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Nutrition During and After Cancer Therapy

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Abstract

Diet and nutritional factors play a large role in influencing both the quality and quantity of life after the diagnosis of cancer. The oncology nurse is well-positioned to: 1) oversee that the nutritional needs of patients who are newly-diagnosed, undergoing active treatment, or those with advanced disease are met; 2) facilitate referrals of patients with more intensive nutritional needs to registered dietitians; and 3) promote the importance of weight management and a healthful plant-based diet, low in saturated fat and simple sugars, and high in fruits and vegetables and unrefined whole grains, to patients who are likely to join the ranks of ever-expanding population of cancer survivors who now constitute roughly 4% of the U.S. population and who number over 11 million.

In 2008, roughly 1.44 million Americans were diagnosed with cancer, (1) and accordingly were labeled as “cancer survivors.” Fortunately, for roughly 65% of those who were newly diagnosed, this label will expand to encompass issues of long-term survivorship and health maintenance.(2) Extended cancer survivorship is a relatively new concept. In the past, most people who were diagnosed with the disease did not survive it. While longer survival times are a measure of success, the dark side of this victory is that a substantial proportion of these survivors will experience recurrence or second cancers. In addition, many more will go on to develop other co-morbid conditions, such as cardiovascular disease (CVD), diabetes, or osteoporosis, which often kill or debilitate survivors at much higher rates than the cancer itself. (3,4) Evidence exists that lifestyle factors, such as diet and physical activity, may make a difference, not only in preventing the primary risk of cancer, but also in improving quality of life and ameliorating symptoms.(3) Evidence also exists that nutritional status may influence the course of disease and affect cancer progression.(5,6). Given that dietary needs change for most persons as they move through the cancer continuum, oncology nurses apprised of current guidelines are best positioned to aid those under their care in making better food choices and paying heed to weight management.

The first nutrition guidelines that specifically addressed cancer survivors were established by the American Cancer Society (ACS) in 2003, and were updated three years later.(7,8) In 2007, the American Institute for Cancer Research (AICR) in collaboration with the World Cancer Research Fund (WCRF) also issued dietary guidelines for cancer prevention and also extended these to cancer survivors.(9) Both the ACS and the WCRF/AICR guidelines are based heavily on recommendations for primary cancer prevention, and share many commonalities with those established for the prevention and management of other prevalent chronic diseases, such as CVD and diabetes. Both sets of guidelines also include recommendations for physical activity, which, for the most part, are outside of the scope of this paper, except for the key role that physical activity plays in weight management. Tables 1 and 2 provide guideline summaries from each organization.

This article will address nutrition-related aspects of cancer survivor care from the point of diagnosis to long-term survivorship, including issues of appetite loss and inadequate food intake common with some cancer treatments, and extending to weight-related problems, and

co-morbid conditions that cancer survivors share with the general population. It also will examine the need for interventions, and what is currently known (or not known) about how best to deliver them. The time of cancer diagnosis has been identified as a “teachable moment” when a high proportion of cancer survivors are hungry for nutrition information;(3) it is a prime opportunity for the astute practitioner to kick-start the practice of lifestyle behaviors that can promote lifelong health benefits.

WEIGHT MANAGEMENT

Unintentional Weight Loss

For patients who are underweight, the overall goals for nutritional care are to prevent or reverse nutrient deficiencies, to preserve lean body mass, to minimize nutrition-related side effects (such as reduced appetite, changes in taste and smell, difficulty swallowing, and nausea or vomiting), and to maximize quality of life.(8) During cancer treatment, substantial weight loss, especially among patients of normal or lower body mass index, is associated with poorer treatment tolerance and outcomes, and poorer quality of life.(10) Patients with lung, head and neck and specific gastro-intestinal cancers are most at risk for weight loss and adverse events stemming from undernutrition (8). Dietary counseling among these patients and during the time of treatment has been shown to improve outcomes (8,10).

For added calories, consumption of more energy- and nutrient-dense foods (such as peanut butter, yogurt, dried fruit, avocados, cheese, granola, legumes, and eggs), is recommended. Smaller, more frequent feedings can be helpful in obtaining adequate energy. While mouth sores may impede consumption of foods that are either chemically or physically abrasive (e.g., citrus or tomato-based foods, tortilla chips), soft, bland foods and casseroles are usually well-tolerated. For those unable to eat enough solid food, several liquid supplements are commercially available that can provide much-needed nutritional support, without carrying the food safety risks of homemade formula (8). The ACS guidelines strongly suggest referral of cancer patients to a registered dietitian (contact the American Dietetic Association at www.eatright.org “Find a Nutrition Professional”), especially for those patients who cannot eat or those who have already tried and failed to gain weight.

Problems Related to Weight Gain

At the other end of the spectrum, overweight and obesity also can undermine the overall health and survival of the patient with cancer. First of all, overweight and obesity are well-established risk factors for cancers of the breast (post-menopausal), colon, kidney, and endometrium, and the list of obesity-related cancers grows as data continue to accumulate.(9) Therefore, a substantial proportion of cancer patients are overweight or obese at the time of diagnosis. Case in point, the prevalence of overweight and obesity (BMI >24.9) exceeds 70% in the two largest segments of cancer survivors, i.e., survivors of breast and prostate cancer.(11) Second, data show that increased body weight at the time of diagnosis is associated with increased mortality (overall and cancer-specific) for all cancers combined, and specifically for non-Hodgkin’s lymphoma and multiple myeloma, and cancers of the breast, esophagus, colon and rectum, cervix, uterus, liver, gallbladder, stomach, pancreas, prostate, and kidney.(12) Finally, weight gain is common during or after treatment for a variety of cancers,(7,8,13) and may be triggered by some forms of treatment (i.e., adjuvant chemotherapy) or physical inactivity brought about by treatment-related fatigue. Gains in weight post-diagnosis have been found to reduce quality of life and exacerbate risk for functional decline, co-morbidity, and perhaps even cancer recurrence and cancer-related death.(5,13) While studies exploring the relationship between post-diagnosis weight gain and disease-free survival have been somewhat inconsistent,(5,7, 8) one of the largest studies found that breast cancer survivors who experienced increases in BMI post-diagnosis of 0.5 units or more had a significantly higher risk of recurrence and all-

cause mortality.(5) This accumulating evidence of adverse effects of overweight and obesity on disease-specific survival, plus evidence indicating that obesity has negative consequences for overall health and physical function, make weight management a priority for cancer survivors.(3,8,9,13)

Current guidelines advocate a modest rate of weight loss (no more than two pounds per week) during the time of treatment among patients who are overweight or obese, as long as it meets with oncologist approval.(7,8) Guidelines established for weight management in the general population should be applied to cancer survivors, and should include not only caloric restriction and increased energy expenditure through exercise, but also behavior therapy.(7,8,14) While modest rates of weight loss can be achieved by portion control and by substituting low-energy density foods (e.g., water-rich vegetables, fruits, whole grains, and broth-based soups) for foods that are higher in calories,(15) more structured and intensive programs that include exercise and promote energy deficits of up to 1,000 calories/day may yield better results.(16) Previous studies have found exercise to be a strong predictor of weight loss among cancer survivors. (13) Accumulating evidence also suggests that physical activity may independently affect the course of colorectal and breast cancer, and also affects the risk of secondary cancers at each of these sites, as well as for endometrial cancers.(9)

DIETARY PATTERNS AND FOOD CHOICES

Food choice and proportion within the overall diet (dietary pattern) also is important for the cancer survivor. (8,9,13,17) Given that cancer survivors are at increased risk for a host of chronic diseases (most notably second cancers and CVD), guidelines recommend prudent diets that rely heavily on unrefined plant foods such as fruits, vegetables and whole grains, and which contain limited amounts of fat, simple sugars and red or processed meats.(7–9) Indeed, the dietary guidelines to reduce risk of heart disease, diabetes, hypertension (as well as other chronic diseases) are quite similar to those aimed at reducing cancer risk (see Table 3 for resource links). Data from observational studies of colorectal-cancer survivors suggest that, as compared to those who report a Western-type diet (i.e., high proportional intakes of meat, refined grains, high fat dairy products, and desserts), those who report a prudent diet (i.e. high proportional intakes of fruits, vegetables, whole grains and low-fat dairy products) have improved overall survival and reduced rates of colorectal recurrence and mortality.(17) Furthermore, cross-sectional data from breast and prostate cancer survivors suggest that diet quality during survivorship is significantly and positively associated with quality of life and physical functioning.(18,19)

Adequate protein intake is essential during all stages of cancer treatment, recovery, and long-term survival.(8) Choosing protein foods that also are low in saturated fat (lean meat and poultry, fish, low-fat dairy products, nuts, seeds, and legumes) reduces calories and provides cardio-protective benefits. While the potential benefit of low fat diet is still controversial,(9, 20) one fact remains indisputable: fats and oils are energy-dense. Therefore, diets high in fat are typically high in calories, making weight control more difficult. Healthy (but not low-calorie) fats include monounsaturated and polyunsaturated fats (from plants and oils), while intake of saturated fats (from animal sources or solid fats) should be limited, and trans fats (formed while processing fats) should be minimized as much as possible.

Other food-related recommendations

Recommendations that pertain to the avoidance of red and processed meats and to reduction of salty foods are based primarily on the prevention of select cancers (e.g., colorectal and aerodigestive cancers).(7–9) Sugars (including honey, brown- and raw-sugar, molasses, and high-fructose corn sweeteners), have not been shown to directly increase risk or progression of

cancer.(8) However, they can add substantial amounts of nutrient-poor calories, often replacing more nutritious food choices.

Alcohol-Use

While moderate-to-heavy drinking is noted more frequently among select groups of cancer survivors (i.e., survivors of head, neck, lung and prostate cancers), alcohol consumption among cancer survivors overall is similar to that of the general population.(21) The ACS recommends limiting alcohol intake to less than two drinks per day for men and less than one drink/day in women, but the WCRF/AICR concludes that “the evidence on cancer justifies a recommendation not to drink alcoholic drinks.”(8,9) Alcohol may provide cardio-protective benefits; however, it supplies a substantial dose of calories of poor nutrient benefit. Continued alcohol-use is strongly discouraged among survivors of head and neck cancers due to significantly higher rates of co-morbidity and poorer treatment outcomes. (4)

Dietary Supplements

Supplement-use is especially high among cancer survivors; however there is little evidence to suggest that they are helpful in improving the health of this vulnerable population, while some studies show that they are harmful.(8,9) Supplement use may interfere with some forms of cancer treatment, such as chemo- and radiation therapy, though the evidence for such effects is limited. While standard multiple vitamin/mineral supplements containing roughly 100% of the Dietary Reference Intake often are recommended during times of suboptimal intake,(8) both the ACS and WCRF/AICR encourage cancer survivors to meet their dietary needs from foods, not supplements.

HEALTH BEHAVIOR CHANGE

While some cancer survivors may begin to adopt healthier lifestyle practices on their own,(3) for the most part, cancer survivors' health behaviors parallel those of the general population – a population marked by inactivity, overweight or obesity, and consumption of a diet high in fat and low in fruits, vegetables and fiber.(21) Given higher rates of co-morbidity among survivors and evidence that diet and exercise affect risk for other cancers and other chronic diseases, there is a remarkable need for lifestyle interventions that target this vulnerable population of cancer survivors.

Cancer survivors may have special needs (e.g., fatigue, incontinence, lymphedema, food intolerances or digestive disorders, long-term addictions to tobacco or alcohol) that must be considered if attempts to promote healthful lifestyle practices are to succeed.(22) Timing of interventions also may be important, since readiness to pursue various lifestyle changes may wax and wane along the survivorship continuum. Gender differences exist in levels of psychological distress after diagnosis (males report low initial levels which decrease significantly over time, while females have high initial levels that decrease less precipitously), highlighting the fact that optimal intervention timing may need to be tailored.(23) Other factors, such as concurrent demands of treatment and rehabilitation, level of difficulty for changing a specific behavior, the patients' self-efficacy in pursuing behavior change, and other unique patient characteristics are likely to influence success.(4,22) Access issues (e.g., travel, and time) are well-recognized barriers to participation and are likely to become even more significant with the upturn in energy costs (22).

To date, most reported health behavior interventions among cancer survivors have utilized clinic-based interventions.(22) However, distance-medicine based approaches may offer alternative means for targeting highly mobile or geographically-dispersed survivor populations (e.g., childhood cancer survivors) or those needing long-term follow-up. Telephone counseling

offers a traditional means of addressing distance barriers and has been used with varying levels of success among cancer survivors.(4,22) Web-based formats hold future promise; however, limited computer access, particularly among elderly survivors, may impede such methods.(4) Indeed, data currently suggest that cancer survivors prefer mailed print interventions when given a choice of program delivery.(11,24)

The recommendation of the health care provider is a critical first step in motivating patients to consider lifestyle change.(3) Unfortunately, data suggest that only a minority of oncology care physicians offer guidance regarding healthful lifestyle change. Physicians report barriers such as competing treatment or health concerns, time constraints, or uncertainty regarding the delivery of appropriate health behavior messages.(25) As such, they are more apt to mention lifestyle practices to patients who already adhere to healthful lifestyle behaviors, and not to those who are more in need of intervention.(26) Nurses can play a key role not only in prompting physicians to interact with patients on issues of lifestyle behaviors, but also can take the initiative to actively promote healthful dietary change and provide follow-up as needed.

SUMMARY

The cancer survivor can face a harrowing journey from diagnosis and treatment, to recovery. Nurses keen to provide sound nutritional guidance, and who come armed with knowledge of modalities best-suited to enhance survival and health post-recovery, will find survivors to be an unusually motivated audience primed for change. Harnessing this desire is key to facilitating health behavior change in cancer survivors – change that may reduce the risk of recurrence, as well as lessen the threat of other co-morbid conditions. Crucial factors for long-term health after cancer diagnosis include weight management by balancing calorie intake with adequate exercise, and the consumption of a nutrient-dense diet to provide adequate elements for healing as well as a defense against cancer recurrence or adverse sequelae and other forms of co-morbidity. In crafting interventions that capitalize on this opportune moment for behavior change in survivors, we must address diverse patient needs, understand unique barriers to change, and conduct further research to discover cost-effective interventions that are best able to promote disease-free survival and overall health.

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Selected References

1. American Cancer Society. Cancer Facts & Figures 2008. Atlanta, Georgia: American Cancer Society; 2008.
2. Ries, LAG.; Melbert, D.; Krapcho, M., et al. SEER Cancer Statistics Review, 1975–2004. National Cancer Institute; 2006 [Accessed October 20, 2008]. Available at: www.seer.cancer.gov/csr/1975_2004
3. Demark-Wahnefried W, Aziz NM, Rowland JH, Pinto BM. Riding the crest of the teachable moment: promoting long-term health after the diagnosis of cancer. *J Clin Oncol* 2005;23(24):5814–5830. [PubMed: 16043830]
4. Pinto BM, Trunzo JJ. Health behaviors during and after a cancer diagnosis. *Cancer* 2005;104(11 Suppl): 2614–2623. [PubMed: 16247806]
5. Kroenke CH, Chen WY, Rosner B, Holmes MD. Weight, weight gain, and survival after breast cancer diagnosis. *J Clin Oncol* 2005;23(7):1370–1378. [PubMed: 15684320]
6. Chlebowski RT, Aiello E, McTiernan A. Weight loss in breast cancer patient management. *J Clin Oncol* 2002;20(4):1128–1143. [PubMed: 11844838]

7. Brown JK, Byers T, Doyle C, et al. Nutrition and physical activity during and after cancer treatment: an American Cancer Society guide for informed choices. *CA Cancer J Clin* 2003;53(5):268–291. [PubMed: 14570227]
8. Doyle C, Kushi LH, Byers T, et al. Nutrition and physical activity during and after cancer treatment: an American Cancer Society guide for informed choices. *CA Cancer J Clin* 2006;56(6):323–353. [PubMed: 17135691]
9. World Cancer Research Fund/American Institute for Cancer Research. Food, Nutrition. Physical Activity and the Prevention of Cancer: a Global Perspective. Vol. 2. Washington, DC: AICR; 2007.
10. Hopkinson JB, Wright DN, Foster C. Management of weight loss and anorexia. *Ann Oncol* 2008;19 (Suppl 7):vii289–93. [PubMed: 18790968]
11. Demark-Wahnefried W, Peterson B, McBride C, Lipkus I, Clipp E. Current health behaviors and readiness to pursue life-style changes among men and women diagnosed with early stage prostate and breast carcinomas. *Cancer* 2000;88(3):674–684. [PubMed: 10649263]
12. Calle EE, Rodriguez C, Walker-Thurmond K, Thun MJ. Overweight, obesity, and mortality from cancer in a prospectively studied cohort of U.S. adults. *N Engl J Med* 2003;348(17):1625–1638. [PubMed: 12711737]
13. Rock CL, Demark-Wahnefried W. Nutrition and survival after the diagnosis of breast cancer: a review of the evidence. *J Clin Oncol* 2002;20(15):3302–3316. [PubMed: 12149305]
14. Demark-Wahnefried, W. Cancer Prevention. Alexandria, VA: American Society of Clinical Oncology; 2007. Diet: Energy balance and obesity; p. 5.1-5.33.
15. Rolls BJ, Roe LS, Meengs JS. Reductions in portion size and energy density of foods are additive and lead to sustained decreases in energy intake. *Am J Clin Nutr* 2006;83(1):11–17. [PubMed: 16400043]
16. Saquib N, Natarajan L, Rock CL, et al. The impact of a long-term reduction in dietary energy density on body weight within a randomized diet trial. *Nutr Cancer* 2008;60(1):31–38. [PubMed: 18444133]
17. Meyerhardt JA, Niedzwiecki D, Hollis D, et al. Association of dietary patterns with cancer recurrence and survival in patients with stage III colon cancer. *JAMA* 2007;298(7):754–764. [PubMed: 17699009]
18. Demark-Wahnefried W, Clipp EC, Morey MC, et al. Physical function and associations with diet and exercise: Results of a cross-sectional survey among elders with breast or prostate cancer. *Int J Behav Nutr Phys Act* 2004;1(1):16. [PubMed: 15516261]
19. Wayne SJ, Baumgartner K, Baumgartner RN, Bernstein L, Bowen DJ, Ballard-Barbash R. Diet quality is directly associated with quality of life in breast cancer survivors. *Breast Cancer Res Treat* 2006;96 (3):227–232. [PubMed: 16538543]
20. Chlebowski RT, Blackburn GL, Thomson CA, et al. Dietary fat reduction and breast cancer outcomes: Interim efficacy results from the Women’s Intervention Nutrition Study. *J Natl Cancer Inst* 2006;98:1767–1776. [PubMed: 17179478]
21. Bellizzi KM, Rowland JH, Jeffery DD, McNeel T. Health behaviors of cancer survivors: examining opportunities for cancer control intervention. *J Clin Oncol* 2005;23(34):8884–8893. [PubMed: 16314649]
22. Stull VB, Snyder DC, Demark-Wahnefried W. Lifestyle interventions in cancer survivors: Designing programs that meet the needs of this vulnerable and growing population. *J Nutr* 2007;137:243S–248. [PubMed: 17182834]
23. McBride CM, Clipp E, Peterson BL, Lipkus IM, Demark-Wahnefried W. Psychological impact of diagnosis and risk reduction among cancer survivors. *Psycho Oncol* 2000;9(5):418–427.
24. Rutten LJ, Arora NK, Bakos AD, Aziz N, Rowland J. Information needs and sources of information among cancer patients: a systematic review of research (1980–2003). *Patient Educ Couns* 2005;57 (3):250–261. [PubMed: 15893206]
25. Sabatino SA, Coates RJ, Uhler RJ, Pollack LA, Alley LG, Zauderer LJ. Provider counseling about health behaviors among cancer survivors in the United States. *J Clin Oncol* 2007;25(15):2100–2106. [PubMed: 17513816]
26. Prevalence of health-care providers asking older adults about their physical activity levels -United States. *MMWR* 1998;51(19):412–4.2002

TABLE 1**American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention.**

Maintain a healthy weight throughout life.	Balance caloric intake with physical activity.
	Avoid excessive weight gain throughout the lifecycle.
	Achieve and maintain a healthy weight if currently overweight or obese.
Adopt a physically active lifestyle.	Adults: engage in at least 30 minutes of moderate-to-vigorous physical activity, above usual activities, on 5 or more days of the week. Forty-five to 60 minutes of intentional physical activity are preferable.
	Children and adolescents: engage in at least 60 minutes per day of moderate-to- vigorous physical activity at least 5 days per week.
Consume a healthy diet, with an emphasis on plant sources.	Choose foods and beverages in amounts that help achieve and maintain a healthy weight.
	Eat five or more servings of a variety of vegetables and fruits each day.
	Choose whole grains in preference to processed [refined] grains.
If you drink alcoholic beverages, limit consumption.	Limit consumption of processed and red meats.
	Drink no more than one drink per day for women or two per day for men.

Taken from: Nutrition and Physical Activity During and After Cancer Treatment: An American Cancer Society Guide for Informed Choices. CA: A Cancer Journal for Clinicians 56: 323–353, 2006. Reprinted with Permission from the American Cancer Society

TABLE 2

World Cancer Research Fund/American Institute for Cancer Research Recommendations for Food, Nutrition, Physical Activity and the Prevention of Cancer

Body Fatness	Be as lean as possible within the normal range of body weight.
Physical Activity	Be physically active as part of everyday life.
Foods and Drinks that Promote Weight Gain	Limit consumption of energy-dense foods. Avoid sugary drinks.
Plant Foods	Eat mostly foods of plant origin.
Animal Foods	Limit intake of red meat and avoid processed meat.
Alcoholic Drinks	Limit alcoholic drinks.
Preservation, Processing, Preparation	Limit consumption of salt.
Dietary Supplements	Aim to meet nutritional needs through diet alone.
Cancer Survivors	Follow the recommendations for cancer prevention.

Taken from: Food, Nutrition, Physical Activity and the Prevention of Cancer: a Global Perspective (2nd edition). 2007 Reprinted with Permission from the AICR

TABLE 3

Resource links for dietary recommendations

American Heart Association	http://circ.ahajournals.org/cgi/reprint/CIRCULATIONAHA.106.176158
American Diabetes Association	http://care.diabetesjournals.org/cgi/reprint/31/Supplement_1/S61
American Dietetic Association	http://www.eatright.org/cps/rde/xchg/ada/hs.xsl/nutrition_12286_ENU_HTML.htm
Caring 4Cancer	http://www.caring4cancer.com/go/cancer/nutrition/
Centers for Disease Control and Prevention	http://www.cdc.gov/nccdphp/dnpa/nutrition/index.htm
American Institute for Cancer Research	http://www.aicr.org
National Institute of Health, National Heart Lung and Blood Institute	http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/dash_brief.pdf
Office of Cancer Complementary and Alternative Medicine	http://www.cancer.gov/CAM/health_aboutcam.html