A Background Paper on Older Adult Cancer Survivors and Exercise — Following Treatment: Towards the Development of a Practitioner and Consumer Handout.

Prepared by Bill Hearst, M.P.E., Ottawa, ON

Submitted to ALCOA March/April 2009

Abstract

This background paper reviews the limited literature available on the topic of 'older adult cancer survivors and exercise following treatment'. Few exercise and cancer researchers restrict their trials to older cancer survivors (however defined). Most research has been on breast cancer, which contains some older women, but the mean age is typically in the low 50s. Given that the majority of the published papers have included middle aged participants, and are focused on the major cancers (i.e., prostate, lung, colon, breast), articles were selected based primarily upon their specificity to older adult cancer survivors and exercise following treatment. However it should be noted that in many of the studies, that have been referenced, the research designs included the effects of exercise during and following treatment. This review will focus only on post-treatment participants.

The reviewer had access to the Seniors Health Research Transfer Network (SHRTN) for literature searches (Ageline, Cochrane Database of Systematic Reviews, Medline 2005-, Healthstar 1999-, PsyInfo 2002-, Nursing and Allied Health, Canadian Periodicals, Expanded Academic, Academic Online) and ability to access full copies of selected articles, where warranted. Over 200 abstracts were initially screened (although the search terms may have impacted such a long listing) and short listed to 80 potentially relevant articles. Subsequently, 49 published articles were selected for use in the writing of this background paper.

> The authors reported that the current literature 'provides sufficient evidence that exercise is a safe and well-tolerated supportive intervention that physicians can recommend to their patients following the completion of primary therapy'.

The primary purpose of the background paper is to provide the scientific evidence to support a document for physical activity practitioners who work with cancer survivors (post-treatment) in the fitness centres across Canada e.g., Municipal sector, Y's, private clubs, etc. This practitioner document will then be written in 'clear language' for a consumer document and made available to older adult cancer survivors across Canada. The purpose of these outcome document is to inform the practitioner and consumer about (but not be limited to) the benefits of exercise for older adult cancer survivors; precautions; how to get started/prudent first steps (or continue in the case of adults who are already active); other considerations; and recommended/suggested exercise guidelines. The information included does not represent an exhaustive review of all literature on older adult cancer survivors but rather papers selected at the discretion of the reviewer for the purpose of the Active Living Coalition for Older Adults (ALCOA) project.

The growing evidence suggests that physical activity is safe, during or after completion of treatment, and results in improved outcomes such as cardio respiratory fitness,

ALCOA Active Living Coalition for Older Adults
CVAA Coalition d'une vie active pour les aîné(e)s

Active Living Coalition for Older Adults
P.O. Box 143
Shelburne ON L0N 1S0
Toll Free: 1-800-549-9799
Phone: 519-925-1676
Fax: 519-925-3955
Email: alcoa3@ca.inter.net
Web: www.alcoa.ca

reduction in fatigue, symptoms, quality of life, mental health, or change in body size. There are no cancer-specific evidence-based guidelines, or to the best of our knowledge, any position statement by any group regarding exercise for cancer survivors or for cancer patients in general; little information regarding the best kind of exercise program; or the best way to reach and motivate older adult cancer survivors.

Introduction

Defining the Older Adult for the Purpose of this Paper

Most organizations define the older adult as ≧ 65 years of age, although The American College of Sports Medicine deemed it appropriate to issue a separate recommendation for older adults - men and women age ≧65 yr[1], and adults age 50 to 64 yr[2]. The Public Health Agency of Canada and the Active Living Coalition for Older Adults uses ≧ 55 years, as reflected in Canada's Physical Activity Guide to Healthy Active Living for Older Adults. For the purpose of this paper we have utilized an age range ≧ 50 years of age with particular emphasis on literature pertaining to the upper ranges (≧ 65 years). Also, as opposed to defining cancer survivorship (which refers to any individual diagnosed with cancer, from the time of discovery and for the balance of life), the information in this paper has been limited to 'the role of exercise post-treatment in older adult cancer survivors'.

The authors concluded that a supervised, high-intensity strength training program seems to be an effective means to improve muscle strength, cardiopulmonary function, and health related quality of life and should be incorporated in cancer rehabilitation programs.

Canadian Statistics

Note: All tables have been included in the Appendices for quick reference.

Estimates for Overall Cancer Incidence and Mortality

An estimated 166,400 new cases of cancer and 73,800 deaths from cancer will occur in Canada in 2008 (**Table 1**)[3]. Men outnumber women for both new cases and deaths. Not counting non-melanoma skin cancers, three types of cancer account for at least 55% of new cases in each sex: prostate, lung and colorectal in males and breast, lung and colorectal in females. Lung cancer remains the leading cause of cancer death for both men and women. Overall, colorectal cancer is the second leading cause of death from cancer.

Age and Sex Distribution of Cancer

Cancer is primarily a disease of older Canadians. The estimates for 2008 shown in **Table 2**[4] indicate that about 71,000 new cases (42%) and 45,000 cancer deaths (60%) will occur in Canadians aged 70 years or more, while an additional 44,100 new cases (27%) and 16,200 deaths (22%) will occur in those aged 60-69. In contrast, less than 1% of new cases and deaths occur prior to age 20. The median age at cancer diagnosis is between 65 and 69 years of age and at death between 70 and 74 for both sexes.

Selected Cancers

The age and sex distribution for the most common cancers in Canadians are presented in **Table 3**[5]. More than half of all newly diagnosed lung and colorectal cancers will occur among Canadians aged 70 or more. In contrast, breast cancer occurs primarily in women between the ages of 50 and 69. Only 28% of breast cancers are diagnosed over age 69, while 20% occur in women under age 50. It is notable that although half the new cases of breast cancer are estimated to occur between age 50 and 69, more deaths from breast cancer will occur in the 80 and older age group, reflecting the

benefits of screening and treatment in middle-aged women. Prostate cancer will be diagnosed most frequently in men aged 60-69, but more prostate cancer deaths occur in the 80 and older age group. This pattern likely reflects the effect of screening in the younger men and the long natural history of the disease in many.

Probability of Developing/Dying from Cancer

On the basis of current incidence rates, almost 40% of Canadian women and almost 45% of men will develop cancer during their lifetimes. On the basis of current mortality rates, 24% of women and almost 29% of men, or approximately 1 out of every 4 Canadians, will die from cancer.

What is the relative survival ratio?

The relative survival ratio is the preferred measure for assessing the survival of cancer patients in a population. It is defined as the ratio of the observed survival for a group of cancer patients to the survival expected for people in the same general population.

A five-year relative survival ratio of 80% means that people with that cancer had 80% of the likelihood of living for 5 years after diagnosis compared to similar people in the general population. An alternative interpretation is that 20% of people with that cancer died within 5 years of diagnosis as a direct or indirect result of their cancer, or the risk factors that predisposed them to develop cancer.

Five-year Relative Cancer Survival

Relative survival ratios were highest for thyroid, testicular, prostate cancer, and melanoma. Relative survival ratios were lowest for pancreatic, esophageal, lung, and liver cancer. Relative survival for lung cancer tends to decline with increasing age.

Estimated relative survival ratios for the most common cancers

Estimates included here were produced by Statistics Canada specifically for their 2008 publication. Canadian five-year relative survival ratios for the period from 2001 to 2003 are shown in **Table 4**[6]. The data are presented for all invasive cancers combined and for selected cancers in descending order of survival for both sexes combined.

Five-year RSRs were highest for thyroid (98%) and testicular (96%) cancer. Among men, prostate cancer also had a very favourable prognosis (95% RSR) as did melanoma among women (93% RSR). The lowest RSRs were observed among those diagnosed with pancreatic cancer (6%) followed by cancers of the esophagus (14%), lung (males 13%, females 18%) and liver (males 17%, females 16%). For most of the cancers examined, survival was similar or superior among women.

Estimated relative survival ratios for selected cancers

Five-year relative survival for both breast and prostate cancer was quite favourable for all age groups examined, though reduced somewhat among those diagnosed at relatively very young or very old ages (**Table 5**)[7]. The best prognosis for breast cancer was observed among those diagnosed between the ages of 40 and 79 (88%); for prostate cancer, men aged 50 to 79 faired best at 96%. It is uncertain whether the underlying reasons for the poorer survival among those diagnosed with prostate cancer before the age of 50 are biologically or socially/behaviourally based. For lung cancer, relative

The authors concluded that a 12-week home-based walking intervention program was safe and effective for increasing short-term physical activity levels

survival was highest in the youngest age group, and then generally decreased with increasing age from 39% among those 20 to 39 years at diagnosis to 9% among those aged 80 to 99 at diagnosis. With the exception of those in the oldest group, survival was consistent across age groups for colorectal cancer (64%). Relative survival is generally poorer among those diagnosed with cancer at an older age because they may receive less therapy due to the presence of other diseases or conditions which reduce the body's ability to tolerate and respond to cancer treatments (referred to as 'co-morbidity'); and they may receive less aggressive treatment independently of co-morbidity.

Conditions Affecting Older Adult Cancer Survivors

Effects of Cancer Interventions

The most common medical interventions for cancer include surgery, radiation therapy, and systemic therapies (i.e., drugs) such as chemotherapy and hormone therapy. Although these interventions can improve survival, they also cause side effects, decrements in physical functioning and quality of life (QoL), and an increased risk for second cancers and other major health conditions such as cardiovascular disease, osteoporosis, and obesity.[8]

The authors concluded that moderate intensity, individualized, prescriptive exercise intervention maintains or improves cardiovascular and pulmonary function with concomitant reductions in fatigue in cancer survivors during and following cancer treatment.

Exercise interventions have proven benefits in reducing the functional ability declines associated with cancer and its treatment, and also play an important role in preventing co-morbidities and in reducing risk of death from causes other than cancer. [9,10]

Other Conditions that Affect Older Adult Cancer Survivors

A cancer diagnosis is often made in the context of other medical conditions. Older adult cancer survivors are often faced with coping with cancer while dealing with age-related disabilities, such as deterioration in mobility, vision, and strength. In addition, an inability to cope may lead to deterioration in aspects of psychological QoL, such as symptoms of depression, anxiety, and delirium[11]; social and emotional issues such as widowhood, retirement, and declining social support[12]; and age related changes in cardiac, renal, pulmonary, and gastrointestinal systems (which may increase the likelihood of toxicities from cancer treatments).[13]

As such, cancer survivors are at an increased risk for co-morbid conditions such as cardiovascular disease, diabetes, osteoporosis, hypertension, overweight, and obesity, which may be directly attributed to cancer treatment, their personal genetic disposition, and lifestyle practices. Some of these factors can be reduced by physical activity interventions.

The Determinants of Survival

The prognosis of a cancer patient may be influenced by host factors (e.g., age, sex, co-morbid conditions, socio-economic status and lifestyle factors), tumour-related factors (e.g., stage of disease, histological subtype), and system factors related to cancer control (e.g., availability and quality of early detection, diagnostic and treatment services). Stage of disease at diagnosis is a very important prognostic indicator but is not yet available in Canada at a population level. (Canadian Cancer Statistics 2008)

Disease Recurrence and Survival

Although it is unknown whether exercise will reduce the risk of cancer recurrence, other diseases, or extend survival after a cancer diagnosis[14], preliminary evidence suggests that exercise (before or after treatment) may prolong survival for individuals with breast, prostate, and colon cancer. [15,16,17,18,19,20]

Limitations Of The Research

The benefits of exercise for older adult cancer survivors is only beginning to be described and there are a number of limitations to the current research that is available.

Courneya et al. (2004) reviewed 50 studies on exercise in cancer survivors from an aging perspective. It was concluded that the majority of the papers targeted middle-aged cancer survivors (48 +/- 9 years) as opposed to older adult cancer survivors (65 and older). [21]

In a review by Courneya and Karvinen (2007) it was reported that, although most of the research about exercise in cancer survivors is derived largely from middle-aged survivors, this limited research suggests that, compared with middle-aged cancer survivors, older cancer survivors:

- derive similar benefits from exercise
- have lower exercise participation rates
- have more difficulty adhering to an exercise program
- have different determinants of exercise motivation and behaviour.[22]

Schwartz (2008), in an article written to provide a summary of the research on the effects of exercise on cancer survivors during and following cancer treatment, reviewed 38 studies that examined exercise following the completion of cancer treatment. Interventions consisted of aerobic, resistance, and combined aerobic and resistance exercises in both supervised exercise interventions and home-based exercise. Benefits as a result of post-treatment included:

- cardio respiratory fitness
- muscle strength
- hemoglobin concentration
- reduction in fatigue, depression, anxiety, confusion
- vigor and vitality
- improved body image
- body size
- mental health
- quality of life.

However, it was reported that many of these studies have not been as methodologically rigorous as studies conducted during treatment. It was also reported that definitive conclusions cannot be drawn from the limited meta-analyses because there are too few studies. Furthermore, intervention dose, study procedures, and lack of standardization also limit the scope of the meta-analyses.[23]

> Results of the search showed promising effects of PA on muscular fitness, physical functioning, fatigue, and health-related quality of life.

The Role Of Exercise Post-treatment In Older Adult Cancer Survivors

This section is not meant to be an exhaustive review of the available research regarding older adult cancer survivors and the role of exercise post treatment. In fact there appears to be a limited number of articles published on the topic of older adult cancer survivors and the role of exercise post treatment. Studies were selected at the discretion of the writer and summarized in sequence for the purpose of developing the practitioner and consumer handouts for ALCOA – focusing on relevant articles that were inclusive of older adults. Articles that did not include older adults were not sited. Limitations to the research have been reported previously (and tend to be general for most) and as such no attempt has been made to critique the studies selected for this section.

Of particular relevance to the ALCOA objective is the article by Demark-Wahnefried, W. and Jones, L.W. (2008). This article reviewed the current reports that serve as resources for health care providers, patient advocates, and other stakeholders 'to improve the health and well-being of this rapidly expanding and high risk population'. This included the reports by the Institute of Medicine that summarized the issues and potential benefits of lifestyle modifications and the American Cancer Societys' reissued guide for Informed Choices on Nutrition and Physical Activity During and After Cancer Treatment . Specifically, the article addressed the recommendations that emanated from these reports in light of more recent advances i.e., strength of evidence for the recommendations in areas of weight management, diet, exercise, and smoking cessation; and current evidence examining the efficacy of various intervention approaches. In the section on exercise, the authors reported (following an exhaustive review) that these studies were conducted predominately in breast cancer survivors testing the effects of either endurance or combined (endurance plus resistance training) exercise training prescribed according to standard exercise prescription guidelines for healthy adults. Outcomes of these reports included cardio respiratory fitness; strength; psychosocial e.g., QoL, depression etc.; and various biochemical outcomes such as metabolic and sex hormones. The literature reported that exercise is associated with:

> The authors concluded that it appears that yoga offers a promising alternative choice as a physical activity for cancer survivors, promoting a number of similar psychological benefits that have been previously highlighted in the literature.

- a moderately positive effect on cardio respiratory fitness and QoL;
- small positive effect on fatigue, anxiety, and depression.

The authors reported that the current literature 'provides sufficient evidence that exercise is a safe and well-tolerated supportive intervention that physicians can recommend to their patients following the completion of primary therapy'. The authors also evaluated the strength of this evidence in light of even more recent studies that examined the effects of exercise training intervention among cancer survivors that had completed therapy – again focusing primarily on breast cancer survivors, mixed cancer patients and across the ages. Findings from these studies corroborated the prior conclusions that current literature 'provides sufficient evidence that exercise is safe and feasible for cancer survivors following the completion of primary therapy'. The authors noted the limitations to these recent studies in that they included cancer patients across the ages and noted that the more recent interventions included relatively small sample sizes with short term intervention periods.[24]

May et al (2008) in an original article compared the effect of a group-based 12-week supervised exercise programme, i.e., aerobic and resistance exercise, and group sports, with that of the same programme combined with cognitive-behavioural training on physical fitness and activity of cancer survivors, on 147 middle aged (48.8 +/- 10.9

yr) cancer survivors (all types, medical treatment ≧ 3 months ago). Physical fitness of cancer survivors was improved following the programme, however adding a structured cognitive-behavioural intervention did not enhance the effect.[25]

De Backer, I. C. et al. (2007) in an original article, evaluated the effectiveness of an 18-week high-intensity strength training program in cancer survivors. Fifty-seven patients (age 24 to 73: mean age of males was 50 and females 49) who had received chemotherapy for lymphomas, breast, gynecologic, testicular, or colorectal cancer completed the program. Cancer survivors are generally advised to train at much lower workloads than the standard guidelines for strength training suggest. The authors concluded that a supervised, high-intensity strength training program seems to be an effective means to improve muscle strength, cardiopulmonary function, and health related quality of life and should be incorporated in cancer rehabilitation programs.[26]

Matthews, C.E. et al. (2007) evaluated a 12-week home-based walking intervention among breast cancer survivors and to quantify changes in physical activity behaviours, body weight, and body composition in response to intervention. Thirty-four women (mean age of 51.3 years) in the post-treatment period completed the study. The authors concluded that a 12-week home-based walking intervention program was safe and effective for increasing short-term physical activity levels in breast cancer survivors. [27]

The authors concluded that a supervised, high-intensity strength training program seems to be an effective means to improve muscle strength, cardiopulmonary function, and health related quality of life and should be incorporated in cancer rehabilitation programs.

Schneider, C.M. et al. (2007) investigated the cardiopulmonary function and fatigue alterations in male cancer survivors (primarily prostate and colon cancer) during treatment (DTm) as well as following treatment (FTm). The study included 45 male cancer survivors (mean age 65.6 +/- 10.9 years; 37 participants had completed radiation and/or chemotherapy treatments, whereas 8 participants were undergoing cancer treatments concurrent with the exercise intervention) that were referred by local oncologists. Following a comprehensive screening and physical examination, cardiovascular endurance, pulmonary function, and fatigue were assessed leading to a 12-week program of individualized exercise prescriptions and exercise interventions. Cardiopulmonary function was maintained in the DTm, whereas the FTm showed significant reductions in resting heart rate with concurrent increases in predicted VO^2 max and time on treadmill post-exercise intervention. Fatigue levels did not increase in the DTm group, whereas the FTm group showed significant reductions in behavioural fatigue, affective fatigue, sensory fatigue, cognitive/mood fatigue, and total fatigue after the exercise intervention. The authors concluded that moderate intensity, individualized, prescriptive exercise intervention maintains or improves cardiovascular and pulmonary function with concomitant reductions in fatigue in cancer survivors during and following cancer treatment. [28]

Thorsen, L. et al. (2008) reviewed physical activity (PA) studies in prostate cancer (PC) survivors investigating (a) the effects of PA on health outcomes, (b) the prevalence of PA, and (c) the determinants of PA. A systematic search of the literature identified nine studies on the outcomes of PA, six studies on the prevalence of PA, and four studies on the determinants of PA in PC survivors. The mean age ranges of the selected studies were 60 to 72.9 years. Results of the search showed promising effects of PA on muscular fitness, physical functioning, fatigue, and health-related quality of life. The authors concluded that although promising, there remains a significant amount of research to be done on the role of PA in PC survivors – benefiting from larger samples using randomized controlled trial methodology. [29]

Culos-Reed et al. (2006) examined the physical and psychological benefits afforded by a 7-week yoga program for 'self-selected' breast cancer survivors. Thirty-nine participants (mean age 51.18 +/- 10.33; 92% female) were assigned to either the intervention or control group, on average 4.6 years post diagnosis. Significant differences between the groups at post-intervention were seen only in psychosocial variables i.e., global quality of life, emotional function. The authors concluded that it appears that yoga offers a promising alternative choice as a physical activity for cancer survivors, promoting a number of similar psychological benefits that have been previously highlighted in the literature. [30]

Ahmen, R.L., et al. (2006) examined effects of supervised upper and lower body weight training on the incidence and symptoms of lymphedema in 45 breast cancer survivors (average age of 52 years; 4 to 36 months post-treatment; had axillary dissection as part of their treatment; 13 women had prevalent lymphedema at baseline) who participated in a 6-month Weight Training for Breast Cancer Survivors study. The results indicated that none of the intervention group participants experienced a change in arm circumferences after 6-months, and that self reported incidence of a clinical diagnosis of lymphedema or symptom changes over 6 months did not vary by intervention status. This is the largest randomized controlled trial to examine exercise and lymphedema in breast cancer survivors. This study supports the hypotheses that a 6-month intervention of resistance exercise did not increase the risk for or exacerbate symptoms of lymphedema. The authors conclude that there is a definite need to start to reevaluate common clinical guidelines that breast cancer survivors avoid upper body resistance activity for fear of increasing risk of lymphedema.[31]

… a 6-month intervention of resistance exercise did not increase the risk for or exacerbate symptoms of lymphedema.

In a brief report Damush, T.M. et al. (2006) implemented an oncologist referred, exercise self-management program (and received telephone support) to increase physical activity and health related quality of life. Women with a mean age of 59.6 years; average time since diagnosis was 3.1 years; 45% had stage I breast cancer and 55% had stage II; 62% received chemotherapy and 59% received a mastectomy. Following a baseline assessment on exercise support, self efficacy, barriers and benefits; quality of life; and functional performance test subjects participated in self-management classes and received telephone support. Participants (N=30) repeated the assessment at 6-months. Older women increased frequency of weekly, moderate physical activities, and weekly caloric expenditure. Perceived exercise barriers, aerobic endurance and lower body strength approached statistical significance, and health related quality of life significantly improved. The authors concluded that an exercise self-management format referred by an oncologist is efficacious for implementing a lifestyle modification change among older breast cancer survivors.[32]

Cheema, B. S. and Gaul, C.A. (2006) evaluated the safety and effectiveness of an 8-week full-body resistance and aerobic exercise program for 27 survivors of breast cancer (age 57.7 +/- 7.2 years; years post treatment 0.8 to 21.0) with prior upper body conditioning. Physical fitness and quality of life (QoL) measures were obtained before and after the training period. No incidents of lymphedema or injury were reported. The authors concluded that survivors of breast cancer can safely benefit from engaging in a full body exercise regime.[33]

Lynch, B.M. et al. (2008) examined the relationship between physical activity and quality of life over 2 years after a colorectal diagnosis. Few longitudinal studies have examined whether physical activity has a sustained effect on improvements in quality

of life. Data was collected on 1,966 people (92% of study participants ranged from 50 to 80 years of age) diagnosed with colorectal cancer completing telephone interviews at approximately 6 (1,966), 12 (1,657), and 24 (1,488) months after diagnosis. The findings suggest that the positive association between physical activity and quality of life is consistent over time. The authors conclude that encouraging colorectal cancer survivors to be physically active may be a helpful strategy for enhancing quality of life.[34]

Milne, H.M., et al. (2007) examined breast cancer survivors' perception of exercise and their quality of life (QoL). About 289 breast cancer survivors (mean age 59.5 +/- 10.9 years – range 33 to 94 – average time to diagnosis prior to mail-out was 25.4 +/- 3.5 months) completed a survey addressing exercise attitudes, behaviour and perceived QoL. Their findings identified a framework of multifaceted views held by breast cancer survivors in relation to their QoL and outlook on their disease. The authors concluded that given that cancer survivors are faced with a number of treatment morbidities 2 years post-diagnosis, there is a need for health professionals to carefully address the cancer survivors' exercise needs in an attempt to help improve QoL.[35]

Alfano, C.M., et al. (2007) investigated (in person or by mail) physical activity occurrence of physical symptons and health-related quality of life (HRQOL) in a large (N=545; 78% of participants age 50 to 70+ years of age) ethnically-diverse cohort of breast cancer survivors (on average 6 months post diagnosis, at 29 months post-diagnosis and at 39 months post diagnosis on pain, hormone symptoms, sexual interest/dysfunction, fatigue, physical subscales of HRQOL). The authors concluded that increased physical activity, especially after cancer, was consistently related to better physical functioning and to reduced fatigue and bodily pain, underscoring the need for physical activity promotion among survivors. [36]

Karvinen, K.H, et al. (2007) examined the unique exercise programming and counseling preferences in 397 bladder cancer survivors (70% were 65 years of age and older) who completed a mailed survey. The findings indicated that older survivors were more likely to prefer to exercise at home, do light intensity exercise and want unsupervised exercise sessions. The authors concluded that bladder cancer survivors are interested in receiving exercise counseling and have some consistent programming preferences including exercising at home, walking, and moderate intensity exercise. Many preferences were modified by demographic and medical factors.[37]

Perceived exercise barriers, aerobic endurance and lower body strength approached statistical significance, and health related quality of life significantly improved.. The authors concluded that an exercise self-management format referred by an oncologist is efficacious for implementing a lifestyle modification change among older breast cancer survivors.

Mustian, K.M., et al. (2006) sought to provide pilot data comparing the efficacy of Tai Chi Chuan (TCC) and psychosocial therapy (PST; physical activity control) for improving functional capacity among breast cancer survivors post treatment. Twenty-one women (mean age 52 years +/- 9; range 33 to 78) who had completed treatment of breast cancer received TCC or PST 3 times/week for 12 weeks. The TTC group demonstrated significant improvement in functional capacity (specifically aerobic capacity, muscular strength, and flexibility) whereas the PST group showed significant improvement in flexibility only. The authors concluded that TCC may be an efficacious intervention for enhancing functional capacity among breast cancer survivors and may support the need for larger randomized, controlled clinical trials to further elucidate these relationships.[38]

Implications Of Exercise Guidelines For Older Adult Cancer Survivors

Currently there are no cancer-specific evidence-based guidelines for exercise for cancer survivors or for cancer patients in general, nor is there any position statement by any group e.g., Canadian Society for Exercise Physiology, American College of Sports Medicine, Public Health Agency of Canada, American Society of Clinical Oncology, Oncology Nursing Society, Canadian Cancer Society, and other authorities. Studies that have looked at general guidelines referenced Doyle et al (2006) article titled Nutrition and physical activity during and after treatment: an American Cancer Society (ACS) guide for informed choices[39]. The American Family Physician published guidelines on Nutrition and Physical Activity during and after cancer treatment in 2004 however these were also based on the ACS guidelines.

In a study specifically designed to target older adults, Demark-Wahnefried et al. (2004) examined the association between exercise and physical functioning in 688 older breast and prostate cancer survivors (mean age = 71 +/- 5 y; range 60-94 y.) It was noted that breast and prostate cancer survivors who met public health guidelines (20 minutes of vigorous exercise at least three times per week) reported significantly higher scores on physical functioning than those survivors not meeting the guidelines.[40]

evaluated the safety and effectiveness of an 8-week full-body resistance and aerobic exercise program … No incidents of lymphedema or injury were reported. The authors concluded that survivors of breast cancer can safely benefit from engaging in a full body exercise regime.

Vallance, J.K.H. et al. (2005) using a retrospective survey design, 438 (mean age 61.1+/- 13.1; 51% male; 62.0 +/- 25.3 months since diagnosis) Non-Hodgkin's Lymphoma (NHL) survivors completed a mailed questionnaire. The purpose of the study was to examine differences in quality of life between NHL survivors meeting and not meeting public health exercise guidelines. A secondary purpose was to examine exercise behaviour changes across three distinct cancer-related time periods (i.e., pre-diagnosis, on treatment and off treatment). The results provide evidence that NHL survivors meeting public health exercise guidelines on and off treatment reported higher current QoL than those survivors not meeting guidelines – not unlike research examining exercise behaviour in other cancer survivor groups.[41]

Although exercise has been shown to improve quality of life in some cancer survivor groups, it is unknown if the unique QoL issues faced by bladder cancer survivors are also amenable to an exercise intervention. Karvinen et al (2007) provides the first data examining the association between exercise and QoL in bladder cancer survivors. Survivors (525 bladder cancer survivors mean age 70.2 +/- 11.2) were identified through a provincial cancer registry and mailed a survey designed to measure leisure time exercise, functional assessment of cancer therapy, and fatigue. The results (51% response rate) indicated that 22.3% were meeting public health exercise guidelines, 16.0% were insufficiently active, and 61.7% were completely sedentary. Those meeting the guidelines reported more favorable scores than completely sedentary survivors on factors such as functional well-being, additional concerns, sexual functioning, erectile function, body image and various fatigue indicators. The authors concluded that exercise is positively associated with QoL in bladder cancer survivors, although few are meeting public health exercise guidelines.[42]

Contraindications

There are a few contraindications to exercise that practitioners should be aware of. Schwartz (2008) reported that these include febrile neutropenia, platelet counts below 10 g/dL below 50,000/mm (to the 3rd), hemoglobin below 10 g/dL, and uncontrolled nausea, vomiting, or pain. For example, when platelet counts are low care must be taken to reduce the risk of bleeding and head injury. As well, patients with peripheral neuropathy need to be warned to be aware of increased risk of falling. As such, precautions need to be taken when prescribing exercise to ensure that the patients exercise within their ability and around any physical limitations they may have.[43]

Precautions

Hoffman-Goetz, L. and Courneya, K.S. (2007) reported a number of precautions which must be taken into consideration before undertaking an exercise program including severe anemia, compromised immune function, severe fatigue, and significant neuropathy.[44]

In an exercise resource developed by the National Coalition for Cancer Survivors[45] a number of precautions were outlined and these (with a few additions at the discretion of the writer) have been noted below:

- Survivors with neurological complications affecting coordination or balance will require stable exercises e.g., stationary reclining bicycle rather than walking on a treadmill.
- Survivors with severe anemia should delay exercise until the anemia is improved.
- Survivors who have limited arm mobility following surgery or radiation treatment will be unlikely to fully exercise their upper body.
- Survivors with compromised immune function should avoid public gyms and other public places until their white blood cell counts return to safe levels.
- Survivors suffering from severe fatigue as a result of their therapy may not feel up to an exercise program – to start, encourage alternate programs such as short bouts of stretching or suggest taking up Tai Chi Chuan.
- Survivors should not exercise when they are at risk of infection, are in pain, or experiencing other side effects that are not well-controlled.
- Survivors who have any concerns should ask their doctor before starting a 'high-intensity' exercise program.
- Survivors with physical challenges should be referred to physical therapy or exercise professionals if necessary to learn to exercise within their ability. If there are medical concerns they need to be in a program that can meet their needs e.g., cardiac or cancer rehabilitation programs.

> … suggest that the positive association between physical activity and quality of life is consistent over time. The authors conclude that encouraging colorectal cancer survivors to be physically active may be a helpful strategy for enhancing quality of life

In respect to lymphedema concerns, that have been prevalent in the public and among some health care providers, Hayes, S.C. et al (2009) investigated, in a randomized controlled trial, the effect of participating in a supervised, mixed-type exercise program on lymphedema status among women (younger than 76 years) with lymphedema after breast cancer. The authors actually assessed lymphedema via bioimpedance spectroscopy and perometry as opposed to (only) self monitoring (which was the case in most other studies on this topic). This paper reinforces the fact that, at minimum, exercise does not exacerbate secondary lymphedema and as such women with this condition should be encouraged to be physically active – optimizing their physical and psy-

chological recovery. Additional notable information included that sessions should be supervised where possible, intensity monitored individually with the use of the revised Borg scale, and the decision to wear compression garments (which have their own set of limitations for a woman) during exercise sessions to be left to each individual to decide.[46]

Summary

This background paper reviewed the limited literature available on the topic of 'older adult cancer survivors and exercise following treatment'. It must be kept in mind that cancer diagnosis is often made in the context of other medical conditions including dealing with age-related disabilities, such as deterioration in mobility, vision, and strength; deterioration in aspects of psychological QoL, such as symptoms of depression, anxiety, and delirium; social and emotional issues such as widowhood, retirement, and declining social support; and age related changes in cardiac, renal, pulmonary, and gastrointestinal systems (which may increase the likelihood of toxicities from cancer treatments). As well, medical interventions for cancer cause side effects, decrements in physical functioning and quality of life (QoL), and an increased risk for second cancers and other major health conditions such as cardiovascular disease, osteoporosis, and obesity. Some of these factors can be reduced by physical activity interventions.

> … there is a need for health professionals to carefully address the cancer survivors' exercise needs in an attempt to help improve QoL

The growing research suggests that physical activity (during or) after completion of treatment is safe and results in improved outcomes such as cardio respiratory fitness, reduction in fatigue, symptoms, quality of life, mental health, or change in body size. There is little information regarding the best kind of exercise program or the best way to reach and motivate older adult cancer survivors. Although there are currently no evidence-based cancer-specific guidelines for exercise or a position statement by any group for older adult cancer survivors, health and fitness practitioners should consider recommending following Canada's Physical Activity Guide for Healthy Active Living. Appropriate prescreening by an attending physician or oncologist, although not a requirement, may be a prudent first step for some older adults (particularly those who have not been involved in physical activity before or who may have limitations and/or other medical concerns) to becoming involved in an exercise program.

Acknowledgements

The author would like to thank Patricia Clark (ALCOA Executive Director), Caryl Russell (University of Waterloo), Mike Sharratt , Ph.D. (University of Waterloo) and Kathryn Moore, Information Specialist (Seniors Health Research Transfer Network) for their assistance in producing this paper.

Production of this publication was made possible through a financial contribution from the Public Health Agency of Canada. The views expressed herein do not necessarily represent the views of the Public Health Agency of Canada.

References

1. Nelson, M.E., Rejeski, W.J., Blair, S.N., et al. 2007. *Physical activity and public health in older adults; recommendations from the American College of Sports Medicine and the American Heart Association.* Med. and Sci. in Sports and Ex. 1435-1444. DOI: 10.1249/mss.ObO13e3180616aa2.
2. Haskell, W.L., Lee, I.M., Pate, R.R., et al. 2007. *Physical activity and public health; updated recommendation for adults from the American College of Sports Medicine and the American Heart Association.* 1423-1434. DOI: 10.1249/mss.ObO13180616b27.
3. Canadian Cancer Society/National Cancer Institute of Canada: *Table 1: Estimated New Cases and Deaths for Cancers by Sex.* Canadian Cancer Statistics 2008.
4. Canadian Cancer Society/National Cancer Institute of Canada: *Table 10: Distribution by Age Group and Sex, for All Cancers Combined.* Canadian Cancer Statistics 2008.
5. Canadian Cancer Society/National Cancer Institute of Canada: *Table 11: Distribution by Age and Sex, for Selected Cancers Combined.* Canadian Cancer Statistics 2008.
6. Canadian Cancer Society/National Cancer Institute of Canada: *Table 14: Estimated Five-year Relative Survival Ratio (%) (and 95% Confidence Interval) for the Most Common Cancers by Sex.* Canadian Cancer Statistics 2008.
7. Canadian Cancer Society/National Cancer Institute of Canada: *Table 16: Estimated Five-Year Relative Survival Ratio (%) (and 95% Confidence Interval) by Age Group for Selected Cancers.* Canadian Cancer Statistics 2008.
8. Alfano, C.M. and Rowland, J.H. 2006. *Recovery issues in cancer survivorship: a new challenge for supportive care.* Cancer J. 12: 432-443. PMID: 17034679.
9. Brown, J.K., Byers, T., Doyle, W., et al. 2003. *Nutrition and physical activity during and after cancer treatment : an American Cancer Society guide for informed choices.* CA Cancer J. Clin. 53:268-291.
10. Vallance, J.K.H., Courneya, K.S., Jones, L.W., etal. *Differences in quality of life between non-Hodgkin's lymphoma survivors meeting and not meeting public health exercise guidelines.* 2005. Psychooncology. 14:979-991.
11. Roth, A.J., and Modi, R. 2003. *Psychiatric issues in older cancer patients.* Cri. Rev. Oncol. Hematol. 48: 185-197. PMID: 14607382.
12. Ganz, P.A., Guadagnoli, E., Landrum, M.B., Lash, T., Rakowski, W., and Silliman, R. 2003. *Breast cancer in older women: quality of life and psychological adjustment in the 15 months after diagnosis.* J. Clin. Oncol. 21: 4027-4033. doi:10.1200/JCO. 2003.08.097.
13. Sawhney, R., Sehl, M., and Nacim, A. 2005. *Physiological aspects of aging: impact on cancer management and decision making.* I. Cancer J. 11: 449-460. PMID: 16393479.
14. Courneya, K.S. 2003. *Exercise in cancer survivors: an overview of research.* Med. and Sci. in Sports and Ex. 1846-1852. Doi: 10.1249/01.MSS.0000093622.41587.B6.
15. Giovannucci, E.L., Liu, Y., Leitzmann, M.F., et al.2005. *A prospective study of physical activity and incident and fatal prostate cancer.* Arch. Intern. Med. 165: 1005-1010.
16. Holmes, M.D., Chen, W.Y., Feskanich, D. et al. 2005. *Physical activity and survival after breast cancer diagnosis.* JAMA 293: 2479-2486.
17. Meyerhardt, J.A., Giovannucci, E.L., Holmes, M.D., et al. 2006. *Physical activity and survival after colorectal cancer diagnosis.* J. Clin. Oncol. 24: 3527-3534.

18. Meyerhardt, J.A., Heseltine, D., Niedzwiecki, et al. 2006. *Impact of physical activity on cancer recurrence and survival in patients with stage III colon cancer: findings from CALGB 89803.* J. Clin. Oncol. 24: 3535-3541.

19. Pierce, J., Stefanick, M., Flatt, S., et al. 2007. *Greater survival after breast cancer in physically active women with high vegetable-fruit intake regardless of obesity.* J. Clin. Oncol. 25: 2345-2351.

20. Abrahamson, P., Gammon, M., Lund, M., et al. 2005. *Recreational physical activity and survival among young women with breast cancer.* Cancer. 107: 1777-1785.

21. Courneya, K.S., Vallance, J.K., McNeely, M.L., Karvinen, K.H., Peddle, C.J., and Mackey, J.R. (2004). *Exercise issues in older cancer survivors.* Critical reviews in Oncology/Hematology. 51(3): 249-261.

22. Courneya, K.S., and Karvinen. 2007. *Exercise, aging, and cancer.* Review in Appl. Physiol. Nutr. Metab. 32: 1001-1007.

23. Schwartz, A.L. (August) 2008. *Physical Activity.* Seminars in Oncology Nursing. Vol. 24, No 3, 164-170.

24. Demark-Wahnefried, W. and Jones, L.W. (2008). *Promoting a healthy lifestyle among cancer survivors.* Hematol Oncol Clin N Am. 22: 319-342. Doi:10.1011116/j.hoc.2008.01.012.

25. May, A.M., Van Weert, E., Korstjens, I., et al. 2008. *Improved physical fitness of cancer survivors: a randomized controlled trial comparing physical training with physical and cognitive-behavioural training.* Acta Oncologica. 47:825-834. doi: 10.1080/02841860701666063.

26. Backer, I.C., Van Breda, E., Vreugdenhil, A., et al. (2007). *High-intensity strength training improves quality of life in cancer survivors.* 46:1143-1151. Acta Oncolgica. Doi:10.1080/02841860701418838.

27. Matthews, C.E., Wilcox, S., Hanby, C.L., Ananian, C.D., et al. 2007. *Evaluation of a 12-week home-based walking intervention for breast cancer survivors.* Support Care Cancer. 15: 203-211. DOI. 10.1007/s00520-006-0122-x.

28. Schneider, C.M., Hsieh, C.C., Sprod, L.K., Carter, S.D., and Hayward, R. 2007. *Exercise training manages cardiopulmonary function and fatigue during and following cancer treatment in male cancer survivors.* Integrative Cancer Therapies. 6(3): 235-241. DOI. 10.1177/1534735407305871.

29. Thorsen, L., Courneya, K.S., and Stevinson, C. (2008). *A systematic review of physical activity in prostate cancer survivors: outcomes, prevalence, and determinants.* Support Care Cancer. 16:987-997. DOI: 10.1007/s00520-008-0411-7.

30. Culos-Reed, S.N., Carlson, L.E., Daroux, L.M., and Hately-Aldous, S. 2006. *A pilot study of yoga for breast cancer survivors: physical and psychological benefits.* Psycho-Oncology 15:891-897. DOI: 10.1002/pon.1021.)

31. Ahmed, R.L., Thomas, W., Yee, D., and Schmitz, K.H. 2006. *Randomized controlled trial of weight training and lymphedema in breast cancer survivors.* Journal of Clinical Oncology. Vol. 24: No.18: 2765-2771. DOI: 10.1200/JCO.2005.03.6749.

32. Damush, T.M., Perkins, A., and Miller, K. 2006. *The implementation of an oncologist referred, exercise self-management program for older breast cancer survivors.* Psycho-Oncology 15:884-890. DOI: 10.1002/pon.1020.)

33. Cheema, B.S., and Gaul, C.A. 2006. *Full-body exercise training improves fitness and quality of life in survivors of breast cancer.* Journal of Strength and Conditioning Research. 20(1): 14-21.

34. Lynch, B.M., Cerin, E., Owen, N., Hawkes, A.L., and Aitken, J.F. 2008. *Prospective relationships of physical activity with quality of life among colorectal cancer survivors.* Journal of Clinical Oncology. Vol. 26: No.27: 4480-4487.Doi: 10.1200/JCO.2007.15.7917.

35. Milne, H.M., Guilfoyle, A., Gordon, S., Wallman, K.E., and Courneya, K.S. 2007. *Personal accounts of exercise and quality of life from the perspective of breast cancer survivors.* Qual. Life Res. 16:1473-1481. DOI 10.1007/s11136-007-9251-z.

36. Alfano, C.M., Smith, A.W., Irwin, M.L., Bowen, D.J., et al. 2007. *Physical activity, long- term symptoms, and physical health-related quality of life among breast cancer survivors: a prospective analysis.* J. Cancer Surviv. 1:116-128. DOI: 10.1007/s11764-007-0014-1.

37. Karvinen, K.H., Courneya, K.S., Venner, P., and North, S. 2007. *Exercise programming and counseling preferences in bladder cancer survivors: a population-based study.* J. Cancer Surviv. 1:27-34. DOI. 10.1007/s11764-007-0010-5.

38. Mustain, K.M., Katula, J.A., and Zhao, H. 2006. *A pilot study to assess the influence of Tai Chi Chuan on functional capacity among breast cancer survivors.* The Journal of Supportive Oncology. 4(3): 139-145.

39. Doyle, C., Kushi, L.H., Byers, T., Courneya, K.S., Demark-Wahnefried, W., Grant, B., McTiernan, A., Rock, C.L., Thompson, C., Gansler, T., Andrews, K.S. for the 2006 Nutrition, Physical Activity and Cancer Survivorship Advisory Committee (2006). *Nutrition and physical activity during and after cancer treatment: An American Cancer Society guide for informed choices.* CA: A Cancer Journal for Clinicians. 56(6): 323-353.

40. Demark-Wahnefried, W., Clipp, E.C., Morey, M.C., Pieper, C.F., Sloane, R., Clutter Snyder, D., et al. 2004. *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. 1: 16. doi: 10.1186/1479-5868-1-16. PMID: 15516261.

41. Vallance, J.K.H., Courneya, K.S., Jones, L.W., and Reiman, T. 2005. *Differences in quality of life between non-hodgkin's lymphoma survivors meeting and not meeting public health exercise guidelines.* Psycho-Oncology 14:979-991. DOI: 10.1002/pon.910.

42. Karvinen, K.H., Courneya, K.S, North, S., and Venner, P. 2007. *Associations between Exercise and quality of Life in Bladder Cancer Survivors: A Population-Based Study.* Cancer Epidemiol. Biomarkers Prev. 16(5): 984-990. DOI: 10.1158/1055-9965.

43. Schwartz, A.L. 2008. *Physical Activity.* Seminars in OncologyNursing.24:3:164170.DOI:10.1016/ j.soncn.2008.05.004.

44. Hoffman-Goetz, L. and Courneya, K.S. 2007. *Physical activity and cancer: from prevention to recovery.* Research Update. Issue number 12: copyright by Active Living Coalition for Older Adults.

45. National Coalition for Cancer Survivors. Physical activity issues for cancer survivors. *www.canceradvocacy.org/ resources/treatment-issues/exercise.html*.

46. Hayes, S.C., Reul-Hirche, H. and Turner, J. (2009).*Exercise and secondary lymphedema: safety, potential benefits, and research issues.* Med. And Sci. in Sports and Ex. (41) 3: 483-489. doi:10.1249/ MSS.06013c31818b981b.

47. Courneya, K.S. 2003. *Exercise in Cancer Survivors: An Overview of Research.* Med and Sci. in Sports and Ex. 1846-1852. Doi: 10.1249/01. MSS.0000093622.41587.B6.

48. Segal, R.J., Reid, R.D., Courneya, Malone, S.C., Parliament, M.B., Scott, C.G., Venner, P.M., Quinney, H.A., Jones, L.W., D'Angelo, M.E., and Wells, G.A. (2003). *Resistance exercise in men receiving androgen deprivation therapy for prostate cancer.* Journal of Clinical Oncology. 21(9): 1653-1659.

49. Windsor, P.M., Nicol, K.F., and Potter, J. (2004). *A randomized, controlled trial of aerobic exercise for treatment- related fatigue in men receiving radical external beam radiotherapy for localized prostate carcinoma.* Cancer. 101(3): 550-557.

Table 1 —Estimated New Cases and Deaths for Cancers by Sex, Canada, 2008						
	New Cases — 2008 Estimates			Deaths — 2008 Estimates		
	Total	M	F	Total	M	F
All Cancers	166,400	87,000	79,400	73,800	38,800	35,000
Prostate[1]	24,700	24,700	N/A	4,300	4,300	N/A
Lung*	23,900	12,600	11,300	20,200	11,000	9,200
Breast	22,600	170	22,400	5,400	50	5,300
Colorectal	21,500	11,800	9,700	8,900	4,800	4,100
Non-Hodgkin Lymphoma	7,000	3,800	3,200	3,100	1,700	1,400
Bladder[2]	6,700	5,100	1,700	1,800	1,250	530
Melanoma	4,600	2,500	2,100	910	560	350
Leukemia	4,500	2,600	1,850	2,400	1,400	1,000
Kidney*	4,400	2,700	1,750	1,600	1,000	600
Thyroid	4,300	890	3,400	180	65	110
Body of Uterus	4,200	N/A	4,200	790	N/A	790
Pancreas	3,800	1,800	1,950	3,700	1,800	1,950
Oral	3,400	2,300	1,100	1,150	760	380
Stomach	2,900	1,850	1,000	1,850	1,150	720
Brain	2,600	1,450	1,100	1,750	1,000	740
Ovary	2,500	N/A	2,500	1,700	N/A	1,700
Multiple Myeloma*	2,100	1,150	960	1,350	730	630
Esophagus	1,600	1,200	410	1,750	1,300	430
Liver	1,550	1,200	380	680	520	150
Cervix	1,300	N/A	1,300	380	0	380
Larynx	1,200	1,000	220	530	440	90
Hodgkin Lymphoma	890	480	410	110	60	50
Testis	890	890	N/A	30	30	N/A
All Other Cancers	13,338	6,900	6,400	9,300	4,900	4,400
Non-melanoma skin	73,000	40,000	33,000	260	160	100

N/A – Not applicable

*Caution is needed if the 2008 estimates are compared to previously published estimates as definitions for these cancers have changed.

1 Prostrate cancer estimates are higher than previous years' publications because most provinces have opted to use projections based on modeling rather than averaging.

2 The substantial increase in incidence of bladder cancer as compared with previous years reflects the decisions to include in situ carcinomas (excluding Ontario) as of the 2006 edition of Canadian Cancer Statistics. See Table A3 for in situ bladder cancer in Ontario.

Note: 'All Cancers' excludes the estimated new cases of non-melanoma skin cancer (basal and squamous but includes the estimated 260 deaths with underling cause of other malignant neoplasms of skin (ICD-10 code C44). Total of rounded numbers may not equal rounded total number. Please refer to Appendix II: Methods for future details.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Table 2 — Distribution by Age Group and Sex, for All Cancers Combined, Canada, 2008									
Age Group	**Population (in thousands**								
	Total	**M**	**F**	**Total**	**M**	**F**	**Total**	**M**	**F**
0-19	7,730	3,959	3,770	1,300	690	590	180	99	80
20-29	4,535	2,304	2,231	1,900	880	1,050	230	120	100
30-39	4,601	2,318	2,283	4,400	1,550	2,900	690	290	400
40-49	5,286	2,651	2,635	13,300	4,900	8,400	3,100	1,350	1,750
50-59	4,642	2,295	2,347	30,900	15,100	15,700	8,900	4,400	4,500
60-69	3,121	1,520	1,601	44,100	26,000	18,100	16,200	9,000	7,200
70-79	1,953	897	1,057	41,300	23,900	17,400	21,600	12,300	9,200
80+	1,227	443	785	29,300	14,000	15,300	23,000	11,300	11,700
All Ages	33,095	16,386	16,709	166,400	87,000	79,400	73,800	38,800	35,000

Note: Incidence figures exclude non-melanoma skin cancer (basal and squamous). Total of rounded numbers may not equal rounded total number. Please refer to Appendix II: Methods for further details. The population projections were provided by the Census and Demographics Branch, Statistics Canada 2

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Table 3 — Distribution by Age Group and Sex, for Selected Cancers, Canada, 2008								
Age Group	**Lung**			**Colorectal**			**Prostate**	**Breast**
	Total	**M**	**F**	**Total**	**M**	**F**	**M**	**F**
New Cases								
0-19	10	5	5	10	5	5	10	5
20-29	20	10	10	45	25	20	*	75
30-39	110	45	65	220	120	100	10	840
40-49	1,050	390	660	1,100	580	520	680	3,500
50-59	3,500	1,600	1,850	3,300	1,900	1,400	5,100	6,100
60-69	7,000	3,700	3,300	5,400	3,400	2,100	9,700	5,500
70-79	7,700	4,400	3,300	6,200	3,600	2,600	6,300	3,700
80+	4,600	2,400	2,200	5,200	2,200	2,900	2,900	2,600
All Ages	23,900	12,600	11,300	21,500	11,800	9,700	24,700	22,400
Deaths								
0-19	*	*	*	5	5	*	*	*
20-29	5	5	5	10	10	5	*	5
30-39	60	25	35	55	25	25	*	100
40-49	710	290	420	290	150	130	10	440
50-59	2,500	1,250	1,250	950	550	400	120	940
60-69	5,400	3,000	2,400	1,800	1,150	640	510	1,050
70-79	6,800	3,900	2,900	2,500	1,500	1,000	1,300	1,100
80+	4,700	2,600	2,200	3,300	1,450	1,850	2,300	1,700
All Ages	20,200	11,000	9,200	8,900	4,800	4,100	4,300	5,300

* – Fewer than 3 cases or deaths.

Source: Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

Table 4 —Estimated Five-year Relative Survival Ratio (%) (and 95% confidence interval) for the Most Common Cancers by Sex, Canada excluding Quebec*, 2001-2003			
	Relative Survival Ratio (%) (and 95% confidence interval)		
	Both Sexes	**Males**	**Females**
All Cancers †	62 (62-62)	61 (61-61)	63 (62-63)
Thyroid	98 (97-98)	93 (91-95)	99 (98-99)
Testis	96 (95-97)	96 (95-97)	N/A
Prostate	95 (94-95)	95 (94-95)	N/A
Melanoma	90 (89-91)	87 (86-88)	93 (92-94)
Breast	87 (87-88)	85 (79-91)	87 (87-88)
Body of Uterus	86 (85-87)	N/A	86 (85-87)
Hodgkin Lymphoma	86 (84-87)	85 (83-88)	86 (83-88)
Bladder (including in situ)**	78 (77-80)	79 (77-80)	76 (74-79)
Cervix	74 (73-76)	N/A	74 (73-76)
Kidney	66 (65-67)	65 (63-67)	67 (65-69)
Larynx	64 (62-67)	64 (62-67)	64 (59-69)
Oral	63 (62-64)	60 (59-62)	68 (66-70)
Colorectal	62 (62-63)	62 (61-63)	63 (62-63)
Non-Hodgkin Lymphoma	60 (59-61)	58 (57-60)	63 (61-64)
Leukemia	50 (48-51)	50 (48-51)	50 (48-52)
Ovary	40 (39-42)	N/A	40 (39-42)
Multiple myeloma	34 (32-36)	35 (33-38)	33 (30-35)
Stomach	23 (22-24)	22 (20-23)	26 (24-28)
Brain	23 (21-24)	22 (21-24)	23 (21-25)
Liver	17 (15-19)	17 (15-19)	16 (13-19)
Lung	15 (15-16)	13 (13-14)	18 (18-19)
Esophagus	14 (13-16)	14 (13-16)	14 (11-16)
Pancreas	6 (6-7)	6 (6-7)	6 (5-7)

N/A – Not applicable

* Data from Quebec have been excluded, in part, because the method of ascertaining the date of cancer diagnosis differs from the method used by other registries and because of issues in correctly ascertaining the vital status of cases.

** Excluding data from Ontario which does not currently report in situ bladder cases.

† Cancers have been ranked from highest to lowest relative survival.

Note: The differences in cancer definitions with other sections can be found in Appendix II: Methods.

Source: Health Statistics Division, Statistics Canada.

Table 5 — Estimated Five-year Relative Survival Ratio (%) (and 95% confidence interval) by Age Group for Selected Cancers, for Selected Cancers, Canada Excluding Quebec, 2001-2003						
	Relative Survival Ratio (%) (and 95% confidence interval)					
	20-39	40-49	50-59	60-69	70-79	80-99
Prostate	*	92 (89-94)	96 (95-97)	97 (97-98)	95 (94-96)	83 (81-86)
Breast	81 (80-83)	88 (87-89)	89 (88-89)	89 (88-90)	88 (87-89)	80 (78-83)
Colorectal	64 (61-68)	65 (63-67)	65 (64-67)	64 (63-65)	63 (62-64)	57 (55-58)
Lung	39 (33-44)	22 (20-24)	19 (18-20)	16 (16-17)	14 (13-14)	9 (8-10)

* – Estimates were not available due to the very small number of cases.

Note: The differences in cancer definitions with other sections are described in Appendix II: Methods.

Source: Health Statistics Division, Statistics Canada.

Active Living Coalition for Older Adults

P.O. Box 143
Shelburne ON L0N 1S0
Toll Free: **1–800–549–9799**
Phone: **519–925–1676**
Fax: **519–925–3955**
Email: ***alcoa3@ca.inter.net***
Web: ***www.alcoa.ca***