Lifestyle Interventions to Reduce Cancer Risk and Improve Outcomes

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There are more than one half million cancer deaths in the United States each year, and one third of these deaths are attributed to suboptimal diet and physical activity practices. Maintaining a healthy weight, staying physically active throughout life, and consuming a healthy diet can substantially reduce the lifetime risk of developing cancer, as well as influence overall health and survival after a cancer diagnosis. The American Cancer Society’s Nutrition and Physical Activity Guidelines serve as a source document for communication, policy, and community strategies to improve dietary and physical activity patterns among Americans. In 2006, they published updated guidelines for the primary prevention of cancer and guidelines for improving outcomes among cancer survivors through tertiary prevention. These two sets of guidelines have similar recommendations, including: achievement and maintenance of a healthy weight; regular physical activity of at least 30 minutes per day and at least five days per week; a plant-based diet high in fruits, vegetables, and whole grains and low in saturated fats and red meats; and moderate alcohol consumption, if at all. Physicians are encouraged to find teachable moments to impart appropriate nutrition, physical activity, and weight management guidance to their patients, and to support policies and programs that can improve these factors in the community to reduce cancer risk and improve outcomes after cancer. (Am Fam Physician. 2008;77(11):1573-1578, 1579-1580. Copyright © 2008 American Academy of Family Physicians.)

In the United States, a cancer diagnosis is made every 23 seconds.1 Currently, the lifetime risk for cancer is roughly one in three among American women and one in two among American men.1 Following heart disease, cancer is the second most prevalent disease in the United States and is associated with approximately $210 billion in health care costs annually.2 The most critical modifiable risk factor for cancer is the cessation of tobacco use, followed by weight control, dietary choices, and physical activity.3-5 Evidence also suggests that these lifestyle factors are not only important in primary cancer risk, but also influence health outcomes after a cancer diagnosis. Cancer survivors currently number more than 10.5 million persons and comprise nearly 4 percent of the U.S. population; therefore, weight control and adherence to regular physical activity and a healthy diet can play an important role in both primary and tertiary prevention.6

In 1991, the American Cancer Society (ACS) first published dietary guidelines to advise health care professionals and the general public about lifestyle behaviors to reduce cancer risk.7 The ACS periodically updates these primary prevention guidelines, most recently in 2006.8,9 To address the growing needs of cancer survivors, the ACS also issued a guide in 200310 for informed choices related to nutrition and physical activity specifically aimed at cancer survivors, which was also updated in 2006.11 These guidelines provide a concise and understandable summary of the existing scientific information about weight control, physical activity, and nutrition in relation to risk of cancer and disease-free survival after diagnosis. The guidelines also acknowledge areas in which the evidence is not yet definitive, either because the published results are inconsistent or because the methods of studying lifestyle factors in relation to chronic disease in human populations have recognized limitations. The ACS guidelines are consistent with guidelines established for cancer prevention by other countries4; those from the American Heart Association and American Diabetes Association for the...
## SORT: KEY RECOMMENDATIONS FOR PRACTICE

<table>
<thead>
<tr>
<th>Clinical recommendation</th>
<th>Primary cancer prevention evidence rating</th>
<th>Cancer control evidence rating</th>
</tr>
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<tbody>
<tr>
<td>Maintain a healthy weight throughout life</td>
<td>A – Consistent (Level 1) evidence that overweight and obesity are significant risk factors for cancers of the breast (post-menopausal), colon, endometrium, gastric cardia, and kidney. A/C – Diets that are plant-based and low in saturated fat and cholesterol at least 60 minutes per day of moderate-to-vigorous physical activity (above usual activities) on at least five days of the week (45 to 60 minutes of intentional physical activity are preferable). 2,5,9,14</td>
<td>A/B – Consistent (Level 1) evidence that obesity at diagnosis and limited-quality evidence (Level 2) that obesity at post-diagnosis is a poor prognostic factor for multiple myeloma and non-Hodgkin’s lymphoma, and cancers of the breast, cervix, colorectum, esophagus, gallbladder, kidney, ovary, pancreas, prostate, stomach and uterus. 3,11,20,25</td>
</tr>
<tr>
<td>Adopt a physically active lifestyle</td>
<td>A – Consistent (Level 1) evidence that physical activity offers significant protection for cancers of the breast and colon. 4,5,9,28</td>
<td></td>
</tr>
<tr>
<td>Consume a healthy diet, with an emphasis on plant sources</td>
<td>A – Consistent (Level 1) evidence exists that high intakes of red and processed meats are associated with risk for colorectal cancer. A/C – Diets that are plant-based and low in saturated fat and cholesterol.</td>
<td>C – Current opinion (Level 3) endorses plant-based diets with low intakes of saturated fats, although there are currently limited data to support this from the perspective of cancer control. 11,41-43,47,49</td>
</tr>
<tr>
<td>Limit consumption of alcoholic beverages</td>
<td>A – Consistent (Level 1) evidence exists that high alcohol intake is associated with increased risk for kidney, liver, and head and neck cancers. Alcohol intake also is significantly and linearly associated with risk of breast cancer. 3,9,14,46</td>
<td>A – Consistent (Level 1) evidence exists that individuals diagnosed with head and neck cancer who continue to consume alcohol have a poorer prognosis. Data for breast cancer are less clear, although of the eight studies conducted to date, none have shown a significant adverse effect of alcohol on cancer control among breast cancer survivors; however, these studies may have inadequately addressed the question. 3,10,44,46</td>
</tr>
</tbody>
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A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, see http://www.aafp.org/afpsort.xml.

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8 Protection from prevalent forms of comorbidity (i.e., secondary cancers, cardiovascular disease, diabetes, or osteoporosis).

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**References:**

detail/cancer-briefs-breast-cancer
detail/604005/
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Tertiary prevention evidence rating*

A – Consistent (Level 1) evidence indicates that overweight and obesity are significant risk factors for specific second cancers (see column 2), and comorbidity among cancer survivors (i.e., cardiovascular disease and diabetes).3, 5, 7-9, 12-14, 22, 45, 49

A – Consistent (Level 1) evidence that exercise offers protection from specific second cancers (see column 1), and prevalent forms of comorbidity (i.e., cardiovascular disease, diabetes, and osteoporosis) among cancer survivors.4, 5, 9, 12-14, 28, 29, 47, 49

A/C – Diets that are plant-based and low in saturated fat and intakes of red and processed meats offer protection from specific second cancers (see column 1) and offer significant protection against cardiovascular disease (a prevalent comorbid condition among cancer survivors).5, 7-9, 12-14, 41, 45, 47, 49

A – Consistent (Level 1) evidence exists that moderate alcohol intakes are associated with significant cardioprotective effects, which may provide some benefits among survivors (given increased risk of cardiovascular disease), as well as the population at large.11, 12-14, 41

prevention of coronary heart disease and diabetes,12, 13 and for general health promotion, as defined by the 2005 Dietary Guidelines for Americans.14

Recommendations

An integrated set of common guidelines for primary cancer prevention, cancer control, and tertiary prevention is presented in the Strength of Recommendation Taxonomy (SORT) table.15 These recommendations for practice are briefly addressed below, followed by recommendations specific to primary cancer prevention and those aimed at improving outcomes among cancer survivors. These do not include recommendations for specific supplements (e.g., the use of selenium or vitamin E for prostate cancer), functional foods (e.g., the use or non-use of soy foods for breast cancer), or specific dietary regimens. Although many of these factors were addressed in each of the ACS reports,10, 11 they are not reflected in the recommendations because evidence from carefully controlled trials is currently insufficient. For more comprehensive reviews in this arena, the reader is directed to two recent meta-analyses10, 12 and two systematic reviews.18, 19

MAINTAIN A HEALTHY WEIGHT THROUGHOUT LIFE

The strongest current evidence for primary prevention and for improving outcomes after a diagnosis of cancer relates to the achievement of a healthy weight. Overweight and obesity are known risk factors for several types of cancers, and evidence is increasing for other types.3, 5, 20, 21 Furthermore, overweight or obesity at the time of diagnosis is linked with a poorer prognosis for several types of cancer, as is subsequent weight gain (both with regard to cancer control and common comorbid conditions).22-25 Thus, cancer survivors and persons hoping to reduce their primary risk of cancer should be encouraged to achieve and maintain a healthy bodyweight (body mass index [BMI] = 18.5 to 24.9 kg per m2).26, 27

ADOPT A PHYSICALLY ACTIVE LIFESTYLE

Strong evidence suggests that increased levels of physical activity reduce the risk for colorectal and breast cancers.5, 7-9, 28 In addition, evidence of benefit from regular physical activity is accumulating for cancer survivors.28-32 Moderate-to-vigorous levels of physical activity of at least 30 minutes per day on at least five days per week are recommended, although benefits related to colorectal cancer may require higher levels (i.e., at least 60 minutes per day).30, 32 Examples of moderate-intensity activities include: walking; dancing; horseback riding; yoga; golfing; mowing the lawn; and job-related walking and lifting (e.g., custodial work).9 Examples of vigorous-intensity activities...
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include: jogging or running; fast bicycling; circuit weight training; aerobic dance; soccer; cross-country skiing; and heavy manual labor (e.g., forestry, construction). Regular structured exercise is associated with improved physical function, vigor, mood, quality of life, body composition, and cardiorespiratory fitness, and, therefore, may be of particular benefit among survivors. Because of the immediate and late-occurring effects of cancer treatment (e.g., neurologic deficits, compromised immune function, cardiac toxicity), cancer survivors should be screened before beginning a program of physical activity.

CONSUME A HEALTHY DIET WITH AN EMPHASIS ON PLANT SOURCES

A diet that provides optimal nutrient composition while maintaining energy balance is best achieved through portion control (Table 1) and a heavy reliance on plant foods that deliver ample nutrients and proportionally fewer calories. Processed and red meats should be limited because of strong associations with colorectal cancer. For cancer survivors, plant-based diets have also been significantly associated with an increased overall survival through the reduction of risk for various comorbid conditions, such as cardiovascular disease, for which cancer survivors are especially prone. Fruits, vegetables, and whole grains are fiber-rich foods that contain a number of nutrients and phytochemicals (e.g., polyphenols, terpenes, lignans) that have demonstrated anticarcinogenic activity in laboratory settings and may be helpful in hindering neoplasia individually or, more likely, in concert with one another. Specific foods, such as cruciferous vegetables, tumeric, green tea, and berries are currently under study, given their promising biochemical properties. However, the current evidence does not yet support the purposeful inclusion of any particular food or nutrient.

LIMIT CONSUMPTION OF ALCOHOLIC BEVERAGES

Alcohol is associated with higher risk for a variety of cancers. Risk is largely apparent at levels of more than two drinks per day for men and more than one drink per day for women. However, moderate alcohol consumption is protective against cardiovascular disease, which is the major cause of death in the United States and a significant comorbid condition among cancer survivors. The consumption of moderate amounts of alcohol should be weighed on an individual basis, taking into account risk of cancer versus heart disease and an ability to control intake. Among head and neck cancer survivors, however, complete abstinence from alcohol is recommended because continued alcohol use is associated with higher rates of treatment complications and decreased survival.

Additional Recommendations

REDUCING CANCER RISK THROUGH COMMUNITY ACTION

Cancer is the second leading cause of mortality and shares several common risk factors with other prevalent diseases (e.g., cardiovascular disease, diabetes). Therefore, a significant component of the ACS primary prevention guidelines involved a call for public policy and community action. Health care professionals are well-positioned to support and lead community efforts that promote healthy food choices and increased physical activity. The adoption and maintenance of healthy, nutrition-related, and physically active behaviors can be supported by: increasing access to healthy foods (and reducing access to unhealthy foods) in schools, work sites, and communities; providing safe, enjoyable, and accessible environments for physical activity in schools; and providing transportation and recreation in communities.

MAINTAINING FOOD SAFETY

Food safety from microbiologic contamination is a particular concern after the diagnosis of cancer during episodes

Table 1. Standard Dietary Portion Sizes

<table>
<thead>
<tr>
<th>Category</th>
<th>Recommended servings per day for adults</th>
<th>Serving size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits</td>
<td>3 to 4</td>
<td>1 medium apple, banana, or orange</td>
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<tr>
<td></td>
<td></td>
<td>1/2 cup of chopped, cooked, or canned fruit</td>
</tr>
<tr>
<td>Vegetables</td>
<td>4 to 5</td>
<td>1/2 cup of 100 percent fruit juice</td>
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<tr>
<td></td>
<td></td>
<td>1 cup of raw leafy vegetables</td>
</tr>
<tr>
<td>Grains</td>
<td>6 to 8</td>
<td>1 cup of other cooked or raw vegetables, chopped</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/2 cup of 100 percent vegetable juice</td>
</tr>
<tr>
<td>Beans and nuts</td>
<td>4 to 5 servings per week</td>
<td>1 slice of whole grain bread</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 ounce of whole grain ready-to-eat cereal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/2 cup of whole grain cooked cereal, rice, pasta, etc. (e.g., oatmeal, bulgur, brown rice, buckwheat)</td>
</tr>
<tr>
<td>Dairy foods</td>
<td>2 to 3</td>
<td>1/2 cup of cooked dry beans</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 tablespoons of reduced-fat peanut butter</td>
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<tr>
<td></td>
<td></td>
<td>1/3 cup of nuts</td>
</tr>
<tr>
<td>Meats and eggs</td>
<td>6 ounces or less</td>
<td>1 ounce of cooked lean meat, poultry, fish</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 egg</td>
</tr>
</tbody>
</table>

Information from reference 14.
Table 2. Tips for Physicians on Advising Patients with Cancer About a Healthy Lifestyle

| Take advantage of teachable moments to provide evidence-based guidance to patients regarding cancer prevention and control (e.g., before and after cancer screening; upon the diagnosis of a premalignant lesion; after the diagnosis of cancer in patients or their family members) |
| Reinforce the importance of weight management, regular exercise, and a plant-based diet as a means to prevent and control cancer |
| Encourage patients to get nutrients from food sources rather than dietary supplements because there is little data to support the use of dietary supplements for cancer prevention or control |
| Assist patients in making decisions regarding alcohol use to optimize risk reduction for cancer and cardiovascular disease |
| Encourage the practice of food safety among cancer patients during treatment |
| Support community efforts that promote healthy food choices and increased physical activity |

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of iatrogenic immunosuppression that occur with various forms of cancer treatment.\textsuperscript{10,11} Therefore, during chemotherapy and radiation treatments, cancer survivors and their caregivers should follow safe food practices to reduce the risk of food-borne illnesses.\textsuperscript{10,11} General guidelines for food safety include: washing hands thoroughly before eating or preparing food; washing produce thoroughly; keeping raw foods separate from ready-to-eat foods and cleaning all utensils and surfaces that have contacted raw meats (including fish and poultry) and eggs; cooking food to proper temperatures; and storing food at low temperatures.\textsuperscript{11} Persons eating in restaurants should avoid foods that may potentially have bacterial contamination (e.g., salad bars, sushi, raw or undercooked meats). If the purity of a water source is unknown (e.g., well water), local public health departments can be contacted to check it for bacterial content.\textsuperscript{11}

ROLE OF THE PRIMARY CARE PHYSICIAN

The primary care physician plays a pivotal role in primary and secondary cancer prevention for patients and long-term health care for cancer survivors.\textsuperscript{47-49} Although lifestyle risk factors may differ somewhat between cancers (see http://www.cancer.org for detailed guidelines), it is notable that the overall dietary and physical activity recommendations for cancer risk reduction and for improving outcomes after a diagnosis of cancer are remarkably similar.\textsuperscript{9,11} Thus, for the most part, a similar message can be delivered to cancer survivors, their family members who may be at an increased risk, and the population at large. This consistency should reduce the uncertainty regarding the delivery of appropriate health behavior messages to various patient populations, which can be one of the largest barriers to providing cancer-related diet and physical activity guidance.\textsuperscript{49} Cancer is an area in which a multitude of dietary regimens, isolated nutrients, and alternative and complementary therapies are currently being studied.\textsuperscript{47,49} However, there is limited evidence to support the effectiveness and safety of any of these specific regimens.\textsuperscript{9,11} Although physicians should maintain an open dialogue with patients about the use of dietary supplements and other complementary or alternative therapies,\textsuperscript{16-19,47,49} they should strongly consider delivering messages that can make the most impact on reducing cancer risk and promoting cancer control for their patients (Table 2).

This article is based on guidelines established by the American Cancer Society for the primary prevention of cancer, as well as tertiary prevention among cancer survivors. The authors thank Colleen Doyle, MS, RD, and Ted Gansler, MD, MBA, of the American Cancer Society for their assistance with this manuscript.

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