Reducing Post Bone Marrow Transplant Fatigue by Programmed Exercise among Adult Cancer Patients

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Abstract

Purpose: The purpose of this integrative literature review is to find the association between programmed exercise and post bone marrow transplant (BMT) fatigue.

Methods: Electronic data bases and journals review was conducted to look for relevant articles. The found articles were reduced to 12 articles according to specific inclusion criteria.

Results: Programmed exercise has a role in increasing muscle strength and decreasing the fatigue level post BMT; also the patient can practice it safely directly post transplant, and there is no evidence for negative effects of exercise upon post BMT fatigue.

Implications and recommendations: Further research needs to find the best type of exercise which can be carried out by post transplant patients in the safest and efficient ways, as the literature showed there are many types of exercise like aerobic, strength, and stretching exercise. Also as there is not any negative point about the exercise, the nurses should educate more and more about the exercise and how to educate their patients about the importance of exercise.

Key words: Bone marrow transplant, fatigue, exercise.

1. Introduction
Fatigue is a multidimensional concept with several modes of expression: physical, emotional and cognitive. Fatigue is associated with the inactivity presentation or lack of motivation (Carlson et al., 2006). Fatigue is an exceedingly common, often treatable problem in cancer patients that profoundly affects all aspects of quality of life. Patients report fatigue as one of the most important and distressing symptoms related to cancer (Campos, Hassan, Riechelmann & Giglio, 2010). Also fatigue is reported as one of the most common side effects of chemotherapy (Phillips et al., 2012). Patients describe cancer related fatigue as devastating to many life domains, degrading their vocational, familial, and societal roles (Cheville, 2009). Insufficient coping with the experience of cancer, fear of disease recurrence, dysfunctional cognition concerning fatigue, dysregulation of sleep and dysregulation of activity are all factors that play a role in fatigue severity. (Gielissen et al., 2007).

Chemotherapy is one of the treatment regimens which is used to treat malignant disorders and sometimes non malignant disorders, by itself or in combination with other treatment regimens. The chemotherapy dose plays a role on the fatigue level and its severity (Mahoney et al., 2012). Also one frequently underestimated factor contributing to loss of physical performance in cancer patients is the lack of muscular activity during in-hospital treatment (Dimeo, Fetscher, Lange, Mertelsmann & Keul 2013).

Bone Marrow Transplant (BMT) can be an extraordinary, life-saving treatment; it has now become the standard treatment for a number of neoplastic and immunological disorders (Bishop, Welsh & Wingard, 2001). Post BMT fatigue is common among patients and it has an effect in their quality of life, however this fatigue associated with transplant-related toxicities such as
functional impairment and muscle weakness may be related to corticosteroids usage (Mello, Tanaka & Dulley, 2003). 35% of the BMT patients experienced severe fatigue (Gielissen et al., 2007).

To reduce fatigue, patients have been traditionally advised to avoid physical efforts and to down regulate their activity level (Carlson et al., 2006). Unfortunately many researchers don’t agree with this advice and show a significant effect of physical activity in reducing the fatigue level. The first usage of therapeutic exercise intervention in oncological follow up treatment and rehabilitation was made in Germany about 25 years ago on breast cancer patients, and it shows a positive psychological and physical effect (Baumann, Kraut, Schul, Bloch, & Fauser, 2010).

According to available databases there are few current articles that define the role of exercise in decreasing post bone marrow transplant fatigue, so there is a need to know if there is any relation between programmed exercise and post BMT fatigue level?

Lavine conservational model will guide this literature.

2. Methods
An extensive search was conducted to look for articles related to post BMT fatigue management by programmed exercise. A literature search was undertaken using electronic data bases and journals. The used data bases were: Science Direct, Pubmed, and Ovid nursing. The key words used to find the articles were: exercise, high dose chemotherapy, hematopoietic stem cell transplant, fatigue post BMT, and fatigue induced by chemotherapy, and their alternatives; also a combination of some of these words has been used to find more relevant articles.

The search process yielded many articles but not all of them relevant to the phenomenon of interest, so the articles were reduced to 12 according to specific inclusion criteria.

Articles were considered relevant if they:
1- Contained information about cancer related fatigue, exercise among cancer patients, exercise for BMT patients, bone marrow transplant complications, post bone marrow transplant fatigue, and high dose chemotherapy complications management.
2- Were written in English language.
3- Were a quantitative study with any research design.
4- Any type of transplant.
5- Adult age group (more than 18 years).

Although the time frame for the relevant articles should be the maximum five years, but some articles before 2008 were used to reach the term of data saturation, as there were few current studies related to the topic and that met the inclusion criteria.

2.1 Methodological characteristics
12 articles composing this review ranged from 1997 to 2013 with different research designs. The majority of designs were descriptive studies and prospective studies, in addition to 2 randomized clinical trials, 2 cross sectional studies, and 1 as a review of literature. No article was based on theory, and some old studies were used to reach the term of data saturations as per (Dimeo, Fetscher, Lange, Mertelsmann & Keul, 1997).

The sample size for the relevant articles ranged from 12-231 participants and all the studies have the two types of transplant, Autologous and Allogeneic transplant.

The age group for the participants was from 18 till 65 years old.

3. Results
3.1 Effect of Exercise on Post BMT Fatigue
Impairment of physical performance and fatigue are common, and sometimes they are serious side effects of cancer treatment. It has been estimated that the problem affects up to 70% of cancer patients during chemotherapy or radiotherapy. One frequently underestimated factor contributing to loss of physical performance in cancer patients is the lack of muscular activity during in-hospital treatment (Dimeo, Fetscher, Lange, Mertelsmann & Keul 2013). Also the medications used, such as steroids to manage post BMT complications may affect the physical performance of patients, which leads to muscle atrophy.

Exercise has been proposed as a non-pharmacologic adjuvant therapy to combat the physiological and psychological symptoms of Hematopoietic Stem Cells Transplant (HCST) (Wiskemann & Huber, 2008). Post Bone Marrow Transplant (BMT) fatigue is common among patients and it has an effect on their quality of life, however this fatigue associated with transplant-related toxicities such as functional impairment and muscle weakness, may be related to corticosteroids usage (Mello, Tanaka & Dulley, 2003).

35% of the BMT patients experienced severe fatigue. The percentage of patients with severe fatigue remained stable during the years after transplantation. Several psychosocial factors, but not medical factors, were associated with fatigue; there were no decrease in fatigue complaints during the first years after Stem Cell Transplant (Gielissen et al., 2007). Recent guidelines for exercise prescription for cancer survivors from the American College of Sports Medicine (Schmitz et al. 2010) report no contraindication for starting an exercise program in patients undergoing either autologous or allogeneic HSCT however, issues regarding, the ideal time for starting a program safely and effectively, type of program, frequency, intensity and duration is not confirmed, especially in relation to the HSCT treatment trajectory, but another study conducted in 1997 by Diemo and his colleagues revealed that
aerobic exercise can be safely carried out immediately after high-dose chemotherapy and can partially prevent loss of physical performance (Dimeo, Fetscher, Lange, Mertelsmann & Keul, 1997) Also the programmed exercise will be efficient in promoting muscle strength after Allogenic BMT (Mello, Tanaka & Dulley, 2003). On the other hand Carlson, Smith, Russell, Fibich and Whittaker (2006) mentioned in their study there is a very large improvement in fatigue level over the course of an individualized aerobic exercise program in post HSCT among patients who were suffering from high levels of fatigue for which no morphological, biochemical, hormonal or psychological correlate could be identified. Also there is a significant benefit from the exercise interventions which have been predominantly reported for physical performance, quality of life and fatigue status of the patients like a faster recurrence of immune cells as the post HSCT become neutropenic, or reduced severity of therapy-related side effects can be estimated (Wiskemann & Huber, 2008). A study conducted in 2012 demonstrates that there is a potential positive effect of strength training on physical activity, fatigue, and quality of life in people receiving high-dose chemotherapy and HSCT (Hacker et al., 2012).

A 12 weeks aerobic training program on cycle ergometer initiated between 9 and 92 months after HSCT showed cardiovascular effects through increased stroke volume and decreased heart rate (Carlson et al. 2006).

Donnelly and his colleagues in their study, discuss the role of physiotherapist which may have a role in decreasing cancer related fatigue by using exercise and teaching energy conservation techniques for cancer patients (Donnelly et al., 2009).

Arnold and Taylor in their study which was conducted in 2010, showed that there is no significant effect of aerobic exercise interventions for fatigue outcomes in hospitalized patients with cancer. The study was limited by the small number of included trials, with most having small sample sizes, so its results cannot be generalized.

The findings of Wilson and his colleagues in their study which was conducted in 2005 suggest that individually prescribed, home based aerobic exercise is an acceptable, safe, and potentially effective intervention for improving physical functioning and fatigue in sedentary HSCT recipients. Also his findings showed a significant improvement in the fatigue severity and duration. Another study by Brown and his colleagues (2011) the purpose of which was to evaluate the effect of types of exercise in cancer related fatigue showed that resistance exercise interventions of moderate intensity were more effective than low intensity or aerobic exercise.

Another study by Kuchinski, Reading & Lash (2009), aimed to determine if patients receiving treatment for cancer experienced less treatment-related fatigue if they participated in a regular committed exercise regimen, compared to those who did not exercise regularly, and its result was an individualized exercise program should be included in the treatment of patients receiving chemotherapy and/or radiation therapy.

4. Summary and Conclusion
The purpose of this literature review was to find the association between exercise and post bone marrow transplantation fatigue. Extensive research has been conducted to find if articles met a specific inclusion criteria; 12 articles met the inclusion criteria, their results are discussed and analyzed in this paper.

Physical exercise has a great impact in maintaining a patient's health status in the physical and psychological aspect. From the previous results no study reported that there is a negative effect of exercise among patients post BMT, and the reviewed articles didn’t mention a specific type of exercise to be carried out post BMT. Some of the articles' results revealed the importance of strength exercise, and others revealed the importance of aerobic exercise to decrease fatigue levels and improve quality of life among BMT patients, but no study referred to the negative impact of exercise post BMT; also the exercise can be carried out safely post transplant.

4.1 Implications and recommendations
Further research needs to find the best type of exercise which can be carried out by post transplant patients in the safest and efficient ways, as the literature showed there are many types of exercise like aerobic, strength, and stretching exercise. Also as there are not any negative points about the exercise, the nurses should be educated more and more about exercise and how to educate their patients about the importance of exercise.

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