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A Comprehensive Cancer Care Plan: Examining the Role of Exercise, Nutrition, and Emotional Support in Cancer Recovery

Karen Y Wonders[1,2]*, Jessica Jennings[1] and Kimberly Smith[1]

[1]*Maple Tree Cancer Alliance, Dayton OH 45419, USA*
[2]*Department of Health, Physical Education, and Recreation, Wright State University, Dayton, OH 45435, USA*

Abstract

At present, approximately 1 in 30 Americans are cancer survivors. The 5-year survival rate for all cancers is approaching 65%, and reaches as high as 90% for certain cancers, such as cancer of the breast. As advances in early detection, therapy, and supportive care diffuse into the community, the number of cancer survivors is only expected to continue to increase in the decades to come. More than ever before, cancer survivors are living long enough to be troubled by the persistent and late effects of their illness and its treatment. However, a growing body of research indicates that the long-term health care needs of cancer survivors are not being sufficiently met, highlighting a need for more health care resources to be directed towards this unique group of survivors.

It is becoming increasingly clear that in order to meet the long-term needs of cancer survivors, a cancer care plan must be developed. Integral to this survivorship care plan are resources addressing palliative care, focusing on behavior change, and lifestyle interventions such as exercise, nutrition, and emotional support. This paper focuses on the current guidelines and benefits of exercise training, nutrition guidance, and emotional support, three aspects of cancer care that have been shown to greatly improve the quality of life for cancer patients.

Introduction

Just a few decades ago, the outlook was grim for those diagnosed with cancer. The disease and its associated treatments were poorly understood. The primary focus of health care was on helping those diagnosed with cancer die of their disease [1]. In 1971, when President Nixon signed the National Cancer Act into law, there were only 3 million cancer survivors [2]. Since then, there has been a dramatic upswing in the fight against cancer. Presently there are around 11.7 million cancer survivors living in the US, a three-fold increase from 1971, and representing approximately 1 in every 30 Americans [2]. Due to advances in early detection, therapy, and supportive care, the number of cancer survivors in the US is only expected to continue to increase.

In the midst of these positive advances in the fight against cancer lie some negatives as well. Now patients are living long enough to experience the late effects of cancer and its associated treatments. This has caused the conceptualization of cancer to shift from being a largely fatal illness to a chronic disease [1]. The National Cancer Institute defines a cancer survivor as "anyone who has been diagnosed with cancer from the time of diagnosis through the balance of his or her life" [3]. This definition demonstrates that cancer has the potential to affect nearly every facet of a survivor's life; including the physical [4], emotional [4], cognitive [4], and social [4,5] domains. Cancer survivors are also more likely to be uninsured [6], adding to their financial strain, as well. Toxicities associated with cancer treatment can interfere with activities of daily living and affect quality of life. Some effects are acute (anemia, nausea, vomiting, and hair loss), while others can persist over time (fatigue, peripheral neuropathy, neurocognitive impairment, pain, and fear of recurrence). Still other symptoms (cardiac dysfunction, cancer recurrence, osteoporosis) may not present for months to years following the cessation of treatment.

A cancer survivor is unique because these individuals often are treated using a multi-modal approach requiring treatment by multiple specialists, including surgeons, radiation oncologists, and medical oncologists. Often, chemotherapy administration and radiation therapy are not given in the same facility where surgery is received. As a result, there is seldom a single integrated medical record, and there may be limited communication between the specialists [7]. In light of this, it should come as no surprise that a growing body of research indicates that the long-term health care needs of cancer survivors are not being sufficiently met. Centers for Disease Control and Prevention recognize cancer as a chronic disease in need of ongoing pain and symptom management, continued illness prevention and surveillance, and end of life care when appropriate [8]. However, a 1999 report "Ensuring Quality Cancer Care" pointed to a wide gulf that presently exists between the ideal cancer care and that which is received by most Americans [9]. Subsequently, a 2005 report from the Institute of Medicine highlighted a need to allocate more health care resources for these patients' unique needs [10]. Central to this report was the recommendation for the development and utilization of a survivorship care plan, describing the patient's cancer treatment experience and providing guidance for future care. The core elements of this plan include a cancer treatment history, potential long-term and late effects of treatment, and recommended surveillance for long-term and late effects, as well as recurrence and new cancers [11]. In addition, it was recommended that resources be made available to address palliative care, a fairly new specialty which focuses on symptom management and quality of life as its central components [12]. The concept of palliative care is supported by a growing body of research examining the role of lifestyle and behavior change in improving the health and function of cancer survivors [13,14]. The primary focus of this paper will be to explore the existing literature describing these complex relationships. This research suggests that physical activity, nutrition, and emotional support are associated with decreases in feelings of depression,

***Corresponding author:** Karen Y Wonders, PhD, Associate Professor, Wright State University, Department of Health, Physical Education and Recreation, 316 Nutter Center, 3640 Colonel Glenn Hwy Dayton, USA, OH 45435, Tel: (937) 775-2637; Fax: (937) 775-4252; E-mail: karen.wonders@wright.edu

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symptoms of late effects of treatment, and cancer relapse, as well as increased remission rates [13,14]. In light of this, cancer rehabilitation centers that focus on the physical and mental well-being of cancer survivors are being instituted all over the country. Now more than ever, healthy behavior choices are being promoted in attempt to limit this disease. Because of the unique needs of the cancer survivor, it is recommended that lifestyle modification begin as soon as possible and continue through remission. The primary goal of lifestyle modification is for the cancer survivor to adopt a healthy way of life. Integral to this is the interdisciplinary team of experts, composed of oncologists, nurses, physical therapists, exercise physiologists, nutritionists, and psychologists. Ideally, this team would work together to ensure the highest possible quality of care for the patients.

Exercise

Benefits of exercise

In 2006, 42% of research projects funded through the National Institutes of Health contained an intervention component designed to improve the psychosocial well-being, physical status, and/or health behaviors of cancer survivors [15]. One such intervention, exercise rehabilitation, has been widely reported in the literature to benefit cancer patients. With more than two decades of literature examining this topic [16- 22], research continues to support a link between a physically active lifestyle and improvements in quality of life in cancer survivors [16,17]. As such, the American Cancer Society recommends that exercise serve as an important part of an individual's cancer care plan, asserting that exercise will decrease feelings of fatigue both during and after treatment, and improve an individual's feeling of control and hope [23].

Research documents several positive physiological and psychological changes for cancer survivors who participate in structured exercise. These include improvements in VO_{2max}, which enhance heart and lung function and promote a healthy blood pressure, blood volume, and gas exchange [24]. In addition, studies report improvements in muscular strength and endurance as a result of participating in an exercise program [25]. Finally, exercise is beneficial in reducing the fatigue associated with cancer treatment [26-30], and improving quality of life [30,31], anxiety [32,33], depression [32-34], body image [35], immune function [36], and emotional well-being [32].

Current exercise guidelines

Exercise is safe and effective both during and after most types of cancer treatment, and should therefore be included as an integral part of an individual's cancer care plan [37]. It is vital that the exercise professional work closely with health care providers and understand the specifics of the cancer survivor's diagnosis and treatments received, including existing health conditions and fitness level prior to cancer diagnosis. Typically, the training sessions resemble that of a general exercise program, in that they involve an aerobic component, resistance training, and flexibility exercises. Ideally, for an individual undergoing cancer treatment, the prescription will include a whole-body workout that targets all the major muscle groups. During each exercise session, modifications may need to be made to ensure patient safety, depending on the changing health of each patient. At present, the optimal frequency, duration, and time course of adaptation to aerobic and resistance exercise training in cancer patients are not known, although research indicates that individuals undergoing cancer therapy benefit from low-to-moderate intensity aerobic and resistance exercise [24]. Based on available data, Table 1 presents some general guidelines a fitness professional may follow when designing an exercise program [38-40]. With the right program, remaining physically active during and after cancer treatment will have a favorable effect on symptom management and quality of life.

Nutrition

Risks associated with poor nutrition

Numerous observational studies have been conducted over the past decades to explore the role of diet in cancer development and prevention [41-44]. Until recently, most of these studies had a retrospective case–control design, and many of them support the assertion that nutrition plays an important role in cancer occurrence [42]. It has been estimated that approximately 35% (range 10-70%) of cancer deaths in the US may be attributed to diet [44] making it the most common cause of cancer after smoking [45]. Although scientific evidence on the relationship between several cancer sites and certain foods has been inconsistent, a very small inverse relationship has been observed between fruit intake and cancer risk [42,46-49]. Specifically, retinoids, vitamins E, D_3, C, poliphenols, fibres, calcium, soya, selenium, and Omega-3 appear to be protective against cancer. Conversely, proteins, lipids, sodium, chloride, aphlatossin, and nitrates have been shown to increase cancer risk [50]. Likewise, The World Cancer Research Fund/ American Institute for Cancer Research recommends a minimized consumption of salt-preserved or salted foods, processed foods, red meat, and aflatoxins [51], although these associations are complex and may depend upon the mode of administration.

The excessive intake of food is also associated with neoplastic risk. Overweight and obesity (BMI over 25 kg/m^2) has been suggested to account for approximately 39% of endometrial, 25% of kidney, 11% of colon, 9% of breast (postmenopausal) [52]. As obesity increases, the risk of these cancers increases. In addition, alcohol appears to be a risk factor for tumors of the upper gastrointestinal tract [53], hepatocellular carcinoma [53], colorectal cancer [53,54], oral and laryngeal cancers [51], and some forms of breast cancer [44]. In light of these findings, the National Cancer Institute has established dietetic guidelines for cancer prevention. These are summarized in Table 2.

Metabolic alterations associated with cancer and its treatments

No matter the diet prior to a cancer diagnosis, once an individual is diagnosed with cancer, sound nutrition practices become increasingly important. Both malignant tumors and cancer treatments alike can alter a patient's ability to ingest and metabolize foods properly. Research

	Aerobic Training	Strength Training	Flexibility Training
Frequency	3-5 days/wk	2-3 days/wk	2-7 days/wk
Intensity	40-60% HRR*	40-60% HRR*	Stretch to the point of mild discomfort
Duration	20-60 min/session	1-3 sets, 8-12 reps per exercise	10-30 seconds per stretch
Mode	Walking, cycling, cross trainers, swimming	Free weights, machines, resistance bands, resistance balls	Static stretching

*HRR = Heart Rate Reserve
HRR = [(Maximum Heart Rate – Resting Heart Rate) x % Intensity] + Resting Heart Rate

Table 1: Guidelines for Designing an Exercise Prescription for Individuals Undergoing Cancer Treatment.

1.	Maintain BMI in range of 18.5-25 kg/m^2 [42-43]
2.	Vary your diet with moderate quantities of food [40]
3.	Do not consume alcohol [42,43]
4.	Have a diet that includes at least 400 g/d total fruit and vegetables [42,43]
5.	Moderate consumption of preserved meat and red meat [42,43]
6.	Reduce total consumption of fats [40]
7.	Increase consumption of foods rich in fibers (cereals, whole wheat flour and legumes) [40]

Table 2: Nutrition and Cancer: recommendations.

indicates that tumor-bearing increases energy expenditure and often results in a negative energy balance and progressive weight loss [55-58]. This is referred to as a hypermetabolic response, and is typically observed in sarcomas [59], leukaemias [60], and bronchial carcinomas [61]. On the other hand, patients with pancreatic and hepatobiliary tumors tend to be hypometabolic [62].

Tumors often cause changes in glucose metabolism, as an increased rate of endogenous glucose production has been measured in patients [59,60]. The magnitude of this increase is influenced by tumor stage [63]. In addition, elevated hepatic gluconeogenesis due to insulin receptor insensitivity and increased availability of the gluconeogenic substrates lactate, alanine, and glycerol has been described in hypermetabolic cancer patients, which would accelerate the wasting of body protein [64]. In addition to changes in glucose metabolism, changes in lipid and protein metabolism occur as well. Increased fat metabolism has been observed, which may lead to cachexia [57]. In addition, several investigators have suggested that whole body protein turnover is increased with advancing stage of cancer [65,66]. A 50-70% increase in protein turnover rates have been observed in patients with lung and colorectal cancer [67], small cell cancer [68], and in children with leukemia [69]. Loss of body protein leads to skeletal muscle atrophy and hypoalbuminaemia, and is associated with impaired tolerance of treatment procedures [70].

Antineoplastic therapy results in a multitude of side effects that affect a patient's nutritional status. Surgery to the head and neck may interfere with a patient's ability to chew, swallow, taste or smell food, or make saliva, while surgery to the esophagus, stomach, or intestines may impact the ability to digest and absorb nutrients [71]. Chemotherapy often results in nausea, vomiting, diarrhea, constipation, mouth sores, and loss of appetite. Finally, radiation often causes pain when swallowing, dry mouth, esophageal reflux, and inflamed intestines [71].

Nutrition guidelines

Nutritional interventions specific to these side effects have been shown to contribute to shorter hospital stays, decreased health care costs, faster healing, increased tolerance to treatment and higher treatment dosages [72]. The objectives of a nutritional evaluation should be to help the patient improve his/her quality of life, maintain a healthy weight, improve treatment tolerance, manage treatment-related side effects, and improve eating habits. Nutrition therapy may include a nutrition supplement between meals, increased fiber, and selecting foods high in protein and calories (i.e. eggs, cheese, whole milk, peanut butter, meat, poultry, and fish). Eating smaller meals throughout the day may also be beneficial in relieving nausea and increasing metabolism [71].

Emotional Support

Need for emotional support

Throughout their battle with cancer, patients come face-to-face with their own mortality; often for the first time in their life. They frequently experience a myriad of emotions and worries about the cancer diagnosis, the side effects of treatment, and the possibility of a reduced life span. Once they reach remission, survivors are often plagued with fear about cancer recurrence, as well as the lingering late effects of treatment. It is estimated that between 10-30% of patients experience depression [73] and approximately 23% suffer from anxiety [74], depending on the cancer site and the measurement tool employed. Fifty-three percent of those surveyed in a 2004 study conducted by the Lance Armstrong Foundation reported that their emotional needs were harder than their physical needs [75]. These conditions may persist for years following the conclusion of treatment [76], highlighting a need for on-going emotional support.

Psychoeducational support programs

It is critical to address the psychosocial needs of the cancer survivor through referrals for depression and anxiety. Often these resources may be made available through palliative care, focusing on the psychological, social, and spiritual aspects of cancer care. Although findings are not always consistent, many investigations have found that such care improves the overall quality of life and symptom experience in cancer survivors [77,78]. One such study examined the effect of a psychoeducational support program on breast cancer survivors. Included in this support program was face-to-face education, telephone-delivered health-coaching sessions, and small-group meetings. Results indicated that the continued support helped these survivors better cope with their physical and psychosocial concerns [77]. Likewise, a similar investigation reported that optimism and coping strategies taught to head and neck cancer patients were associated with a positive outlook on their diagnosis [78]. In addition, interventions for care-givers and spouses of cancer patients has been shown effective at reducing distress and improving coping and adjustment to a cancer diagnosis or to cancer symptoms [79] indicating that interventions targeting problem-solving and communication skills may ease the burdens related to patient care and role changes associated with care while improving caregiver's overall quality of life.

A core strategy in many emotional support programs is to restore a sense of wellness, fostered through awareness and enjoyment of the physical, emotional, spiritual, and social aspects of life. The Social-Cognitive Transition Model of Adjustment examines these individual adjustments to cancer. It asserts that a diagnosis of cancer will affect an individual's core assumptions regarding life trajectory, beliefs about the self, control, self-worth, and the existential. Oftentimes cancer survivors find a cancer diagnosis leads them to a process of spiritual transformation [80]. Illness often challenges existing beliefs, redefining a patient's sense of purpose. Although inconsistent, several investigations have found a positive correlation between spirituality and better emotional adjustment to cancer [81,82]. A review of qualitative studies examining ethnocultural breast cancer survivors emphasize the significant role of spirituality in helping patients deal with their thoughts of mortality [81], and is associated with a positive psychological outcome; however these findings may not apply to men, patients with other diagnoses, or other ethnicities.

Conclusion

As advances in early detection, therapy, and supportive care diffuse into the community, the number of cancer survivors is only expected to continue to increase in the decades to come. More than ever before, cancer survivors are living long enough to be troubled by the persistent and late effects of their illness and its treatment. The needs of cancer survivors are multidimensional, complex and interdependent. It is becoming increasingly clear that in order to meet the long term needs of cancer survivors, a survivorship care plan must be developed. Integral to this survivorship care plan are resources addressing palliative care, focusing on behavior change, and lifestyle interventions such as exercise, nutrition, and emotional support. The creation of an interdisciplinary team of experts can ensure that patients receive the highest quality of care and have the best chance for a positive outcome.

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