

INDIVIDUALIZED PHYSICAL ACTIVITY REHABILITATION FOR PEOPLE WITH  
CANCER-RELATED FATIGUE:  
A BEST PRACTICE PROPOSAL

By:

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# CANCER-RELATED FATIGUE AND PHYSICAL ACTIVITY

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### STATEMENT BY AUTHOR

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It is my ultimate goal to realize this plan. Cancer survivors, get ready for a boost in your quality of life!

### **Abstract**

Cancer-related fatigue (CRF) is widely reported by cancer survivors across the cancer treatment and recovery period. This phenomenon profoundly affects individual quality of life. Current research indicates that exercise can reduce fatigue in the Oncology population. The best practice proposed in this paper is based on research about CRF and recommendations by the American College of Sports Medicine. The hypothetical clinical setting for pilot implementation is an inpatient oncology unit in an academic medical center in the Southwest. The target population is adults with hematological cancers. By examining a patient's level of functioning and prescription, three levels are created using a combination of aerobic activity and strength training exercises performed in the bed, in the chair and with free movement. Literature demonstrates that if physical activity is achieved three to four times a week, patients can improve their quality of life, bone mass, and muscle mass.

## **Chapter 1. Introduction**

### **Overview**

The purpose of this chapter is to build a basic understanding of the causes of cancer-related fatigue, introduce the framework for creating a rehabilitation prescription, and indicate the significance in nursing practice. Cancer-related fatigue (CRF) is reported by people with multiple types of cancer and some patients state that the fatigue is worse than the experience of pain (Stricker, Drake, Hoyer, & Mock, 2004). CRF is defined as

“a distressing persistent, subjective sense of physical, emotional and/or cognitive tiredness or exhaustion related to cancer or cancer treatment that is not proportional to recent activity and interferes with usual functioning” (National Comprehensive Cancer Network [NCCN], 2010, p. FT-1).

Cancer-related fatigue can be multi-causal including side effects from cancer treatment, deconditioning, hypoxemia, severe anemia, systemic infection, emotional distress, sleep disturbances and uncontrolled pain. It is very rare that fatigue occurs without at least one of the aforementioned side effects (NCCN, 2010). See Figure 1 for more information on what contributes to CRF. Since people are not able to participate in their normal life events, as consequence their overall quality of life may be reduced. The purpose of this paper is to propose a best practice protocol for reducing cancer-related fatigue (CRF) in an inpatient population of adults with hematological cancers by prescribing individualized physical activity rehabilitation for adults with hematological cancers.

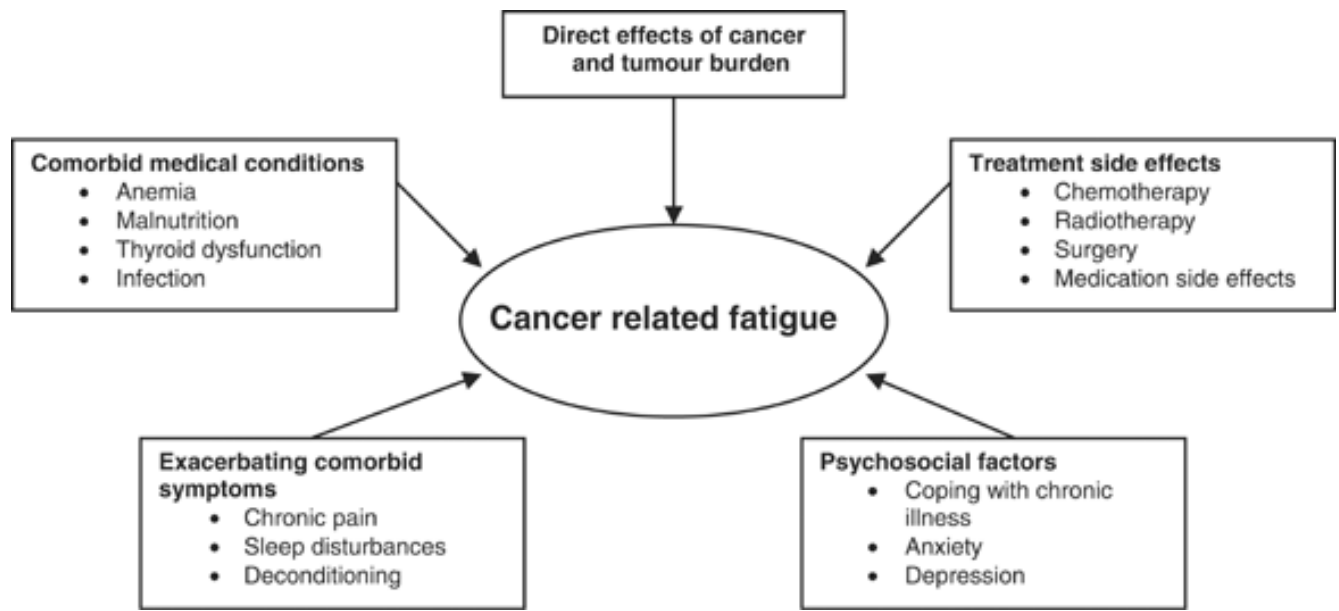


Figure 1. (Wagner and Cella, 2004).

Within the healthcare community, there is strong scientific and empirical evidence that concludes that physical activity is an effective and safe method to control fatigue and improve quality of life. Unfortunately there are few guidelines that exist to tailor or prescribe exercise for cancer patients. The National Comprehensive Cancer Network (NCCN) guidelines for fatigue management list several ways to manage fatigue but lack detail regarding the quantity of physical activity and other interventions needed to manage CRF (NCCN, 2010). The American College of Sports Medicine, in conjunction with the Oncology Nurses Society recently developed new recommendations based on the 2008 Physical Activity Guidelines for Americans (American College of Sports Medicine [ACSM], 2010). The proposed best practice protocol is based on research findings about CRF, evidence-based recommendations about physical activity and current clinical practices treating CRF.



## Background

An overview of pertinent issues in the physiology, symptomatology and treatment for hematological cancers is key in understanding the phenomenon of CRF in this unique population. The Centers for Disease Prevention and Control list three categories of hematological cancers: leukemias, lymphomas, and myelomas. While there are many complicated and advanced subtypes classified in each category, this section focuses on general concepts of each of the most common hematological cancers.

### Demographics.

Statistics for 2007 state that 119,724 people were diagnosed with leukemia, lymphoma or myeloma; Non-Hodgkin lymphoma diagnoses account for half of all 2007 hematologic cancer diagnoses (Center for Disease Control and Prevention [CDC], 2007). For leukemia and lymphoma, Caucasians are the most diagnosed race while African Americans are the most commonly diagnosed race for myelomas. Table 1.1 lists values based on numbers out of 100,000 people who developed each hematological cancer subtype in Arizona. It is important to note how many people are affected by these types of cancer locally.

Table 1.1

2007 CDC Values for Disease Process by Percentage in Arizona

Leukemia	Non-Hodgkin Lymphoma	Multiple Myeloma
7.6 to 10.7	14.9 to 17.2	3.2 to 4.9

*Note:* Adapted from The Center for Disease Control and Prevention (2007). *Hematologic (Blood) Cancers*. Retrieved from <http://www.cdc.gov/cancer/hematologic/index.htm>

### Pathophysiology of leukemia.

#### *Cellular pathology.*

Leukemia is the uncontrolled proliferation of abnormal or immature white blood cells as generated in the bone marrow (Newton, 2009, p. 2115). Leukemia can be classified as either

acute or chronic as well as lymphocytic or myelogenous. Acute leukemia is characterized by sudden onset from a “block in differentiation resulting in massive accumulation of immature cells of blasts” (Newton, Hickey, & Marrs, 2009). In contrast, chronic leukemia has a much more gradual onset. Lymphocytic leukemia is cancer of the lymphoblasts, or cell precursors that turn into B- and T-cell lymphocytes, while myelogenous leukemia is a cancer of myeloid progenitor cells, which become granulocytes (Newton et al., 2009). Even though each type has slightly different pathophysiology, the cause of fatigue remains largely the same. The bone marrow becomes crowded with immature or under-differentiated cells at the expense of normal white blood cells, red blood cells and platelets, which ultimately leads to pancytopenia. The patient is left vulnerable to infection, bleeding and hypoxia.

***Signs, symptoms, and diagnosis.***

Signs and symptoms include malaise, fatigue, bone pain, unexplained fevers, easy bruising and bleeding, petechiae, shortness of breath, and unexplained weight loss (Newton et al., 2009). Clinically, patients may present with severe thrombocytopenia and anemia coupled with an increased white blood cell count. Upon further inspection, the leukocytes are found to be quite immature and dysfunctional.

The diagnostic workup for leukemia includes blood tests such as the complete blood count with differential, serum chemistry panel, cytogenetic analysis, immunophenotyping, chest x-ray, bone marrow biopsy and perhaps lumbar puncture (Newton et al., 2009).

***Common treatment course.***

Most patients undergo a specific course of chemotherapy where the goal is to suppress the bone marrow and facilitate the regrowth of viable cells. Specific phases include “induction,” or the initial round of chemotherapy. Many patients must be hospitalized. Induction is followed

by consolidation therapy, and medications are administered in much higher doses than during the induction phase. Patients may be in treatment for several months up to several years (Newton et al., 2009). Some patients, especially with chronic leukemia, may be sent home on oral chemotherapy agents.

High-risk patients and those who do not respond properly to induction and consolidation therapy are considered for hematopoietic stem cell transplant. In order for patients to be transplanted, they must undergo a high-dose chemotherapy course and whole body radiation to ablate the bone marrow. It is quite a complicated procedure, but it is important to note that this treatment can cause several complications and usually involves a prolonged hospital stay (Newton et al., 2009). These patients are prime candidates for an inpatient physical activity rehabilitation program.

### **Pathophysiology of lymphoma.**

#### ***Cellular pathology.***

Lymphomas include Hodgkin's disease and non-Hodgkin's lymphoma. As non-Hodgkin's lymphoma (NHL) is much more common than Hodgkin's disease, NHL will be discussed in further depth. Non-Hodgkin's lymphoma originates as a cancer of B- or T-lymphocyte cells within the lymphatic system and can be classified as aggressive or indolent, or slow-growing (Newton et al., 2009). The original tumor, or lymphoma, originates in the lymph nodes, the spleen or both. The extraneous growth of B- or T-lymphocytes causes an often noticeable lymphadenopathy (Newton, 2009).

#### ***Signs, symptoms and diagnosis.***

The most common sign of NHL is painless lymphadenopathy in the neck, armpit, groin or abdomen. Some people experience fevers, heavy night sweats and unexplained weight loss due

to the immune process occurring from too many immature B-lymphocytes malfunctioning. Nausea, vomiting or abdominal pain is often related to infiltration of the Mucosa-Associated Lymphoid Tissue (MALT) system, or the lymphoid tissue in the gut. Cutaneous T-Cell lymphoma causes redness, itching or raised patches on the skin. Fatigue is also a symptom of NHL (Newton et al., 2009).

The medical team diagnoses NHL by completing several key laboratory tests including the complete blood cell count, erythrocyte sedimentation rate, serum chemistries, lactate dehydrogenase and uric acid, immunophenotyping, cerebrospinal fluid assessment and lymph node and bone marrow biopsies. Patients may also have chest x-rays, computerized tomographic scans or magnetic resonance imaging of the abdomen or pelvis, and positron emission tomography scans to stage the cancer (Newton et al., 2009).

#### ***Common treatment course.***

Treatment for NHL largely depends on whether the cancer is indolent or aggressive and the stage of the cancer. Chemotherapy is the most common treatment followed by immunotherapy and radiation. Surgery is rarely used beyond diagnosis unless the lymphoma manifests in the gastrointestinal system or in the testes. Hematopoietic stem cell transplant is considered for late stage indolent or aggressive NHL.

#### **Pathophysiology of multiple myeloma.**

##### ***Cellular pathology.***

Multiple myeloma is specifically cancer of the plasma B-lymphocyte. Cancerous plasma B cells infiltrate the bone marrow, destroying other marrow cells and the bone cortex. Pancytopenia is common in this population. As plasma B cells invade the bone marrow, lytic bone lesions in the pelvis and long bones weaken the infrastructure of the bones, which can lead

to pathological fractures. Hypercalcemia, from the bone breakdown, along with hyperuricemia from extensive cell lysis, contribute to extensive renal impairment experienced by this population. Bence-Jones proteins, or monoclonal paraprotein, are secreted by the plasma B cells leading to further renal impairment (Yoder, 2009).

***Signs, symptoms and diagnosis.***

There are typically no signs and symptoms in the early stages. Once bone breakdown occurs, one may notice pain in the lower back or ribs from fractures or bone lesions. Fatigue may be noticeable as anemia worsens. The patient might experience more infections as their immune system declines or present with spontaneous bleeding due to thrombocytopenia (Yoder, 2009; Newton et al., 2009).

Three major diagnostic criteria exist in order to diagnose multiple myeloma. The patient must have biopsy-proven plasmacytoma, elevated Bence-Jones proteins in the serum or urine, and 30% of greater plasma cells discovered via bone marrow biopsy. If the patient almost meets the above criteria and also presents with lytic bone lesions or osteoporosis and depressed blood cell counts, the patient may still be diagnosed with multiple myeloma (Newton et al., 2009).

***Common treatment course.***

Non-symptomatic patients are not treated until they present with symptoms. Symptomatic are given bisphosphonates to lower the serum calcium level, pain management, and possibly radiation or surgical therapy to relieve problematic bone lesions. Chemotherapy is selected depending on how the patient presents with multiple myeloma. Hematopoietic stem cell transplantation is considered occasionally (Newton et al., 2009).

**Fatigue in hematological cancers related to bone marrow suppression.**

All three cancer subtypes and their associated treatments of each can cause low blood cell counts due to bone marrow suppression. While some of the fatigue is caused by the disease process, many of these therapies cause fatigue by creating abnormal decreases in cells created in the bone marrow. Each cell deficit can cause an increase in fatigue or a decrease in the safety of an exercise program. The NCCN Guidelines for CRF state that exercise should be prescribed with caution for those who have any of these blood cell alterations (NCCN, 2010).

Red blood cells carry oxygen throughout the human body. Oxygen carrying capacity of red blood cells is specifically measured in terms of hemoglobin and hematocrit. Anemia is defined as a drop in red blood cell count, hemoglobin or hematocrit less than normal values. Hematocrit is a percentage based on the amount of red blood cells in circulation. As these values diminish, less oxygen can be delivered to other cells. A normal value for hematocrit is between 42 and 52% for men and 37-47% for non-pregnant females. Hematocrit less than 15% is considered critically low, but transfusion is typically considered at any value less than 24 (Pagana & Pagana, 2010). Hemoglobin is the iron complex on a red blood cell. On any hemoglobin molecule, there are four oxygen-binding sites that can each carry one molecule of oxygen. A normal hemoglobin value is between 14 and 18 grams/deciliter (g/dL) in males and 12-16 g/dL in females (Pagana et al., 2010). See table 1 for the grading system of anemia via hemoglobin levels.

The degree of fatigue depends upon onset and type of anemia. People who experience gradual onset often adapt and do not feel the same fatigue as one who experiences acute anemia. Cancer patients most often experience decreased red blood cell production due to chemotherapy or bone marrow failure. Typically this process occurs relatively quickly and people are more

likely to feel fatigued (Wagner, 2010). However, subjective reports of fatigue should be considered when assessing fatigue in the cancer patient (NCCN, 2010).

Table 1. Grading System for Anemia

Severity	Hemoglobin Level (g/dL)
Grade 1 (Mild)	10.0 to 10.9
Grade 2 (Moderate)	8.0-9.9
Grade 3 (Serious/severe)	6.5-7.9
Grade 4 (Life-threatening)	Less than 6.5

*Note:* Adapted from The National Cancer Institute and Cooperative Oncology Groups Grading System for Anemia. AHRQ (2001). *Uses of Epoetin for Anemia in Oncology*. Summary, Evidence Report/Technology Assessment: Number 30. AHRQ Publication Number 01-E008, March 2001. Agency for Healthcare Research and Qualift, Rockville, MD. <http://www.ahrq.gov/clinic/epcsums/epoetsum.htm>

Platelets function in wound healing and blood clotting. The normal value of platelets in the adult body is between 150,000 and 400,000 platelets per cubic millimeter ( $\text{mm}^3$ ).

Thombocytopenia is defined as a decrease in circulating platelets below 100,000. If this value is less than 20,000 platelets/  $\text{mm}^3$ , spontaneous bleeding can occur (Pagana et al., 2010). This may be manifested by unexplained bruising, petechiae, bleeding gums or epitaxis (Gobel, 1993). If a patient is more prone to bleeding, a patient also becomes more prone to anemia and accompanying fatigue.

White blood cells function in the immune system of humans. There are five types of white blood cells including neutrophils, basophils, eosinophils, lymphocytes and monocytes. Each type of cell functions to fight off diseases. Without these cells, people are susceptible to any type of disease, including infections and super-infections that would not be present in the typical person. The most common white blood cells are neutrophils, and they function as first responders against most infectious processes. Absolute neutrophil count (ANC) is calculated by

multiplying the white blood count and percentage of neutrophils. A person is considered neutropenic when an absolute neutrophil count, or ANC, is calculated below  $1000/\text{mm}^3$ . An ANC below  $500/\text{mm}^3$  is considered critically low. Without neutrophils, an infection manifests without the inflammatory process. Most patients present infection in the form of a fever and require immediate hospitalization and antibiotic therapy (Ward-Smith, 2009).

### **Benefits of Exercise**

Best-practice guidelines are not yet definitively set for reducing CRF. Each type and stage of cancer and cancer treatment limits patients in a multitude of ways so it would be nearly impossible to design one universal plan. There are many treatments that could be utilized. However, physical activity can easily be modified for patients with co-morbidities, different baseline strength levels and abilities. Most people can participate on some level.

Besides building long-term benefits for the oncology patient community, exercise can provide a daily measurement of achievement as well as foster feelings of accomplishment and independence. The inpatient population – especially the very ill – spends most of their day in bed resting. Rapid deconditioning occurs and their quality of life drops further. A patient who exercises can log their daily activity and track progress on his or her own. He or she can aim to remain at baseline or to progress above depending on his or her level of illness. Daily physical activity can help improve mood and decrease pain, facilitating adherence and motivation (Hanna, Avila, Meter, Nicholas, & Kaminsky, 2008). Patients can enjoy the benefits of exercise almost immediately after starting the program and can build upon their success. They can enjoy feeling more like themselves.



**Purpose**

The purpose of this paper is to propose a best practice protocol for reducing CRF by prescribing individualized physical activity plans for people with hematological cancer. The paper provides a holistic approach to a realistic and relatively common oncology patient situation. The focus is to examine how research and a nursing intervention, such as the prescription of physical activity, can improve quality of life, day-to-day functioning and provide non-pharmacological complementary treatment in the inpatient setting. Undertaking this program involves careful consideration of safety and ability of patients, something involved in everyday nurse-patient management.

**Use of Literature**

A comprehensive review of literature will be described in Chapter 2: Literature Review. Most evidence for the protocol is drawn from cancer and CRF literature pertaining directly to exercise and its effect on patient quality of life. The NCCN Guidelines on Cancer-Related Fatigue, 2008 Physical Activity Guidelines for Americans and the American College of Sports Medicine guidelines on exercise and cancer are included in this paper, representing the most current guidelines available.

Evidence of the effectiveness of a cancer rehabilitation program is drawn from cancer-related fatigue rehabilitation literature and cardiac rehabilitation literature. In the cardiac field, physical activity has been utilized as an intervention to improve functioning and the evidence is well-established compared to interventional CRF literature. Cardiac rehabilitation interventions specifically aim to improve function and are useful for their strong focus in high-intensity aerobic activity, function testing and structured arrangement.

The goal of this best practice paper is to create a protocol that encompasses the needs of several patients. It is meant to be detailed and to hypothesize the best way to decrease CRF by using exercise. By choosing articles from several specialties, a more objective picture can be shaped.

### **Conceptual Framework: Psychobiological – Entropy Model of Functioning**

Maryl L. Winningham's diagram of Psychobiological – Entropy Model of Functioning will serve as the theoretical framework for this best practice proposal. It is a webbed design that conceptualizes the effect of primary cancer symptoms, pre-existing conditions, environmental influences, and treatments upon one's activity.

In the upper right and left corners, there are two boxes that state biological and adaptive reasons for decreased activity. The diagram shows how physical and psychosocial symptoms of the disease process, preexisting conditions, environmental influences, treatments and the disease contribute to decreased activity. Disease and treatment also point to a box labeled decreased functional status.

No one area shows exactly why patients experience cancer; rather the diagram shows how it is impossible to know precisely which symptom causes a decrease in physical activity. Eventually, decreased activity compounds pre-existing fatigue, causes deconditioning, and ends in disability. This diagram shows the need for physical activity in patients and how this activity can have a positive effect on primary cancer symptoms, pre-existing conditions and treatments. It is a way patients can take control of their disease process or let the disease process overcome the patient. See Appendix A for the full diagram.

**Significance for Patient Care and Nursing**

Patients perceive fatigue to be the most distressing symptom associated with cancer and its treatment, more distressing even than pain or nausea and vomiting, which in the case of most patients can be managed effectively by medication (Stricker, Drake, Hoyer, & Mock, 2004). If chemotherapy is the cause of their fatigue, patients may have to choose between tolerating their fatigue or tolerating their cancer treatment (NCCN, 2010). Patients need to function well to tolerate their treatments and for their overall well-being.

Bedridden patients have several more complications than patients who frequently move about. Some of these conditions can be painful and life-threatening, including pneumonia and decubitus ulcers. As advocates for their patients, nurses can help implement a physical activity program on their unit. They can provide support and encouragement on the days a patient may not feel like moving around. A properly educated nurse can provide coaching and advice, ensuring that the patient is participating properly in their rehabilitation program. The nurse can keep a patient moving forward in their recovery.

**Clinical Practice Questions**

Creating a best practice guideline poses certain questions best left to experts in the field. Questions include:

- Is the plan feasible for an inpatient population? How safe is it?
- What is the most objective and consistent way for patients and staff to measure fatigue?
- Despite recent research recommendations and published studies, what types of barriers remain?
- What is the best way to ensure adherence by both patients and staff?
- What are some associated costs with beginning an inpatient physical activity program?

**Summary**

This paper is based around a concept that would ideally work in the hospital setting for patients with blood and bone cancers. Currently, the plan, further described in Chapter 3, is not being tested, but all proposed protocol are based upon research from the literature and advice from experts working in the field. It is designed to present a realistic idea that could be implemented in the inpatient setting.

By creating a flexible and individualized exercise plan, patient quality of life can improve using a non-pharmacological method which has few costs and much benefit. The three tiers represent the concept that each patient can reduce fatigue even if he or she is unable to maintain full functioning. Since the protocol is heavily centered upon evidence from professional and current research, a realistic strategy for reducing fatigue will be produced.

## **Chapter 2. Review of Literature**

### **Overview**

This chapter first provides a definition of key terms followed by a review of literature about current recommendations for physical activity by the American College of Sports Medicine and from the 2008 Guidelines for Physical Activity for Americans. Next, research found on strategies for reducing CRF by physical activity is reviewed. Lastly, cardiac rehabilitation by physical activity is reviewed in order to compare what is appropriate for the examined population versus what is well-established in another discipline.

### **Cancer-related Fatigue Literature**

#### **Definitions and guidelines.**

Clear definitions have been formed to classify what constitutes CRF, physical activity and the difference between baseline activity and health-enhancing activity. This distinguishes CRF from other classifications of fatigue and clarifies that it must be related to cancer. CRF is best defined as

“a distressing persistent, subjective sense of physical, emotional and/or cognitive tiredness or exhaustion related to cancer or cancer treatment that is not proportional to recent activity and interferes with usual functioning” (NCCN, 2010).

These patients find their quality of life profoundly affected by CRF. It is unclear exactly what causes an individual's fatigue, but the National Comprehensive Cancer Network (NCCN) found that pain, emotional distress, anemia, sleep disturbances, malnutrition, activity and comorbidities highly influence a person's experience of fatigue. Several treatment options are available, but physical activity is the focus of this paper. It is something a patient can control, modify and individualize.

Physical activity has been defined as “any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level” (U.S. Department of Health and Human Services [HHS], 2008, p.2). Baseline activity “refers to the light-intensity activities of daily life, such as standing, walking slowly, and lifting lightweight objects.” Short episodes of moderate-or vigorous-intensity activity does not count toward meeting the guidelines (HHS, 2008, p. 2). Health-enhancing physical activity is best defined as activity “when added to baseline activity, produces health benefits.” (HHS, 2008). While baseline physical activity will be measured, health-enhancing physical activity is the focus of the exercise prescription. While patients will be performing physical activity, the idea is to practice physical activity at the health-enhancing level. This is where patients will maintain and regain their strength. Health-enhancing physical activity is the overall goal of the exercise prescription described in Chapter 3.

Before examining the effects of exercise on patients undergoing cancer treatment, the recommendations for a healthy population must be defined. The 2008 Physical Activity Guidelines for Americans state that a healthy adult should participate in 150 minutes a week of moderate-intensity exercise or 75 minutes of vigorous-intensity exercise in order to gain many of the numerous health benefits. Episodes of activity are best performed in intervals of at least 10 minutes and performed several days a week. Even if the adult cannot exercise, it is recommended that he or she absolutely avoid inactivity (HHS, 2008). These recommendations differentiate between moderate intensity and vigorous intensity exercises. Walking briskly, water aerobics, bicycling less than 10 miles per hour, doubles tennis, ballroom dancing and general gardening are all classified as moderate intensity exercises (HHS, 2008). Vigorous intensity exercises include racewalking, jogging or running, swimming laps, singles tennis, aerobic dancing,

bicycling greater than 10 miles per hour, jumping rope, heavy gardening, and hiking uphill or backpacking (HHS, 2008).

The American College of Sports Medicine (ACSM) created recommendations suggesting that cancer patients follow the 2008 Physical Activity Guidelines for Americans as closely as safely possible. The need to avoid inactivity and making the effort to complete the recommended amount of exercise for healthy adults was addressed in the ACSM roundtable (ACSM, 2010). Notably, all modes of cancer treatment are said to cause fatigue (ACSM, 2010), meaning that basically all of the cancer survivors will experience this phenomena to some degree. The guidelines found that according to the studies reviewed, exercise is safe for all people battling cancer, including those with a hematologic cancer regardless of Hematopoietic Stem Cell Transplantation status (ACSM, 2010).

### **Barriers and facilitators.**

A study was conducted investigating ways to facilitate exercise adherence for multiple myeloma patients. The study had 14 patients participating in a structured activity program and 10 patients participating in a control group that did not partake in any structured activities. Patients performed strength training activities with a resistance band and aerobic exercises such as walking. (Coleman et al., 2003). Researchers focused mainly upon identifying facilitators to activity. For example, if the patient feels that a large challenge is having a weakened immune system, the exercise plan prescribed specifically implemented tasks that could be done in the home and around the individual's neighborhood. If the person felt particularly fatigued from either the disease process or side effects from treatment, the physical activity for that period was tailored to how much the patient could do. Exercises were prescribed as low as performing "eight chair stands throughout the day" (Coleman et al., 2003, p. 530). The researchers also chose

simple exercises that limited the amount of equipment needed and phoned each individual weekly for accountability and encouragement (Coleman et al., 2003, p. 530). Since this article relates to an inpatient-driven best practice proposal, some of these motivators are inherently implemented especially supervised and individualized exercise programs. Exercise motivators identified were a “supervised, individualized, group-based program,” weight loss, and a sense of achievement over their illness (Blaney et al., p. 1143).

Despite strong evidence suggesting that despite health-enhancing physical activity is a proven effective treatment for fatigue, those with cancer often decrease their physical activity levels, a trend that continues even after treatment has concluded (Blaney et al., 2010, p. 1141). In a qualitative study conducted in the United Kingdom, researchers examined barriers and facilitators to physical activity identified by 26 participants via focus group. Facilitators match those mentioned in the last paragraph. Half of those stated that before their cancer diagnosis, that they would have considered themselves “very active.” Post-diagnosis, not one participant considered themselves “very active” and only two could say that they considered themselves “above average” (Blaney et al., 2010, p. 1141). Barriers for exercise that were identified in the Blaney et al. study included those attributed to side effects of treatment, especially fatigue and physical deconditioning. Others identified were social isolation, lack of access to exercise facilities, and difficulty in creating a manageable routine (Blaney et al., 2010, p. 1140). None of these are quite unexpected, as the typical healthy person trying to start an exercise program often has the same types of obstacles to overcome and similar responses are predictable.

#### **Activity and cancer-related fatigue.**

Several studies have been conducted with various results utilizing diverse physical activities. Aspects of these studies are incorporated into the planning, implementation and



evaluation stages later in the paper. Stricker et al. presented a comprehensive summary of which intervention was used to reduce fatigue as well as any significant evidence derived from each study (Stricker, et al., 2004, p. 966-7). Popular exercises included aerobics, walking, cycling and strength training, with several studies combining several modalities (Stricker et al. 2004, p. 966-7). The conclusions from the summary indicate an overall decrease in fatigue throughout most of the studies (Stricker et al., 2004, p. 966-7). This evidence drives the purpose of this best practice proposal.

One study had 39 participants at an outpatient cancer center complete either walking or sitting exercises twice a week, adding intensity and time incrementally until the individual exercised for 40 minutes (Hanna et al., 2008). There were 16 activity sessions and each participant was able to reach the goal 40 minute interval and increased their intensity individually (Hanna et al. 2008). Patients showed a marked decrease in fatigue and increase in quality of life at the end of the program.

A hospital piloted an inpatient walking program where patients were given a pedometer and a numerical step goal of 10,000. As a goal-directed program, patients were able to increase their baseline distance and reduce fatigue. Patients logged their progress weekly and were given recognition every two weeks. At the end of the study, both patients and nurses evaluated the program (Courtney & Hock, 2009, p. 5-6). The study illustrated a successful way to implement a realistic rehabilitation program.

A questionnaire focused on the use of physical activity interventions was sent to all members of the UK Association of Chartered Physiotherapists in Oncology and Palliative Care. Results of the questionnaire showed that 78% of U.K. physiotherapists are prescribing or recommending exercise as part of CRF management (Donnelly et al., 2009). Many are utilizing

walking, bed and chair exercises, and flexibility exercises with all types of cancer from diagnosis to recovery (Donnelly et al., 2009). Most of the services available in the UK include individual exercise sessions with the physiotherapists and giving informational resources to help the patient exercise properly (Donnelly et al. 2009, p. 822). Physical activity rehabilitation is already being implemented in other places with positive results for patients.

### **Cardiac Approaches to Exercise and Functioning**

Physical activity rehabilitation programs are well-established in the cardiovascular healthcare community and there are several strides improving methodology of research for these patients. Throughout each study, it is clear that this population has lost exercise tolerance, day-to-day energy for functioning and may experience pain upon exercise (Brubaker, Moore, Stewart, Wesley, & Kitzman, 2009; Guiraud, Juneau, Nigam, Gayda, Meyer, Mekary, Paillard, & Bosquet, 2009; Kocur, Deskur-Śmielecka, Wilk, & Dylewicz, 2009; Macchi, Polcaro, Cecchi, Zipoli, Sofi, Romanelli, Pepi, Sibilio, Lipoma, Petrilli, & Molino-Lova, 2009; Meyer, Guiraud, Gayda, Juneau, Bosquet, & Nigam, 2010; Pozehl, Duncan, & Hertzog, 2008; Rezaei-Araryani, Ahmadi, & Asghari-Jafarabadi, 2009; & Toufan & Afrasiabi, 2009).

### **Modes of Activity**

Hagglund, Boman, & Lundman examined fatigue in 10 elderly women who have chronic heart failure. The study defined fatigue as a persistent exhaustion that caused persistent feelings of tiredness, a need to sleep, and weakness (Hagglund et al., 2008). Participants experienced fatigue as “living with the loss of physical energy” and “striving for independence while being aware of deteriorating health” (Hagglund et al., 2008, p. 292). The women were not necessarily using exercise to treat their condition but they shared their experience of how debilitating and overwhelming their fatigue was. Each woman was over the age of 70 and found that the fatigue

affected their ability to get up and take any kind of physical action, regardless of how their minds requested an action. Hagglund et al. deeply explored the women's feelings of frustration, guilt and annoyance as well as coping mechanisms (Hagglund et al., 2008).

An early intervention is key regarding the effect of exercise upon this population's recovery. Rezaei – Araryani et al. (2009) determined that early ambulation after cardiac catheterization in seventy 18 to 20 year olds facilitated a better outcome. Typically, patients are on strict bed rest for several hours in a supine position after cardiac catheterization. The typical cardiac catheterization patient experiences a high level of fatigue and discomfort. The experimental group was ambulated seven hours after the procedure. These patients had less fatigue than others within the control group (Rezaei – Araryani et al., 2009). This can be said the same of cancer patients, who physically decondition early in the cancer process. Better outcomes for both populations occur if exercise is prescribed earlier.

Cardiac rehabilitation exercise programs often include a warm up, some sort of aerobic exercise and a cool down. Most sessions were one hour long and took place in an outpatient setting. The warm up lasted between five to ten minutes and was not typically specified in any of the articles examined. Between studies, the aerobic section of the rehabilitation ranged widely in amount of time, rest cycles, and execution. Several studies utilized stationary bicycles (Brubaker et al., 2009; Jahangard et al., 2009; Macchi et al., 2009; Pozehl et al., 2008; & Toufan et al., 2009). This method is considered low intensity, able to be used with those who are obese, and is cost-effective. Every study reviewed showed some significant improvement in exercise endurance in patients' performance by this method (Brubaker et al., 2009; Jahangard et al., 2009; Macchi et al., 2009; Pozehl et al., 2008; & Toufan et al., 2009). Other methods of aerobic

exercise included walking on treadmills, rowers (Pohezl et al., 2008), and track walking (Brubaker et al., 2009).

Guirard et al. looked at four different exercise programs, each utilizing the format of warm up, high intensity interval exercise (HIIE), and a cool down/recovery session. The interval between rest and exercise was either fifteen or thirty seconds depending on the exact program. It was found that the subjects preferred the lowest intensity program, which included an eight minute warm up, 15 second intervals of HIIE, and a ten minute recovery. However, the trend showed that the highest intensity exercise gave the greatest improvement in function and exercise tolerance (Guirard et al. 2009).

A study was performed where participants were instructed to utilize Nordic walking sticks to participate in cardiac rehabilitation. Nordic walking is a form of physical activity where one has two trekking poles enabling the individual to walk using all four extremities. These patients had a more improved baseline exercise tolerance than the control group who were instructed on walking without the Nordic walking sticks. Patients in the experimental group were able to participate in high intensity exercise at a lower intensity (Kocur et al. 2009). Even though this study seemed to show great benefit, there were several limitations. The patient could not have any kind of arm, wrist or hand injury preventing him or her from using the Nordic walking stick. Patients would have to buy the sticks which are an added cost, unlike walking, which is free. Overall, this method of activity would limit adherence due to cost.

### **Length and Duration of Rehabilitation**

It did not seem to matter how many days a week the exercises were performed; each exercise study showed some functional improvement of some sort for the patient. Three of the studies reviewed had the subjects perform the exercise three times per week (Brubaker et al.,

2009; Pohezl et al., 2008; & Toufan et al., 2009). Macchi et al.'s study had patient adhere to a five time per week exercise regimen. About half the patients that reported a low level of activity were able to adhere to that schedule, while every patient who had reported an active lifestyle managed the five day a week routine (Macchi et al., 2009, pp. 727). In the other three day per week studies, subjects had better adherence to the routine and demonstrated improvement despite exercising two days per week less (Brubaker et al. 2009; Pohezl et al. 2008; Toufan et al. 2009). These results indicate that most patients who undergo exercise cardiac rehabilitation will show improvement if any exercise regimen is implemented.

### **Cardiac Rehabilitation Methods with the Cancer Population**

Young-McCaughan, et al. (2003) tested the effectiveness of a phase II cardiac rehabilitation program in 62 patients with cancer. The patients met two days each week for 12 weeks and participated in exercise and education. The study found that participants had greater activity tolerance, better sleep patterns, and an improved quality of life (Young-McCaughan, Mays, Arzola, Yoder, Dramiga, Leclerc, Caton, Sheffler, & Nowlin, 2003). The researchers chose cardiac rehabilitation due to its 60 year history of reliability, effectiveness and standardization (Young-McCaughan et al., 2003). The main recommendation for nurses from this study is to create a more individualized cancer rehabilitation program with similar structure and supervision as the cardiac rehabilitation program (Young-McCaughan et al., 2003).

### **Summary**

Due to a different cause cardiac rehabilitation patients experience deconditioning much more quickly than many cancer patients but report similar issues with their quality of life, particularly with fatigue. Cardiac rehabilitation is a well-established and well-accepted field in practice and in the literature. It is structured, supervised, and already implemented in most

regimens for cardiac event recovery. Cancer-related fatigue rehabilitation is in a younger stage of development. Cardiac rehabilitation literature can be used to shape physical activity rehabilitation for cancer patients.

### **Chapter 3: Planning**

#### **Overview**

The inpatient unit at an academic teaching hospital in the southwestern United States is the model unit for implementation of this best practice proposal. Focus will be spent in the inpatient setting for patients with hematological cancers, since the individual can be guided by an expert interdisciplinary team around the clock. Physiotherapists are able to customize a physical activity regimen based on each patient's own functional ability level. Ideal patients for this proposal include adults over the age of 18 and older and those without extreme comorbidities as determined by the interprofessional team.

Tables 3.1, 3.2, and 3.3 further define criteria for placement within tiers. Patients will be divided into three tiers of exercise intensity, with Tier 1 including those with the lowest amount of function and Tier 3 including those with the highest. Each tier will include activities designed to improve or maintain baseline function, maintain bone and muscle mass, and allow the patient to set individualized goals and pace. It must be noted that the patient should never feel sore during or after the performance of the activity. The patient will be able to safely perform these exercises without the direct supervision of a healthcare professional and will log his or her progress independently. Due to the limitations of this paper, actual activities will not be stipulated at this time. The patient must be shown how to perform each activity correctly in order to improve results and prevent injury. A physiotherapist must be brought onto the unit and consult with each patient.

#### **Description of Pilot Environment**

The Hematological-Oncology unit of a southwest academic hospital has 29 beds. Twenty-one rooms are single-bed, positive-pressure, HEPA-filtered rooms for patients who are

neutropenic, on isolative precautions or undergoing treatment that requires isolation. One mile around the unit equals 16 laps. The hospital has a limited amount of exercise bikes which are available to patients upon request. There is no space explicitly for group exercise. There is no current inpatient exercise protocol for the unit.

### **Discussion of Tiers**

Patients with the highest level of fatigue and lowest level of function belong in Tier 1. These patients have an inability or lack of desire to leave the bed. They have more “bad” days than “good” days. These patients may not tolerate chemotherapy well by suffering several adverse reactions. They might be sedated most of the day or feel extremely ill. This patient may also have a serious co-morbidity that limits their exercise capabilities. These patients present the largest safety concern and hold the biggest risk of non-adherence. Most likely, he or she will divide their exercise program into small increments throughout the day. Bed and sitting exercises are the choice intervention for Tier 1.

Patients presenting moderate to severe fatigue will fall into Tier 2. A Tier 2 patient’s fatigue fluctuates during the day and can change daily. This class has few restrictions other than an inability or lack of desire to walk and spends a significant time of the day sitting in a chair. This patient’s program will also work best if the patient splits their activity into smaller portions during the day. Tier 2 is an option for patients under any kind of isolation that prohibits them from leaving their room. Chair and standing exercises are recommended for Tier 2.

Tier 3 patients experience moderate fatigue. Most days they will feel tired but the fatigue will not restrict their energy levels enough to be confined to the bed. Movement includes walking, higher resistance strength exercises and perhaps light aerobics. Patients in this tier are often more robust in general and may have fewer comorbidities than other tiers. This patient may



be tolerating their inpatient treatment fairly well and might be focusing specifically on energy and function levels within their prescription. Tier 1 has the most variety of exercises available to patients.

### **Estimated Cost of a Physical Activity Program**

The length of stay for each hematologic cancer patient varies between three days and over one hundred days, the cost of an activity program will vary per individual. Several costs must be accounted for. Median cost to the hospital for a full-time physical therapist or exercise physiologist is \$66,590 per year (Salary.com, 2011). A full-time physiotherapist might not be necessary; a quarter- or half- physiotherapist might suffice. At most, 21 patients with hematological cancers would occupy the single positive pressure rooms. A patient could stay for three days with a neutropenic fever or over twelve weeks with a complicated hematopoietic stem cell transplant. Therefore, at least one-hundred copies of the Brief Fatigue Inventory (BFI) and physical activity log should be made to account for all patients. In order to use the BFI, the institution would have to pay \$300 to the University of Texas M.D. Anderson in copyright fees. This cost reflects the institution delivery of BFI in one language for academic research purposes. It is an additional \$150 to have a second language, which would most likely be necessary for the pilot unit's population. For commercial research, it would cost \$800 for the first language BFI and \$400 for the second. However, this appears to be a one-time fee and from there, the pilot institution could use the BFI continually (University of Texas M.D. Anderson). Costs could be cut if a different scale was designed and tested on the unit and found effective. Nurses would have to be educated regarding the physical activity rehabilitation program. This would cost the institution an hourly amount for time spent educating nurses. The institution could also create a computer-based program, leading to further man-hours and monetary expenses to design the

course. The final cost incurred to the institution is resistance bands. One website offered 150-foot spools of a name-brand resistance band between \$69.95 and \$179.95. The cost increased as resistance increased. Patients would ideally receive two different resistances. Several varying spools would have to be ordered. To reduce risk of injury, only easy- to moderate-grade resistance bands would be ordered. To buy one roll of each resistance band grade, the cost to the institution is around \$400. Potential cost to the institution for the first year of implementation ranges from \$16,700 to \$67,590.

### **Psychosocial Implications**

Socialization will assist with adherence. These are specific to patients who ambulate in the hallway. Due to the high traffic daily, the unit could decide upon some “walking” hours, in which patients are invited to ambulate at a certain time. Patients will be able to see each other and can encourage each other. To avoid boredom, the direction of walking laps around the hall can change daily. If patients are set for a long-term stay and have similar diagnoses, nurses can ask if the patients would like to meet and become activity partners. Since there is no group activity area, these are some suggestions to promote adherence and psychosocial wellness for participants.

Table 3.1 Tier 1 Patient Description

Patient Characteristic Eligibility of Tier 1	Objective Markers	Exercise Prescription Recommendations
<ul style="list-style-type: none"> <li>- This patient is mostly confined to the bed and perhaps even to sitting up.</li> <li>- A number “bad days,” where the patient feels completely drained or experiences uncontrolled adverse reaction(s) to treatment</li> <li>- This patient entered the hospital deconditioned or had deconditioned to a point that he/she is bedridden.</li> <li>- Comorbidities that interfere with physical activity, such as claudication or spinal injuries</li> <li>- Patient is trying to maintain a baseline function level</li> </ul>	<ul style="list-style-type: none"> <li>- Bi-weekly Brief Fatigue Inventory score of 63 to 90 OR daily rating 7 to 10 OR checked the box “Too tired to fill out survey”</li> <li>- Symptomatic anemia (Hemoglobin Grade 3 or 4) OR patient requires packed RBC transfusion OR whole blood transfusion</li> <li>- Thrombocytopenia that causes spontaneous bleeding OR patient has less than 20,000 platelets/mm<sup>3</sup> OR patient requires platelet transfusion</li> <li>- Patient unable to rise without assistance OR patient unable to walk OR patient scores greater than 10 on Fall Risk Assessment (Appendix F)</li> <li>- Patient unable to exercise due to same day surgery OR prescribed immobilization OR not cleared by doctor/physical therapy</li> <li>- Patient experiencing intractable nausea or vomiting</li> </ul>	<ul style="list-style-type: none"> <li>- Strength and resistance training using a resistance band. Strength and resistance exercises specifically target certain muscle groups to improve function and strength (HHS, 2008)</li> <li>- Short intervals throughout the day, 2 to 4 minutes long, no more than 8 times per day, 3 times per week</li> <li>- Recovery/rest days about every other day of complete rest, not to exceed 4 days per week</li> <li>- Target Perceived Exercise Intensity: 1-3 (per patient report on a 0 to 10 numerical scale. It increases in each tier because the functional goals are different. However, a patient should not strive above 7 in the hospital setting due to safety and adherence.)</li> </ul> <p>Sample activities may include gluteal or quadriceps setting (contracting and holding for 5 seconds, repeat) sitting up and sitting down, and lifting extremities to chest and lowering back to bed (Girard, 2009 &amp; Bowman, 2009).</p>

Table 3.2 Tier 2 Patient Description

Patient Characteristic Eligibility for Tier 2	Objective Markers	Exercise Prescription Recommendations
<ul style="list-style-type: none"> <li>- This patient mostly stays within their room.</li> <li>- A patient in tier 2 due to fatigue spends time in the chair or standing but not necessarily walking or other aerobic activity.</li> <li>- A patient qualifies for tier 2 if he or she is unable to leave the room due to isolation precautions or confined radiation therapy</li> <li>- Patient is working to maintain and slightly build upon baseline activity level.</li> </ul>	<ul style="list-style-type: none"> <li>- Bi-weekly Brief Fatigue Inventory score of 36 to 62 OR daily rating 4 to 6</li> <li>- Symptomatic anemia (Hemoglobin Grade 2) OR patient requires packed RBC transfusion OR whole blood transfusion</li> <li>- Thrombocytopenia that requires platelet transfusion</li> <li>- Patient able to rise in single movements OR patient successfully rises with multiple tries OR patient scores greater than 7 on Fall Risk Assessment</li> <li>- Patient experiencing well-controlled nausea and vomiting, but perhaps having an episode of uncontrolled nausea or vomiting</li> <li>- Severe neutropenia or active infection that prevents the patient from leaving the room, including <i>C. diff</i>, VRE or MRSA.</li> </ul>	<ul style="list-style-type: none"> <li>- Mild aerobic exercise coupled with strength and resistance training using the resistance band. Aerobic exercise specifically targets one's endurance and is meant to raise the heart rate above baseline (HHS, 2008)</li> <li>- Active days include short intervals throughout the day (2 to 5 minutes), not to exceed 6 times per day, 4 times per week.</li> <li>- One "long" interval (5 to 10 minutes) not to exceed 15 minutes, 4 times per week</li> <li>- A mix of active rest/recovery days and inactive recovery days not to exceed 4 times per week. Active recovery days have the patient performing tier 1 exercises while inactive rest/recovery days allow the patient to choose complete rest.</li> <li>- Target Perceived Exercise Intensity: 2-6</li> </ul> <p>Sample exercises include biking with minimal resistance on an exercise bike, walking from bed to chair or bathroom a set number of times, squats, and bicep curls.</p>

Table 3.3 Tier 3 Patient Description

Patient Characteristic Eligibility for Tier 3	Objective Markers	Exercise Prescription Recommendations
<ul style="list-style-type: none"> <li>- A patient in tier 3 may already be an active person.</li> <li>- This patient has little or no restrictions on activity and has not experienced such serious deconditioning as to prevent participation.</li> <li>- A patient that is newly diagnosed may fit here in order to prevent deconditioning early.</li> <li>- This patient has the energy to build upon their baseline activity level.</li> </ul>	<ul style="list-style-type: none"> <li>- Bi-weekly Brief Fatigue Inventory score of 0 to 35 OR daily rating 0 to 3</li> <li>- Asymptomatic anemia (Hemoglobin Grade 1) OR patient is not anemic</li> <li>- Patient able to rise in single movements OR patient scores less than 7 on Fall Risk Assessment</li> <li>- Patient is not experiencing nausea or vomiting OR has reactions well managed.</li> </ul>	<ul style="list-style-type: none"> <li>- Aerobic activity and strength and resistance training, using the resistance band</li> <li>- Unrestricted movement within the walls of the inpatient unit</li> <li>- Active days include short intervals as needed, (2 to 5 minutes), not to exceed 6 times per day, 4 to 5 times per week.</li> <li>- One to two “long” interval a day (7 to 15 minutes) not to exceed 20 minutes, 4 to 5 times per week.</li> <li>- Rest/recovery days are active, where patient participates in either Tier 1 or Tier 2 exercises not to exceed 3 times per week. Patient may also choose to have one complete rest day in the week and 1 to 2 active rest/recovery days.</li> <li>- Target Perceived Exercise Intensity: 2-7</li> </ul> <p>Sample exercises include using the stationary bike with resistance, walking a prescribed rate around the unit, squats, bicep curls, and depending on patient function, push-ups, planks, core work, and if available, treadmill running.</p>

## **Measuring Fatigue and Progress**

Upon initial admission, patients will meet with a physiotherapist who will help the patient determine his or her baseline activity level. The physiotherapist, in conjunction with the multidisciplinary team, will develop an individualized exercise prescription. The goal is for the patient to remain at baseline or above for the duration of their hospital stay. The nurse's role is to act as an advocate and a coach. The nurse will offer support and encouragement. The nursing team sees the patient day-to-day and can ensure that the prescription is followed or modified. Patients will meet weekly with the consulting healthcare professional to assess which exercise tier the patient will best benefit within.

Initially and weekly, patients will self-report their levels of fatigue via the MD Anderson Brief Fatigue Inventory (BFI). The BFI will be given to patients mid-week in order to get a more clear idea of a patient's fatigue. For example, if a patient is exercising every other day then the BFI will be administered alternately on an active day or recovery day every other week. This scale is chosen over the any other fatigue scale due to the shortened length and types of questions asked. The BFI utilizes a zero to 10 self-rating formula and identifies not only a quantitative measure of one's fatigue but also how fatigue has affected one's life in six key areas. A Japanese study found that the BFI is an effective and objective measure of fatigue (Okuyama et al., 2003). It is linguistically validated in 43 languages and psychometrically evaluated in nine languages (University of Texas M.D. Anderson). Unlike some other fatigue scales, the BFI does not have an area for subjective comments. It is thought that since a patient must to undergo many treatments in the hospital and is considerably busy, a quick self-reported measure of fatigue would offer the most adherence while still obtaining necessary information. See Appendix C for the full version of the BFI.

Daily, each patient will log their own exercises. Ambulatory patients can measure laps with either a magnet on the door jamb or a pedometer. They will also rate their fatigue daily using a numerical zero to 10 rating scale. See Appendix D for a sample log. Patients are expected to be active in some capacity nearly every day. Therefore, all patients and nurses will be educated regarding Tier 1 exercises. Nurses can suggest these activities to their patients when they are having a particularly off day. Nurses can also promote activity when the patient starts to refrain from the exercise prescription.

A ribbon will be placed upon the door frame of every participant upon enrollment in the rehabilitation program. After every week completed, the patient will receive a sticker to add to their ribbon. Two stickers will be given for each week the patient completes their goal. Placed on the doorframe, the ribbon symbolizes participation and shows other patients on the unit that they are not alone in their rehabilitation endeavor. For those who are able to walk in the hallway, they can see how many others are participating. This should contribute to greater feelings of inclusion and decrease in social isolation.

Upon discharge, the patient will be expected to continue the exercise prescription. It must be carried on outpatient during and beyond treatment. It is outside of the scope of this paper to discuss outpatient partnership. Ultimately, the benefit of physical activity can only be realized if a patient is willing to commit to a lifestyle change.

## **Summary**

Chapter 3 presented necessary aspects of the rehabilitation program, including the description of the pilot environment, outline of each tier, resources needed, and measurement tools. These must be considered before implementation.

## **Chapter 4: Implementation**

### **Overview**

As with any change, several events must take place to ensure a successful implementation. By applying Everett Rogers's Diffusion of Innovations theory and through insight by experts in the field, a thorough plan is devised regarding the execution of the physical activity rehabilitation program.

### **Application of Rogers's Diffusion of Innovations Theory**

Rogers's Diffusion of Innovations theory defines diffusion as "the process in which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003, p. 5). The four elements of diffusion are innovation, communication, time, and the social system (Rogers, 2003). In this case, the physical activity rehabilitation program is the innovation. Communication will involve speaking with all members of the interdisciplinary team, providing presentations and in-services on this topic. A timeline must be decided by those leading the project. The social system consists of all entities of the pilot unit, including hospital stakeholders, administrators, unit opinion leaders, unit management, staff nurses, physicians, physiotherapists, and patients.

Cain and Mittman (2002) identified ten elements of successful diffusion in healthcare based off of Rogers's Diffusion of Innovations theory. These ten outcomes are relative advantage, trialability, observability, communication channels, homophilous groups, norms/roles/social networks, opinion leaders, compatibility, and infrastructure (Cain & Mittman, 2002). The most relevant are extrapolated.

Relative advantage is defined as the perceived value and benefit of adopting a physical activity rehabilitation program over the unit's current lack of protocol (Cain & Mittman, 2002).



The social system must be educated about the potentially large benefits of implementing the physical activity rehabilitation program. Ideally, patients will be hospitalized for less time with less complications and report better quality of life.

Trialability is the “ability to try out an innovation without total commitment and with minimal investment” (Cain & Mittman, 2002, p. 9). For example, the implementation of this program requires the floor to hire a physiotherapist who specializes in cancer symptom management and to divide patients into three tiers of functioning. To begin the program, the floor can implement the lowest tier, bed and sitting exercises. There is little risk and little cost associated with this tier, as patients do not have to leave the bed. In order to decide which exercises will be taught, the pilot floor can consult a member of the physical therapy team already hired at the hospital. The physical therapist can educate patients during a regular physical therapy session and ask a simple zero to ten rating of fatigue.

Infrastructure consists of the resources already available on the unit to facilitate diffusion (Cain & Mittman, 2002). For example, the pilot unit already has exercise bikes, which are already occasionally utilized as physical activity for patients on the unit. However, the pilot unit does not have space to hold a group exercise class or to have a designated exercise area. Both of these will affect the execution of the initial implementation.

### **Clinical Expertise**

Several healthcare professionals were interviewed regarding the implementation of a physical activity program. Two published experts in the field of cancer-related fatigue, an attending doctor on the pilot unit, a clinical nurse specialist on the pilot unit, and a nurse who had implemented an inpatient physical activity program were interviewed. The list of interview questions is attached on Appendix E.

Both CRF experts consulted explained that while there is extensive literature available that touts positive patient outcomes through physical activity, the evidence diffuses into practice about twenty to thirty years after conception (Anna L. Schwartz and Barbara F. Piper, personal communication, March 18, 2011). Both experts have participated in the field of CRF research for at least twenty years and are just recently seeing widespread results. They postulated that physicians and nurses lack the knowledge base to prescribe physical activity despite clear benefits to the patients. They also both noted that the treatment of CRF must be multidimensional, addressing a patient's anxiety, nutrition, anemia, depression and sequelae of chemotherapy treatments.

As for current interventions by the clinical expertise panel, one expert stated that she is working with the Young Men's Christian Association (YMCA) to implement a nationwide cancer program called "Livestrong at the Y." This is an outpatient program strictly designed for outpatient cancer survivors (Anna L. Schwartz, personal communication, April 18, 2011). Another expert stated that her institution is beginning to study the effect of yoga and meditative movement on CRF with outpatients. Both experts stated that there was currently no inpatient physical activity program in the hospitals they are affiliated with. The doctor who attends to patients on pilot unit stated that he tells his patients to walk. He can cite several cases of patients who were deconditioned, encouraged to walk around the unit, and then became overall healthier and better able to tolerate treatment (Dr. Ravi Krishnadasan, personal communication, March 3, 2011). The doctor has not yet implemented strength and resistance training for his patients, but agreed that such an intervention would be applicable inpatient. One nurse had implemented a group exercise program on the bone marrow transplant unit where she was employed. She and a

physical therapist on the unit created a tri-weekly class that attracted several patients each time (Joy Kiviat, personal communication, April 11, 2011).

Several barriers were identified by the clinical panel regarding the implementation of a physical activity rehabilitation program. It is difficult to specify frequency, duration and intensity because of the varying levels of functioning between patients. The patient's own fatigue might get in the way of physical activity for the day. The physical therapist must be willing to design a rehabilitation program for patients at the patient's current functional level, not where they are going to be, and willing to make frequent, possibly daily, adjustments. Initially, it will be difficult for a patient to complete the recommended 150 minutes per week. Other factors include whether or not the patient is on contact isolation and hospital policies regarding patient isolation. If a patient is not allowed to leave the room, physical activity must be modified (Susan Bohnenkamp, Joy Kiviat, Barbara F. Piper, & Anna L. Schwartz, personal communication).

Regarding the staffing, there are possible time limitations. If a patient has a busy day, physical activity may drop on the priority list. Clear responsibilities about who educates and documents the intervention will have to be delineated (Susan Bohnenkamp, personal communication, April 11, 2011). Other barriers identified include lacking support from the interprofessional team and nurses not encouraging their patients to participate. Ultimately, if people are not committed to this intervention, it will fail. However, the clinical nurse specialist stated that even though time and accountability might be an initial barrier to implementation, members of the team will generally execute treatments that benefit their patients (Susan Bohnenkamp, personal communication, April 11, 2011).

Several facilitators of the physical activity rehabilitation program were identified by the clinical expertise panel. Patients who participate will leave the hospital quicker, have a decreased

need for blood transfusions, and patients will most likely have less falls. Having an exercise physiologist for the unit was considered a facilitator because patients and staff would be able to get their questions answered as well as the overall safety of the program would be increased with greater supervision. One expert pointed out that there are no limitations for physical activity, creating a large database of activity choices that patients can utilize (Anna L. Schwartz, personal communication, March 18, 2011). Regardless of blood cell counts, lymphedema, or any other side effect of cancer, patients can be active in some way.

The nurse that implemented a group fitness program on a Bone Marrow Transplant unit stated that she saw that the patients who participated had an improved psychosocial outlook. After partaking in the group exercise program, the patients would sit outside of their rooms talking, laughing, singing and dancing. The patients “felt normal” (Joy Kiviat, personal communication, April 11, 2011). This is an enormous advantage to having a physical activity program, as inpatients often complain of feeling socially isolated, contributing heavily to depression and anxiety.

Overall, all members of the clinical expertise panel agreed that an individualized, tiered physical activity program would be an effective way to improve CRF. Most agreed that it would take one person to lead the intervention and the rest of the people will follow suit.

### **Pre-implementation**

Before the plan can be implemented, several details must be clarified and possible solutions for anticipated issues be developed. First, all members of the interdisciplinary team must join and discuss this common goal. The protocol presented in the plan must be approved. Money will have to be allocated to the hiring of extra staff and supplies. The patient isolation policy may have to be revisited in order to determine if highly functional patients must stay in

their rooms or if they can ambulate in the hallway following a pre-determined infection control protocol.

A physical therapist or exercise physiologist needs to be brought onto the unit where this program will take place. This person must be well-educated regarding physical activity, physiology of cancer and CRF, and the several safety limitations coupled with the course of cancer treatments. He or she must be willing to listen to the patient's report of fatigue and to work with changes in condition. The physician team must be willing to allow the physiotherapist to prescribe exercise for the patients and show support by referring patients to the physiotherapist. Finally, the physiotherapist will need to formally develop the activities in each tier.

The nursing team plays one of the largest roles in implementing the physical therapy rehabilitation program. Nurses will be able to encourage patients to participate better if they have knowledge and understanding of the program. Nurses will have to be educated regarding this program and how it is designed to benefit the patient. All the nurses on the floor will have to attend an in-service that outlines each tier and then teaches the nursing staff how to perform tier 1 exercises correctly. Since they will play one of the largest roles in patient support and adherence, they must know how to do the lowest level of functional exercises. The nursing staff will also have to decide how to document their role in the program. Each nurse will have to agree to participate and ensure that physical activity integrates into the patient's plan of care.

Other members of the team include hospital administrators, the information technology (IT) department, and the actual participants, or patients. Hospital administrators must be persuaded to participate in the program by hiring the physiotherapist and allotting money for some supplies. A presentation outlining current research, benefits, and similar programs would

be best. The IT department will have to add a parameter to the nursing flowsheet in the electronic medical record. In the same way there is an intake and output record and diabetes monitoring flowsheet, nurses will be able to document a patient's physical activity in the chart. Once the formalities are cleared, the patients partake in the program. The interprofessional team can coax patients and present all the evidence and benefits, but it is ultimately up to the patient to decide whether or not to participate.

### **Implementation**

Nurses must attend an in-service explaining the topic tier 1 exercises in detail. Nurses on this unit participate in a monthly "skills day," which would be the perfect medium to present the information. The in-service would educate nurses regarding the benefits of physical activity, how to support and encourage patients, and how to utilize Tier 1 activities, the BFI, the weekly log, resistance bands. Every three months for the first year, the program's progress and popularity will be evaluated by the nursing staff and areas of needed education identified.

Formal implementation will include systematically adding tiers. Initially, patients will be taught tier 1 exercises and encouraged to walk. While some patients may have higher functional status and would fit better in tier 3, implementation must start small. Within three months, tier 2 exercises will be added. By one year, the tier 3 activity level will be available for prescription. This allows for adjustments to be made at the most basic level. The interdisciplinary team can begin to measure the value of having an activity program.

### **Summary**

The advantage of implementing such a program lies in its inherent quality and safety outcomes. Patients' balance and strength will improve upon participation, leading to less falls, less days spent in the hospital, and more money saved for the institution. Patients will be happier

and healthier overall. Each member of the multidisciplinary team has something to contribute to make implementing the plan possible.

## **Chapter 5: Evaluation**

### **Overview**

This chapter will evaluate the implementation scenario from Chapter 4, discuss strengths and weaknesses of the project and recommendations for future research. Evaluation is key to find ways to improve the project overall.

### **Post-implementation Evaluation**

All members of the interdisciplinary team will have to complete an evaluation of the program. The program can be modified based upon the feedback of staff. Anticipated outcomes include:

- Patient-reported improvement over CRF
- Patient-reported improvement in quality of life
- Interprofessional team collaboration, including the addition of a floor physiotherapist
- Reduction or Maintenance in Hendrich II Fall Risk Assessment score before and after hospital stay
- 90% of Nurses will document and promote the outcome within one year of implementation

This change will come about slowly as the rehabilitation program becomes more popular and well-established on the unit. Statistics for each of these parameters will be gathered and compared each month and results presented to the administration at six months and one year.

### **Strengths**

The most significant strength of the rehabilitation program is that it addresses a need that nearly all patients have when undergoing treatment for cancer; fatigue reduces their quality of life. Patients would be more likely to participate because they see their fatigue as an issue. An



important strength of the rehabilitation program is the tiered design. The tiered design allows for a liberalized physical activity plan available to each patient. No patient is locked into a set amount or type of activity. It allows for patient changes in condition throughout the course of his or her treatment. It can be implemented in the patient's plan of care relatively quickly without extensive patient education needed. The patient's fatigue is evaluated daily and weekly, allowing the patient to see their progress. Another strength is the availability of such a large base of evidence supporting the implementation of such a plan. Physical activity literature is a popular topic in today's research community. Several researchers are looking at how to implement such programs and trying various means to ensure the patient sees the benefit of physical activity. As results are consistently positive in the literature, the implementation committee will have many pieces of solid evidence to convince hospital administrators to begin the program.

### **Limitations**

An inherent limitation of this best practice proposal results in having no quantitative data. Most of the paper relies on educated speculation, planning and research. Having few actual exercises within the plan is a limitation of the project. Without consulting a physiotherapist, designing the activity routine for each tier would be outside the author's scope of practice. Influencing institutional change is a limitation of any new innovation. Persuading hospital administrators, setting up the physical activity education classes for nurses, and hiring a physiotherapist are pieces of implementation that take time. Patients probably would not see the benefit of this program for several months to years. Some people might not see the value in this change and perhaps it would never make it to the floor.

**Recommendations for Future Research**

One future recommendation for research is holding a pilot study where quantitative data is measured. The tiered plan would have to be implemented for a time to see if there is any benefit. Data would have to be collected and measured, including the patient's own assessment of fatigue, the number of falls and blood transfusions on the unit, and the average length of hospitalization before and after the program. Another recommendation is to research the type, intensity, frequency and duration of activities that provide the most benefit to the patient. The plan lists non-specific frequency and duration for each tier, but does not differentiate between types of exercises. Average intensity depends on the activity and must be measured appropriately through patient report.

**Dissemination of Information**

In order to benefit patients on a broader scale, this information must be disseminated. Initial dissemination of evidence-based best practices includes professional presentation at local nursing specialty meetings. One goal is to publish the literature review section in a clinical journal. Another is to begin implementation at other acute care oncology settings. This thesis is available in the University of Arizona libraries for anyone to borrow.

**Summary**

Chapter 5 has given the anticipated evaluation outcomes, strengths, limitations and recommendations for future research. The program will treat fatigue in patients nonpharmacologically and according to the literature, successfully. The opinion of the author is that a physical activity rehabilitation program is necessary to progress toward a more holistic mode of nursing and provides another opportunity for nurses to be better patient advocates. This

idea offers symptom management in a way that allows the patient some autonomy. Physical activity rehabilitation could make a difference for many patients.

## References

- American College of Sports Medicine (2010). *American college of sports medicine roundtable on exercise: Guidelines for cancer survivors*. Retrieved from [http://www.acsm.org/AM/Template.cfm?Section=About\\_ACSM&TEMPLATE=/CM/ContentDisplay.cfm&CONTENTID=15491](http://www.acsm.org/AM/Template.cfm?Section=About_ACSM&TEMPLATE=/CM/ContentDisplay.cfm&CONTENTID=15491)
- Balls'N'Bands (n.d.) *Thera-Band resistance bands: 150 FOOT bulk roll*. Retrieved from [http://www.ballsnbands.com/theraband\\_resistance\\_band\\_150\\_foot\\_bulk\\_rolls.html](http://www.ballsnbands.com/theraband_resistance_band_150_foot_bulk_rolls.html)
- Blaney, J., Lowe-Strong, A., Rankin, J., Campbell, A., Allen, J., & Gracey, J. (2010). The cancer rehabilitation journey: barriers to and facilitators of exercise among patients with cancer-related fatigue. *Physical Therapy*, 90(8), 1135-1147.
- Bowman, L. (2009). Management of clients with stroke. In J.M. Black & J.H. Hawks (Ed.8), *Medical-surgical nursing: clinical management for positive outcomes*. St. Louis, MO: Saunders Elsevier.
- Brubaker, P.H., Moore, J.B., Stewart, K.P., Wesley, D.J., & Kitzman, D.W. (2009). Endurance exercise training in older patients with heart failure: results from a randomized, controlled, single-blind trial. *Journal of the American Geriatrics Society*, 57(11), 1982-89.
- Centers for Disease Control and Prevention (2007). *Leukemia statistics*. Retrieved from <http://www.cdc.gov/cancer/hematologic/leukemia/statistics/index.htm>
- Centers for Disease Control and Prevention (2007). *Non-hodgkin lymphoma statistics*. Retrieved from <http://www.cdc.gov/cancer/hematologic/lymphoma/statistics/index.htm>
- Centers for Disease Control and Prevention (2007). *Myeloma statistics*. Retrieved from <http://www.cdc.gov/cancer/hematologic/myeloma/statistics/index.htm>

- Coleman, E.A., Hall-Barrow, J., Coon, S., & Stewart, C.B. (2003). Facilitating exercise adherence for patients with multiple myeloma. *Clinical Journal of Nursing Oncology*, 7(5), 529-40.
- Courtney, L., & Hock, K. (2009). Decreasing cancer-related fatigue through an EBP walking program pilot. *Oncology Nursing Forum*, 36(3), 5-6.
- Donnelly, C.M., Lowe-Strong, A., Rankin, J.P., Campbell, A., Allen, J.M., & Gracey, J.H. (2010). Physiotherapy management of cancer-related fatigue: a survey of U.K. current practice. *Support Care Cancer* 18, 817-825.
- Girard, N.J. (2009). Clients having surgery: Promoting positive outcomes. In J.M. Black & J.H. Hawks (Ed.8), *Medical-surgical nursing: clinical management for positive outcomes*. St. Louis, MO: Saunders Elsevier.
- Guiraud, T., Juneau, M., Nigam, A., Gayda, M., Meyer, P., Mekary, S., Paillard, F. & Bosquet, L. (2009). Optimization of high intensity interval exercise in coronary heart disease. *European Journal of Applied Physiology*, 108(4), 733-40.
- Gobel, B.H. (1993). Bleeding disorders. *Cancer nursing: Principles and practice*. (Ed. 3). Jones and Barlett Publishers: Boston, MA.
- Hagglund, L., Boman, K., & Lundman, B. (2008). The experience of fatigue among elderly women with chronic heart failure. *European Journal of Cardiovascular Nursing*, 7(4), 290-5.
- Hanna, L.R., Avila, P.F., Meter, J.D., Nicholas, D.R., & Kaminsky, L.A. (2008) The effects of a comprehensive exercise program on physical function, fatigue, and mood in patients with various types of cancer. *Oncology Nursing Forum*, 35(3), 461-469.
- Jahangard, T., Torkaman, G., Ghosheh, B., Hedayati, M., & Dibaj, A. (2009). The effect of

- short-term aerobic training on coagulation and fibrinolytic factors in sedentary healthy postmenopausal women. *Maturitas*, 64(4), 223-7.
- Kocur, P., Deskur-Śmielecka, E., Wilk, M., & Dylewicz, P. (2009). Effects of Nordic walking training on exercise capacity and fitness in men participating in early, short-term inpatient cardiac rehabilitation after an acute coronary syndrome -- a controlled trial. *Clinical Rehabilitation*, 23, 995-1004.
- Macchi, C., Polcaro, P., Cecchi, F., Zipoli, R., Sofi, F., Romanelli, A., Pepi, L., Sibilio, M., Lipoma, M., Petrilli, M., & Molino-Lova, R. (2009). One-year adherence to exercise in elderly patients receiving postacute inpatient rehabilitation after cardiac surgery. *American Journal of Physical Medicine & Rehabilitation*, 88(9), 727-34.
- Meyer, P., Guiraud, T., Gayda, M., Juneau, M., Bosquet, L., & Nigam, A. (2010). High-intensity aerobic interval training in a patient with stable angina pectoris. *American Journal of Physical Medicine & Rehabilitation*, 89(1), 83-6.
- National Comprehensive Cancer Network (2010). *NCCN Clinical Practice Guidelines in Oncology<sup>TM</sup>: Cancer-related fatigue* [v.1.2010]. Retrieved from [http://www.nccn.org/professionals/physicians\\_gls/PDF/fatigue.pdf](http://www.nccn.org/professionals/physicians_gls/PDF/fatigue.pdf)
- Newton, S. (2009). Management of clients with leukemia and lymphoma. In J.M. Black & J.H. Hawks (Ed.8), *Medical-surgical nursing: clinical management for positive outcomes*. St. Louis, MO: Saunders Elsevier.
- Okuyama, T., Wang, X.S., Akechi, T., Mendoza, T.R., Hosaka, T., Cleeland, C.S. et al. (2003). Validation study of the Japanese version of the Brief Fatigue Inventory. *Journal of Pain and Symptom Management*, 25, 106-117.

- Pozehl, B., Duncan, K., & Hertzog, M. (2008). The Effects of exercise training on fatigue and dyspnea in heart failure. *European Journal of Cardiovascular Nursing*, 7(2), 127-32.
- Rezaei-Araryani, M., Ahmadi, F., & Asghari-Jafarabadi, M. (2009). The effect of changing position and early ambulation after cardiac catheterization on patients' outcomes: a single-blind randomized controlled trial. *International Journal of Nursing Studies*, 46(8), 1047-53.
- Salary.com (2011) *Physical therapist:Tucson, AZ*. Retrieved from <http://swz.salary.com/SalaryWizard/Physical-Therapist-Salary-Details-Tucson-AZ.aspx>
- Stricker, C.T., Drake, D., Hoyer, K.A. & Mock, V. (2004). Evidence-based practice for fatigue management in adults with cancer: exercise as an intervention. *Oncology Nursing Forum*, 31(5), 963-976.
- The National Cancer Institute and Cooperative Oncology Groups Grading System for Anemia. AHRQ (2001). *Uses of Epoetin for Anemia in Oncology*. Summary, Evidence Report/Technology Assessment: Number 30. AHRQ Publication Number 01-E008, March 2001. Agency for Healthcare Research and Qualift, Rockville, MD. <http://www.ahrq.gov/clinic/epcsums/epoetsum.htm>
- Toufan, M., & Afrasiabi, A. (2009). Benefits of cardiac rehabilitation on lipid profile in patients with coronary artery disease. *Pakistan Journal of Biological Sciences*, 12(19), 1307-13.
- University of Texas, M.D. Anderson Cancer Center. (n.d.). *The brief fatigue inventory (BFI)*. Retrieved from <http://www.mdanderson.org/education-and-research/departments-programs-and-labs/departments-and-divisions/symptom-research/symptom-assessment-tools/brief-fatigue-inventory-bfi.html>

U.S. Department of Health and Human Services. (2008). *2008 physical activity guidelines for Americans*. Retrieved from [www.health.gov/paguidelines/pdf/paguide.pdf](http://www.health.gov/paguidelines/pdf/paguide.pdf)

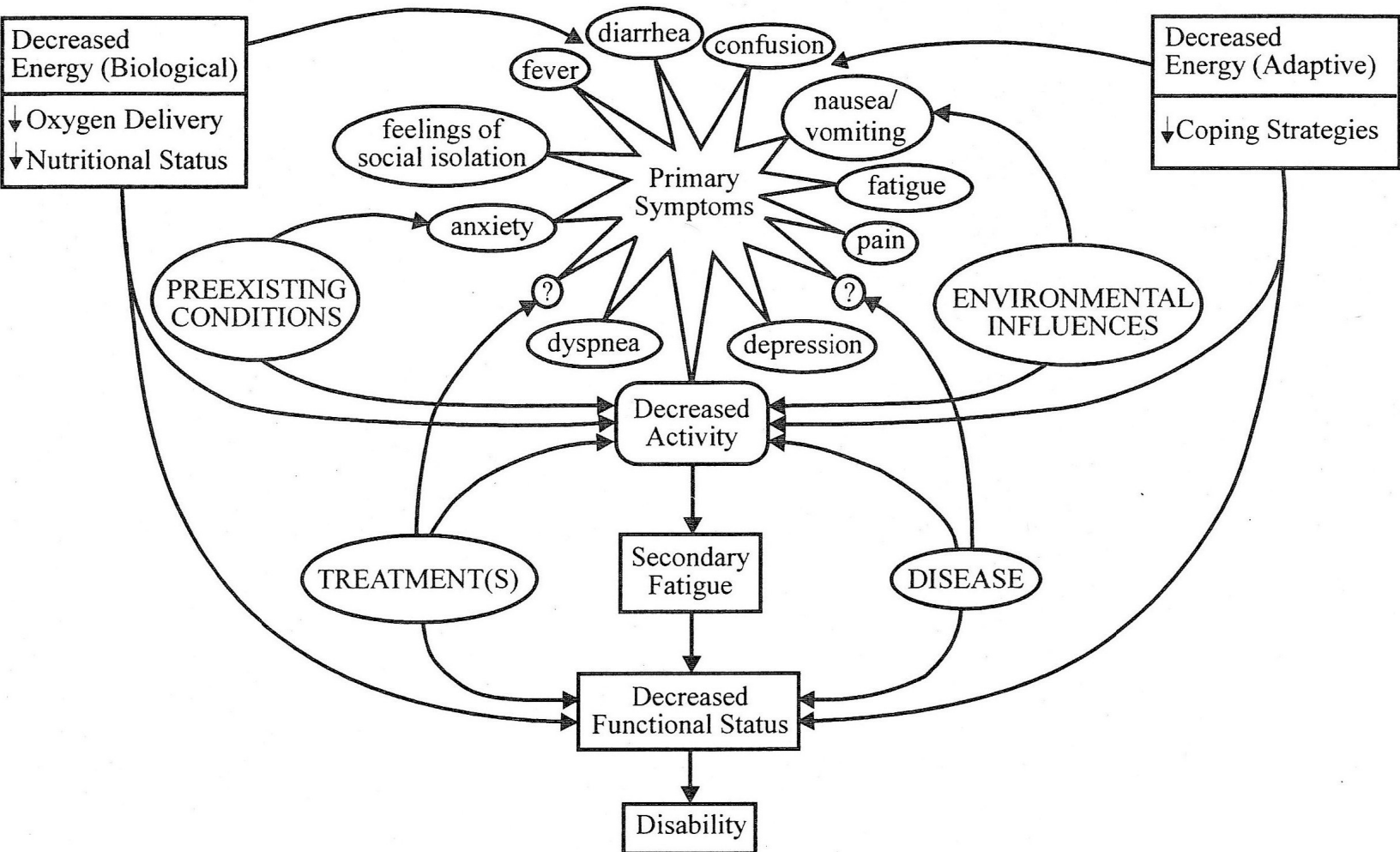
Ward-Smith, P. (2009). Clients with cancer. In J.M. Black & J.H. Hawks (Ed.8), *Medical-surgical nursing: clinical management for positive outcomes*. St. Louis, MO: Saunders Elsevier.

Yoder, L.H. (2009). Management of clients with hematologic disorders. In J.M. Black & J.H. Hawks (Ed.8), *Medical-surgical nursing: clinical management for positive outcomes*. St. Louis, MO: Saunders Elsevier.

Young-McCaughan, S., Mays, M.Z., Arzola, S.M., Yoder, L.H., Dramiga, S.A., Leclerc, K.M., Caton, J.R., Sheffler, R.L., & Nowlin, M.U. (2003). Change in exercise tolerance, activity and sleep patterns, and quality of life in patients with cancer participating in a structured exercise program. *Oncology Nursing Forum* 30(3), 441-452.



# APPENDIX A: Psychobiological-Entropy Model of Functioning



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**Table B.1 Cancer-related Fatigue Literature**

<b>Article</b>	<b>Sample and Sample size</b>	<b>Level of Evidence</b>	<b>Type of Exercise</b>	<b>Results</b>
Facilitating exercise Adherence for Patients with Multiple Myeloma (Coleman et al., 2003)	14 patients in exercise group and 10 in the usual care group	Quasi-experimental study, (Level 4)	Resistance bands, walking, stretching	Positive results in functional status and QOL
Evidence-Based Practice for Fatigue Management in Adults with Cancer: Exercise as an Intervention (Stricker et al. 2004).	Review of literature	Systematic Review, (Level 1)	Cycling, walking, treadmill, aerobic, resistance	Several exercise programs are used with mixed results, old evidence >5 years used; all positively correlated
2008 Physical Activity Guidelines for Americans (US Department of Health and Human Services, 2008)	None	Integrative Review of Experimental Studies (Level 2)	Several, but cancer is not mentioned specifically except for "Cancer Prevention"	ACSM guidelines are based off of this piece
The Effects of a Comprehensive Exercise Program on Physical Function, Fatigue, and Mood in Patients with Various Types of Cancer (Hanna et al., 2008)	39 patients with cancer and cancer survivors who voluntarily completed a 16-session comprehensive exercise program	Quasi-experimental study (Level 4)	Low-to-moderate aerobic and resistance exercise, education and support twice weekly	Significant improvements from pre- to post-testing

Physiotherapy management of cancer-related fatigue: a survey of UK current practice (Donnelly et al., 2009)	All members of the UK's Association of Chartered Physiotherapists in Oncology and Palliative Care	Descriptive Survey (Level 7)	Walking, maybe.	Physiotherapists would prescribe more exercise if they had guidelines – but they are using physical activity interventions
Decreasing cancer-related fatigue through an EBP walking program pilot (Courtney et al., 2009)	Inpatient and ambulatory units at Arthur G James Cancer Hospital and Richard J Solove Research Insitute in Columbus, OH	Quasi-experimental study, abstract (Level 7)	Walking	In progress, no results yet
NCCN CRF practice guidelines (National Comprehensive Cancer Network, 2010)	None	Integrative Reviews of Experimental Studies (Level 2)	None specifically stated, although activity enhancement and maintenance is noted	----
ACSM Roundtable on Exercise Guidelines for Cancer Survivors (American College of Sports Medicine, 2010)	No sample, merely review	Integrative Reviews of Experimental Studies (Level 2)	Following the 2008 guidelines	Lists common cancer categories and evidence that supports
The Cancer Rehabilitation Journey: Barriers to and Facilitators of Exercise Among Patients with Cancer-Related Fatigue (Blaney et al., 2010)	26 patients diagnosed with cancer, either undergoing treatment, palliative care or survivors. Patients were adults over 18 years of age	Qualitative study (Level 6)	No exercise	Barriers/Facilitators identified for physical activity

**Table B.2 Cardiac Rehabilitation Literature**

<b>Article</b>	<b>Sample and Pertinent Study Information</b>	<b>Level of Evidence</b>	<b>Type of Exercise</b>	<b>Results</b>
Change in exercise tolerance, activity and sleep patterns, and quality of life in patients with cancer participating in a structured exercise program (Young-McCaughan et al., 2003)	62 adult outpatient patients diagnosed with cancer within two years; 46 completed the program	Repeated measures study (Level 3)	Phase II Cardiac Rehabilitation program for 12 weeks	Exercise tolerance, QOL, activity and sleep patterns improved
The effects of exercise training on fatigue and dyspnea in heart failure (Pohezl et al., 2008)	15 participants in the study, 6 in the control group, 24 week long intervention	Randomized control trial, Experimental (Level 3)	Aerobic and resistance training 3x a week	Decreased sensory fatigue, dyspnea decreased,
High-intensity aerobic interval training in a patient with stable angina pectoris (Meyer et al., 2008)	67-year old patient with stable exertional angina pectoris participating in high intensity training study	Case study ( Level 7)	High intensity exercise	Patient had no angina or ischemia after 30 minutes of physical activity
The experience of fatigue among elderly women with chronic heart failure (Hagglund et al., 2008)	Ten elderly women with fatigue and Chronic Heart Failure	Qualitative study (Level 6)	No exercise	Two themes and Five subthemes were noted
The effect of changing position and early ambulation after cardiac catheterization on patients' outcomes: A single-blind randomized controlled trial (Rezaei-Arayani et al., 2009)	18 to 20 year old patients who had an MI	Experimental study (Level 3)	Walking	higher comfort and lower fatigue, with no increase in bleeding or hematoma

The effect of short-term aerobic training on coagulation and fibrinolytic factors in sedentary healthy postmenopausal women (Jahangard et al., 2009)	20 postmenopausal women, with a control group and an exercise group	Experimental study (Level 3)	Aerobic cycling	Several cardiac risk enzymes were reduced, PR, PRR and tissue plasminogen activator activity and antigen increased
Effects of Nordic Walking training on exercise capacity and fitness in men participating in early, short-term inpatient cardiac rehabilitation after and acute coronary syndrome - a controlled trial (Kocur et al., 2009)	80 men around their early fifties with good baseline exercise tolerance	Experimental study (Level 3)	Nordic walking sticks vs regular walking	Exercise capacity increased for NW
Benefits of Cardiac Rehabilitation on Lipid Profile in Patients with Coronary Artery Disease (Toufan et al., 2009)	50 men and 15 women	Qualitative study (Level 5)	Treadmill	Lower LDL, triglyceride and total cholesterol decreased, pts had greater sense of well-being and could return to work
Endurance exercise training in older patients with heart failure: results from a randomized, controlled, single-blind trial (Brubaker et al., 2009)	30 patients in experimental group; 29 in control group. All are >60 years old with heart failure/reduced ejection fraction	Randomized control trial, Experimental (Level 3)	16 weeks of supervised endurance exercise, undrugged walking and stationary cycling; 3 times per week for 30 to 40 minutes	The experimental group had greater exercise time and workload than the control group; no significant difference in QOL
One-year adherence to exercise in elderly patients receiving postacute inpatient rehabilitation after cardiac surgery (Macchi et al., 2009)	131 patients over age 65 years at inpatient cardiac rehabilitation – tested 1 year adherence to rehab. Program	Descriptive survey (Level 7)	Patients reported 1/hr/day on 5 days/week of physical activity; measured with survey and 6-minute walk test	65% of elderly patients can recover/increase physical activity after cardiac surgery

Optimization of high intensity interval exercise in coronary heart disease (Guirard et al., 2009)	17 men and 2 women	Quasi-experimental study (Level 4)	4 different high intensity exercise modes differing in duration, recovery type, and intensity	Physical activity often halted due to patient exhaustion
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\* Level of evidence taken from Burns N. & Grove, S.K. (2007). *Understanding nursing research: Building an evidence-based practice (4)*. St. Louis, MO: Saunders Elsevier, p. 512.

# Brief Fatigue Inventory

STUDY ID# \_\_\_\_\_

HOSPITAL # \_\_\_\_\_

Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

Time: \_\_\_\_\_

Name \_\_\_\_\_

Last

First

Middle Initial

Throughout our lives, most of us have times when we feel very tired or fatigued. Have you felt unusually tired or fatigued in the last week? Yes ☐ No ☐

1. Please rate your fatigue (weariness, tiredness) by circling the one number that best describes your fatigue right NOW.

0	1	2	3	4	5	6	7	8	9	10
No										As bad as
Fatigue										you can imagine

2. Please rate your fatigue (weariness, tiredness) by circling the one number that best describes your USUAL level of fatigue during past 24 hours.

0	1	2	3	4	5	6	7	8	9	10
No										As bad as
Fatigue										you can imagine

3. Please rate your fatigue (weariness, tiredness) by circling the one number that best describes your WORST level of fatigue during past 24 hours.

0	1	2	3	4	5	6	7	8	9	10
No										As bad as
Fatigue										you can imagine

4. Circle the one number that describes how, during the past 24 hours, fatigue has interfered with your:

**A. General activity**

0	1	2	3	4	5	6	7	8	9	10
Does not interfere										Completely Interferes

**B. Mood**

0	1	2	3	4	5	6	7	8	9	10
Does not interfere										Completely Interferes

**C. Walking ability**

0	1	2	3	4	5	6	7	8	9	10
Does not interfere										Completely Interferes

**D. Normal work (includes both work outside the home and daily chores)**

0	1	2	3	4	5	6	7	8	9	10
Does not interfere										Completely Interferes

**E. Relations with other people**

0	1	2	3	4	5	6	7	8	9	10
Does not interfere										Completely Interferes

**F. Enjoyment of life**

0	1	2	3	4	5	6	7	8	9	10
Does not interfere										Completely Interferes

## Daily Fatigue and Activity Log WEEK \_\_\_\_

**Do you feel too tired/unwell to fill this out today? Please place an “X” for each day under the “Fatigue Rating BEFORE” column.**

	Monday Day:	Tuesday Day:	Wednesday Day:	Thursday Day:	Friday Day:	Saturday Day:	Sunday Day:
Fatigue Rating BEFORE (0 to 10)							
Active Day?							
Exercise 1:							
Exercise 2:							
Exercise 3:							
Rest Day?							
Fatigue rating AFTER (0 to 10)							
Comments:							

\*Under Exercise 1: please list the exercise you did and then under the “Day” column please place how many repetitions or amount of time you spent performing the exercise.



### Clinical Expertise Questionnaire

1. Tell me about your experience(s) with cancer-related fatigue (CRF) as a symptom. In general, what was the etiology of the CRF in your patients?
  
2. How do you feel about physical activity as an intervention for CRF? Describe your experience with fatigue management strategies in hematology/ oncology patients. Describe your experience with using physical activity as a fatigue management strategy.
  
3. How would you chart an intervention of physical activity in the current charting system? What is your current involvement in using physical activity as a strategy for fatigue management? Is there a physical therapist on the healthcare team for hematology/ oncology patients?
  
4. What are your thoughts about having a structured, prescribed exercise program for hematology/ oncology inpatients? In your opinion, what would be the facilitators for such a program on your unit? What do you see as potential barriers to implementing an exercise program on your unit?

## Fall Risk Assessment for Older Adults: The Hendrich II Fall Risk Model

*By: Deanna Gray-Miceli, DNSc, APRN, BC, FAANP, University of Pennsylvania;  
New Jersey Department of Health and Senior Services*

**WHY:** Falls among older adults, unlike other ages tend to occur from multifactorial etiology such as acute<sup>1,2,3</sup> and chronic<sup>4</sup> illness, medications,<sup>5</sup> as a prodrome to other diseases,<sup>6</sup> or as idiopathic phenomena. Because the rate of falling increases proportionally with increased number of pre-existing conditions and risk factors,<sup>7</sup> fall risk assessment is a useful guideline for practitioners. One must also determine the underlying etiology of “why” a fall occurred with a comprehensive post-fall assessment.<sup>8</sup> Fall risk assessment and post-fall assessment are two interrelated, but distinct approaches to fall evaluation, both recommended by national professional organizations.<sup>9</sup>

**BEST PRACTICE APPROACH:** In acute care, a best practice approach incorporates use of the Hendrich II Fall Risk Model which is quick to administer and provides a determination of risk for falling based on gender, mental and emotional status, symptoms of dizziness, and known categories of medications increasing risk.<sup>10</sup> This tool screens for primary prevention of falls and is integral in a post-fall assessment for the secondary prevention of falls.

**TARGET POPULATION:** The Hendrich II Fall Risk Model is intended to be used in the acute care setting to identify adults at risk for falls. The Model is being validated for further application of the specific risk factors in pediatrics and obstetrical populations.

**VALIDITY AND RELIABILITY:** The Hendrich II Fall Risk Model was validated in a large case control study in an acute care tertiary facility with skilled nursing and rehabilitation populations. The risk factors in the model had a statistically significant relationship with patient falls (Odds Ratio 10.12-1.00, .01 > p < .0001). Content validity was established through an exhaustive literature review, use of accepted nursing nomenclature and the extensive experience of the principal investigators in this area.<sup>11</sup> The instrument is sensitive (74.9%), specific (73.9%) with interrater reliability measuring 100% agreement.

**STRENGTHS AND LIMITATIONS:** The major strengths of the Hendrich II Fall Risk Model are its brevity, the inclusion of “risky” medication categories, and its focus on interventions for specific areas of risk rather than on a single, summed general risk score. Categories of medications increasing fall risk as well as adverse side effects from medications leading to falls are built into this tool. Further, with permission, the Model can be inserted into existing documentation forms or used as a single document. It has been built into electronic health records with targeted interventions that prompt and alert the caregiver to modify and/or reduce specific risk factors present.<sup>11</sup>

### REFERENCES:

Best practice information on care of older adults: [www.ConsultGeriRN.org](http://www.ConsultGeriRN.org).

1. Ooi, W.L., Hossain, M., & Lipsitz, L.A. (2000). The association between orthostatic hypotension and recurrent falls in nursing home residents. *American Journal of Medicine*, 108(2), 106-11.
2. Davies, A.J., Steen, N., & Kenny, R.A. (2001). Carotid sinus hypersensitivity is common in older patients presenting to an accident and emergency department with unexplained falls. *Age and Ageing*, 30(4), 273-274.
3. Heitterachi, E., Lord, S.R., Meyerkort, P., McCloskey, I., & Fitzpatrick, R. (2002). Blood pressure changes on upright tilting predict falls in older people. *Age and Ageing*, 31(3), 181-186.
4. Stolze, H., Klebe, S., Zechlin, C., Baecker, C., Friege, L., & Deuschl, G. (2004). Falls in frequent neurological diseases-prevalence, risk factors and etiology. *Journal of Neurology*, 251(1), 79-84.
5. Leipzig, R.M., Cumming, R.G., & Tinetti, M.E. (1999). Drugs and falls in older people: A systematic review and meta-analysis: Cardiac and analgesic drugs. *JAGS*, 47(1), 40-50.
6. Gray-Miceli, D., Waxman, H., Cavalieri, T., & Lage, S. (1991). Prodromal falls among older nursing home residents. *Applied Nursing Research*, 7(1), 18-27.
7. Tinetti, M.E., Williams, T.S., & Mayewski, R. (1986). Fall risk index for elderly patients based on number of chronic disabilities. *American Journal of Medicine*, 80(3), 429-434.
8. Gray-Miceli, D., Johnson, J., & Strumpf, N. (2005). A step-wise approach to a comprehensive post-fall assessment. *Annals of Long-Term Care*, 13(12), 16-24.
9. American Geriatrics Society, British Geriatrics Society, & American Academy of Orthopaedic Surgeons Panel on Falls Prevention. (2001). Guidelines for the prevention of falls in older persons. *JAGS*, 49, 664-672.
10. Hendrich, A.L., Bender, P.S., & Nyhuis, A. (2003). Validation of the Hendrich II Fall Risk Model: A Large Concurrent CASE/Control Study of Hospitalized Patients. *Applied Nursing Research*, 16(1), 9-21.
11. Hendrich, A., Nyhuus, A., Kippenbrock, T., & Soga, M.E. (1995). Hospital falls: Development of a predictive model for clinical practice. *Applied Nursing Research*, 8, 129-139.

**CASE EXAMPLE: FALL RISK ASSESSMENT WITH PRIOR FALLS HISTORY**

An 80 year old woman with new onset confusion, anxiety and urinary incontinence who has fallen repeatedly at home in the past 2 months is hospitalized for further observation and possible long-term care placement. On admission she is anxious and confused, and unable to move. Medications include Haldol 0.5 mg PO BID and Ativan 0.5 mg PO BID both started 1 week prior to admission. Admission laboratory work shows a normal CBC and SMA-12. The urinalysis has 50 WBC per high power field and +2 Bacteria. The Hendrich II fall risk score was 9. A comprehensive post-fall evaluation and review of the high risk parameters led to a presumptive diagnosis of the underlying cause of the fall: acute confusion due to urinary tract infection. Haldol and Ativan were stopped and Bactrim DS BID was started. Two weeks later, the urinary incontinence, confusion and anxiety lessened and the falling stopped. She was discharged home to live with her daughter.

**CASE DISCUSSION:** This woman possesses several “red flag” areas of a dynamic nature, e.g., falls occurring on an acute, potentially reversible basis, acute urinary incontinence, urinary tract infection, poly-pharmacy and delirium. Falling is related to these dynamic events and once the underlying causes of the fall were identified and managed, the falling stopped. Note that the review of fall related risk factors surfaced no past or static events associated with falls, such as dementia or Parkinson’s disease, but use of the Hendrich II Fall Risk Model captured significant risk factors including confusion (4 points), administered benzodiazepines (1 point) and inability to rise (4 points). These risks elicited from the Hendrich II Fall Risk Model along with information from a comprehensive post-fall assessment informed the nursing interventions and overall plan of care.

## Hendrich II Fall Risk Model™

Confusion Disorientation Impulsivity		4	
Symptomatic Depression		2	
Altered Elimination		1	
Dizziness Vertigo		1	
Male Gender		1	
Any Administered Antiepileptics		2	
Any Administered Benzodiazepines		1	
<b>Get Up &amp; Go Test</b>			
Able to rise in a single movement – No loss of balance with steps		0	
Pushes up, successful in one attempt		1	
Multiple attempts, but successful		3	
Unable to rise without assistance during test (OR if a medical order states the same and/or complete bed rest is ordered) * If unable to assess, document this on the patient chart with the date and time		4	
<b>A Score of 5 or Greater = High Risk</b>		<b>Total Score</b>	
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