

REVIEW ARTICLE

Informal education and health promoting approaches in adult cancer survivors

A.A. Argyriou¹, A.A. Ifanti², H. Kalofonos¹

¹Department of Medicine-Division of Oncology, University Hospital of Patras, Rion-Patras; ²Department of Educational Sciences and Early Childhood Education, University of Patras, Rion, Greece

Summary

This review looks at the available data relating to the informal education aspects and other health promoting approaches applied by adult cancer survivors to reduce the risk of cancer. The implications of such behavioral interventions on oncology practice are discussed. We also highlight areas of future research to pursue.

Available data show that many cancer survivors remain engaged in risky health behaviors post-diagnosis, which are associated with an increased risk of disease's recurrence. However, over the last years patients seem to increasingly receive adequate risk-based medical care. The application of appropriate informal education approaches, such as diet, exercise, and cessation of former unhealthy habits, such as smoking and alcohol has facilitated behavioral changes in cancer survivors, thoroughly improving their well being and overall quality of life (QOL).

Most of the research studies published to date have applied structured lifestyle interventions on intensive, individualized counseling sessions delivered by trained personnel or psychosocial-based mediations and reported that these approaches are largely effective in promoting the adoption of a healthier lifestyle in cancer survivors. These interventions have been reported to reduce the risk of cancer recurrence and thus to obtain an obvious positive impact on their well-being and overall QOL.

However, there is still insufficient evidence to conclude and support with confidence the effectiveness of any of these behavioral interventions and therefore future interventions should be initiated to assess the long-term effects and validating outcomes of lifestyle and other psychosocial interventions.

Key words: attitudes to cancer, cancer survivors, health promotion, informal education, lifestyle interventions, quality of life

Introduction

Disclosing the diagnosis of cancer emerges as a central organizing construct that evokes transformational changes in patients. Such a diagnosis results in a constellation of attitudinal and behavioral change across the lifespan in those who have achieved to survive [1]. Over the last years, the continued advances in early detection and therapy of cancer have led to a significant increase in the population of cancer survivors [2]. However, it should be acknowledged that they will have to cope with several long-term health and psychosocial difficulties, some of which are enduring. As a result, different coping strategies are adopted by cancer survivors to maintain increased control and mastery of their lives [3].

Coping with cancer is considered a potent predictor of QOL, rather a medical variable [4]. As such,

it is critical to identify and establish the best long-term coping strategies and interventions that promote the best possible normalization of life for cancer survivors. Hence, the need for establishment and clinical application of effective health promotion and lifestyle interventions in cancer survivors in order to best possibly cope with their illness is obvious.

To integrate and effectively apply health promotion and informal education approaches into oncology care has attracted to date relatively little attention as literature contains only few studies prospectively evaluating lifestyle changes and health education curricula. Those studies attempt to reduce the vulnerability of cancer-related health risks and also the emergence of health risking behaviors and have an overall objective to achieve a better QOL in cancer survivors [5]. Current knowledge shows that patients should be aware about

Correspondence to: Haralabos P. Kalofonos, MD, PhD. Department of Medicine-Division of Oncology, University Hospital, University of Patras Medical School, Rion-Patras, 265 04 Greece. Tel: +30 2610 999535, Fax: +30 2610 994645, E-mail: kalofonos@upatras.gr

Received 01-04-2011; Accepted 10-04-2011

factors that are able to reduce the risks of both early and delayed treatment complications and also to increase the overall health risks.

On an attempt to prevent both primary cancer and its recurrence and to improve the outcomes, the disease-free survival and QOL of cancer survivors, the American Cancer Society (ACS) published in 2006 the most updated version of guidelines related to nutrition and physical activity issues during the various phases of cancer treatment and recovery [6]. According to these guidelines, the appropriate lifestyle interventions appear to be essential and should include counseling regarding the importance of maintaining a tobacco-free environment, appropriate diet for age considering any treatment-based restrictions to maintain a normal weight throughout life, regular exercise, reduction of alcohol intake, sun protection measures and continued surveillance for prevention of disease's recurrence [6,7].

Available data show that patients, in hope of preventing recurrence, are quite interested in employing lifestyle interventions, i.e., diet and exercise, and cessation of former habits, such as smoking and alcohol [8]. A significant proportion of cancer patients (80%) reported their preference in participating to multidimensional behavior interventions, comprising of a 15-week rehabilitation program including individual exercise, sports, psycho-education, and information [9]. Towards this view, behaviors that aim at preventing secondary cancers, occurring at the same organ or at other sites, are also quite important for cancer survivors and should be incorporated in the counseling programs [10].

Theories underlying health promotion in cancer survivors, mainly including transtheoretical model, motivational interviewing, social cognitive theory as also the cognitive behavioral theory, might also be able to significantly contribute to the development of effective health promotion interventions [11,12].

We herein review and briefly discuss all available data relating to the lifestyle interventions and other health promoting approaches applied from cancer survivors to reduce the risk of cancer and improve their overall QOL. The implications of such behavioral changes on oncology practice are discussed. We also highlight areas of future research to pursue.

Lifestyle practices and interventions among cancer survivors

Restriction of tobacco use

It is estimated that about one third of patients who smoked before the diagnosis of cancer continue to

smoke with an associated significant adverse effect on their outcomes and QOL [13]. Hence, smoking discontinuation interventions are considered to be closely associated with a decreased incidence of tobacco-related cancers, such as lung, head and neck (H&N) and bladder carcinomas. In addition, smoking cessation is important for prevention of cancer recurrence. More than 5 studies have been published thus far to describe the application of smoking cessation interventions in cancer survivors [14-19].

In 1994, Stanislaw and Wewers firstly reported the application and effect of a structured smoking cessation intervention in 26 cancer patients on short-term smoking abstinence. In that setting, subjects were allocated either to the experimental group (n=12) and received a structured smoking cessation intervention or to the control group (n=14) and received standard care. A difference of 32% was observed in the smoking abstinence rates, as 75% of patients receiving the smoking cessation intervention remained abstinent compared with 42.9% of the controls [14].

Similar results were disclosed in a retrospective study that examined the effect of a brief consultation with a nicotine dependence counselor on the self-reported, 6-month tobacco abstinence rates between lung cancer patients (n=201) and non-lung cancer patients (n=201) who served as controls. This smoking cessation intervention was applied in patients treated at the Mayo Clinic Nicotine Dependence Center during a 12-year study period. Although the results of this study revealed a significantly different 6-month tobacco abstinence rate in lung cancer patients, compared to controls (22 vs. 14%; p=0.024), this effect did not remain strong after adjusted analyses [18]. Moreover, the analysis of other long term follow-up data (up to 4 years following diagnosis) on cigarette-smoking behavior of 840 patients with stage I non-small cell lung cancer showed that 40% of patients maintained a permanent smoking cessation by a time period of 2 years [20].

However, opposite results were reported from a study in which the efficacy of a National Institutes of Health (NIH) physician-based smoking cessation treatment was evaluated in 432 cancer patients. Patients were randomly allocated to either the intervention arm or usual care. The primary outcome of this study was the 7-day point prevalence abstinence at 6 and 12 months. Contrary to previous reports, this study revealed insignificant difference in quit smoking rates between study groups both at the 6-month (14.4 vs. 11.9%) and the 12-month (13.3 vs. 13.6%) follow-up [19].

Overall, the available data show that the smoking cessation interventions appear to be in most of the cases effective and cancer patients are motivated to quit

smoking. However, considering the existence of contradicting data supporting that the smoking cessation interventions may fail to increase the long-term quit rates among cancer patients, additional studies are needed to overcome the limitation of most available studies relating to the short-term follow-up data. Further research is also needed to disclose the true effect of relevant interventions and to reveal the most suitable tobacco abstinence method in cancer survivors.

Restriction of alcohol intake

The regular daily consumption of alcohol is considered to be significantly associated with higher risk, mostly, for manifestation of H&N cancer, and less often of breast and lung cancer. Its regular use also evokes higher rates of treatment complications, whereas those cancer patients consuming the highest intakes of alcohol are most prone to develop both disease recurrence and second primary cancers, thoroughly compromising their outcome [21-23]. This is why a complete abstinence from alcohol is recommended in cancer survivors, especially for those with H&N cancer.

Nevertheless, available data show that alcohol abstinence occurs in about 50% of H&N cancer patients and in about 12% of breast and lung cancer survivors [24,25]. To our knowledge, the literature does not contain reports assessing any particular alcohol cessation intervention in cancer survivors. As such, the need for initiation of relevant studies appears to be mandatory.

Dietary changes to maintain normal weight

Available data show that a dietary modification, employing reduced intakes of animal fat and increased consumption of fruits and vegetables, is an integral part of maintaining the health and preventing recurrence in cancer survivors [26,27]. This lifestyle intervention is estimated to be applied from a relatively large proportion of cancer survivors, ranging from 40 to 60% [5]. However, there is evidence that although this modification is employed from many cancer survivors, the proportion of overweight or even obese patients remains large after diagnosis and this event might be attributed to the significant recidivism in meat intake that occurs over the course of 2 years [28,29].

Most of the research studies published to date have applied a plant-based, low-fat or energy restriction dietary interventions on intensive, in-person, individualized counseling sessions delivered by trained personnel and reported that this kind of intervention is largely effective in promoting the adoption of a healthier nutrition profile in cancer survivors [5,30-32]. Other studies,

employing less intensive intervention techniques, such as through telephone counseling, appear to have some beneficial effect to achieve and also to maintain long-term adherence to a high-vegetable diet [31-34].

The beneficial effect of dietary interventions was supported by the overall reduction of body weight combined with either an increased circulating concentrations of carotenoids, as a biomarker of fruit and vegetable intake, or an improved estrogen and metabolism profile [31,32,35-38].

Contrary to the above-referenced studies were the results of a randomized trial of monthly dietician counseling to try to abrogate weight gain among 107 women receiving adjuvant chemotherapy for breast cancer at the Mayo clinic. Patients were equally divided into the experimental and the control group. The analysis of results showed that patients receiving the dietician counseling experienced a statistically insignificant reduction in both calories consumption and weight gain [39].

Yet, the question that still remains to be answered is whether modifications in diet affect disease-free and overall survival, especially in hormone-related cancers such as prostate and breast cancer, through implication of circulating levels of sex steroid hormones and growth factor proteins. Current knowledge shows that the lifestyle intervention-induced hormonal changes, including an improvement of insulin sensitivity as also dysregulation of circulating sex steroid hormones and insulin-like growth factor (IGF) axis proteins, might be able to positively affect the disease-free and overall survival of cancer survivors [40,41].

In support of the latter view are the results of a secondary analysis from the Women's Healthy Eating and Living Study in which over 3000 breast cancer survivors were included. This study showed that both overall and cruciferous vegetable intake might be associated with reduced risk of disease recurrence, particularly in women treated with tamoxifen [42].

Overall, it seems that the efficacy results of dietary interventions appear to be promising, but in our opinion they should be considered with caution on the basis of treatment-based restrictions, because of the lack of adequate control groups and the absence of long-term follow-up data. The true impact of dietary interventions on disease progression and recurrence should be further determined, before one can conclude with confidence on these clinically important endpoints.

Regular exercise

Exercise is considered to be a preventing measure against cancer as it has been estimated that more than 10% of all cancers, particularly colorectal carcinomas,

could have been prevented by 30 min daily exercise [43]. Recent research data on the role of exercise have disputed the traditional recommendation of oncologists to cancer survivors to rest and avoid activity. As such, current knowledge supports the view that regular exercise in cancer survivors supports their well-being and improves their QOL, the sense of self-empowerment and eventually promotes their social integration [44]. Most importantly, regular exercise after a diagnosis of both solid organ and haematological malignancies has been shown to prolong overall survival and to prevent disease recurrence [45,46].

Research data regarding physical activity in breast, colon, and prostate cancer survivors show that a significant proportion of survivors (30-50%) report exercising 30 min per day at least 5 days per week, as proposed by the American College of Sports Medicine [47,48]. Other guidelines, such as those proposed by the Institute of Medicine, require more intensive physical activity lasting one hour on most days per week [49].

To date, literature contains several exercise-intervention trials in cancer survivors, the majority of which were designed to determine the effect of physical activity on alleviating the severity of toxicities, such as nausea and fatigue, or on improving the physical functioning and overall health related QOL of patients [50]. Available data support the view that increased physical activity is associated with less treatment-related toxicities, increased physical and social functioning, thoroughly positively affecting the overall QOL of patients [51].

In a previously published randomized study, 70 cancer patients receiving high-dose chemotherapy followed by autologous peripheral blood stem cell transplantation were allocated either to follow an aerobic exercise program (n=37) or not to train (n=37). Trained patients experienced a significantly higher maximal physical performance than controls (p=0.04). Likewise, exercise had significantly reduced the duration and severity of treatment-related toxicities [52]. The beneficial effect of exercise on physiological and psychological variables has been also proven in a small-sized study enrolling 18 breast or colon cancer survivors. The results of this study have demonstrated that regular aerobic exercise had positively influenced the physical and functional capacity of patients, whereas a significant increase in their QOL (p<0.001) was also observed [53]. Another similar study reached to the conclusion that psychotherapy combined with moderate intensity exercise program may improve both the physical and functional well-being as well as the overall QOL of 60 cancer survivors [54].

To date, based on the results of research studies, one cannot definitely conclude on the impact of exer-

cise on survival and therefore further long-term follow-up studies are required [51]. Another issue that remains vaguely defined consists of whether exercise interventions should be initiated soon post-diagnosis and to which intensity. Some authors suggest that daily aerobic exercise for 30 min can be safely carried out immediately after or even during high-dose chemotherapy [52]. However, this conclusion cannot be easily generalized and several confounding factors, such as comorbidities and treatment-related toxicities, should be taken into account before a physician can advise cancer patients to aggressively practice exercise. In our opinion, a moderate intensity and stepped escalated approach is more advisable to fit in the vast majority of cancer survivors.

Sun protection measures

To our knowledge, literature contains only very few studies to describe sun protection interventions in cancer survivors. A previously published study sought to assess whether the experience of patients diagnosed with a non-melanoma skin cancer was able to raise the awareness of her/his helper [55]. In that setting, patients and their corresponding helpers completed a self-report questionnaire, which was consisted of items examining, among others, the attitudes and behaviors relating to sun protection. The subjects completed the questionnaire twice, namely, prior to the intervention and 1 year after the intervention. The results of this study showed that the experience of cancer patients enhanced the related knowledge of their helpers. Subjects susceptible to easy sun burning and poor tanning were more prone to employ sun protection behavioral changes [55].

There is evidence that education and behavioral interventions as well as counseling concerning self-exam and sun protection may improve skin and reduce the risk of primary skin cancer or its recurrence [56]. In support of the latter view are the results of another more recently published study in which 229 patients diagnosed with melanoma completed measures of skin self-exam and sun protection attitudes. A great proportion of participants (84%) reported a strong engagement in skin self-examination and a moderate engagement in sun protection practices [57].

Theory-based interventions to promote healthy behaviors

Providing interventions related with theory-based constructs appears to be an interesting area of research, whereas their efficacy in promoting healthy behaviors has been tested in both cancer and non-cancer popu-

lations. Overall it seems that these theory-based approaches might have positive mediational effects in changing unhealthy behaviors and be also health promoting in cancer survivors [5]. A description of such interventions to promote a health behavior change in cancer survivors is presented below.

Transtheoretical model

The transtheoretical model (TTM) is a theory of intentional change that focuses on the decision making of an individual to adopt a new healthier behavior through a series of 6 stages from the precontemplation, i.e. not thinking of or wanting to change for the next 6 months; contemplation, i.e. intending to take action in the next 6 months, and preparation stages, to the action i.e. perform overt modifications in the lifestyles; maintenance, i.e. keeping up the necessary lifestyle modification from 6 months to about 5 years and termination stages, i.e. no possibility of recidivism to the old unhealthy habit [58]. TTM is particularly applicable for persons who are not likely to be easily willing to change. The theory of TTM is based on an analysis of different theories of psychotherapy and has as a conceptual framework the situation-specific confidence individuals have that they can cope with high risk situations without relapsing to their previous unhealthy or high risk habit [58].

TTM has effectively been used thus far in several populations of cancer patients to target smoking cessation, dietary interventions or both [59-62]. In a randomized controlled trial, 86 sedentary breast cancer patients were randomly assigned either to a TTM-based physical activity counseling for 12 weeks or standard care. This intervention was associated with an increased physical activity and fitness, reduction of the severity of pain and improvement of specific aspects of psychological well-being [61]. The same beneficial effect of a TTM-based lifestyle intervention was demonstrated in another randomized controlled trial in which 60 breast cancer patients were allocated to this approach or standard care. The results showed that the TTM-based lifestyle intervention was associated with increased physical activity, thoroughly improving physical functioning and QOL of participants [62].

Motivational interviewing

The motivational interviewing (MI) is a method of counseling that aims at increasing an individual's awareness of the potential unhealthy behavior and the consequences experienced as a result of the behavior in question and ultimately to convince her/him to move toward change successfully and with confidence [63]. Available

data show that MI might be able to significantly improve the domains of behaviors, such as smoking, nutrition, diet, physical activity, weight management, or medication adherence in non-cancer populations [63,64]. However, summarized results of two relevant studies show that this method has not been proven to be effective as a smoking cessation intervention among 250 patients with various types of cancer [65,66].

Social cognitive theory

The social cognitive theory (SCT) identifies human behavior as an interaction of personal factors, behavior, and the environment provides. It provides a framework for understanding and predicting both individual and group behavior and identifies methods in which a risky behavior can be modified or changed [67].

Literature contains several studies of breast cancer patients, in which the SCT approach was applied as a lifestyle intervention to target dietary changes and sedentary behaviors [68-70]. Changing unhealthy dietary behaviors with this approach was demonstrated to be effective for increasing the physical activity levels and reducing the body weight in breast cancer survivors. It has also been proposed as being able to improve the relapse-free survival of these patients [71].

Cognitive behavioral theory

The cognitive behavioral theory (CBT) deals with various facets of human personality and behavior and aims to solve problems concerning dysfunctional emotions, behaviors and cognitions through a goal-oriented, systematic procedure. Current knowledge shows that CBT is an effective psychotherapeutic approach for the treatment of various psychiatric disorders [72].

However, this seems that might not be applicable in the case of cancer survivors. In a recently published study CBT was employed as a smoking cessation intervention in 109 cancer survivors. Patients were allocated to either the CBT intervention or to standard care, whereas all patients received nicotine replacement therapy. Analysis of data disclosed insignificant differences in 30-day point-prevalence abstinence between groups and therefore researchers have concluded that the CBT intervention has not achieved significant effects [73]. On the contrary, in another randomized controlled setting of patients with H&N cancer, CBT intervention plus medication achieved to significantly increase the 6-month smoking cessation rates compared to controls (47 vs. 31%; $p < 0.05$). However, CBT failed to be associated with significant differences in 6-month depression and alcohol outcomes [74].

Nevertheless, we should acknowledge that its application in oncology practice as a lifestyle intervention approach is limited and therefore one cannot conclude with confidence on its true value.

Conclusion and future research perspectives

We herein have reviewed published data on lifestyle interventions to promote healthy behaviors in cancer survivors. Over the last years, there is a growing research interest to detect and change known risk factors for cancer recurrence, such as smoking, alcohol consumption, lack of exercise and weight management. Available data show that several behavioral lifestyle interventions hold promise for improving the physical well-being of patients. Oncology care providers seem to be in charge of the counseling process with respect to the lifestyle changes, but the assistance of other trained personnel to guide patients to adopt a healthier lifestyle should also be acknowledged.

However, there is still insufficient evidence to conclude and support with confidence the effectiveness of any of these behavioral interventions. The variability in the methodology applied among different studies mainly holds responsibility for the discrepancy between reported results. Future educational interventions should be designed to assess the long-term effects and validating outcomes of dietary changes, exercise and psychosocial interventions. Oncology care providers should be further encouraged to spend teachable moments to provide their patients the appropriate guidance for achieving effective long-term lifestyle changes and thoroughly reducing the risk of cancer in this growing population of cancer survivors.

References

- Mystakidou K, Parpa E, Tsilila E, Katsouda E, Vlahos L. Cancer information disclosure in different cultural contexts. *Support Care Cancer* 2004; 12: 147-154.
- Aziz NM. Cancer survivorship research: state of knowledge, challenges and opportunities. *Acta Oncol* 2007; 46: 417-432.
- Kyngäs H, Mikkonen R, Nousiainen EM et al. Coping with the onset of cancer: coping strategies and resources of young people with cancer. *Eur J Cancer Care (Engl)* 2001; 10: 6-11.
- Manne SL, Rubin S, Edelson M et al. Coping and communication-enhancing intervention versus supportive counseling for women diagnosed with gynecological cancers. *J Consult Clin Psychol* 2007; 75: 615-628.
- 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(Suppl 1): 243S-248S.
- Doyle C, Kushi LH, Byers T et al; 2006 Nutrition, Physical Activity and Cancer Survivorship Advisory Committee; American Cancer Society. Nutrition and physical activity during and after cancer treatment: an American Cancer Society guide for informed choices. *CA Cancer J Clin* 2006; 56: 323-353.
- 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: 5814-5830.
- Stewart DE, Cheung AM, Duff S et al. Attributions of cause and recurrence in long-term breast cancer survivors. *Psychooncology* 2001; 10: 179-183.
- van Weert E, Hoekstra-Weebers J, Grol B et al. A multidimensional cancer rehabilitation program for cancer survivors: effectiveness on health related quality of life. *J Psychosom Res* 2005; 58: 485-496.
- Demark-Wahnefried W, Rock CL, Patrick K, Byers T. Lifestyle interventions to reduce cancer risk and improve outcomes. *Am Fam Physician* 2008; 77: 1573-1578.
- Courneya KS, Friedenreich CM, Sela RA, Quinney HA, Rhodes RE. Correlates of adherence and contamination in a randomized controlled trial of exercise in cancer survivors: an application of the theory of planned behavior and the five factor model of personality. *Ann Behav Med* 2002; 24: 257-268.
- Burke BL, Arkowitz H, Menchola M. The efficacy of motivational interviewing: a meta-analysis of controlled clinical trials. *J Consult Clin Psychol* 2003; 71: 843-861.
- Schnoll RA, James C, Malstrom M et al. Longitudinal predictors of continued tobacco use among patients diagnosed with cancer. *Ann Behav Med* 2003; 25: 214-222.
- Stanislaw AE, Wewers ME. A smoking cessation intervention with hospitalized surgical cancer patients: A pilot study. *Cancer Nurs* 1994; 17: 81-86.
- Gritz E, Carr C, Rapkin D. Predictors of long-term smoking cessation in head and neck cancer patients. *Cancer Epidemiol Biomarkers Prev* 1993; 2: 261-270.
- Griebel B, Wewers ME, Baker CA. The effectiveness of a nurse-managed minimal smoking cessation intervention among hospitalized patients with cancer. *Oncol Nurs Forum* 1998; 25: 897-902.
- Browning KK, Ahijevych KL, Ross P Jr, Wewers M. Implementing the Agency for Health Care Policy and Research's Smoking Cessation Guideline in a lung cancer surgery clinic. *Oncol Nurs Forum*. 2000 27: 1248-1254.
- Sanderson-Cox L, Patten C, Ebbert J et al. Tobacco use outcomes among patients with lung cancer treated for nicotine dependence. *J Clin Oncol* 2002; 20: 3461-3469.
- Schnoll R, Zhang B, Rue M et al. Brief physician-initiated quit-smoking strategies for clinical oncology settings: A trial coordinated by the Eastern Cooperative Oncology Group. *J Clin Oncol* 2003; 21: 355-365.
- Gritz E, Nisenbaum R, Elashoff RE, Holmes EC. Smoking behavior following diagnosis in patients with stage I non-small cell lung cancer. *Cancer Causes Control* 1991; 2: 105-112.
- Day GL, Blot WJ, Shore RE et al. Second cancers following oral and pharyngeal cancers: role of tobacco and alcohol. *J Natl Cancer Inst* 1994; 86: 131-137.
- Deleyiannis FW, Thomas DB, Vaughan TL, Davis S. Alcoholism: independent predictor of survival in patients with head and neck cancer. *J Natl Cancer Inst* 1996; 88: 542-549.
- Smith-Warner SA, Spiegelman D, Yaun SS et al. Alcohol and breast cancer in women: a pooled analysis of cohort studies.

- JAMA 1998; 279: 535-540.
24. Duffy S, Terrell JE, Valenstein M, Ronis DL, Copeland LA, Connors M. Effect of smoking, alcohol, and depression on the quality of life of head and neck cancer patients. *Gen Hosp Psychiatry* 2002; 24: 140-147.
 25. Evangelista L, Sarna L, Brecht ML, Padilla G, Chen J. Health perceptions and risk behaviors of lung cancer survivors. *Heart Lung* 2003; 32: 131-139.
 26. Maskarinec G, Murphy S, Shumay DM, Kakai H. Dietary changes among cancer survivors. *Eur J Cancer Care* 2001; 10: 12-20.
 27. Patterson RE, Neuhouser ML, Hedderson MM, Schwartz SM, Standish LJ, Bowen DJ. Changes in diet, physical activity, and supplement use among adults diagnosed with cancer. *J Am Diet Assoc* 2003; 103: 323-328.
 28. Chlebowski RT. The American Cancer Society guide for nutrition and physical activity for cancer survivors: A call to action for clinical investigators. *CA Cancer J Clin* 2003; 53: 266-267.
 29. Wayne SJ, Lopez ST, Butler LM, Baumgartner KB, Baumgartner RN, Ballard-Barbash R. Changes in dietary intake after diagnosis of breast cancer. *J Am Diet Assoc* 2004; 104: 1561-1568.
 30. Chlebowski RT, Rose D, Buzzard IM et al. Adjuvant dietary fat intake reduction in postmenopausal breast cancer patient management: The Women's Intervention Nutrition Study (WINS). *Breast Cancer Res Treat* 1991; 20: 73-84.
 31. Pierce J, Faerber S, Wright FA et al. Feasibility of a randomized trial of a high-vegetable diet to prevent breast cancer recurrence. *Nutr Cancer* 1997; 28: 282-288.
 32. Hebert JR, Ebbeling CB, Olenzki BC et al. Change in women's diet and body mass following intensive intervention for early-stage breast cancer. *J Am Diet Assoc* 2001; 101: 421-431.
 33. Pierce J, Newman VA, Flatt SW et al; Women's Healthy Eating and Living (WHEL) Study Group. Telephone counseling intervention increases intakes of micronutrient- and phytochemical-rich vegetables, fruit and fiber in breast cancer survivors. *J Nutr* 2004; 134: 452-458.
 34. Pierce JP, Newman VA, Natarajan L et al. Telephone counseling helps maintain long-term adherence to a high-vegetable dietary pattern. *J Nutr* 2007; 137: 2291-2296.
 35. Rose DP, Connolly JM, Chlebowski RT, Buzzard IM, Wynder EL. The effects of a low-fat dietary intervention and tamoxifen adjuvant therapy on the serum estrogen and sex hormone-binding globulin concentrations of postmenopausal breast cancer patients. *Breast Cancer Res Treat* 1993; 27: 253-262.
 36. Djuric Z, DiLaura NM, Jenkins I et al. Combining weight-loss counseling with the Weight Watchers plan for obese breast cancer survivors. *Obesity Res* 2002; 10: 657-665.
 37. Jen KL, Djuric Z, DiLaura NM et al. Improvement of metabolism among obese breast cancer survivors in differing weight loss regimens. *Obes Res* 2004; 12: 306-312.
 38. Forman MR. Changes in dietary fat and fiber and serum hormone concentrations: nutritional strategies for breast cancer prevention over the life course. *J Nutr* 2007; 137 (Suppl 1): 170S-174S.
 39. Loprinzi CL, Athmann LM, Kardinal CG et al. Randomized trial of dietician counseling to try to prevent weight gain associated with breast cancer adjuvant chemotherapy. *Oncology* 1996; 53: 228-232.
 40. Kaaks R. Nutrition, insulin, IGF-1 metabolism and cancer risk: a summary of epidemiological evidence. *Novartis Found Symp* 2004; 262: 247-268.
 41. Pan SY, DesMeules M. Energy intake, physical activity, energy balance, and cancer: epidemiologic evidence. *Methods Mol Biol* 2009; 472: 191-215.
 42. Thomson CA, Rock CL, Thompson PA et al. Vegetable intake is associated with reduced breast cancer recurrence in tamoxifen users: a secondary analysis from the Women's Healthy Eating and Living Study. *Breast Cancer Res Treat* 2011; 125: 519-527.
 43. Vrieling A, Kampman E. The role of body mass index, physical activity, and diet in colorectal cancer recurrence and survival: a review of the literature. *Am J Clin Nutr* 2010; 92: 471-490.
 44. Speed-Andrews AE, Courneya KS. Effects of exercise on quality of life and prognosis in cancer survivors. *Curr Sports Med Rep* 2009; 8: 176-181.
 45. Moyad MA. The use of complementary/preventive medicine to prevent prostate cancer recurrence/progression following definitive therapy: part I-lifestyle changes. *Curr Opin Urol* 2003; 13: 137-145.
 46. Warner JT. Body composition, exercise and energy expenditure in survivors of acute lymphoblastic leukaemia. *Pediatr Blood Cancer* 2008; 50 (Suppl 2): 456-468.
 47. Blanchard CM, Courneya KS, Stein K; American Cancer Society's SCS-II. Cancer survivors' adherence to lifestyle behavior recommendations and associations with health-related quality of life: results from the American Cancer Society's SCS-II. *J Clin Oncol* 2008; 26: 2198-2204.
 48. Schmitz KH, Courneya KS, Matthews C et al. American College of Sports Medicine. American College of Sports Medicine roundtable on exercise guidelines for cancer survivors. *Med Sci Sports Exerc* 2010; 42: 1409-1426.
 49. Institute of Medicine. Fulfilling the promise of cancer and prevention and early detection. 2003, Consensus report; <http://www.iom.edu/Reports/2003/Fulfilling-the-Potential-of-Cancer-Prevention-and-Early-Detection.aspx>
 50. Courneya K. Exercise in cancer survivors: An overview of research. *Med Sci Sports Exerc* 2003; 35: 1846-1852.
 51. Galvao DA, Newton RU. Review of exercise intervention studies in cancer patients. *J Clin Oncol* 2005; 23: 899-909.
 52. Dimeo F, Fetcher S, Lange W, Mertelsmann R, Keul J. Effects of aerobic exercise on the physical performance and incidence of treatment-related complications after high-dose chemotherapy. *Blood* 1997; 90: 3390-3394.
 53. Burnham T, Wilcox A. Effects of exercise on physiological and psychological variables in cancer survivors. *Med Sci Sports Exerc* 2002; 34: 1863-1867.
 54. Courneya K, Friedenreich CM, Sela RA, Quinney HA, Rhodes RE, Handman M. The group psychotherapy and home-based physical exercise (group-hope) trial in cancer survivors: Physical fitness and quality of life outcomes. *Psychooncology* 2003; 12: 357-374.
 55. Robinson J, Rademaker A. Skin cancer risk and sun protection learning by helpers of patients with non-melanoma skin cancer. *Prev Med* 1995; 24: 333-341.
 56. Manne S, Fasanello N, Connors J, Floyd B, Wang H, Lessin S. Sun protection and skin surveillance practices among relatives of patients with malignant melanoma: prevalence and predictors. *Prev Med* 2004; 39: 36-47.
 57. Manne S, Lessin S. Prevalence and correlates of sun protection and skin self-examination practices among cutaneous malignant melanoma survivors. *J Behav Med* 2006; 29: 419-434.
 58. Prochaska JO, Butterworth S, Redding CA et al. Initial efficacy of MI, TTM tailoring and HRI's with multiple behaviors for employee health promotion. *Prev Med* 2008; 46: 226-231.
 59. Demark-Wahnefried W, Morey MC, Clipp EC et al. Leading

- the Way in Exercise and Diet (Project LEAD): intervening to improve function among older breast and prostate cancer survivors. *Control Clin Trials*. 2003; 24: 206-223.
60. Emmons KM, Puleo E, Park E et al. Peer-delivered smoking counseling for childhood cancer survivors increases rate of cessation: the partnership for health study. *J Clin Oncol* 2005; 23: 6516-6523.
 61. Pinto BM, Frierson GM, Rabin C, Trunzo JJ, Marcus BH. Home-based physical activity intervention for breast cancer patients. *J Clin Oncol* 2005; 23: 3577-3587.
 62. Basen-Engquist K, Taylor CL, Rosenblum C, Smith MA, Shinn EH, Greisinger A, Gregg X, Massey P, Valero V, Rivera E. Randomized pilot test of a lifestyle physical activity intervention for breast cancer survivors. *Patient Educ Couns* 2006; 64: 225-234.
 63. Olsen JM, Nesbitt BJ. Health coaching to improve healthy lifestyle behaviors: an integrative review. *Am J Health Promot* 2010; 25: e1-e12.
 64. Lai DT, Cahill K, Qin Y, Tang JL. Motivational interviewing for smoking cessation. *Cochrane Database Syst Rev* 2010; (1): CD006936.
 65. Wakefield M, Olver I, Whitford H, Rosenfeld E. Motivational interviewing as a smoking cessation intervention for patients with cancer: randomized controlled trial. *Nurs Res* 2004; 53: 396-405.
 66. Thomsen T, Tønnesen H, Okholm M et al. Brief smoking cessation intervention in relation to breast cancer surgery: a randomized controlled trial. *Nicotine Tob Res* 2010; 12: 1118-1124.
 67. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev* 1977; 84: 191-215.
 68. Hebert JR, Ebbeling CB, Olendzki BC et al. Change in women's diet and body mass following intensive intervention for early-stage breast cancer. *J Am Diet Assoc* 2001; 101: 421-431.
 69. Matthews CE, Wilcox S, Hanby CL et al. Evaluation of a 12-week home-based walking intervention for breast cancer survivors. *Support Care Cancer* 2007; 15: 203-211.
 70. Chlebowski RT, Blackburn GL, Thomson CA et al. Dietary fat reduction and breast cancer outcome: interim efficacy results from the Women's Intervention Nutrition Study. *J Natl Cancer Inst* 2006; 98: 1767-1776.
 71. Pinto BM, Floyd A. Theories underlying health promotion interventions among cancer survivors. *Semin Oncol Nurs* 2008; 24: 153-163.
 72. Butler AC, Chapman JE, Forman EM, Beck AT. The empirical status of cognitive-behavioral therapy: a review of meta-analyses. *Clin Psychol Rev* 2006; 26: 17-31.
 73. Schnoll RA, Rothman RL, Wielt DB et al. A randomized pilot study of cognitive-behavioral therapy versus basic health education for smoking cessation among cancer patients. *Ann Behav Med* 2005; 30: 1-11.
 74. Duffy SA, Ronis DL, Valenstein M et al. A tailored smoking, alcohol, and depression intervention for head and neck cancer patients. *Cancer Epidemiol Biomarkers Prev* 2006; 15: 2203-2208.