Translating Research to Practice Using a Team-Based Approach to Cancer Rehabilitation: A Physical Therapy and Exercise-Based Cancer Rehabilitation Program Reduces Fatigue and Improves Aerobic Capacity

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Background and Objective: Intervention research has shown that exercise-based rehabilitation is safe and effective for reducing disease burden across the cancer continuum. However, the translation of this research to programs implemented in health care settings remains a challenge. This study describes the implementation of a physical therapy–based exercise program for patients who have been diagnosed with cancer and its effectiveness for reducing fatigue and improving aerobic capacity. **Methods:** Retrospective analysis of a single-group, pre/postprogram assessment for adult patients who have been diagnosed with cancer (N = 546). Six-Minute Walk Test (6MWT) measured aerobic capacity. Functional Assessment of Chronic Illness Therapy–Fatigue (FACIT-Fatigue) and Piper Fatigue Scale (PFS) measured fatigue. Paired-samples *t* tests examined changes in outcomes from pre- to postprogram assessments. Linear regression explored predictors of postprogram outcomes. **Results:** Participants were 63.7 ± 12.2 years old, diagnosed with breast (27.1%), hematological (15.4%), head and neck (12.6%), lung (12.3%), prostate (11%), colorectal (7.3%), or other (14.3%) cancers. For those who completed the postprogram measures (N = 169), FACIT-Fatigue scores improved ($M\Delta = +8.42 \pm 9.2$, $t_{79} = -8.21$, $P = .000$), PFS scores improved ($M\Delta = -2.1 \pm 2.0$, $t_{81} = 9.5$, $P = .000$), and 6MWT distance improved ($M\Delta = +42.9 \pm 53.8$ m, $t_{160} = -10.1$, $P = .000$). Age ($P = .034$) and time since completing chemotherapy ($P = .000$) or radiation therapy ($P = .014$) was inversely associated with the 6MWT. Greater exercise session attendance was associated with higher PFS scores ($P = .020$). **Limitations:** Only 31%

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The authors have full control of all primary data and agree to allow the journal to review data if requested.

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of participants completed postprogram assessments, and limited information was available regarding reasons for dropout/withdrawal. **Conclusions:** This study provides a real-world example of a cancer rehabilitation program implemented in a health care setting, which was successful in reducing fatigue and improving aerobic capacity. **(Rehab Oncol 2018;36:206–213)** *Key words: aerobic capacity, cancer, exercise, fatigue, rehabilitation*

The American Cancer Society estimates that, in 2017, there will be 1 688 780 new cancer diagnoses in the United States.[1] While advancements in screening and treatment techniques have reduced cancer mortality rates, there is considerable room for improvement in the rehabilitative care of this ever-growing population of patients who have had cancer.[2] Patients who have had cancer face numerous, negative, treatment-related side effects, many of which can be ameliorated by rehabilitative interventions that involve exercise.[3]

In the last 2 decades, intervention research and efficacy studies have shown exercise to be a safe and effective means of reducing disease burden across the cancer continuum by improving physical function and quality of life, reducing fatigue, and providing decreased risk of cancer-related mortality for some cancers.[4-8] Several community-based programs have corroborated the effectiveness of exercise for improving physical function and fitness, reducing fatigue, and improving quality of life in patients who have had cancer,[9-13] but integrating exercise and rehabilitation services into the cancer delivery system remains a challenge in the field.[3,14]

Only one previous study has described an exercise-based cancer rehabilitation program delivered in a clinical care setting and demonstrated its effectiveness for improving physical function and quality of life and reducing fatigue.[15] To move forward in translating intervention research into practice, a greater understanding of how exercise-based rehabilitation programs can be implemented and sustained in real-world health care–based settings is needed.[16] In addition, to move toward the development of clinical practice guidelines, and fully integrate exercise and rehabilitation services into the cancer delivery system, more studies that describe and evaluate existing programs are needed.

The purposes of this study are to (1) describe the implementation of a physical therapy–based exercise program delivered within a health care setting for patients who have had cancer and (2) evaluate its effectiveness for reducing fatigue and improving aerobic capacity. We hypothesize that fatigue will be reduced and aerobic capacity will improve from pre- to postprogram assessments.

METHODS

Design and Setting

This study was a retrospective analysis of a single-group physical therapy–based exercise program, with outcomes measured at pre- and postprogram assessments. Patients diagnosed with cancer received an initial evaluation and treatment visit with a physical therapist who developed the individualized exercise program for each patient. In the first evaluation session, the physical therapist identified any functional deficits (ie, postmastectomy care, lymphedema management, pelvic floor dysfunction, swallowing deficits, cognitive deficits, vestibular deficits, etc) and, if indicated, recommended additional skilled physical therapy sessions. All physical therapist visits were billed to either health insurance or paid out of pocket. Following the first 2 visits with the physical therapist, patients were referred to the exercise program. These patients then paid $6 per session to exercise twice per week under the supervision of a Clinical Cancer Exercise Specialist (CCES; https://www.cancerrehabexercise.com). After approximately 3 months, a reevaluation was scheduled with the same physical therapist.

Participants

This study includes patients who have been diagnosed with cancer and enrolled in the program between January 2012 and December 2015. Patients were referred by oncology clinicians or staff via the electronic medical record system and were required to have a physician referral to enroll in the program. Any adult with a history of cancer, and a referral signifying ability to participate in physical activity (ie, endorsing the safety of exercise for the patient), was eligible to enroll in the program during or after any cancer treatment. To begin the program, patients had to have the cognitive ability to read and follow directions and adequate balance to safely ambulate independently around the gym. If patients had an abnormal response to the baseline 6-Minute Walk Test (6MWT) (ie, drop in systolic blood pressure, chest pain, dizziness, signs of poor perfusion, shortness of breath) or were deemed by the physical therapist to be too ill to participate, they were sent back to their referring provider. This study was approved by the university's Institutional Review Board for the protection of human subjects. All data were stripped of identifying information prior to analysis to ensure patient confidentiality. For this type of study, formal consent was not required.

Exercise Sessions

Before August 2015, exercise sessions took place at Poudre Valley Hospital using the pulmonary rehabilitation gym. The exercise program consisted of supervised drop-in exercise sessions between 8:00 AM-12:00 PM and 1:00 PM-4:00 PM on Tuesdays and Thursdays. After August 2015, exercise sessions took place at the UC Health Cancer Center Harmony Campus) in gym space allocated to cancer rehabilitation. The exercise program consisted of supervised exercise sessions, with four 1-hour time blocks on Tuesdays and Thursdays to accommodate a maximum of 10 patients. Patients were given the choice of time depending which classes had space available but were able to adjust as needed to accommodate chemotherapy and/or radiation therapy visits. Exercise sessions followed the same format at both locations. Sessions lasted approximately 1 hour and consisted of low- to moderate-intensity aerobic, resistance, and balance exercises. Exercise intensity, duration, and modality were determined for each patient by the physical therapist based on results from the initial assessment, patient medical and treatment history, and presence of any functional limitations or comorbidities. The CCES oversaw program modifications, only referring back to the physical therapist if there were changes to the patient's health or treatment plan. To ensure safety of patients, vital signs (ie, heart rate, blood pressure, and oxygen saturation) were monitored before and after each exercise session. Aerobic exercise was performed for 10 to 20 minutes using a NuStep (ie, recumbent elliptical trainer), cycle or arm ergometer, or treadmill. The remainder of the session consisted of resistance exercise, targeting all major muscle groups and using body weight, resistance bands, and dumbbells, with a goal of 3 sets of 10 repetitions for each exercise. Participants were encouraged to exercise at an intensity equivalent to 11 to 14 rating of perceived exertion (RPE) on the 6 to 20 Borg scale of RPE ("Fairly light to somewhat hard"). The CCES monitored RPE throughout the session, instructing patients to increase or decrease their intensity if the RPE fell outside of the 11 to 14 range. Aerobic exercise intensity was progressed by the smallest increment possible (eg, 1 level on the NuStep), and resistance exercise was progressed by first increasing repetitions and then load by the smallest increment possible. Refer to the Appendix for a summary of the exercise prescription.

Outcome Measures

Cancer diagnosis and treatment information was retrieved from a cancer registry database through linkage of medical record number. At baseline, participants reported age and sex, completed a questionnaire to rate fatigue, and performed the 6MWT to assess aerobic capacity. The 6MWT measures the distance someone can walk quickly on a flat, hard surface in 6 minutes and may reflects a person's ability to perform daily physical activities. The 6MWT was administered by the physical therapist using 2 cones 100 ft apart in a hallway within the facility following standard instructions.[17] A 14- to 30.5-m improvement has been previously reported as the minimally clinically important difference (MCID) across multiple patient groups.[18]

For the first 2 years of the program, fatigue was measured by the Piper Fatigue Scale (PFS).[19] The PFS is a 22-item questionnaire on a scale of 0 to 10, with a lower score indicating less fatigue. A PFS score of 4 or more indicates moderate or greater fatigue.[19,20] In 2014, the fatigue measure was changed to the Functional Assessment of Chronic Illness Therapy–Fatigue (FACIT-Fatigue) in order to have a consistent survey tool that could be used by multiple disciplines throughout the oncology service line and one with an established MCID.[21] The FACIT-Fatigue (version 4) is a 13-item questionnaire on a scale of 0 to 52, with a higher score indicating less fatigue and a change of 3 points considered and MCID.[21,22] Participants completed a postprogram assessment with the same measures.

Statistical Analyses

Baseline characteristics were compared between all patients who enrolled and those who completed postprogram assessments using mean and χ^2 tests. Only participants who completed postprogram assessments were included in analyses that examined changes in outcomes from baseline to postprogram assessments. Changes in outcome variables from baseline to postprogram assessments were evaluated using paired-samples *t* tests. To combine the 2 different measures of fatigue, a Fatigue *Z* score was created by centering and scaling each of the PFS and FACIT-Fatigue scores. Normality was visually considered using box-and-whisker plots, distributions of the change in the outcome variables were considered, and observations that had a difference between baseline and postprogram scores that were more than 3 observations from the mean were removed from analyses. We calculated the percentage of patients who reached or exceeded the published MCID threshold, when available. Analyses were conducted using SAS v 9.4.

Individual multiple regression analyses with dependent variables of the postprogram outcome (6MWT, PFS, and FACIT-Fatigue, Fatigue *Z* scores) were conducted to explore the effects of age, sex, diagnosis, treatment variables, and exercise session attendance. Baseline values of the respective postprogram outcome were included in each analysis. A significance level of .05 was used for all tests of significance.

RESULTS

A total of 546 patients enrolled in the program and completed baseline assessments, and 169 (31%) completed postprogram assessments. Assessments were on average 3.27 ± 1.02 months apart, and participants who completed postprogram assessments attended an average of 18.7 ± 7.6 exercise sessions. Program participants were primarily older adults ($M \pm SD = 63.7 \pm 12.2$ years), female (57%), and began the program within 1 year of completing chemotherapy ($M \pm SD = 8.0 \pm 19.4$ months) or radiation therapy ($M \pm SD = 8.4 \pm 17.4$ months). Most participants had completed chemotherapy (58.8%) or radiation therapy (72.9%) before beginning the program. The most common type of cancer was breast (27.1%), followed by hematological (15.4%), and cancer stage (0/I/II vs III/IV) was evenly split (∼36%).

Table 1 describes the baseline demographic and medical characteristics of all study participants. Compared with participants who enrolled but did not complete postprogram assessments, those who completed postprogram

TABLE 1
Study Participant Characteristics

	Enrolled in Program (N = 546)	Completed Baseline and Postprogram Assessment (N = 169)
Age, mean (SD)	63.7 (12.2)	68.3 (10.3)[a]
Sex, n (%)		
Female	309 (56.7)	91 (53.9)
Male	236 (43.3)	77 (45.8)
Cancer type, n (%)		
Breast	148 (27.1)	44 (26.0)
Hematological	84 (15.4)	35 (20.7)
Brain, head, and neck	69 (12.6)	24 (14.2)
Lung	67 (12.3)	15 (8.9)
Prostate and urological	60 (11.0)	18 (10.7)
Colorectal	40 (7.3)	13 (7.7)
Gynecological	28 (5.1)	7 (4.1)
Other, multiple	50 (9.2)	13 (7.7)
Stage, n (%)		
0/I/II	199 (36.5)	68 (40.2)
II/IV	196 (35.9)	55 (32.5)
Undetermined/missing	151 (27.7)	46 (27.2)
Received chemotherapy or radiation therapy, n (%)		
Yes	414 (87.9)	124 (84.9)
No	57 (12.1)	22 (15.1)
Missing	*N*=75	*N*=23
On chemotherapy during program, n (%)		
Yes	111 (20.3)	34 (20.1)
No	321 (58.8)	96 (56.8)
Missing	114 (20.9)	39 (23.1)
On radiation therapy during program, n (%)		
Yes	70 (12.8)	13 (7.7)
No	398 (72.9)	131 (77.5)
Missing	78 (14.3)	25 (14.8)
Exercise session attendance, mean (SD)	9.1 (9.5)	18.7 (7.6)[a]
Months between chemotherapy end and program start, mean (SD)	8.0 (19.4)	8.0 (15.0)
Months between radiation therapy end and program start, mean (SD)	8.4 (17.4)	10.7 (19.2)
6MWT, mean (SD)	409.0 (119.3)	405.24 (106.2)
Baseline revised PFS (N = 257; 82), mean (SD)	5.14 (1.91)	4.7 (2.0)
Baseline FACIT-Fatigue (N = 282; 82), mean (SD)	28.2 (11.6)	28.1 (12.1)
Fatigue *Z* score (N = 539; 164), mean (SD)	− 0.0002 (1.00)	− 0.11 (1.0)

Abbreviations: FACIT, Functional Assessment of Chronic Illness Therapy; PFS, Piper Fatigue Scale; 6MWT, 6-Minute Walk Test.
[a]Significantly different between groups ($P < .05$).

assessments were older ($t_{168} = 5.78$, $P < .005$) and attended more exercise sessions ($t_{168} = 11.94$, $P < .005$). No other baseline characteristics were different between the 2 groups.

There was a significant improvement in 6MWT, PFS, FACIT-Fatigue, and Fatigue *Z* scores from baseline to postprogram assessments (Table 2). The average increase (ie, improvement) in 6MWT distance was 42.9 ± 53.8 m, and 56.4% of participants improved by at least 30 m. The average decrease (ie, improvement) in PFS scores was 2.1 ± 2.0. At baseline, 72% of participants had a PFS score of 4 or more; at postprogram assessments, 21% of participants had a PFS score of 4 or more. The average increase (ie, improvement) in FACIT-Fatigue scores was 8.4 points, and 90% of participants had a change that was more than 3 points.[22]

Significant predictors of postprogram 6MWT distance were age and time between chemotherapy and radiation therapy completion and baseline assessment (Table 3). With increasing age and greater time between chemotherapy or radiation therapy end and program start, 6MWT distance decreased. Attending more exercise classes was associated with higher PFS scores (ie, more fatigue) (Table 3). More time between radiation completion and baseline assessment was associated with lower FACIT-Fatigue scores (ie, more fatigue) (Table 3).

DISCUSSION

The aim of this study was to describe the implementation of an exercise-based cancer rehabilitation program within a health care setting and its effectiveness for reducing fatigue and improving aerobic capacity. Results support the hypothesis that fatigue would be reduced and aerobic capacity would be improved from pre- to postprogram assessments.

From baseline to postprogram assessments, there were significant improvements in 6MWT distance and

TABLE 2

Change in Outcomes From Baseline to Postprogram Assessment

	N	Baseline, Mean (SD)	Postprogram Assessment, Mean (SD)	Change, Mean (SD)	*t*, *P*
6MWT, m	161	405.6 (103.1)	448.5 (111.5)	+42.9 (53.8)	−10.1, $P < .001$
PFS (0-10)	82	4.7 (2.0)	2.6 (1.9)	− 2.1 (2.0)	9.5, $P < .001$
FACIT-Fatigue (0-52)	82	28.7 (11.6)	37.2 (8.8)	+8.4 (9.2)	−8.2, $P < .001$
Fatigue *Z* score	162	− 0.1 (1.0)	0.02 (1.0)	+0.2 (1.0)	−2.0, $P = .0467$

Abbreviations: FACIT, Functional Assessment of Chronic Illness Therapy (higher score indicates less fatigue); PFS, Piper Fatigue Scale (higher score indicates more fatigue); 6MWT, 6-Minute Walk Test.

reduction in fatigue. These findings corroborate a previous study that evaluated the effectiveness of a hospital-based cancer rehabilitation program.[15] Our study found that 6MWT distance increased by an average of 43 m comparable with the 46-m increase found by Kirkham et al.[15] This average increase is a clinically important difference, exceeding the range of 14 to 30.5 m suggested by a recent review of changes in 6MWT distance of adults with a variety of medical issues,[18] and was also comparable to a large, community-based exercise program for cancer survivors that found a 29-m difference between the exercise and control groups.[13]

We found an average decrease of 2.1 on PFS scores (ie, less fatigue) from pre- to postprogram assessments, which is similar to a study in posttreatment breast cancer survivors that found an average decrease of 2.0 on PFS scores following an aquatic-based exercise intervention.[23] We also found that fatigue, when measured by the FACIT-Fatigue questionnaire, reduced following the program. FACIT-Fatigue scores increased 8.4 points (higher scores indicate less fatigue), which exceeds the MCID of 3.[22]

This study also found that age was a significant predictor of aerobic capacity, with older age predicting shorter 6MWT distance. We found that every 10-year increase in age corresponded with a 10-m decrease in 6MWT distance. This finding is similar to those of Kirkham et al, who found that older age was associated with lower aerobic capacity following a hospital-based cancer rehabilitation program.[15] Aging is a heterogeneous process, and although older adults are more likely to have other co-occurring conditions besides cancer (eg, diabetes, arthritis, and other geriatric syndromes), it is important to be aware of their abilities and functional status prior to cancer treatment and rehabilitation to provide a better sense of their ability to recover.[24]

Postprogram 6MWT distance was also associated with the time between treatment end and program start, with *less* improvement occurring in those who had *more* time since completing chemotherapy or radiation therapy. For example, those who completed chemotherapy less than 2 months before starting the program increased their postprogram 6MWT distance by 49.1 ± 58.3 m compared with 23.2 ± 46.8 m for those who completed chemotherapy more than 2 months before starting the program. This trend was similar for changes in fatigue, with less improvement in PFS scores occurring in those who had *more* time since completing chemotherapy and less improvement in FACIT-Fatigue scores for those who had *more* time since completing radiation therapy. For example, those who completed chemotherapy less than 2 months before starting the program decreased their PFS scores (ie, lowered fatigue) by 2.8 ± 1.9 compared with 1.7 ± 2.4 for those who completed chemotherapy more than 2 months before starting the program. Baseline scores for the 6MWT, PFS, or FACIT-Fatigue tended to be lower for those who were within 2 months of completing treatment (vs those >2 months), potentially explaining the greater magnitude of change; however, these baseline differences were not significant. This seemingly contradictory finding of greater time since treatment completion and lesser improvement in outcomes replicates the finding of Kirkham et al, who also found less improvement in 6MWT distance occurring

TABLE 3

Variables Predicting Postprogram Outcomes[a]

	Coefficient (95% CI)	*P*
Significant predictors of the 6MWT		
Age	− 1.01 (−1.94 to −0.08)	.034
Days between chemotherapy end and program start	− 0.04 (−0.06 to −0.02)	.000
Days between radiation therapy end and program start	− 0.03 (−0.05 to −0.01)	.014
Significant predictors PFS		
Exercise session attendance	0.06 (0.01 to 0.11)	.020
Significant predictors of FACIT-Fatigue		
Days between radiation therapy end and program start	− 0.01 (−0.02 to 0.0002)	.045

Abbreviations: FACIT, Functional Assessment of Chronic Illness Therapy; PFS, Piper Fatigue Scale; 6MWT, 6-Minute Walk Test.
[a]All models controlled for baseline values of the outcome variable.

in those who had completed radiation treatment than in those who were receiving radiation treatment during the program.[15]

Attending exercise sessions was associated with postprogram PFS scores, with those who attended more sessions having higher PFS scores (ie, worse fatigue). The effect of exercise programs conducted outside a research setting on fatigue is inconsistent,[25-27] and similarly, our study did not find a relationship with exercise session attendance and FACIT-Fatigue or Fatigue *Z* scores. Furthermore, the small coefficient for attendance and PFS, and a small bivariate correlation ($r = 0.25$) between these 2 variables, suggests that the number of exercise sessions attended may not have had a clinically relevant effect on postprogram fatigue. More research using consistent measures of fatigue, and examining the dose response of exercise and fatigue (eg, frequency and intensity of exercise, duration of program), is needed to further understand the relationship between exercise and fatigue.

Strengths and Limitations

To our knowledge, this is only the second published report of an exercise-based cancer rehabilitation program delivered in a health care or clinical setting (vs a community-based fitness facility or research setting). A similar design and large sample size allowed us to draw comparisons between our findings and those of Kirkham et al.[15] A strength of this study is a sample of predominantly older cancer survivors. More than half of the sample was 65 years or older and had an average age of 63.7 ± 12.2 years. By 2030, more than 70% of all patients diagnosed with cancer will be in this age group, making research that includes older adults with cancer extremely valuable. This program was not designed for ad hoc research but has been sustained in practice for 6 years (as of 2018). Evaluation of programs such as this is paramount to understanding what is working and the improvements needed to enhance effectiveness. A major strength of the delivery of this program was the team-based approach of the physical therapist and the CCES. This allowed direct referral to the program from oncology clinicians and staff through the electronic medical record system, for physical therapy sessions to guide treatment based on initial evaluation needs, and for these sessions to be reimbursable by health insurance. To enhance consistency of data collection, and reduce between-person errors, the same clinician completed baseline and postprogram evaluations. The retrospective design allowed us to assess this program in a true "real-world" setting (ie, not informed by ad hoc research); however, this design does introduce limitations.

First, the 31% completion rate was lower than that reported in the other community-based exercise programs for cancer survivors, and the only other report of a cancer rehabilitation program delivered in a health care setting, in which 44% of participants completed baseline and postprogram assessments.[9,11,13,15,28] This low completion rate potentially introduces positive bias (ie, only the patients who were "doing well" completed the program), although our comparison of available characteristics between all participants enrolled and those who completed postprogram assessments revealed few significant differences. In addition, without information regarding reasons for dropout, we cannot draw further conclusions regarding characteristics of completers versus not completers. Future cancer rehabilitation programs should be sure to assess additional factors that may influence dropout or withdrawal (eg, employment status, income) and collect information about the participants who dropout or withdraw. Second, the fatigue measure was not consistent throughout the program, reducing our sample size for analyses. However, when the measures were combined using a *Z* score, results still showed significant reduction in fatigue. Prior to initiation, future cancer rehabilitation programs may consider consultation with published literature and/or experts in a given outcome of interest to determine the most appropriate measurement tool. Third, although the assessments done by the physical therapist allow for insurance reimbursement, clinical time constraints may not allow for more comprehensive outcome measures (eg, balance/fall risk, muscular strength or endurance, body composition, blood pressure) or information that may impact program effectiveness (eg, smoking status, current levels of physical activity, physical activity readiness or previous experience, demographic information such as marital status, income, education). One suggestion might be to build these measures into the exercise sessions and/or use patient-reported methods that decrease time burden for the patient and the clinician (eg, single-question measures, take-home or online measures, and use of iPad or other technologies).

Conclusions and Future Directions

A cancer rehabilitation program led by a physical therapist and a CCES and delivered in a health care setting was effective for improving aerobic capacity and reducing fatigue in cancer survivors. Participants, regardless of tumor type or cancer stage, experienced clinically important improvements in aerobic capacity and reduction in fatigue.

Program structure (ie, set class times, and prepayment) may enhance attendance and program completion rates. Previous studies suggest that this structure, similar to a cardiac rehabilitation model, is adaptive to patients with cancer, feasible in patients diagnosed with breast and colorectal cancer,[29,30] and effective in improving fitness and quality of life in patients diagnosed with breast cancer.[30] In preliminary analyses comparing program completion and exercise session attendance (before August 2015: N = 443; after August 2015: N = 103), we did not find differences after transitioning to a set class time in the program after August 2015 (before vs after August 2015: 31% vs 28% completed postprogram assessments, 36% vs 26% attended ≥12 exercise sessions). Moving forward, this program will continue to use set class times instead of drop-in/open gym because it is more cost-effective (eg open gym would often have hours with no patients, and paying the exercise physiologist for this time was not fiscally responsible) and enhances patient safety by limiting the number of participants per class.

To increase the potential for dissemination, future cancer rehabilitation programs should take steps to enhance generalizability. This includes gathering information about program reach (ie, what percentage of the target population participates), representativeness (eg, income, ethnicity, insurance coverage), and reasons for withdrawal or discontinuation. Future programs might also consider nonburdensome strategies to incorporate additional outcome measures that assess physical function (eg, strength, balance) and assess past physical activity experience and preferences to help tailor exercise sessions and improve long-term exercise adherence.[31]

Overall, this study demonstrates successful implementation and effectiveness of an exercise-based cancer rehabilitation program delivered in a health care setting, supporting the need to adopt cancer rehabilitation as part of standard oncology care.

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APPENDIX

Exercise Prescription

	Frequency	Intensity	Time	Type	Progression
Aerobic	2 d/wk	RPE 11-14	10-20 min per session	NuStep, elliptical trainer, recumbent bike, treadmill	Time in 2- to 5-min increments and then intensity incrementally (eg, increase by 1 level)
Resistance	2 d/wk	RPE 11-14; initial load for upper-body exercises set at 50% 1RM	3 sets of 10 repetitions for each exercise, 30-45 min per session	Upper-body exercises using resistance bands and dumbbells; lower-body exercises using body weight; specific exercises were selected on the basis of functional deficits identified by the physical therapist and patient-specific ability and goals	Increase repetitions first, up to 20 per set, and then increase load by the smallest increment possible

Abbreviations: RPE, rating of perceived exertion on a scale of 6 to 20; 1RM, 1 repetition maximum.