



Promoting physical activity in pediatric oncology. Where do we go from here?

Carolina Chamorro Viña^{1*}, Amanda J. Wurz¹ and S. Nicole Culos-Reed^{1,2,3}

¹ Faculty of Kinesiology, University of Calgary, Calgary, AB, Canada

² Department of Psychosocial Resources, Tom Baker Cancer Centre, Calgary, AB, Canada

³ Department of Oncology, Faculty of Medicine, University of Calgary, Calgary, AB, Canada

*Correspondence: cchamorro@kin.ucalgary.ca

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Smita Bhatia, City of Hope Comprehensive Cancer Center, USA

INTRODUCTION

Advances in treatment and technology over the last 30 years are credited with the improved survival rates (in excess of 80%) in pediatric oncology (1). This growing survivor population has resulted in an increased awareness among clinicians about the negative side effects that may develop after treatments (1, 2). Physical side effects may include diminished muscular strength, peripheral neuropathy, decreased functional capacity, and increased fatigue (3–6). Psychosocial side effects may include elevated levels of fear and anxiety, poor social functioning, and decreased health related quality of life (HRQoL). These physical and psychosocial side effects are well-documented consequences of childhood cancer and occur in at least half of the population (4, 5, 7–10). These common physical and psychosocial side effects, in combination with a sedentary lifestyle, may further aggravate and accelerate the development of physical inactivity-related diseases such as hypertension, diabetes, coronary artery disease, osteoporosis, and cancer recurrence (11–13). The Childhood Cancer Survivor Study found that 62% of childhood cancer survivors had at least one chronic condition and 27.5% had a severe, life-threatening, or disabling condition (1). Recently, physical activity (PA) intervention research has emerged as a promising adjuvant therapy to mitigate the negative effects of cancer and its treatment. In this opinion article: (1) the rationale for PA in pediatric cancer (patients and survivors) will be summarized, (2) the challenges to promoting PA behaviors in this population will be discussed, and (3) our vision for the next steps (research, education, and knowledge translation) will be highlighted.

EVIDENCE FOR PA IN PEDIATRIC CANCER

There is growing evidence for the efficacy of PA to improve strength, cardiorespiratory fitness, symptoms of fatigue, and general physical functioning in pediatric cancer populations (11, 13–16). While the effect of PA on HRQoL outcomes, such as functional, social, and mental domains is mixed, the majority of the research suggests potential improvements (15). Additionally, none of the studies to date have reported any negative outcomes, even in immune-compromised patients (17).

Due to the relative rarity of a pediatric cancer diagnosis (153 cases/per million children in Canada), evaluating the effect of PA in this population is inherently more challenging (13). Although findings are preliminary, and are often limited by small sample sizes, the existing evidence consistently suggests that mild-moderate exercise is safe, beneficial, and feasible for both childhood patients and survivors (11).

SEDENTARY BEHAVIOR IN PEDIATRIC CANCER

Scientific evidence suggests that childhood cancer survivors are more sedentary than their healthy peers (14, 18, 19). Three potential explanations have emerged in the literature (20). The first, a physiological explanation, postulates that survivors of cancer are less active because they experience fatigue as a result of the adverse consequences of chemotherapy and radiotherapy (21, 22). The second argues that childhood cancer survivors are subject to an insidious “spectrum of disuse” as a result of an overly cautious approach toward PA fostered by concerned parents, physicians, school teachers, and others

(23). This overprotective attitude may stem from a general lack of education about what a child can be expected to do after cancer diagnosis and treatments, and may alter the child’s perception of their actual capacity for PA (20). As an example, more than 70% of school physical education teachers reported a lack of knowledge about appropriate activities for childhood cancer survivors (24). The third explanation suggests that the timing of the diagnosis and the length of the treatment often coincide with a period of life when children are introduced to organized sports, resulting in the child missing out on this critical period and not being introduced to numerous PA options (15, 25).

THE IMPORTANCE OF PHYSICAL FITNESS AND PA DURING CHILDHOOD

Physical activity is one of the main determinants of physical fitness (26) and has been suggested to improve cardiovascular capacity, strength, HRQoL, and daily functioning in a wide range of pediatric chronic diseases (i.e., juvenile idiopathic arthritis, asthma, cerebral palsy, and cystic fibrosis) (9, 27, 28). In healthy populations, research shows that physical inactivity is an independent risk factor for non-communicable diseases (NCD) such as obesity, diabetes, hypertension, cardiovascular disease, and cancer (29, 30). Recognizing and intervening on physical inactivity during childhood is an important public health concern. Enhancing PA during childhood is necessary to: (a) prevent and treat NCD, (29, 30), (b) promote the adoption of PA behavior that will translate into adulthood (29), and (c) improve aerobic capacity and muscle mass and maximize peak bone mineral density (31–33).

HOW DO WE PROMOTE PA IN PEDIATRIC CANCER?

Physical activity is a key factor in the development of healthy children. Due to the high levels of sedentary behavior reported in children, a recent article proposed integrating exercise assessments into primary care as a means of intervening before a childhood exercise deficit disorder occurs (34). The importance of intervening in childhood cancer patients and survivors is necessary, as they are at a greater risk (compared to healthy children) to develop a sedentary lifestyle and the associated co-morbid conditions. Due to the varying hypotheses for physical inactivity in this population, it is clear that several factors must be taken into account when developing strategies to improve the PA participation rates of childhood cancer patients and survivors. We acknowledge that continued research is necessary to develop adequately powered, solidly designed PA research interventions to continue exploring key issues within pediatric oncology (15, 35). However, the evidence to date consistently suggests that mild-moderate PA is safe, beneficial, and feasible in this population (13–15, 35). Therefore, enhancing the dissemination of the evidence that already exists is an important next step.

DEVELOPING GUIDELINES

In 2010, The American College of Sports Medicine published a roundtable report that brought together a team of clinical and research experts in adult cancer and exercise. The group advised “avoiding inactivity, even in cancer patients with existing disease or undergoing difficult treatments, is likely helpful” (36). While the pediatric literature is not as extensive, the evidence to date suggests we should promote an active lifestyle throughout the pediatric cancer experience in order to diminish many of the negative physical and psychosocial side effects (35). As a starting point, the Children’s Oncology Group published The Long-Term Follow-Up Guidelines for survivors of childhood, adolescent, and young adult cancers (35). This guideline does not include any specific recommendations for PA, but does include a section on healthy living. Additionally, The American Cancer Society currently recommends 60 min of moderate-vigorous exercise 5 days/week in child and adolescent in order to prevent cancer (37). While specific

PA guidelines cannot be developed due to the current state of the literature, other avenues may be used in order to increase community and health care professional (HCP) awareness regarding the benefits of exercise during childhood cancer.

Enhanced knowledge translation may begin to diminish the overly cautious approach of parents, physicians, and teachers, which has been acknowledged as one of the limiting factors for PA involvement (23). HCPs are a key factor in the promotion of PA in pediatric cancer. Survivors report that they are more willing to participate in PA if their HCP recommends it (14). Therefore, a practical evidence-based PA guideline that summarizes the evidence we already have, highlighting the strengths and limitations of the research, could give HCPs the tools to talk about exercise with their patients and appropriately refer to exercise experts when necessary. Furthermore, creating an exercise manual for a lay-audience may improve the inclusion of childhood cancer survivors in regular PA at school and at home. Increasing accessibility of the evidence would begin to address the lack of knowledge reported by parents, physicians, and teachers (24). Our research group is currently developing a Pediatric Oncology Exercise Manual (POEM) with an international team of researchers [Spain, Germany, Canada, Netherlands, and the United States of America (USA)]. POEM will summarize the pediatric cancer and exercise evidence that we have and make it more accessible for professionals and families. This manual will be given along with educational sessions for families and professionals.

KNOWLEDGE TRANSLATION: CREATING AND PROMOTING EVIDENCE-INFORMED EXERCISE PROGRAMS

Physical activity programming for pediatric cancer patients and survivors is growing. Worldwide, we have identified three programs based in the community. Pediatric Survivors Engaging in Exercise for Recovery (PEER) is offered for pediatric cancer patients and survivors at the University of Calgary. Play Strong – A Pediatric Cancer Exercise Program, was developed in the Nationwide Children’s Hospital in Ohio, USA. The third was developed at the University of South Australia’s School of Health Sciences in partnership with the Little Heroes Foundation Child Family Care Project and Leukemia Foundation. These

three programs have as part of their goals the restoration of healthy levels of physical fitness as well as provide childhood cancer survivors an opportunity to develop sports-based skills that allow them to return to PA classes designed for healthy children.

As the number of survivors continues to grow, expanding, and researching PA programs specifically for children with cancer should be a priority. PA research needs to occur in order to resolve the barriers that cancer and its treatment create, as well as assist with the reintegration of children back into the community (2, 13, 16).

Based on research evidence and what we have learned from our program, we suggest that community-based programs take into account: (a) medical history, (b) specialist supervision, (c) the fun factor, (d) parent and child education, and (e) frameworks/evaluation:

- (a) Childhood cancer patients and survivors should be screened and cleared by their physician prior to participation in PA. It is imperative that an oncologist or primary care physician evaluates each patient based on diagnosis, therapy, long-term complications, and side effects (14, 38). This information can be given to exercise specialist, allowing them to tailor the exercise to each patient’s medical history (14). Fluent communication with the patient’s oncology team should occur to ensure the continued tailoring of the exercise sessions to individual’s needs (13, 36).
- (b) Programs should be supervised by appropriately trained individuals such as cancer and exercise specialists or certified exercise physiologists (14).
- (c) The program should be fun while addressing psychological and pedagogical developmental needs. This component is a key factor to improve program adherence (2).
- (d) Program should include educational component. Educating families and children on the benefits of PA may mitigate the overprotective attitudes parents hold and may help motivate children to perform PA (24).
- (e) Program designs and evaluation should be based on theoretical frameworks. This will likely increase program success as well as the ability to adequately evaluate the program.

CONCLUSION

There is a need to enhance awareness among HCP's, families, and educators about the benefits of PA throughout the pediatric cancer experience (diagnosis to survivorship). Evidence-based recommendations accessible to families, educators, and HCP's are needed and accessible programing's built upon this are the first steps to promoting better fitness and health in pediatric cancer patients and survivors. Fostering healthy PA habits and providing the infrastructure in which these habits can be developed will ultimately promote a healthy childhood cancer survivor population.

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