Cancer-related fatigue is one of the most common and distressing side effects experienced by patients with cancer. Increased activity and exercise have been shown to significantly impact cancer-related fatigue and are beneficial during and after treatment. This article describes the development and implementation of a 12-week evidence-based exercise and education program for cancer survivors in a community medical center. Participants consistently reported significant improvements in fatigue, depression, sleep disturbances, pain, and quality of life. The improvements were independent of the type of cancer, extent of disease, or treatment status. Additional benefits described by participants were support, a sense of belonging, and being understood.

Background

Well-established evidence from randomized, controlled trials supports increased physical activity and exercise as an intervention to significantly impact CRF during and following cancer treatment (Cramp & Bryon-Daniel, 2012; Litterini & Jette, 2011; Stricker, Drake, Hoyer, & Mock, 2004). Of the nonpharmacologic interventions recommended by the NCCN (2013) and the Oncology Nursing Society Putting Evidence Into Practice resources (Mitchell & Beck, 2009), exercise has the strongest evidence for treating fatigue. Quality of life, sleep disturbances (Young-McCaughan et al., 2003), pain, and depressive symptoms also have been shown to improve with exercise (Visovsky & Dvorak, 2005). In addition, evidence suggests that psychosocial interventions that include education, stress management, and support groups improve energy and reduce fatigue (Knobf, Musanti, & Dorward, 2007; Schwartz, 2007).

Program Development

LifeSpring, an exercise and education program for individuals with cancer, was developed in 2007 to impact CRF. The brainchild of an oncology clinical nurse specialist (CNS) and director of health enhancement services, the program was created using the successful model from cardiac rehabilitation (American Association of Cardiovascular and Pulmonary Rehabilitation, 1999) and the increasing evidence in the oncology nursing and physical therapy literature on the impact of physical exercise on CRF. Led by a physical therapist, an interdisciplinary team of medical and radiation oncologists, general surgeons, nurses, and cancer survivors provided input into the structure, content, and format of the program. For additional insight, information on participant recruitment and retention, program design, education session topics, screening tools, and anecdotal reports of successes and failures from other cancer recovery programs were obtained through phone interviews with program leaders. The program is provided at no cost to participants. Funding is provided by the medical center’s foundation and covers the cost of t-shirts with the LifeSpring logo, resistance bands for home use for each participant, handout materials, snacks, and balloons to release at graduation. The therapist time for planning, preparation, and session facilitation is reimbursed by the foundation. Honoraria for several speakers (e.g., art therapist, women’s health
Each exercise session includes 20–30 minutes of aerobic exercise and 20–30 minutes of group exercises.

Program Components

During the first half hour, participants perform five-minute intervals of their choice of the following: stationary bike, treadmill, walking on the indoor track, recumbent stepper (Nu-SteP), or upper-body ergometer. Participants monitor the intensity of their exercise using heart rate (to stay in their predetermined target heart rate zone) or the Rate of Perceived Exertion scale, which ranges from 6 (sensations of exertion during rest) to 20 (maximal level of exertion) (target range = 11–13). Participants who cannot sustain 20–30 minutes of exercise are encouraged to alternate rest periods for every other five-minute interval. The physical therapist assists participants with set-up of the machines and provides encouragement, in addition to assessing participant performance and recommending changes in intensity, mode of exercise, and positioning. The second half hour focuses on a different mode of exercise each session. These include (a) resistance training with elastic bands, dumbbells, or machines; (b) balance, stretching, and flexibility; (c) relaxation; (d) yoga, Pilates, or BODYFLOW; or (e) aquatic exercises in a warm water pool.

The number of participants in each class ranged from 5–19. The second class, with 19 individuals who started and completed the program, created challenges for the therapist in providing individualized support and resulted in a decision to limit the class to 12 participants from then on.

The comprehensive educational topics were developed with input from the medical community and cancer survivors to provide a holistic approach to recovery of body, mind, and spirit. The sessions are led by content experts and include discussion that allows participants to share ideas, provide encouragement, and ask questions in the small group supportive environment facilitated by the speaker. Initial topics included exercise and cancer, nutrition, healing arts, managing menopausal symptoms, lymphedema, communication and coping, relaxation, spirituality, and sleep (see Figure 1). LifeSpring initially was limited to women diagnosed with breast cancer, as recommendations from other programs were to start small, adjust as needed, and then expand.

Assessment

Outcome analysis of the first three programs found the improvement in fatigue ratings was significant only in women who were five or fewer years since diagnosis (p = 0.005) compared

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**TABLE 1. Sample Program Calendar**

<table>
<thead>
<tr>
<th>Week</th>
<th>Education Topic or Class</th>
<th>Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Welcome, group introductions, facility tour, Strength Training 101</td>
<td>Stretch, aerobic exercise, and strength with dumbbells and resistance bands</td>
</tr>
<tr>
<td>2</td>
<td>Exercise and Cancer</td>
<td>Stretch, aerobic exercise, and strength with dumbbells and resistance bands</td>
</tr>
<tr>
<td>3</td>
<td>Lymphedema</td>
<td>Yoga</td>
</tr>
<tr>
<td>4</td>
<td>Nutrition 101</td>
<td>Aquatic exercise in warm water therapy pool</td>
</tr>
<tr>
<td>5</td>
<td>Managing Menopausal Symptoms or Cognitive Dysfunction</td>
<td>Stretch, aerobic exercise, and strength with dumbbells and resistance bands</td>
</tr>
<tr>
<td>6</td>
<td>Nutrition 102</td>
<td>Stretch, aerobic exercise, and strength with dumbbells and resistance bands</td>
</tr>
<tr>
<td>7</td>
<td>Healing Arts</td>
<td>Aerobic exercise followed by BODYFLOW™</td>
</tr>
<tr>
<td>8</td>
<td>Communication and Coping</td>
<td>Aerobic exercise followed by Pilates</td>
</tr>
<tr>
<td>9</td>
<td>Relaxation Techniques</td>
<td>Stretch, aerobic exercise, and strength with dumbbells and resistance bands</td>
</tr>
<tr>
<td>10</td>
<td>Spirituality</td>
<td>Aquatic exercise in warm water therapy pool</td>
</tr>
<tr>
<td>11</td>
<td>Sleep</td>
<td>Stretch, aerobic exercise, and strength with dumbbells and resistance bands</td>
</tr>
<tr>
<td>12</td>
<td>Review of individual exercise plans and graduation party</td>
<td>Stretch, aerobic exercise, and strength with dumbbells and resistance bands</td>
</tr>
</tbody>
</table>

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**Implications for Practice**

- Exercise interventions for cancer-related fatigue should include aerobic activity and resistance training.
- Significant improvement in depression, sleep disturbances, pain, and quality of life can be realized by cancer survivors, regardless of cancer type, treatment status, or disease stage.
- The support, encouragement, understanding, and friendships patients gain in an exercise intervention contribute to emotional and spiritual recovery after a cancer diagnosis.
with women who were diagnosed more than five years prior (p = 0.88). In addition, women who were in active treatment showed significant improvement in the areas of fatigue (p < 0.01) and quality of life (p < 0.01) compared to women not in treatment. As a result of those findings, an overwhelming interest among patients with other cancer types, and referrals from medical oncologists, the program was expanded to all adults diagnosed with cancer within the previous two years or currently in treatment. With the expansion of the program to include all types of cancer, the classes on lymphedema and managing menopausal symptoms were discontinued and cognitive dysfunction and strength training were added because of their relevance to more participants.

All participants are screened by a physical therapist and oncology CNS one to two weeks prior to the start of the program. The CNS reviews individual medical histories, including type of cancer and date of diagnosis; treatment, including surgical procedures, specific chemotherapy drugs, hormone therapy, and radiation therapy; and status of treatment and current side effects (e.g., neuropathies, pain syndromes, cardiotoxicity, myelosuppression). Participants currently on chemotherapy receive information on adjustments to their exercise regimen if they experience a low platelet count or instructions to not attend the next session if their absolute neutrophil count is less than 1,000/mm³ because of increased risk of infection.

Each participant completes a self-assessment of their fatigue, depression, pain, sleep, and quality of life. As fatigue more commonly clusters with sleep disturbance, depression, or pain, assessment of all potential related or causative factors is recommended (Barsevick, 2007; NCCN, 2013). The assessment developed for the program uses a single question for each item (e.g., “How would you rate your fatigue during the past week?”) with a response on a 0–10 scale, with higher scores indicating worse symptoms, as supported by Varricchio (2006). Additional assessment is completed for scores of 5 or higher to determine whether more interventions or referrals for pain or depression are needed. The self-assessment is completed again at six weeks and at the completion of the 12-week program to evaluate symptoms and overall quality of life. Results provide participants with a personal progress report and assist staff in evaluation of program goals and justification for continued program funding.

The physical therapist records vital signs (e.g., heart rate, blood pressure), self-reported height and weight, grip strength, hamstring flexibility, shoulder flexibility, and two-minute step test at baseline prior to the first class. These screening tools were selected based on ease of instructions and performance, established norms for healthy individuals, and being commonly used. The screening tools are modified for participants who are unable to complete them in the standard position. Each participant also is educated on the physical activity portion of LifeSpring and assured that the exercise is tailored for their fitness level and adjusted as needed throughout the program.

LifeSpring is offered three times a year on weekday evenings. Several morning sessions were held during the first three years but were discontinued because of limited participation.

Results

Nineteen sessions have been provided since 2007, with 182 individuals participating and 152 (80%) completing the program.

Women (n = 139, 91%) with breast cancer (n = 96, 63%) and individuals with local or regional disease (n = 135, 89%) comprise the majority of participants completing the program (see Table 2). However, 17 (11%) participants had known metastatic disease at the time of enrollment. The primary reason for program incompleteness was difficulty attending sessions because of treatment schedules or dealing with treatment side effects (n = 23). Other reasons included increased weakness and symptoms from disease progression (n = 7), with two of the individuals dying from progression of their disease during the program. An additional 15 individuals expressed interest in participating but did not complete the program because of limited participation.

Cognitive Dysfunction: Chemotherapy may affect memory and concentration, or what is referred to as “brain fog.” You will obtain information about brain fog—what can affect it and effective treatments.

Communication and Coping: You survived cancer, now thrive in relationships with your spouse, children, family, coworkers, and friends. Learn practical tips for improving intimate relationships, adjusting to changing relationships, and communicating effectively.

Exercise and Cancer: Physical activity provides an opportunity to regain a sense of control, to renew and restore the body, and to boost the immune system. Experience a variety of exercises, and learn how the right exercise, intensity, and technique will help you reach your fitness goals.

Healing Arts: Art can serve as a doorway to well-being and recovery. It also can expand horizons and create an outlet for feelings and emotions. You’ll take part in a unique art project that provides you with a lasting keepsake. Prior knowledge or training is not required—just you and the creativity within you!

Lymphedema: Preventable, treatable! Swelling in the arm or trunk after breast and lymph node surgery can impair overall function. Learn ways to decrease risk for lymphedema and treatment options available if it develops.

Managing Menopausal Symptoms: Become proactive in understanding the causes and symptoms of menopause, choices for treatment, and the best overall strategy for managing the changes that occur during this transition.

Nutrition 101: Learn about nutrition needs during and after treatment, and how a well-balanced nutrition plan can improve tolerance and response to therapy and promote recovery. Develop tools to get the extra nutrition your body needs and handle side effects that interfere with eating.

Nutrition 102: Successful weight management depends on lifestyle changes. You’ll get the tools to healthy eating habits as our registered dietitians educate and entertain you with easy-to-fix recipes and a cooking demonstration.

Relaxation Techniques: Coping with stress during life-changing events can be very difficult. You will learn and experience relaxation techniques to assist in healthy management during this stressful time.

Sleep: Good sleep is one of several mind-body factors that can improve overall well-being. Interruptions in sleep cycles can alter the balance of hormones that influence cancer. Learn ways to improve your own sleep habits.

Spirituality: Gain inner awareness and understand the role emotions and spirituality play in overall wellness.

Strength Training 101: Strength-training concepts will be reviewed along with ways to be successful long-term with your exercise and barriers that may exist.
TABLE 2. Sample Characteristics (N = 152)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>X</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>54.57</td>
<td>12.3</td>
<td>23–87</td>
</tr>
</tbody>
</table>

**Gender**
- Female: 139 (91)
- Male: 13 (9)

**Treatment status**
- Undergoing treatment: 58 (38)
- Completed treatment:
  - Two years or more prior: 64 (42)
  - Less than two years prior: 30 (20)

**Type of cancer**
- Breast: 96 (63)
- Lung: 6 (4)
- Ovarian: 6 (4)
- Uterine: 6 (4)
- Colon: 5 (3)
- Hodgkin lymphoma: 4 (3)
- Myeloma: 3 (2)
- Non-Hodgkin lymphoma: 3 (2)
- Prostate: 3 (2)
- Other*: 20 (13)

*Includes anal, bladder, brain, cervical, fallopian tube, skin, thyroid, and tonsil cancers, as well as acute lymphoblastic leukemia, chronic lymphocytic leukemia, and sarcoma

were determined to not be appropriate during the preprogram assessments. Gait disturbances from peripheral neuropathies, significant hypertension, and exertional dyspnea because of cardiotoxicity were several findings requiring medical evaluation. A physical therapy referral was made for participants who demonstrated functional impairments (n = 6), but that did not preclude them from participating in LifeSpring. For five individuals participating in the program, the presence of lymphedema or the need for manual therapy for soft tissue restrictions related to surgery or radiation therapy was identified and an appropriate referral was provided.

Participants consistently report improvements in their fatigue, pain, sleep disturbances, depression, and quality of life, as evidenced from their pre-, mid-, and postprogram scores (see Table 3). The improvements are independent of the type of cancer, extent of disease, or treatment status. Although 152 participants completed the program, all three assessments were completed by 80% of those participants (n = 121). Only participants who completed all three assessment scores were included in the statistical analysis. Mean fatigue, pain, depression, sleep, and quality-of-life scores all declined during the course of the program, with all changes being statistically significant.

### Discussion

Improvement in fatigue both during and after treatment is consistent with the findings of Cramp and Bryon-Daniel (2012), Litterini and Jette (2011), Mitchell and Beck (2009), NCCN (2013), and Stricker et al. (2004). In addition, improvements in depression, pain, and quality of life following aerobic exercise during or following treatment are consistent with the findings of Visovsky and Dvorak (2005) and Knobf et al. (2007).

#### Participant Perceptions of Program Benefits

The immeasurable benefits of the program are support, sense of belonging, and being understood, as illustrated by participant comments shared at the program’s graduation.

LifeSpring has helped me feel less alone in my battle with breast cancer! And . . . has helped me get back into running and exercise.

The class has been absolutely great! I do have more energy, better blood pressure, and sleep great—especially after swimming.

Went on the three-mile Race for the Cure—I couldn’t have done it without this group.

This group has been more of a support to me than my family and friends.

This program has enabled me to be more positive and to have more energy because of the exercise sessions.

After 12 weeks, you will find that you have enriched your life with a network of support and a feeling of accomplishment. LifeSpring is an exercise and education program with a healthy dose of laughter and friendship.

One participant, a 52-year-old woman who started the program after a stem cell transplantation for acute lymphoblastic leukemia, eloquently described the goals of the program—physical, emotional, and spiritual recovery after a cancer diagnosis. After spending five months in treatment, I am still trying to get back to a “new” normal that I can live with. It is difficult to express all that LifeSpring has done for me. I am physically better than before, even after having to miss about two weeks of class because of shingles. My endurance and flexibility [are] increased. I am now able to bend to the ground to pick up something or clean without a struggle, so my life is enhanced. Most of us discussed that we would not have entertained the idea of getting into a swimming suit or a

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Preprogram</th>
<th>Midprogram</th>
<th>Postprogram</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue</td>
<td>5.58</td>
<td>4.51</td>
<td>3.55</td>
<td>1.86</td>
</tr>
<tr>
<td>Pain</td>
<td>2.52</td>
<td>2.23</td>
<td>2.24</td>
<td>1.85</td>
</tr>
<tr>
<td>Depression</td>
<td>2.72</td>
<td>2.33</td>
<td>2.17</td>
<td>1.65</td>
</tr>
<tr>
<td>Sleep</td>
<td>4.77</td>
<td>3.75</td>
<td>3.26</td>
<td>2.27</td>
</tr>
<tr>
<td>Quality of life</td>
<td>3.63</td>
<td>2.85</td>
<td>2.09</td>
<td>2.08</td>
</tr>
</tbody>
</table>

Note: Fatigue and sleep scores range from 0–10, pain and depression scores range from 0–8, and quality-of-life scores range from 0–9, with higher scores indicating worse symptoms.

TABLE 3. Results of Self-Assessments of Fatigue and Other Related Factors (N = 121)
Implications for Nursing Practice

Interdisciplinary healthcare teams are at the forefront of patient care and must take a leadership role in addressing cancer-related fatigue. Nurses and physical therapists together can encourage patients to maintain a moderate level of physical activity during and after cancer treatment. Figure 2 includes valuable patient education resources for cancer-related fatigue. The authors’ experience demonstrates that a community-based exercise and education program can be developed and implemented using the evidence to establish the testing, framework, and evaluation of the exercise program. Published results of significant improvements in fatigue and other symptoms can be replicated in the community and experienced by all cancer survivors, regardless of the type of cancer, treatment status, and stage of disease.

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References


