

AFTER THE STORM: NUTRITION AFTER CANCER TREATMENT

Kathy Chapman,¹ Fiona Stacey,² Emma Groves³ and Iain S Pratt^{3,4}

1. Cancer Council New South Wales.

2. School of Medicine and Public Health, University of Newcastle and Hunter Medical Research Institute, New South Wales.

3. Cancer Council Western Australia.

4. Curtin University, Western Australia.

Email: SPratt@cancerwa.asn.au

Abstract

For cancer survivors who have completed their active treatment, evidence that a healthy lifestyle can improve chronic illness risk, cancer recurrence, secondary cancers and late and long-term effects of treatment has been increasing. Lifestyle behaviours of cancer survivors are similar to the general population, and they have much to gain from intervention. Obesity has been shown to be an independent risk factor for cancer recurrence and survival, and is associated with poor functioning and quality of life. There are inconsistent results for specific dietary components and risk of cancer recurrence and survival. Micronutrient supplementation is commonly reported among cancer survivors, however there is no conclusive evidence of survival or recurrence benefits with supplementation. Evidence suggests risks of toxicity caused by large doses of certain micronutrients, and possible increases in mortality risk with supplementation. Despite alcohol being a risk factor for the incidence of some cancers, little is known about its impact on cancer survivors after diagnosis. Cancer survivors should be encouraged to follow the general recommendations for cancer prevention as developed by the World Cancer Research Fund. More research is needed which identifies strategies to assist cancer survivors in modifying their lifestyle behaviours to optimise their health.

The number of cancer survivors worldwide is expected to triple from 25 million in 2008 to 75 million in 2030.¹ In Australia alone, there are approximately 340,000 cancer survivors, representing about 2% of the population.² Cancer survivors are high health care users and the total expected lifetime economic cost for Australians diagnosed with cancer is around \$95 billion.³

In the context of this article, the term 'cancer survivor' refers to people who are living with a diagnosis of cancer, but who have completed their active treatment.⁴ Some cancer survivors may have negative after-effects from their cancer treatment (eg. digestive issues following gastric surgery) or the cancer itself that affects their ongoing nutrition status.⁵ Cancer survivors are an

important target group for nutrition intervention as they are at increased risk of many chronic illnesses, such as cardiovascular disease and diabetes, death from non-cancer causes, cancer recurrence, secondary cancers, and the late effects of treatment, such as functional decline, depression, reduced quality of life and weight gain.⁶⁻⁹

The increasing importance of nutrition and physical activity for cancer survivors has been recognised in recent guidelines.^{5,10} An international review by the World Cancer Research Fund (WCRF) concluded that cancer survivors should follow the same diet, healthy weight and physical activity principles for cancer prevention as the general population.⁵ These recommendations are shown in Box 1.

Box 1: WCRF recommendations for cancer prevention.⁵

- Be as lean as possible within a healthy body weight.
- Be physically active.
- Limit energy dense food and drink.
- Eat mostly foods of plant origin.
- Limit red meat and avoid processed meat.
- Limit salt.
- Aim to meet nutritional needs through diet alone not diet supplements.

There is clear and consistent evidence about the benefits of physical activity for cancer survivors, as acknowledged in recent US and Australian physical activity guidelines for cancer survivors.^{11,12} However, evidence for weight loss and specific dietary interventions is still an emerging area of research.⁴ The purpose of this article is to summarise the current evidence and recommendations for providing appropriate body weight and nutrition support for cancer survivors.

Few lifestyle differences exist between individuals diagnosed with cancer and the general population – a population marked by inactivity; overweight and obesity, and suboptimal fruit and vegetable consumption.^{13,14} Similar to international findings,⁹ Australian data from the National Health Survey indicated no difference between cancer survivors and those without a cancer history on levels of physical inactivity and fruit or vegetable consumption.¹⁵ However, cancer survivors were more likely to be overweight or obese, to have higher levels of alcohol consumption, and to report a range of chronic co-morbid medical conditions.¹⁵

Body weight

Obesity has been shown to contribute to the risk of cancer recurrence and survival independent of diet and physical activity.¹⁶ Being overweight or obese has been associated with an increased risk of dying of cancer – 14% of cancer deaths in men and 20% in women were attributed to obesity in an American cohort study.¹⁷ There was an increased risk of death (30-50%) in heavier women with breast cancer compared to women in the healthy weight range.¹⁷ As well, a high body mass index or body fatness before or at the time of a bowel cancer diagnosis appears to be associated with higher all-cause mortality and recurrence.¹⁸

Weight gain after a cancer diagnosis has been suggested as a significant contributor to cancer recurrence and decreased survival. In breast cancer patients, weight gain after diagnosis is common in the year following diagnosis.¹⁹ In breast cancer patients, for each five kilogram increase in weight, breast cancer mortality increased by 13% and in contrast there was no increase in mortality for women who lost weight.²⁰ Results from the Nurses Health Study indicated a gradient of risk between weight gain and risk of breast cancer recurrence, with the largest weight gains resulting in a 64% increased risk of recurrence.²¹

The Women's Intervention Nutrition Study, a randomised control trial of women with early stage breast cancer, highlighted the importance of weight management for cancer survivors. The intervention resulted in significantly lower dietary fat intake among the intervention group, and a corresponding reduction in body weight over five years of follow-up.²² This resulted in a 24% lower risk of recurrence among intervention participants, compared to those in the control group.²² The low fat diet was most beneficial in women with

oestrogen or progesterone-receptor negative tumours. Further analysis is required to determine if it was the decrease in fat intake, the change in fatty acid profile, or weight loss that was responsible for the benefits.

Interestingly, another randomised control trial of breast cancer survivors, the Women's Healthy Eating and Living study, did not show an improvement in survival or breast cancer recurrence.²³ Unlike in the Women's Intervention Nutrition study, the Women's Healthy Eating and Living study women in both the intervention and control groups experienced small increases in weight, and this may be a factor in the different results.²³

In addition to the links between overweight and risk of cancer recurrence and mortality, there is evidence that supports an association between body weight and health-related quality of life, with both body mass index and physical activity contributing independently.²⁴ Healthy weight and overweight cancer survivors reported significantly better physical functioning than those cancer survivors who were obese.²⁴ Lifestyle interventions that prevent weight gain, encourage participation in physical activity, and a healthy diet show some potential to impact on health, survival and quality of life outcomes for cancer survivors.²⁵

Dietary factors

After treatment, some cancer survivors may have residual metabolic and structural damage, exemplified by example gastrointestinal surgery or xerostomia. These survivors may require individualised medical nutrition therapy with ongoing medical and dietetic support.⁵

Cancer survivors have reported high levels of interest in dietary interventions and a preference for these interventions to be initiated at diagnosis or soon after.⁹ A recent review has suggested that changes in health behaviours occurring after the cancer diagnosis may be important determinants in cancer survivors' wellbeing.²⁶ Although some cancer patients make healthy lifestyle changes after diagnosis, these changes may not be seen in all populations of cancer survivors or, when they do occur, may only be temporary.

There is considerable research on the association between diet and cancer incidence, however there are fewer studies that have looked specifically at cancer survivors.²⁷ Studies of cancer survivors are difficult to compare, as it is such a heterogeneous group with inconsistent definitions for cancer survivors. For example, studies can include one or a number of cancer types and may involve people who have been diagnosed but not yet treated, those with ongoing treatment and those who have been free from disease for years.⁵ Most studies that have examined diet and cancer survival have been conducted in breast cancer survivors. To date, these studies, as well as those in other types of cancers, have had conflicting results, with some studies indicating a benefit and others suggesting no benefit.²⁷

The results of the two randomised control trials referred to in the body weight section provided conflicting results about the effect of dietary intervention in survivors. The Women's Intervention Nutrition study found a small improvement in secondary breast cancer events in the intervention arm that followed a reduced fat diet, however this group also lost a significant amount of weight.²² The Women's Healthy Eating and Living study suggested dietary information for a healthier diet, encouraging five serves of vegetables, two cups of vegetable juice, three serves of fruit, 30g fibre and 20% energy from fat. Yet the study found that dietary intervention made no difference in the incidence of breast cancer recurrence or all-cause mortality. However, both intervention and control arms gained weight in the study.²⁸

The American Cancer Society's Study of Cancer Survivors-II found an association between meeting fruit and vegetable recommendations and increased health-related quality of life. Breast, prostate, melanoma and bowel cancer survivors who met the recommendations reported significantly higher quality of life than those not meeting fruit and vegetable recommendations.²⁹ While recommendations on diet and cancer survival remain conservative, a healthy diet remains one of the most important lifestyle behaviours for survivors to reduce the risk of other chronic diseases to which survivors are particularly susceptible.^{6-9, 15}

Micronutrient supplements

The use of micronutrient supplements is common in cancer survivors. A systematic review of supplement use in cancer patients in the United States reported that an estimated 64–81% of cancer patients and survivors use a vitamin or mineral supplementation, with up to a third of these cancer patients starting micronutrient supplementation after diagnosis.³⁰

Despite the widespread use of supplements in cancer survivors, there are few studies assessing the effect of nutritional supplements on cancer recurrence and survival.⁵ The World Research Cancer Fund assessed 39 randomised control trials of micronutrient supplementation in cancer survivors including retinol, β -carotene, vitamin B6, multi-vitamins, vitamin E, selenium and isoflavones. It concluded that the evidence "does not show that micronutrients supplements have any benefits in cancer survivors".⁵

While not specific to cancer survivors, large-scale randomised control trials on the efficacy of dietary supplements to reduce the risk of cancer have raised serious safety concerns.³¹ Most water-soluble vitamins are thought to be harmless at pharmacological doses, but there are some concerns about the safety of some nutrients such as selenium, β -carotene, magnesium and chromium which are known to be toxic at pharmacological doses.³²

A systematic review of 68 randomised trials of antioxidant supplements in the general population found no significant effect on mortality. When the

meta-analysis was restricted to only the high quality trials (47 trials), there was a slightly increased risk of mortality from antioxidant supplements.³³ The conclusions drawn were that vitamin C and selenium had no significant effect on mortality and required further study, while treatment with β -carotene, vitamin A, and vitamin E may increase mortality.³³

Of particular concern to many breast cancer survivors is soy and phyto-oestrogen. Evidence to date is inconclusive about the role soy foods might play in preventing cancer or cancer recurrence, however high-dose phyto-oestrogen supplementation is not recommended, especially in women with existing breast cancer.³⁴ Soy foods can be encouraged as part of a varied and nutritious diet, consistent with recommendations to consume a diet rich in plant-based foods.

While it appears that people who eat more vegetables and fruit, which are rich sources of antioxidants, may have a lower risk of cancer, the specific components which provide the cancer protective effect are not definitively known.⁵ As it is not possible to replicate the nutrient combinations found in foods in supplement form, and due to the potential adverse effects high-dose supplementation may have, whole foods appear to be the most beneficial. The World Cancer Research Fund states that dietary supplements are not recommended for cancer prevention and people should aim to meet their nutritional needs through diet alone.⁵

Some cancer survivors may require micronutrient supplementation due to the late effect of cancer treatment or unrelated co-morbidities. Supplements should only be given when clinically indicated. Instances where lower-dose micro-nutrient supplementation may be indicated for cancer survivors are: biochemically confirmed nutrient deficiency; where dietary approaches have been inadequate; nutrient intakes persistently below recommended intake levels; to meet public health recommended levels of intake if not contraindicated due to cancer therapy; and known health sequelae related to cancer therapy or other co-morbidities such as osteoporosis.³¹

A daily multivitamin supplement in amounts equivalent to 100% of the recommended dietary intake is a good choice for those cancer survivors who are not able to eat a healthy diet. As high doses of dietary supplements may be associated with toxicity, the use of vitamin and mineral supplements in higher doses should be assessed and discussed on an individual basis.³¹ Box 2 provides a checklist for cancer health professionals to discuss with survivors who are considering supplementation.

The association between post-diagnosis alcohol intake and cancer survival remains unclear, despite the convincing evidence that alcohol drinking causes some types of cancer.^{5, 35}

There is evidence from observational studies suggesting a worse prognosis for individuals with head and neck

Box 2: Checklist for cancer survivors considering micronutrient supplements.³

- Is the dietary supplement suitable for treating the condition? Is there any scientific evidence for its use?
- Does the dietary supplement have the potential to prevent, alleviate and/or cure symptoms or in other ways contribute to improved health and wellbeing?
- Is the dietary or herbal supplement provided by a qualified (preferably registered and certified) practitioner with adequate training background, good skills and knowledge?
- Are the products or materials of assured quality and what are the contraindications and precautions?
- Are the dietary or herbal supplements available at a competitive price?

cancers who report higher alcohol consumption after diagnosis.³⁶⁻³⁸ Despite there being a positive association between alcohol intake and risk for primary breast cancer, findings conflict regarding alcohol intake and breast cancer recurrence.^{35, 39-41} Small sample sizes, differences in study design and data collection, and correlations between alcohol intake and other lifestyle factors (eg. smoking) or comorbid conditions may be responsible for the conflicting results reported thus far.²⁷

However in view of the consistency of the evidence suggesting alcohol is a modifiable risk factor for some types of cancer, and its contribution to other health problems, it is prudent to recommend that alcohol is limited or drunk only in moderation by cancer survivors. This is consistent with recommendations from the World Cancer Research Fund.⁵

Conclusions

The World Cancer Research Fund recommends that cancer survivors follow the recommendations for cancer prevention (box 1).⁵ These recommendations are consistent with advice to reduce the risk of cancer and promote general health and wellbeing, and should be considered within the context of the individual survivor's overall health and social circumstances.

Lifestyle modification is an important component of cancer survivorship. With a growing number of cancer survivors, research and knowledge will have to grow and develop to provide recommendations specific to their needs and in turn, a health system that responds and adapts to such needs is crucial. A recent article has summarised some intervention studies currently being undertaken with survivors in Australia, that include randomised control trials of exercise, telephone lifestyle modification counselling and face-to-face lifestyle training.⁴²

Health professionals such as general practitioners and oncologists have an important role to play, and with routine follow-up of survivors are well placed to provide a leading role in promoting and supporting health behaviour change.⁶ Long-term follow-up of cancer survivors should include advice and information on general healthy lifestyle recommendations.

A brief intervention tool, 'Making changes to prevent cancer: A summary guide to brief interventions for general practitioners', has been developed by Cancer Council Western Australia to guide general practitioners through an ask, assess, advise, assist and arrange pathway for addressing smoking, alcohol, sun exposure, nutrition, healthy weight and/or physical activity with their patients.⁴³

Resources for cancer survivors that provide information and support on eating well and being active after cancer treatment, can be handed out by general practitioners or oncologists to encourage healthy lifestyle change in cancer survivors.⁴⁴ With ongoing improvements in cancer treatments and survival, it is important for health professionals to look beyond the cancer treatment storm and provide survivors with advice on a healthy lifestyle for life after cancer.

References

1. Ferlay J, Shin H, Bray F, Forman D, Mathers C, Parkin D. Cancer incidence and mortality worldwide: IARC CancerBase No.10. 2010, Lyon, France: International Agency for Research on Cancer.
2. Australian Institute of Health and Welfare and Australasian Association of Cancer Registries. Cancer in Australia: an overview, 2006. Cancer Series. Vol. 37. 2007, Canberra: AIHW.
3. Access Economics. Cost of cancer in NSW. A summary of a report by Access Economics Pty Limited for The Cancer Council NSW. Cancer Council NSW; 2007.
4. Jefford M. Improving outcomes for cancer survivors in Australia. Cancer Forum. 2009;33(3):159-163.
5. World Cancer Research Fund and American Institute for Cancer Research. Food, nutrition, physical activity, and the prevention of cancer: A global perspective. Washington DC: AICR; 2007.

6. Hewitt M, Greenfield S, Stovall E. From cancer patient to cancer survivor. Lost in transition. 2005, Washington DC: The National Academies Press.
7. Stanton A. Psychosocial concerns and interventions for cancer survivors. *J Clin Oncol.* 2006;24(32):5132-5137.
8. Ganz P. Monitoring the physical health of cancer survivors: a survivorship-focused medical history. *J Clin Oncol.* 2006;24(32):5105-5111.
9. 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(1):243S-2488S.
10. Doyle C, Kushi L, Byers T, Courneya K, Demark-Wahnefried W, Grant B, et al. Nutrition and physical activity during and after cancer treatment: an American Cancer Society guide for informed choices. *CA Cancer J Clin.* 2006;56:323-353.
11. Schmitz K, Courneya K, Matthews C, Demark-Wahnefried W, Galvao D, Pinto B, et al. American College of Sports Medicine roundtable on exercise guidelines for cancer survivors. *Med Sci Sports Exerc.* 2010;42:1409-1426.
12. Hayes S, Spence R, Galvao D, Newton R. Australian Association for Exercise and Sport Science position stand: optimising cancer outcomes through exercise. *J Sci Med Sport.* 2009;12:428-434.
13. Coups E, Ostroff J. A population-based estimate of the prevalence of behavioral risk factors among adult cancer survivors and noncancer controls. *Prev Med.* 2005;40(6):702-711.
14. Bellizzi K, Rowland J, Jeffery D, McNeel. Health behaviors of cancer survivors: examining opportunities for cancer control intervention. *J Clin Oncol.* 2005;23(34):8884-8893.
15. Eakin EG, Youlden D, Baade P, Lawler S, Reeves M, Heyworth, et al. Health behaviors of cancer survivors: data from an Australian population-based survey. *Cancer Causes Control.* 2007;18(8):881-894.
16. Toles M, Denmark-Wahnefried W. Nutrition and the cancer survivor: evidence to guide oncology practice. *Semin Oncol Nurs.* 2008;24(3):171-179.
17. Calle E, Rodriguez C, Walker-Thurmond K, Thun M. Overweight, obesity, and mortality from cancer in a prospectively studied cohort of US adults. *N Engl J Med.* 2003;348(17):1625-1638.
18. 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(3):471-490.
19. Irwin M, McTiernan A, Baumgartner R. Changes in body fat and weight after a breast cancer diagnosis: influence of demographic, prognostic, and lifestyle factors. *J Clin Oncol.* 2005;23(4):774-82.
20. Nichols HB, Trentham-Dietz A, Egan K, Titus-Ernstoff L, Holmes M, Bersch A, et al. Body mass index before and after breast cancer diagnosis: associations with all-cause, breast cancer, and cardiovascular disease mortality. *Cancer Epidemiol Biomarkers Prev.* 2009;18(5):1403-1409.
21. Kroenke C, Chen W, Rosner B, Holmes M. Weight, weight gain, and survival after breast cancer diagnosis. *J Clin Oncol.* 2005; 23(7):1370-1378.
22. Chlebowski R. Lifestyle change including dietary fat reduction and breast cancer outcome. *J Nutr.* 2007;137:233S-235S.
23. Pierce J, Natarajan L, Caan B, Parker B, Greenberg E, Flatt S, et al. Influence of a diet very high in vegetables, fruit, and fiber and low in fat on prognosis following treatment for breast cancer: the Women's Healthy Eating and Living (WHEL) randomized trial. *JAMA.* 2007;298(3):289-298.
24. Blanchard CM, Stein K, Courneya KS. Body mass index, physical activity, and health-related quality of life in cancer survivors. *Med Sci Sports Exerc.* 2010;42(4):665-671.
25. Chlebowski R, Aiello E, McTiernan A. Weight loss in breast cancer patient management. *J Clin Oncol.* 2002;20(4):1128-1143.
26. Park C, Gaffey A. Relationships between psychosocial factors and health behavior change in cancer survivors: an integrative review. *Ann Behav Med.* 2007;34(2):115-134.
27. Robien K, Demark-Wahnefried W, Rock C. Evidence-based nutrition guidelines for cancer survivors: current guidelines, knowledge gaps, and future research directions. *J Am Diet Assoc.* 2011;111(3):368-375.
28. Pierce J. Diet and breast cancer prognosis: making sense of the Women's Healthy Eating and Living and Women's Intervention Nutrition Study Trials. *Curr Opin Obstet Gynecol.* 2009;21:86-91.
29. Blanchard CM, Courneya KS, Stein K. 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(13):2198-2204.
30. Velicer C, Ulrich C. Vitamin and mineral supplement use among US adults after cancer diagnosis: a systematic review. *J Clin Oncol.* 2008;26(4):665-673.
31. Chapman K, James E, Read J, Bauer J. The benefits of nutrition and physical activity for cancer survivors, in *When Cancer Crosses Disciplines; a Physician's Handbook.* New South Wales: Cancer Council Australia; 2009.
32. National Health and Medical Research Council, Nutrient reference values for Australian and New Zealand. Commonwealth of Australia; 2006.
33. Bjelakovic G, Nikolova D, Gludd L, Simonetti R, Gludd C, et al. Mortality in randomized trials of antioxidant supplements for primary and secondary prevention: systematic review and meta-analysis. *Journal of American Medical Association.* 2007; 297(8):842-857.
34. Cancer Council Australia. Position Statement: Soy, phyto-oestrogens and cancer prevention. 2009 [cited 2011 February 21]. Available from: <http://www.cancer.org.au/policy/positionstatements/nutritionandphysicalactivity/Soyphytoestrogensandcancer.htm>
35. Rock C, Demark-Wahnefried W. Nutrition and survival after the diagnosis of breast cancer: a review of the evidence. *J Clin Oncol.* 2002;20:3302-3316.
36. Day G, Shore R, Blot W, McLaughlin, Austin D, Greenberg R, et al. Dietary factors and second primary cancers: a follow-up of oral and pharyngeal cancer patients. *Nutr Cancer.* 1994;21:223-232.
37. Deleyiannis F, Thomas D, Vaughan T, Davis S, et al. Alcoholism: independent predictor of survival in patients with head and neck cancer. *J Natl Cancer Inst.* 1996;88:542-549.
38. Mayne S, Cartmel B. Alcohol and tobacco use prediagnosis and postdiagnosis and survival in a cohort of patients with early stage cancers of the oral cavity, pharynx and larynx. *Cancer Epidemiol Biomarkers Prev.* 2009;18(12):3368-3374.
39. Trentham-Dietz A, Newcomb P, Nichols H, Hampton J. Breast cancer risk factors and second primary malignancies among women with breast cancer. *Breast Cancer Res Treat.* 2007;105:195-207.
40. Li C, Daling J, Porter P, Tang M, Malone K. Relationship between potentially modifiable lifestyle factors and risk of second primary contralateral breast cancer among women diagnosed with estrogen receptor-positive invasive breast cancer. *J Clin Oncol.* 2009;27:5312-5318.
41. Kwan M, Kushi L. Alcohol consumption and breast cancer recurrence and survival among women with early-stage breast cancer: the life after cancer epidemiology study. *J Clin Oncol.* 2010;28(29):4410-4416.
42. Pollard A, Eakin E, Vardy J, Hawkes A. Health behaviour interventions for cancer Survivors: an overview of the evidence and contemporary Australian trials. *Cancer Forum.* 2009;33(3):182-186.
43. Cancer Council Western Australia. Making changes to prevent cancer: a summary guide to brief interventions for general practitioners. Perth: Cancer Council Australia; 2009.
44. Cancer Council New South Wales. After your cancer treatment: a guide for eating well and being active. Woolloomooloo: Cancer Council New South Wales; 2009.