**Impact of an allied health prehabilitation service for haematologic patients receiving high dose chemotherapy in a large cancer centre**

**Supportive Care in Cancer**

**Jessica Crowe1,2, Jill J Francis3,4,5, Lara Edbrooke1,2, Jenelle Loeliger1, Trish Joyce6, Christina Prickett7, Alicia Martin1,3, Amit Khot6,8, Linda Denehy1,2,3, and the Centre for Prehabilitation & Peri-operative Care (CPPOC)#**

1Allied Health Department, Peter MacCallum Cancer Centre, Melbourne, Victoria, Australia

2 Department of Physiotherapy, The University of Melbourne, Melbourne, Victoria, Australia

3 Melbourne School of Health Sciences, The University of Melbourne, Melbourne, Victoria, Australia

4 Clinical Epidemiology Program, Ottawa Hospital Research Institute, Ottawa, Canada

5 Department of Health Services Research, Peter MacCallum Cancer Centre, Melbourne, Victoria, Australia

6Department of Clinical Haematology, Peter MacCallum Cancer Centre and Royal Melbourne Hospital, Melbourne, Victoria, Australia

7 Department of Clinical Psychology, Psychosocial Oncology Program, Peter MacCallum Cancer Centre, Melbourne, Victoria, Australia

8 Sir Peter MacCallum Department of Oncology, The University of Melbourne, Melbourne, Victoria, Australia

#Members listed in the supplementary file 1

**\* Correspondence:**Jess.crowe@petermac.org

**Template for Intervention Description and Replication (TIDiER)**

|  |
| --- |
| **Item 1. Brief Name**Multidisciplinary allied health (exercise, nutrition, and psychology) prehabilitation for haematologic cancer patients being considered for intensive chemotherapy with autologous stem cell transplant (AuSCT) support. |
| **Item 2. Why: Describe any rationale, theory, or goal of the elements essential to the intervention.** Cancer prehabilitation is defined as a process on the care continuum prior to major oncological treatment that involves thorough screening, assessment, and treatment of physical and psychological impairments with targeted interventions [1]. The aim of cancer prehabilitation is to reduce post-treatment complications, enhance functional capacity and empower the patient to withstand the stressors of their treatment [2]. There is growing evidence for exercise prehabilitation prior to stem cell transplant for haematological cancer [3-6].Nutrition therapy is indicated and should be initiated early for patients prior to AuSCT, as they are likely to develop symptoms such as anorexia and gastrointestinal disturbance, which increases their risk of malnutrition [7]. Individualised nutrition interventions coupled with exercise and psychological interventions are likely to be beneficial for this patient cohort [7].  |
| **Item 3. What (materials): describe any physical or informational materials used in the intervention including those provided to participants or used in intervention delivery or in training of intervention providers****Exercise materials:** Patients were provided a printed copy of their exercise program at the initial assessment using physiotherapy exercise prescription software, SimpleSet [8]. Resistance bands were provided if patients did not have access to weights for resistance training. **Nutrition materials**: Patients received information including a handout titled ‘Nutrition during your Stem Cell Transplant’. If protein intake was inadequate, increasing dietary protein or protein supplements were recommended.  |
| **Item 4. What (procedures): describe each of the procedures, activities, and/or processes used in the intervention, including any enabling or support activities****Patient referral and enrolment:** Patients were referred for allied health services, screened during a telephone call from the Allied Health Assistant for exercise program eligibility using the Australian-modified Karnofsky Performance Status (AKPS), a validated screening tool [9]. Screening for clinical psychology eligibility was completed using the patient health questionnaire (PHQ4). Patients were eligible for clinical psychology if they scored > 2 (mild distress). **Following screening:** Eligible patients were invited to participate in the service, which, as they were informed, was now routine care. Upon acceptance patients were booked for individual assessments with the physiotherapist or exercise physiologist, the dietitian, and the clinical psychologist if eligible. **Exercise Physiology/Physiotherapy:**  An individually tailored exercise program consisting of cardiovascular continuous moderate intensity aerobic and resistance exercise was prescribed at initial assessment. The exercise intervention was based upon initial assessment findings and aimed to progress towards meeting the Exercise and Sports Science Australia [10] and American College of Sports Medicine [11] recommendations of 150 minutes of moderate-intensity aerobic exercise and two resistance exercise sessions per week. Aerobic training modality (bike, walking, treadmill) was prescribed according to patient preference. Patients were instructed to monitor intensity via modified Borg scale (aiming for a moderate-high intensity ‘4-5 – somewhat hard’). Resistance exercise prescribed involved functional exercises which often included: sit to stand, heel-raises, squats, step ups, bench push ups, bicep curls, overhead press, shoulder abduction. Exercises were prescribed based on 10RM and then each exercise started at 80% of this, with patients performing 2 sets of 8-10 reps. Patients completed the program either independently at home, in a local gym, supervised at a community health centre or at the hospital gym. The program location was determined by patient residential location and preference and the level of supervision needed. Patients who attended the hospital gym were encouraged to attend at least two of the five group sessions offered weekly. Patients were supervised by exercise physiologists or physiotherapists and exercised using a treadmill or cycle for aerobic exercise and completed an individually tailored resistance program. Patients who would benefit from supervised exercise but were unable to attend the hospital gym due to location were referred to community exercise physiologists or physiotherapists to complete their prescribed program, with the recommendation to attend the community service at least twice a week. Patients with reported or perceived lack of motivation were referred to the psychology team if consenting. Home based exercise programs were printed or emailed to patients at initial assessment. **Nutrition:**  Patients received individually tailored medical nutrition therapy, information about the benefits of nutrition prehabilitation, prescription of relevant therapeutic diet, information including a handout on ‘nutrition during your Stem Cell Transplant’ and nutrition support and discussion of individual nutrition prehabilitation goals.**Psychology:** Patients received individualised psychological support based on initial assessment findings. Interventions included cognitive behavioural approaches to managing worry and pain, maintaining motivation, and activating supports in preparation for AuSCT. |
| **Item 5. Who Provided: for each category of intervention provider (for example, psychologist, nursing assistant), describe their expertise, background and any specific training given.**Staff delivering the service were physiotherapists or exercise physiologists with an average of three years specialised oncology experience; dietitians with an average of five years specialist oncology experience and a clinical psychologist with an average of 4 years specialist oncology experience.  |
| **Item 6. How: Describe the modes of delivery (such as face to face or by some other mechanism, such as internet or telephone) of the intervention and whether it was provided individually or in a group.****Exercise Physiology/Physiotherapy**: An initial individual face to face consultation at the hospital was conducted and treatment initiated. Patients completed the prescribed exercise intervention either independently at home, in a local gym, supervised at a community health centre or at the hospital gym. Patients who attended the hospital gym were encouraged to attend at least two of the five group sessions offered weekly. Weekly or fortnightly telehealth (via videoconferencing), phone or face-to-face follow-up progress review was planned for each patient if not attending weekly group supervised sessions. Frequency of review follow-up was determined by initial assessment, patients with poorer exercise capacity were followed up weekly (six-minute walk test distance <440m). **Nutrition**: Patients received individual consultations (either face-to-face in the hospital or via phone). Follow up appointments (either face-to-face in the hospital or via phone) were scheduled if indicated at the initial assessment.**Psychology**: Patients received individual face-to-face sessions in the hospital. Face-to-face follow up appointments were scheduled if indicated at the initial assessment.  |
| **Item 7. Where: Describe the type(s) of location(s) where the intervention occurred including any necessary infrastructure or relevant features.****Exercise Physiology/Physiotherapy**: Initial consultation occurred in the hospital gym. Patients completed the prescribed exercise intervention either independently at home, in a local gym, supervised at a community health centre or at the hospital gym. Weekly or fortnightly follow up occurred at the hospital gym or via phone or telehealth (videoconferencing). If follow up was via phone or telehealth this intervention occurred anywhere the patient had internet or phone access and an appropriate device (predominantly in the home environment).**Nutrition**: Initial and follow up appointments occurred either face-to-face in a clinic room at the hospital or via telephone. If follow up was via phone this intervention occurred anywhere the patient had phone access.**Psychology**: Initial and follow up appointments occurred face-to-face in a clinic room at the hospital.  |
| **Item 8. When and how much: Describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule and their duration, intensity or dose.**Prehabilitation programs were of 4-12 weeks duration depending on the timing of referral in relation to medical treatment interventions (autologous stem cell transplant).**Exercise Physiology/Physiotherapy**: The initial consultation was of 60 minutes’ duration. Patients who attended the hospital gym were encouraged to attend at least two of the five 60-minute group sessions offered weekly. Patients who did not attend the hospital gym and were completing their program at home were recommended to perform a minimum of 2 resistance and 3 aerobic exercise sessions a week [11]. Patients’ exercise programs were reviewed weekly – fortnightly for the duration of the prehabilitation program and were individually progressed as outlined in Item 9 below. Follow up appointments were scheduled for 30 minutes. **Nutrition**: The nutrition intervention consisted of 1-4 sessions of 20-minutes duration. The frequency of follow up appointments was based on individual assessment findings at the initial consultation, as outlined in Item 9 below. **Psychology:**  Patients received between 1 and 7 60-minute face-to-face sessions for psychological intervention. The frequency of follow up appointments was based on individual assessment findings at the initial consultation. |
| **Item 9. Tailoring: If the intervention was planned to be personalised, titrated or adapted, then describe what, why, when and how.****Exercise Physiology/Physiotherapy:**  Program adherence was monitored using patient self-report at follow up appointments. When patients reported improvements at follow-up appointments, resulting in exercises being performed at less than moderate intensity, the exercise parameters were progressed to maintain moderate intensity. If patients were unable to complete the prescribed program at moderate-intensity exercise parameters were reduced based on individual requirements. E.g.: 1. Progression of aerobic exercise program: ensure continuing to work at > Borg 3, increase aerobic duration, increase aerobic speed. If on bike can also increase resistance provided to ensure still achieving Borg 4.
2. Progression of strengthening exercise program; Increase until patient can perform 3 sets of 15 then increase weight/reduce chair seat height and drop back sets and reps to original number, gradually increase back to 2 sets of 15 then progress to 3 sets and repeat.

**Nutrition:** If a patient was not meeting their nutritional requirements (as assessed from a full dietetic assessment), or if they were classified as malnourished (PG-SGA B or C) then a follow up appointment would be made after the initial nutrition assessment and treatment. However, if on initial assessment the patient was meeting requirements and scored an ‘A’ on the PG-SGA then no further prehabilitation intervention was provided. **Psychology:** Modifications were made to patients’ treatment at follow up appointments based on individual feedback from the patient.  |
| **Item 10. Modifications.** The intervention was not modified. However, findings of this study will be used to modify the ongoing program.  |
| **Item 11. How well (planned): if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them.****Training of providers:** Staff were informed about the service during scheduled staff meetings. The program model of care was distributed, and outcome measure guidance provided to staff delivering the service. These were based on guidelines for exercise interventions and standardised measurement of specific outcomes using valid measures. Senior prehabilitation staff participated in weekly staff meetings during the first 6 months of service commencement where service challenges including assessment and intervention fidelity were discussed and processes refined. These meetings became monthly for the following 6 months. **Delivery of intervention:** An analysis of exercise intervention fidelity was conducted. Results of this analysis in conjunction with the implementation of electronic medical records (EMR) at the hospital in August 2020 led to changes in exercise prescription reporting and staff training. **Receipt of intervention**: Adherence to the prescribed exercise intervention was monitored using patient self-report at follow up assessment. Adherence to and fidelity of the nutrition and psychology interventions was not assessed. |
| **Item 12. How well (actual): if intervention adherence or fidelity was assessed, describe the extent to which the programme was delivered as planned.**Exercise treatment fidelity was evaluated. Evaluation involved a retrospective audit of the 116 patients who participated in the exercise prehabilitation program to review the proportion of patients who received the exercise intervention and assess whether the exercise parameters were documented by the clinician in the patient’s medical record based upon the frequency, intensity, time and type (FITT) exercise principles.  |

**References**

1. Silver JK, Baima J. Cancer prehabilitation: an opportunity to decrease treatment-related morbidity, increase cancer treatment options, and improve physical and psychological health outcomes. Am J Phys Med Rehabil. 2013;92(8):715-27.

2. Macmillan Cancer Support. Prehabilitation for people with cancer 2017.

3. Jacobsen PB, Le-Rademacher J, Jim H, Syrjala K, Wingard JR, Logan B, et al. Exercise and stress management training prior to hematopoietic cell transplantation: Blood and Marrow Transplant Clinical Trials Network (BMT CTN) 0902. Biol Blood Marrow Transplant. 2014;20(10):1530-6.

4. Coleman EA, Coon S, Hall-Barrow J, Richards K, Gaylor D, Stewart B. Feasibility of exercise during treatment for multiple myeloma. Cancer Nursing 2003 Oct-Nov;26(5):410-419. 2003.

5. van Haren I, Staal JB, Potting CM, Atsma F, Hoogeboom TJ, Blijlevens NMA, et al. Physical exercise prior to hematopoietic stem cell transplantation: A feasibility study. Physiother Theory Pract. 2018;34(10):747-56.

6. Wood WA, Phillips B, Smith-Ryan AE, Wilson D, Deal AM, Bailey C, et al. Personalized home-based interval exercise training may improve cardiorespiratory fitness in cancer patients preparing to undergo hematopoietic cell transplantation. Bone Marrow Transplantation. 2016;51(7):967-72.

7. Arends J, Bachmann P, Baracos V, Barthelemy N, Bertz H, Bozzetti F, et al. ESPEN guidelines on nutrition in cancer patients. Clin Nutr. 2017;36(1):11-48.

8. SimpleSet. SimpleSet 2009 [Available from: https://simpleset.net.

9. Abernethy AP, Shelby-James T, Fazekas BS, Woods D, Currow DC. The Australia-modified Karnofsky Performance Status (AKPS) scale: a revised scale for contemporary palliative care clinical practice [ISRCTN81117481]. BMC Palliat Care. 2005;4:7.

10. Hayes SC, Newton RU, Spence RR, Galvao DA. The Exercise and Sports Science Australia position statement: Exercise medicine in cancer management. J Sci Med Sport. 2019;22(11):1175-99.

11. Campbell KL, Winters-Stone KM, Wiskemann J, May AM, Schwartz AL, Courneya KS, et al. Exercise Guidelines for Cancer Survivors: Consensus Statement from International Multidisciplinary Roundtable. Med Sci Sports Exerc. 2019;51(11):2375-90.