommendations include smoking cessation, and because she is willing to make a quit attempt, NRT may be offered in the form of transdermal nicotine. Counseling regarding smoking cessation will increase effective-

ness of the intervention. Physical activity of moderate intensity for at least 150 minutes per week is a behavioral goal. Dietary counseling is necessary, focusing on eating fewer high-fat foods and consuming at least 2.5 cups of fruits and vegetables per day. Counseling on the techniques, benefits, and limitations of breast self-examination will increase the patient's confidence in performing this examination.

- A screening mammogram is appropriate, along with a referral to a gastroenterologist for a screening colonoscopy. Informational needs include screening recommendations for mammogram and CBE annually, pelvic examination with Pap and HPV co-testing every five years, and colonoscopy every five years, given her positive family history (assuming initial colonoscopy results are benign). She is not a candidate for LDCT because of her low risk for lung cancer at this point. Smoking cessation should still be advised.
3. Before she leaves, A.K. inquires about a television commercial for a vaccine for cervical cancer and wants to know if that is an option for her. How does the oncology APN respond?
- The oncology APN tells A.K. that three vaccines are available, Gardasil, Gardasil 9, and Cervarix, and are for the prevention of cervical cancer associated with HPV infection in females 9–26 years of age. Therefore, A.K. is not a candidate for this vaccination, and the APN recommends she continue with Pap and HPV co-testing for early detection of cervical cancer as discussed previously.

Key Points

- Primary prevention of cancer is achieved through promotion of wellness and reduction of known risks for cancer.
- Cancer risk assessment involves an individualized, comprehensive patient history and examination to provide accurate cancer risk–reduction counseling and screening recommendations.
- Major components of cancer risk reduction for the general population include
 - Avoid or cease cigarette smoking.
 - Minimize UVR exposure, and use sunscreen with an SPF of at least 15 on sun-exposed skin.
 - Maintain an active lifestyle with regular physical activity.
 - Maintain a healthy weight (avoid obesity).
 - Eat a diet high in fiber, fruits, and vegetables and low in red or processed meats, fats, and sugars.
- Chemoprevention is an option for certain high-risk patients.
- Secondary prevention includes screening and early detection of cancer.
- Screening tests require specificity (few false positives) and sensitivity (few false negatives) for the disease being screened for.
- Screening guidelines exist for the general population and for populations at high risk for various cancers, including those with a genetic predisposition for certain cancers.

Recommended Resources for Oncology Advanced Practice Nurses

- Breast Cancer Risk Assessment Tool (www.cancer.gov/bcrisktool): This tool was developed to estimate a woman's risk for breast cancer. The model has been updated to include risk for racial differences. Mobile access is available.

- Colorectal Cancer Risk Assessment Tool (www.cancer.gov/colorectalcancerrisk): This tool was developed for risk estimation in men and women of multiple racial backgrounds and with a variety of other gastrointestinal precursors. Mobile access is available.
- Melanoma Risk Assessment Tool (www.cancer.gov/melanomarisksktool): An interactive tool developed to estimate absolute risk of developing invasive melanoma. Mobile access is available.
- NCCN guidelines for detection, prevention, and risk reduction (www.nccn.org): Guidelines are available on breast, hereditary breast and ovarian, cervical, colorectal, lung, and prostate cancer screening or early detection.
- NCI's *Dictionary of Cancer Terms* (www.cancer.gov/dictionary): This resource contains more than 7,000 terms related to cancer and medicine and is available in Spanish.

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