# **QUALITY IMPROVEMENT**

# A Pilot Program Implementing an Evidence-Based Walking Plan to Improve Cancer-Related Fatigue in Adult Patients on Oral Cancer Treatments

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Authors' disclosures of conflicts of interest are found at the end of this article.

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#### Abstract

Background: Fatigue is a prevalent symptom among cancer patients, even after completing treatment. The National Comprehensive Cancer Network Guidelines recommend incorporating physical activity as a strategy to combat cancer-related fatigue. **Objectives:** The goal was to develop and implement an evidence-based translational research quality improvement project to improve fatigue in patients starting oral cancer treatment. Methods: Outpatient oncology nurses (registered nurses and licensed practical nurses) responsible for educating patients starting treatment for cancer were provided education about the walking program. The information was incorporated into education for patients starting oral chemotherapy. Nursing knowledge, beliefs, and attitudes were evaluated before and after the subject-intensive education. Patient study participants were provided with pedometers and completed the Brief Fatigue Inventory and a survey about their beliefs and attitudes before and after implementing the walking program. Outcomes: Fatigue scores showed a slight decrease post intervention but not a statistically significant difference. Advanced-stage cancer showed a near-significant relationship with increased fatigue levels. Nursing knowledge improved by 13%, and nurses reported increased confidence in six of nine topics. Nursing barriers to education shifted from personal comprehension to a need for resources. **Recom**mendations: Patients diagnosed with advanced-stage cancer should receive timely fatigue prevention and management education. In addition, educating nurses to address this knowledge deficit is imperative. The information gathered from this project presents an opportunity for further research using a walking plan and nursing education to improve current interventions used to reduce cancer-related fatigue.

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atigue is a prevalent issue faced by patients with cancer across all stages of their care journey. Most patients undergoing treatments for cancer, including surgery, chemotherapy, and radiation, experience fatigue (Aapro et al., 2017; Bower et al., 2018). Additionally, about one third of patients continue to battle persistent fatigue for several years after completing treatment (Aapro et al., 2017; Bower et al., 2018). Cancer-related fatigue (CRF) can significantly impact the overall quality of life for patients, as well as for their caregivers and families. This fatigue can affect various aspects of life, including physical, psychosocial, and economic elements (Mohandas et al., 2017). Given the profound impact of CRF, there is a critical need for more evidence-based interventions to effectively manage and address this debilitating condition experienced by patients with cancer.

Currently, there is no specific prescription or supplement available to directly address CRF as a side effect of cancer treatment. However, studies indicate that physical activity during cancer treatment reduces disease-related and treatmentinduced fatigue (Mohandas et al., 2017). The National Comprehensive Cancer Network (NCCN) Guidelines confirm the benefits of physical activity in managing CRF, providing Category One evidence that incorporating physical activity at any stage of cancer care can effectively alleviate fatigue levels (NCCN, 2022). These findings highlight the importance and effectiveness of integrating physical activity interventions as a key component in managing and alleviating fatigue experienced by patients with cancer.

Physical activity has been widely recognized as an effective strategy for managing CRF, with more than 20 meta-analyses and systematic reviews of randomized controlled trials published since 2010 supporting this intervention. These studies have demonstrated the effectiveness of physical activity in various populations, including individuals with different types of tumors, those who have undergone different treatment modalities (chemotherapy, radiation, surgery, stem cell transplants), in all age groups, and cancer survivors.

A meta-analysis conducted by Puetz & Herring (2012) revealed that exercise exerts a therapeutic effect on fatigue during active cancer treatment and a restorative effect following treatment. The studies included in these analyses have examined various exercise types, including walking, cycling, swimming, resistive exercise, and combination exercises. There is also considerable variation in activity frequency, duration, intensity, and the level of supervision involved in the studies (e.g., fully supervised groups vs. self-directed exercise). However, there are still some uncertainties regarding the specific type, intensity, and duration of physical activity that yields the most significant benefits in fatigue improvement at various stages of the disease and treatment (Puetz & Herring, 2012). Several limitations were noted in the studies evaluated, including generally small effect sizes and inconsistent positive results for CRF across studies (Cramp & Byron-Daniel, 2012; Eickmeyer et al., 2012; Mustian et al., 2012). Thus, further investigation is needed to systematically assess the safety, tolerability, and efficacy of exercise and strength training in individuals with cancer (Brown et al., 2011; Paramanandam & Dunn, 2014).

# **OBJECTIVES**

This project encompassed five key objectives. The primary goal was to establish an evidence-based protocol aimed at encouraging physical activity among individuals undergoing cancer treatment with oral therapies, with the specific aim of reducing CRF through a structured walking plan. Additionally, oral chemotherapy nurses were to receive education on the relationship between CRF and physical activity benefits. All patients initiating oral chemotherapy treatment would receive education about the walking program to potentially enhance outcomes related to fatigue management. It was hypothesized that patients engaging in the program would experience improvements in fatigue with regular physical activity upon completing the 6-week plan, thereby contributing to enhanced overall well-being and quality of life.

# **METHODS**

# **Project Design**

This project was a translational research initiative aimed at improving the quality of care provided to patients on oral chemotherapy. It was undertaken as part of a Doctor of Nursing Practice (DNP) project. The project utilized the Plan-Do-StudyAct (PDSA) methodology as a guiding framework (Figure 1), allowing for the systematic development, implementation, and analysis of the Start Walking to Improve Fatigue Throughout Treatment (SWIFT) program.

The SWIFT program was created as a comprehensive guide to encourage individuals to engage in regular walking, aligning with the American College of Sports Medicine's recommendation of 150 minutes of physical activity per week (Abbott & Hooke, 2017). To support this initiative, a patient education brochure and nursing education presentation were developed, providing information on the benefits of walking, suggestions for questions to ask oncologists, tips for creating personalized walking plans, preparation guidelines, goal-setting strategies, safety reminders, insights on recognizing when to stop the activity, as well as a sample plan to enhance endurance through walking gradually (Figure 2). The necessary licensure to utilize the Brief Fatigue Inventory (BFI) tool was obtained, pedometers were acquired from Garmin, and licensure was obtained to use the Labfront software used for collecting data from pedometers and surveys. Relevant survey questions were designed to evaluate participant and nurse attitudes and beliefs regarding physical activity and CRF before and after implementation.

The pedometers were used as a motivational tool to encourage participants to walk regularly. The devices used included goal-setting capabilities, reminders to move if the participant remained sedentary for 30 minutes, and notifications of goal achievement. Upon completion of the 6-week SWIFT program, participants were gifted the pedometers to promote sustained adoption of SWIFT program principles. Additionally, a series of weekly text messages were delivered via the Labfront app. These messages were created to provide tips, information, and other forms of encouragement to promote intentional movement through walking. Due to the temporary licensure of the Labfront software used to deliver these messages, they were exclusively a component of the research study participants. The messages were discontinued at the conclusion of the 6-week program.

# Setting

The SWIFT program was implemented at Ironwood Cancer and Research Centers (ICRC), a community outpatient hematology and oncology center. ICRC has a strong presence across the



Figure 1. SWIFT program PDSA cycle.



Figure 2. Sample walking plan.

greater Phoenix area, operating 15 offices. At the time of the project's initiation, ICRC's multidisciplinary team was comprised of 47 medical oncologists, 10 radiation oncologists, 12 breast surgeons, 2 gynecologic oncologists, 9 urologists, 16 advanced practice providers, and 1 integrative oncologist.

# **Participants**

Participants included 20 adult patients starting oral cancer treatment therapy. Inclusion criteria were age between 18 and 60 years, an active cancer diagnosis, currently receiving oral chemotherapy for the duration of the 6-week program, ability to walk without difficulty, ownership of a smartphone, willingness to provide informed consent, willingness to participate in a walking program to help manage fatigue, comfort with wearing a pedometer and the collection of biometric data for research purposes, and willingness to attempt walking for 150 minutes per week.

Exclusion criteria were presence of brain metastasis, bone metastasis with a risk for fracture, a history of neuropathy in the feet, mobility impairments, chronic kidney disease stage IV or higher, chronic fatigue syndrome, transfusion-dependent anemia, and chronic sleep disturbances. These exclusion criteria were developed to minimize the risk of injury while participating in the SWIFT program and to limit the cause of fatigue to cancer and its treatment.

# **Institutional Review Board Approval**

In addition to receiving support from leadership at ICRC, the Missouri State University (MSU) Institutional Review Board (IRB) granted approval to proceed with this project. Given the vulnerable nature of the oncology patient population, MSU required IRB approval for this DNP project.

# **Data Collection**

The investigator had access to potential participants prescribed new oral treatments. These individuals were screened using inclusion and exclusion criteria. Once eligibility was confirmed, these individuals received an explanation of the SWIFT program and written consent was obtained. Pretreatment surveys were administered to evaluate participant knowledge, attitudes, and beliefs about physical activity and fatigue using the BFI. Participants were then provided the SWIFT patient education brochure and one-on-one education regarding how physical activity affects fatigue. Participants were then provided with a Garmin vivosmart 5 wearable device. Each week, an inspirational text message was sent to the participant. The number of daily steps was collected from each participant's wearable device via the Labfront software. The program ran for 6 weeks for each participant. After 6 weeks of participation in the SWIFT program, a post-implementation survey was administered that included the BFI questionnaire, as well as follow-up questions about participating in the program.

Before the commencement of the SWIFT program and data collection, the nurse participants (registered nurses and licensed practical nurses responsible for patient education before starting new treatments) were requested to complete a knowledge assessment survey that included questions about their attitudes and beliefs regarding physical activity and CRF. Subsequently, the nurses received a comprehensive education session on CRF through a focused and in-depth presentation. The insights gained from this educational session were then integrated into the educational materials utilized for instructing patients regarding the potential side effects of chemotherapy. Following a 4-week period, the nurses were asked to retake the knowledge assessment survey to assess any alterations in their understanding and perception of physical activity and CRF.

#### **Privacy and Data Storage**

To ensure the security and confidentiality of data, a secure SharePoint file, managed by Missouri State University, was utilized. Data were deidentified to maintain confidentiality and privacy of all participants. The SharePoint access was limited to study personnel. Paper documents were scanned to SharePoint, then subsequently disposed of using secure destruction protocols.

#### **Data Analysis and Statistical Methods**

Descriptive statistics are reported as medians and ranges for continuous variables and as counts and percentages for categorical variables. Changes in fatigue scores were analyzed using the Wilcoxon signed-rank test. A simple linear regression model analyzed the relationship between a participant's average step count and their change in fatigue score. Mann-Whitney U-tests were used to analyze demographic and clinical differences between participants whose fatigue scores remained the same or improved and participants whose fatigue scores worsened from baseline to

Table 1. Summary Statistics	,
	Overall ( <i>N</i> = 20)
Cancer type	
Breast	6 (30%)
Colorectal	4 (20%)
Gastrointestinal stromal tumor	1 (5%)
Kidney	1 (5%)
Leukemia	2 (10%)
Liver	1 (5%)
Multiple myeloma	1 (5%)
Prostate	4 (20%)
Cancer stage	
1	3 (15%)
2	4 (20%)
3	3 (15%)
4	10 (50%)
Age range	
26-30	2 (10%)
31-35	1 (5%)
36-40	1 (5%)
41-50	7 (35%)
51-60	9 (45%)
Gender	
Female	9 (45%)
Male	11 (55%)
Race	
American Indian or Alaska Native	1 (5%)
Asian	2 (10%)
Hispanic	3 (15%)
White or Caucasian	14 (70%)
Number of prior treatments	
0	5 (25%)
1	8 (40%)
2	4 (20%)
3 or more	3 (15%)

# Table 2. Summary Statistics

	Overall (N = 20)	
BMI at start		
Mean (SD)	28.7 (4.59)	
Median [min, max]	29.3 [19.9, 38.6]	
BMI at end		
Mean (SD)	28.4 (4.07)	
Median [min, max]	29.6 [18.9, 35.8]	
Pre-fatigue score		
Mean (SD)	2.98 (2.25)	
Median [min, max]	2.61 [0, 8.56]	
Post-fatigue score		
Mean (SD)	2.39 (2.31)	
Median [min, max]	1.44 [0, 7.33]	
Change in fatigue score		
Mean (SD)	-0.592 (1.53)	
Median [min, max]	-0.111 [-4.22, 1.44]	
Change in fatigue score (categor	y)	
Same or better	12 (60%)	
Worse	8 (40%)	
Pre-rating		
Mild	12 (60%)	
Moderate	5 (25%)	
None	2 (10%)	
Severe	1 (5%)	
Post-rating		
Mild	14 (70%)	
Moderate	3 (15%)	
None	2 (10%)	
Severe	1 (5%)	
Do you feel you had physical ben participation in the SWIFT progra	efits from am?	
Agree	3 (15%)	
Disagree	1 (5%)	
Neither	2 (10%)	
Strongly agree	14 (70%)	
Do you think others should also participate in the SWIFT program	1?	
Agree	4 (20%)	
Neither	1 (5%)	
Strongly agree	15 (75%)	

Table 2. Summary Statistics (cont.)		
	Overall (N = 20)	
Did the 6 text messages about the inspire you to walk?	e benefits of walking	
Agree	11 (55%)	
Disagree	1 (5%)	
Neither	3 (15%)	
Strongly agree	5 (25%)	
Did walking improve your fatigue temporarily over the course of the	level e 6 weeks?	
Agree	10 (50%)	
Neither	2 (10%)	
Strongly agree	8 (40%)	
Do you plan to continue to attemp 150 minutes of physical activity pe	ot er week?	
Agree	6 (30%)	
Disagree	2 (10%)	
Strongly agree	12 (60%)	
Did the pedometer inspire you to	walk more?	
No	6 (30%)	
Yes	14 (70%)	
Average steps: Week 1		
Mean (SD)	6,210 (3,150)	
Median [min, max]	5,060 [2,020, 12,400]	
Average steps: Week 2		
Mean (SD)	6,460 (3,040)	
Median [min, max]	5,930 [1,970, 12,700]	
Average steps: Week 3		
Mean (SD)	6,130 (2,860)	
Median [min, max]	6,170 [1,720, 12,200]	
Average steps: Week 4		
Mean (SD)	6,540 (3,250)	
Median [min, max]	6,070 [1,700, 13,300]	
Average steps: Week 5		
Mean (SD)	6,280 (3,050)	
Median [min, max]	6,140 [2,370, 13,000]	
Average steps: Week 6		
Mean (SD)	7,010 (4,620)	
Median [min, max]	5,890 [2,600, 20,400]	
Average steps: Overall		
Mean (SD)	6,440 (2,900)	
Median [min, max]	6,560 [2,370, 12,400]	

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CANCER-RELATED FATIGUE

follow-up. All analyses were run in RStudio version 2023.03.1+446 (Boston, MA) using a two-sided level of significance of 0.05.

# RESULTS

# **Participant Demographics**

Twenty participants were included in the analysis. Sixteen (80%) of the participants were over the age of 40, and eleven (55%) were male. The median starting body mass index (BMI) was 29.3 (range = 19.9–38.6). The three most frequent cancer types were breast cancer (30%), colorectal cancer (20%), and prostate cancer (20%), with half of the participants having stage 4 cancer (50%; Table 1). The median average daily step count for the duration of the program was 6,560 (range = 2,370–12,400; Table 2).

# Outcomes

Overall, participants' self-reported attitudes towards the SWIFT program were positive. Seventeen (85%) participants felt they had physical benefits from the program, 19 (95%) believed others should participate in the program, 16 (80%) were inspired to walk after text messages, 18 (90%) reported improved fatigue levels from walking, 18 (90%) plan to continue to attempt 150 minutes of physical activity per week, and 14 (70%) were inspired to walk more because of the pedometer (Table 2).

Table 3. Change in Fatigue Score			
	Overall ( <i>N</i> = 20)	p value	
Mean (SD)	-0.6 (1.5)	.240	
Median [min, max]	-0.1 [-4.2, 1.4]		

Fatigue scores did not significantly decrease from baseline to follow-up (median = -0.1, range = -4.2 to 1.4, p = .240; Table 3), although the data showed a trend toward a decrease. This is likely a sample size issue, meaning that with additional participants following a similar pattern, this may become significant.

Average daily step counts were not significantly associated with changes in fatigue scores ( $\beta$  = -0.2 per 1,000 steps, *p* = .169; Table 4), although there was a slight negative trend in the relationship between step count and a decrease in fatigue score. The relationship between higher cancer stages and worsening fatigue scores was approaching significance; all 8 participants whose fatigue worsened throughout the program had stage 3 or 4 cancer (*p* = .070). No other demographic or clinical variables were significantly associated with fatigue score changes.

The nursing knowledge assessment showed a noteworthy increase of 13% in the nursing knowledge assessment scores after the subject-

Table 4. Correlating Steps With Fatigue				
Model term	Estimate	SE	t	<i>p</i> value
(Intercept)	0.49	0.83	0.60	.558
Average steps (per 1,000)	-0.17	0.12	-1.43	.169

Table 5. Text Messages Sent to Participants		
Description	Message	
Welcome	Welcome to the SWIFT program hosted by Ironwood Cancer & Research Centers and Missouri State University - Start Walking to Improve Fatigue Throughout Treatment!	
Week 1 encouragement	Walking can improve your mood, cognition, memory, and sleep	
Week 2 encouragement	Walking is a weight-bearing exercise that can strengthen your bones	
Week 3 encouragement	Walking can boost your immune system	
Week 4 encouragement	Walking can reduce stress and tension	
Week 5 encouragement	The American College of Sports Medicine advises 150 minutes of activity per week to help you reach optimum health	
Week 6 encouragement	Taking a brisk walk regularly can help to improve cardiovascular fitness	
Thank You	Thank you for participating in the SWIFT program research! Please take the time to complete the Conclusion Survey in the Labfront app at this time.	

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intensive education session. This session included two clinic nurses who were directly involved with all twenty participants and their educational process. The nurses surveyed displayed enhanced confidence in six of nine survey topics related to CRF and physical activity. The education significantly impacted the nurses' perceptions regarding barriers to patient education on physical activity. Specifically, four out of six surveyed topics demonstrated a shift in perception. The primary barrier to educating patients about CRF and physical activity transformed from a lack of personal understanding of CRF and treatment options to a scarcity of informative and accessible patient education materials.

#### DISCUSSION

# Sustainability

To sustain this quality improvement project, it needs to be viewed as not just a project but as a practice change. For the SWIFT program to ultimately impact every patient starting treatment at ICRC, the information about fatigue and physical activity will be incorporated into the standard education materials provided to patients starting treatment. While providing pedometers to all patients starting treatment would be costprohibitive, adding information about using a pedometer for motivation into the materials is more feasible.

#### Limitations

Ideally, a quality improvement project would encompass all eligible patients. However, due to budgetary constraints related to the cost of pedometers, which were fully funded by the researcher, this project had limited availability of the pedometers. As a result, data collection was limited to a small sample, potentially limiting the generalizability to a broader population of cancer patients. Another limitation was the lack of recent data supporting the project's findings. Recent publications, including the NCCN Guidelines, relied on outdated resources to support conclusions regarding physical activity in managing CRF. The project was designated as a pilot study in one office, which may restrict the applicability of its findings to a broader population beyond the sampled office.

# IMPLICATIONS FOR THE ADVANCED PRACTICE PROVIDER

Despite the limited sample size and the lack of established statistical significance, the self-reported attitudes and effects of the SWIFT program hold value. Implementing the SWIFT program, which involves engaging patients in physical activity and utilizing motivational techniques, including inspirational text messages (Table 5) and setting goals with a pedometer, offers a structured plan that can have positive impacts. This highlights the importance of incorporating interventions like the SWIFT program to enhance patient engagement in physical activity and promote motivation, even if further research is needed to establish statistical significance in fatigue level changes.

The knowledge that stages three and four cancers appear to correlate with worsening fatigue over time can be beneficial for an oncology advanced practice provider in several ways. It informs the provider to pay closer attention to fatigue levels in patients with higher-stage cancer. They can use this information to develop a systematic approach for assessing and monitoring fatigue in these patients throughout their treatment. Fatigue can significantly impact a patient's quality of life and ability to tolerate treatment. Knowing that higher-stage cancer is associated with worsening fatigue helps the provider anticipate and plan for potential fatigue-related challenges that the patient may face during treatment. This includes considering appropriate treatment options to minimize or manage fatigue.

With this knowledge, advanced practice providers can educate patients about the potential for worsening fatigue as their cancer progresses. This allows patients to be proactive in managing their fatigue, such as adjusting daily activities, incorporating rest periods, and seeking supportive care interventions like exercise or psychosocial support. Understanding the correlation between higher-stage cancer and worsening fatigue can highlight the need for proactive integration of supportive care interventions. The provider can collaborate with other health-care professionals, such as physical therapists or social workers, to develop personalized strategies to manage fatigue, enhance overall well-being, and optimize treatment outcomes. Overall, this knowledge helps

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the oncology advanced practice provider deliver comprehensive and patient-centered care by identifying, addressing, and managing fatigue as an important aspect of symptom management in higher-stage cancer patients.

# Disclosure

The authors have no conflicts of interest to disclose.

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