I am sitting at my desk contemplating the topic of this editorial, physical activity and exercise after hematopoietic cell transplantation (HCT) and the need to keep on moving. My wearable physical activity tracker just informed me that it is time to move again. Apparently, contemplating this editorial has made me too sedentary for the past few hours. I know that I should get up and put in my 250 steps for this hour. I have met this goal for the past 7 hours, and I am really trying to accomplish the physical activity goal that I set for myself today. Within seconds, I can also think of several reasons why I should delay putting in my steps for just awhile longer (or maybe the rest of the day). As a cancer nurse researcher with expertise in physical activity and exercise in people who receive intensive cancer therapy, it seems reasonable that someone like me, who espouses the very real health benefits of physical activity and exercise, would know better. Still, I sit here wondering, “Do I get up, start moving, and put in those 250 steps for this hour or continue working for just a few minutes more?”

This editorial, however, is not about the minor challenges that I face to stay physically active. My challenges pale in comparison to those faced by people with acute and chronic illnesses. Rather, this editorial will address some of the major issues that people with cancer receiving intensive cancer therapy face when trying to incorporate physical activity and exercise into their lives while simultaneously experiencing cancer and/or cancer-related treatment effects.

High-dose chemotherapy followed by HCT is a life-saving treatment but frequently results in life-threatening and life-changing complications leading to physical deconditioning.[1,2] Over 50,000 people worldwide undergo HCT each year.[2] Although potentially curative, HCT survivors face critical physical, psychological, and social challenges that make it difficult to initiate and/or maintain a physically active lifestyle and/or structured exercise program. These challenges vary depending on the stage of treatment. The physical fitness needs and challenges of those...
actively undergoing HCT may be vastly different from the needs of long-term survivors. For example, implementing an exercise program in the immediate post-transplant period may be physically challenging for those experiencing the noxious effects of high dose chemotherapy. Conversely, the physical fitness needs of long-term HCT survivors with few long-term complications may resemble the healthy population. Symptoms, such as fatigue, however, may persist across the HCT recovery trajectory and lead to physical inactivity, impaired functional ability, and diminished quality of life. Interventions to address these challenges are crucial for promoting successful health outcomes in HCT survivors. Oncology nurses play a vital role in addressing these challenges given our mission to optimize health and promote well-being of the people that we serve.

The health benefits of physical activity and exercise in people with cancer are well-established as evidenced by the recently released 2018 Physical Activity Guidelines Advisory Committee Scientific Report. The terms, physical activity and exercise, are used interchangeably in the lay and healthcare literature although key differences in meaning exist. Physical activity refers to any type of body movement that occurs in response to skeletal muscle contraction and results in increased energy expenditure; exercise is a specific type of physical activity that consists of structured, repetitive body movements performed to improve and/or maintain physical fitness. All body movements, such as taking a deep breath, moving from a sitting to standing position, walking, or playing a sport, are classified as physical activity. All of us engage in physical activity every day, although some more, and maybe much more, than others. Physical activity that occurs within the confines of daily life is sometimes referred to as lifestyle physical activity or free-living physical activity to differentiate it from exercise. There are substantial health benefits to living an active lifestyle. Increasing physical activity and reducing sedentary behaviors, even in small increments, may increase life expectancy and promote positive health outcomes.

Exercise programs, in healthy people as well as people with cancer, are universally implemented to improve physical and/or psychological fitness and well-being. The specific goals of the exercise program, in relation to desired health outcomes, determine the choice of exercise modality and structure of the exercise prescription. Commons goals for exercise programs in HCT recipients include improving cardiorespiratory fitness, restoring, maintaining, and/or building muscle strength and/or endurance, alleviating symptoms, such as fatigue, and improving functional status. The most common exercise modalities include aerobic exercise, strength training, and stretching/flexibility. Aerobic exercises use the large muscle groups in a continuous, rhythmic fashion to promote cardiorespiratory fitness. Examples include indoor or outdoor walking, jogging, and cycling. Using progressive resistance, strength training builds muscle mass and enhances muscle strength and endurance in the specific area(s) of the body being trained. Fitness programs frequently combine aerobic exercises with strength training and stretching to achieve a more robust level of fitness and physical performance. The current American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Survivors recommend that people avoid a sedentary lifestyle, return to normal activity as soon as possible following diagnosis, engage in regular physical activity, participate in 150 minutes of moderate-intensity aerobic exercise per week, if possible, and strength train two times per week. These guidelines are very similar to those published by other professional organizations, such as the American College of Sports Medicine. All of these guidelines, however, must be tailored to the desired health outcomes and the individual's level of fitness. For example, exercising at a moderate intensity for 30 minutes per day five days per week may be very unrealistic in someone who has been largely sedentary or recovering from cancer treatment.

Although the literature supporting the health benefits of physical activity and exercise is well established, the HCT population represents an under-studied group even though they may be one of the neediest, in terms of physical deconditioning following cancer treatment. Small sample sizes, heterogeneity of exercise interventions, timing differences related to exercise initiation, and different levels of exercise supervision, among other factors, make it very difficult to effectively combine results across studies. Ultimately, the pillars of an ideal exercise program following HCT have yet to be established. While substantial progress has been made, further research is needed. For example, information regarding dose-response of various exercise interventions would help determine how much exercise is enough to detect a clinically meaningful change in health outcomes. This may be accomplished by evaluating the health outcomes of HCT recipients randomized to the same exercise intervention but at different levels of intensity or duration. Likewise, a head-to-head comparison of a lifestyle physical activity intervention to a structured exercise program may provide important information regarding the comparable effects of these interventions on symptoms, functional status, quality of life, and exercise adherence. Lifestyle physical activity interventions that gradually boost physical activity levels throughout the day, as opposed to daily episode(s) of exercise following HCT, may be more manageable for...
some HCT recipients, particularly those who do not like to exert themselves. Conversely, more strenuous exercise may result in improved health outcomes. Two meta-analyses evaluating exercise following HCT identified positive effects across a range of potential outcomes, including fatigue, functional ability, muscle strength, and quality of life, although information regarding lifestyle physical activity interventions was lacking.

Translating research evidence into practice is paramount for successful outcomes following HCT, and oncology nurses play a vital role in the process. After evaluating the research findings from physical activity and exercise research after HCT, the following questions may be helpful when considering changes to clinical practice. For example, who is the primary target for the physical activity or exercise intervention? An individual HCT recipient? All inpatients on a specific unit? Long-term HCT survivors? When will the physical activity or exercise program be initiated? On admission to the hospital for the transplant? On discharge from the hospital following HCT? Three months following hospital discharge? What strategies will be used to encourage the initiation of a physical activity or exercise program? Who will design the physical activity or exercise program? Who will monitor progress? How will progress be monitored? What strategies will be used to enhance exercise adherence? What resources are available to encourage adherence? Will this be a formal program systemically implemented and monitored by individuals within the health care system? The answers to these and other related questions are not simple and require substantial thought. The issues become further complicated when considering the multitude of potential problems that HCT recipients experience.

Although initiating and maintaining formal, structured exercise programs are difficult in the complex and challenging HCT population, nurses are well-equipped to promote physical activity following intensive chemotherapy and HCT. Although this editorial did not identify the pillars of an ideal exercise program following HCT, there are several take home messages. HCT recipients should be encouraged to stay as physically active as possible while hospitalized and following completion of treatment. A physically active lifestyle, barring any contraindications, should be strongly recommended. A plethora of physical activity and exercise programs are readily available online, in print, and through personalized training programs in health fitness centers. HCT survivors face multiple challenges when adopting a physical activity or exercise program; thus, the program should be tailored to the individual’s capabilities and strategies to enhance adherence implemented. The best designed physical activity or exercise intervention will be completely ineffective if the pragmatic needs of the HCT recipient are not addressed, and the HCT recipient does not adopt or maintain the program. There is something for everyone; the key is to find the right combination. Just keep on moving!

Conflicts of interest

There are no conflicts of interest.

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