RELIABILITY AND VALIDITY TESTING OF THE MD ANDERSON SYMPTOM INVENTORY- HEART FAILURE (MDASI-HF): AN EVALUATIVE INSTRUMENT FOR SYMPTOM IDENTIFICATION IN CANCER PATIENTS WITH CONCURRENT HEART FAILURE

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To the Dean of the Graduate School:

I am submitting herewith a dissertation written by Anecita Fadol entitled "Reliability and Validity Testing of the MD Anderson Symptom Inventory –Heart Failure (MDASI-HF): An Evaluative Instrument for Symptom Identification in Cancer Patients with Concurrent Heart Failure." I have examined this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy with a major in Nursing.

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ABSTRACT

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RELIABILITY AND VALIDITY TESTING OF THE MD ANDERSON SYMPTOM INVENTORY-HEART FAILURE (MDASI-HF): AN EVALUATIVE INSTRUMENT FOR SYMPTOM IDENTIFICATION IN CANCER PATIENTS WITH CONCURRENT HEART FAILURE

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The purpose of this study was to evaluate the psychometric properties of the MD Anderson Symptom Inventory- Heart Failure (MDASI-HF), an evaluative instrument for symptom assessment in cancer patients with concurrent heart failure (HF). One hundred and fifty six patients (male=88, female=68) with a diagnosis of cancer and HF receiving care in a major cancer center participated in the study. The mean age was 63.3 $\pm$ 13.2 years (range 23-97 years). The majority of the subjects (60.3%, n=94) had solid tumors, while 39.7% (n=62) had hematological cancers. All of the participants had concurrent HF, 65% (n=102) with systolic dysfunction (EF<40%), while 34.6% (n=54) had diastolic dysfunction (EF>40%). Using a descriptive, cross-sectional design, the subjects completed the 24-item symptom assessment and a six item interference MDASI-HF instrument. A cardiologist's assessment of the patient's symptoms using the New York Heart Association (NYHA) classification, and an oncologist's assessment using the Eastern Cooperative Oncology Group (ECOG) performance status were recorded

simultaneously with the patient's completion of the MDASI-HF instrument. Internal consistency reliability showed a Cronbach's α=.92 (21 symptoms), α = .89 (13 core symptoms), α = .83 (8 HF symptoms), and α = .92 (interference items). Criterion validity indicated moderate correlation scores with the ECOG performance status with r=.622, .548, and .645 for the 13 core items, 8 HF items, and six interference items respectively; and the NYHA classification with r= .622 (13 core items), r = .590 (8 HF items) and r = .588 (6 interference items). All correlations were statistically significant at p=.01. Construct validity determination using factor analysis revealed the MDASI-HF measured four constructs: 1) general symptom severity factor, 2) gastrointestinal factor, 3) covert heart failure factor and 4) overt heart failure factor. Based on the findings of this study, the MDASI-HF is a valid and reliable instrument for the assessment of symptoms in cancer patients with concurrent HF. The instrument can be used to identify symptom occurrence and enhance the provider's understanding of the prevalence and severity of symptoms from the patient's perspective that will assist in managing the complex condition of cancer and concurrent heart failure.

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CHAPTER 1

INTRODUCTION

Cancer patients are at risk for developing heart failure secondary to the cardiotoxic effects of cancer therapy and as a consequence of preexisting coronary artery disease and other structural abnormalities of the heart. The associated symptoms are primarily subjective sensations that signal a change in body function. In patients with cancer and a concurrent diagnosis of heart failure, there is an exponential increase in the severity of symptoms which can adversely affect the patient's functional status and quality of life.

Uncontrolled symptoms are devastating to patients, families and the healthcare system. Despite standard medical therapy, patients with heart failure often continue to experience symptoms that not only diminish the quality of life, but also lead to frequent visits to the emergency centers, increase hospital readmission and prolonged hospitalization. Heart failure exacerbation is the major cause of hospitalization among those patients aged 65 years and older, and has increased by 174% in the last 24 years, costing the healthcare system an annual estimated expenditure of $29.6 billion (Thom, Haase, Rosamond, Howard, Rumsfeld, & Manolio, et al., 2006). Approximately one third of all patients hospitalized for heart failure are readmitted to the hospital within 90 days after discharge because of the recurrence of symptoms (Heart Failure Society of America Guidelines, 2000).

Early identification of symptoms and initiation of appropriate management strategies are essential components of care for patients with chronic illnesses such as cancer and heart failure. In the majority of cases, patients experience symptoms related to one specific disease condition, however, cancer patients with a concurrent diagnosis of heart failure experience an exponential increase in the number and severity of symptoms related to cancer, cancer therapy, and heart failure. Moreover, a host of other comorbid conditions contribute to the multiplication of symptoms experienced by these patients, which affects their quality of life, morbidity and mortality.

Multiple studies have indicated that heart failure has a range of physical, psychological, and social symptoms (Cline, Willenheimer, Erhart, Wiklund & Israelsson; 1999; Grady, 1993; Reidinger, Dracup, Brecht, Padilla, Sarna, & Ganz, 2001), which affect the well-being and quality of life of the individual. Responses to symptoms include physiological, psychological, sociocultural and behavioral components (Dodd, Miaskowski, & Paul, 2001). Although symptoms are based on the perception of the individual, they are important cues to an underlying problem that need to be explored by providers and patients. A valid and reliable symptom measurement scale that adequately assesses symptoms of cancer patients with heart failure is essential if the symptoms are to be effectively managed, thereby preventing unnecessary hospital readmission and improving a patient's quality of life.

Several measurement tools for cancer symptom assessment with documented reliability and validity have been published (McCorkle, & Young, 1978; Portenoy,

Thaler, Kornblith, Lepore, Friedlander-Klar, & Kiyasu, et al. 1994; de Haes, van Knipenberg, & Neijt, 1990; Bruera, Kuehn, Miller, Selmser, & Mc Millan, 1991; Cleeland, Mendoza, Wang, Chou, Harle, & Morrissey, et al., 2000). One of the symptom assessment instruments is the M.D. Anderson Symptom Inventory (MDASI), developed by Cleeland and colleagues (2000). This is a 19 item instrument that measures the severity and impact of cancer related symptoms. Many of the symptoms assessed by MDASI are common to both cancer and heart failure; however, symptoms specific to patients with accompanying heart failure are not addressed in the instrument. Therefore, a need exists for the development of a symptom inventory tool specific to cancer patients with associated heart failure.

Statement of the Problem

The purpose of this study is to evaluate the psychometric properties of the M D Anderson Symptom Inventory – Heart Failure (MDASI-HF), and to establish reliability and validity. Evaluation of the psychometric data from this study will validate the symptom items representing the three underlying constructs (physiologic, emotional and psychological factors) that are measured by the instrument.

Rationale for the Study

Heart failure is the most rapidly growing cardiovascular disorder in the United States. The magnitude of the problem is expected to increase because more cardiac patients are able to survive a myocardial infarction and cardiac surgery, and live longer which increases the chance of developing heart failure. Cardiovascular disease surpassed

infectious diseases as the leading cause of death worldwide in 1990, and by 2020, may be the leading cause of disability (Pearson, 1999). In addition, more people are surviving cancer, previously considered a terminal illness, because of the improvements in early detection, treatment and general supportive care. The Surveillance, Epidemiology, and End Results Program (SEER) estimates an overall five-year (1996-2002) relative survival rate of 65% of the 1.3 million patients diagnosed with invasive cancer every year (http://seer.cancer.gov/statfacts/html/all.html). Nonetheless, the cancer survivors are at an increased risk for developing cardiovascular complications (Yeh, Tong, Lenihan, Yusuf, Swafford, & Champion, et al, 2003) particularly congestive heart failure as a result of cancer treatment related cardiotoxicity secondary to chemotherapy, radiation therapy, and biotherapy (Loerzel & Dow, 2003; Jacob Adams & Lipshultz, 2005).

The care of the patients with cancer and heart failure is very challenging. These patients usually have substantial and progressive symptoms that are debilitating, and most of which are non-specific. Shortness of breath and fatigue, for example are primary symptoms of heart failure, but may also be a clinical manifestation of patients with cancer or a side effect of cancer therapy. The physical signs of heart failure are also nonspecific, and have serious limitations because many patients with heart failure in the early stage have few abnormal signs. Additionally, some of the physical signs may be related to causes other than heart failure. For example lower extremity edema, which is a common presenting feature of heart failure, can also be related to numerous non cardiac causes. Edema is also common in elderly people due to immobility, venous stasis or

hypoalbuminemia. Additionally, a diagnostic criteria for heart failure is difficult to define and apply, because the physical signs, blood assay such as the b-type natriuretic peptide (BNP) or imaging test are not definitive for the diagnosis of heart failure alone (Schellenbaum, Rea, Heckbert, Smith, Lumley, & Roger, et al. 2004). Frequently, the symptoms experienced by heart failure patients do not often correlate with cardiac performance (Hunt, Baker, Chin, Feldman, Cinquengrani, & Francis, et al. 2005). Patients with a very low ejection fraction may be asymptomatic, whereas patients with preserved systolic function may have severe disabling symptoms.

The development of the MDASI-HF instrument is essential for early detection of symptoms, provide a mechanism for a patient self-report evaluation, measurement of the severity and impact of symptoms in cancer patients with heart failure, and to assist clinicians to devise strategies for early intervention of symptom relief to improve patient's functional status and quality of life. Understanding the patient's perspective of the symptoms will provide information for better awareness of the issues that influence their compliance to therapy, and for development of a model of care that will help clinicians in dealing with the complex issues of providing care to this unique patient population.

Theoretical Framework for the Study

The theoretical frameworks for this study are the middle-range theory of unpleasant symptoms (Lenz, Pugh, Milligan, Gift, & Suppe, 1997) and the classical test theory (Crocker & Algina, 1986). The theory of unpleasant symptoms provides the

framework for evaluating the construct of the symptom experience of individuals with cancer and heart failure, and the consequences resulting from the symptom experience. Whereas, the classical test theory will guide the evaluation of the psychometric properties of the instrument to assess the model fit between the conceptual models (theory of unpleasant symptoms) as measured by the variables in the measurement model.

The middle-range theory of unpleasant symptoms was developed in 1997 by Lenz and colleagues (Appendix A), based on the assumption that there are sufficient commonalities among symptoms. The theory of unpleasant symptoms has three major components: the symptoms that the individual is experiencing, the influencing factors that give rise to or affect the nature of the symptom experience, and the consequences of the symptom experience.

The theory of unpleasant symptoms likewise identifies the multidimensional phenomenon of the symptom with psychological, physiologic, cognitive and social aspects that affect the individual's performance. This includes the functional status, cognitive functioning, and actual physical performance. In cancer patients with heart failure, the unpleasant symptoms of dyspnea and fatigue for example are common to both diagnoses. Although these symptoms may have different physiologic components for each disease condition, they may have similar psychological components and can influence cognitive functioning and physical performance. Both fatigue and dyspnea often occur together in the same clinical situation, but may have a multiplicative effect when occurring simultaneously as a result of two disease conditions. Understanding the

interaction of these components of the concurrence of symptoms is essential if the symptoms are to be effectively managed.

The theory of unpleasant symptoms can be used to guide clinical research to improve the understanding of how to prevent, ameliorate, or reduce the impact of these symptoms in cancer patients with heart failure. An understanding the impact of these symptoms may lead to the identification of preventive interventions to modify some of the factors that produce the symptoms or to develop innovative treatments that can be applied across symptoms when they occur.

Classical test theory was developed by Charles Spearman in 1904, based upon the decomposition of observed scores into true and error scores, and thus provides a model for assessing random measurement error. The two assumptions of classical test theory are: a) all measurements are tau-equivalent or true score equivalent; and b) error components across measurement units are mutually independent and uncorrelated (Becker, 2001). Tau equivalence or true score equivalence indicate that proportionality among the interunit covariance matrix exists or that there is unidimensionality of the measurement units (Becker, 2001).

Classical test theory provides a framework for assessing the extent to which the observed data actually fit the conceptual model as measured by the variables that are included in the measurement model. The measurement model defines the specific variables that will be incorporated to measure each construct. In this study, the concept or construct of unpleasant symptoms in patients with cancer and heart failure is measured by

the multidimensional phenomenon of the symptom which includes the psychological, physiologic, cognitive and social aspects that can affect the individual's physical performance, functional status, and cognitive functioning. Classical test theory includes the measurement of reliability and validity, the major components for psychometric testing in the construction of instruments and procedures for measurement.

Assumptions

The following assumptions are made in relation to this study:

1. The sample population of the study will have different levels of physical performance and functional capability to demonstrate the different levels of symptom severity.

2. The demographic characteristics and the cultural diversity of the samples will allow for variability and reflect the heterogeneity of the population afflicted with cancer and heart failure.

Research Questions

For the purpose of this study, the following research questions will be addressed:

1. Does the MD Anderson Symptom Inventory –Heart Failure (MDASI – HF) demonstrate an internal consistency of .70 or greater?

2. Do all items of the MD Anderson Symptom Inventory –Heart Failure (MDASI-HF) interrelate in measuring the concept of symptoms in cancer patients with heart failure at a level of at least .50 or greater?

3. Do the scores of the MD Anderson Symptom Inventory –Heart Failure

(MDASI-HF) correlate with the Eastern Cooperative Oncology Group (ECOG) performance status at the level of .70 or greater?

4. Do the scores of the MD Anderson Symptom Inventory –Heart Failure (MDASI-HF) correlate with the New York Heart Association (NYHA) functional classification of cardiac disabilities at the level of .70 or greater?

Definition of Terms

For purposes of this study, the following terms are defined:

1. Symptom is conceptually defined as a subjective experience reflecting changes in the biopsychosocial functioning, sensations, or cognition of an individual (Dodd, Janson, Facione, Froelicker, Humphreys, & Lee, et al. 2001). Operationally, symptom is described as an indicator of perceived change from normal functioning as experienced by the individual.

2. Heart failure is defined as a complex clinical syndrome that can result from any structural or functional cardiac disorder that impairs the ability of the ventricles to fill or eject blood (American College of Cardiology/American Heart Association/ European Society of Cardiology, 2005). Heart failure may be associated with a normal ventricular function but impaired filling secondary to diastolic dysfunction or with a depressed left ventricular ejection fraction with dilated ventricles in systolic dysfunction. In most patients, abnormalities of systolic and diastolic dysfunction coexist, regardless of the ejection fraction (ACC/AHA guidelines, 2005). Operationally, heart failure is a condition

characterized by specific signs and symptoms of fluid retention, dyspnea and fatigue in the setting of abnormal heart function.

3. Cancer is a term used to describe diseases in which abnormal cells divide without control and can invade and spread through the bloodstream and lymphatic system to other parts of the body (National Cancer Institute, http:// www. cancer.gov/dictionary. Accessed March 4, 2006). Operationally defined, cancer includes various types of malignant neoplasms: carcinoma that begins in the skin or in tissues that cover internal organs; sarcoma that begins in the bone, cartilage, fat, muscle, blood vessels, or other connective or supportive tissue; leukemia that starts in blood forming tissue such as the bone marrow and causes production of abnormal cells that enter the blood stream; and lymphoma and multiple myeloma that begins in the cells of the immune system.

Limitations

The results of this study will be generalizable only to the population with characteristics similar to the characteristics of the sample in the study.

Summary

Heart failure is a progressive disease with debilitating symptoms that can adversely affect the patient's quality of life. With a concurrent diagnosis of cancer, the complexity of symptoms can increase exponentially that can result in frequent hospitalizations.

The management of symptoms related to heart failure and cancer presents a challenge to patients, families, and health care providers throughout the entire trajectory

of the disease process, from the initial diagnosis to the immediate and long term consequence of cancer therapy and disease progression of cancer, heart failure or both conditions. However, there is a lack of a validated instrument to assess symptoms in patients with cancer and heart failure. Therefore, the purpose of this study is to determine if the MDASI-HF is a valid and reliable measure of symptoms in cancer patients with heart failure. Improved management of patients with heart failure is critically important in light of the economic burden on the health care system, unacceptable high mortality and severe impact on the quality of life.

CHAPTER 2

REVIEW OF LITERATURE

A comprehensive understanding of the concept of "symptoms" can assist health care providers in forming an accurate diagnosis and developing effective management strategies that can impact the patient's quality of life. Symptoms play a significant role in the entire trajectory of any disease process. They are indicative of a change in the person's functioning or presence of a health problem which causes the individual to seek medical attention (Dodd, Janson, Facione, Froelicker, Humphreys, & Lee, et al. 2001). Unpleasant symptoms signal an impending illness, whether acute or chronic. In chronic conditions such as cancer and heart failure, the occurrence of symptoms span across the different stages of the disease process. As patients move through the continuum of the disease from diagnosis and aggressive therapies to palliative care, the focus of the interventions may change, but the significance of controlling symptoms remains constant. Although treatment may relieve disease related symptoms, adverse effects symptoms related to therapy may occur. For example, in patients who are in clinical remission from breast cancer, cancer symptoms may be resolved; however other symptoms may persist as a consequential complication of therapy, such as chemotherapy induced heart failure.

Symptom assessment forms the foundation for effective management, especially in patients with persistent recurrence of symptoms resulting in frequent hospitalizations. This is critical in cancer patients with a concurrent diagnosis of heart failure because of its high morbidity and mortality. This presents a major challenge to health care providers because heart failure symptoms can be masked by cancer and cancer therapies. A clear understanding of the symptoms is necessary for effective management of these patients.

The focus of this chapter is to present an overview of the concept of the symptom experience of patients with cancer and heart failure, and the process of instrument development for symptom assessment in the specific patient population. Frequently used instruments in symptom assessment for both conditions, cancer and heart failure are addressed.

Symptom and Symptom Experience: Conceptualization

According to the Merriam-Webster online dictionary (2005), symptom is defined as a subjective evidence of disease or physical disturbance. It is a subjective experience reflecting changes in the biopsychosocial functioning, sensations, or cognition of the individual (Dodd, Janson, Facione, Froelicker, Humphreys, & Lee, et al. 2001). The subjective nature of symptoms differentiates it from signs which are objective observations by the individual of the changes in the affected parts or functions. When the individual perceives the sensation and recognizes the symptom, a meaning is assigned to the

symptom based on the different factors that affect one's perception. The symptom is then described according to its location, severity, intensity, frequency, pattern of symptom occurrence, and aggravating and relieving factors.

The individual's recognition and interpretation of symptoms is influenced by the different variables in an individual's personal, psychological, physiological, and sociological background. The personal factors include the individual's age and gender. Women are noted to report more physical symptoms than men (O'Neill & Morrow, 2001). This may possibly be a result of the social upbringing that boys are not supposed to cry, and complaining of symptoms connotes weakness. The psychological factors are influenced by the individual's personality traits. The sociological factors include cultural background, social support from family and friends, as well as religious orientation. Culture has a significant influence on the recognition of symptoms and on the meaning given to symptoms.

The severity of symptoms as perceived by the individual determines the behavioral response resulting in initiation, continuation, or discontinuation of activities that could prevent or relieve the symptoms (Fu, Anderson, McDaniel & Armer, 2002; Kurtz , Stommel, Given & Given, 2000). The individual's response to symptoms is also determined by one's coping mechanism, and can be displayed as a physiological, behavioral, or emotional manifestation. For example, patients who experience severe fatigue related to cancer or a side effect of cancer therapy would resort to learned

techniques of relaxation, increased pharmacologic intervention, or a decision to stop the therapy to relieve the symptom.

Multiple studies describe symptoms as subjective, experienced, unpleasant, and distressing (Fu, Anderson, McDaniel, & Armer, 2002; Fu, LeMone, & Mc Daniel, 2004), especially when there is a multiplication of symptoms in the presence of several co-morbid conditions. Current research focuses on the prevalence and severity of symptoms that occur in combination, sometimes referred to as "symptom clusters" (Gift, Jablonski, Stommel & Given, 2004), which result in symptom burden (Cleeland, & Reyes-Gibby, 2002). The occurrence of symptom clusters (e.g. pain, fatigue, insomnia) has been found to have a positive relationship with the mean severity of symptoms (Dodd, Miaskowski, & Lee, 2004). Gift and colleagues (2004) in their study with lung cancer patients found a correlation between the number of symptoms reported and mean limitations attributed to them ($r = 0.35$, $p < 0.01$). A relationship was also noted between perceived limitations and symptom severity scores ($r = 0.43$, $p < 0.01$). The number of symptoms in the cluster that were reported was found to be related to the perception of limitations in functioning and self-reported functioning (Dodd et al., 2001; Gift et al., 2004) Thus, the more severe the symptoms, the more likely they were to be perceived as self-limiting.

The increase in mortality in heart failure patients with the development of symptoms suggests that the optimal time for intervention is well before the onset of substantial left ventricular dysfunction, even in the absence of overt clinical symptoms of heart failure. Epidemiological data indicates that the prevalence and incidence of heart

failure increases substantially with age. With dramatically increasing proportion of the elderly population and the increased survivorship from cancer (Schultz, Beck, & Stava, 2003), heart failure is likely to become an increasing problem in the very near future.

Patients with heart failure often continue to experience symptoms that limit activities and result in poor quality of life despite of the treatment protocol. Stanek, Oates, Mc Ghan, Denofrio, and Loh (2000) in a study of 51 heart failure patients revealed that a majority of congestive heart failure patients placed greater importance on improvement of symptoms rather than on longer survival as the preferred therapeutic outcome. This is in concordance with the findings by Rector and colleagues (1995) that 40% of congestive heart failure (CHF) patients are willing to accept a 5% risk of death for a 5-point improvement in quality of life scores.

Symptoms Associated with Cancer and Heart Failure

Cancer and heart failure are both chronic disease conditions in which patients experience increasing severity of symptoms at different stages as the disease progresses. In a cancer patient with heart failure, the symptoms that occur may be due to the cancer, side effects of cancer therapies, heart failure or a combination of the factors. In many situations, heart failure symptoms are concealed in the cancer patient because of the overlapping of symptoms common to both conditions.

Nordgren and Sorensen (2003) found that patients with end stage heart failure have symptoms similar to patients with end stage cancer. Heart failure is manifested by non specific but characteristic symptoms including dyspnea, fatigue, and fluid retention

(Watson, Gibbs, & Lipp, 2000; Hunt, et al, 2005). These symptoms are likewise found in patients with cancer. This may be due to the fact that there is a pathological similarity in the manifestations of major metabolic abnormalities occurring in chronic terminal conditions such as cancer and heart failure (Neunschwander, Bruera, & Asthenia, 1998). In both advanced stages of heart failure and cancer, there are similar physiological changes such as gross muscle wasting, loss of muscle function and impaired blood supply to the muscles. Additionally, there are abnormal metabolic changes, which cause the muscles to metabolize anaerobically and fatigue easily (Massie, Conway, & Rajagopalan, 1988). Anxiety can also contribute to the increase in ventilatory rate and the sensation of dyspnea. Other studies have shown that palpitations, sleeplessness, and angina are also common symptoms noted prior to hospitalization for heart failure exacerbation (Friedman, 1997). As the syndrome progresses, patients may experience symptoms with minimal exertion or even at rest.

The number of comorbid conditions affects the number of symptoms reported by patients. Gift, Jablonski, Stommel, and Given (2004) found in their study of patients with lung cancer that those with more comorbid conditions tended to report more symptoms ($p< 0.004$), changing from a low of 1.7 symptoms for those with one comorbid condition to more than 3.5 reported symptoms for those with five or more co morbid conditions (Gift, et al. 2004). Thus, the cumulative effect of comorbidities rather than any specific individual comorbidity affects the symptoms in the symptom cluster. Patients on chemotherapy or those immediately completing a cycle tend to report more symptoms

than those who had no chemotherapy experience (Gift, 2004). Certain cluster of symptoms may have a synergistic effect which impacts the patient outcomes and may predict morbidity (Dodd, Miaskowski & Lee, 2004).

Symptoms and Quality of Life

The occurrence and severity of symptoms in cancer patients with concurrent heart failure not only diminishes the quality of life but also may lead to utilization of medical resources through frequent visits to the emergency centers resulting in hospital admissions or prolonged hospitalization. Patients with heart failure suffer distressing and poorly controlled symptoms (Ward, 2002) for a prolonged period of time, as the disease progresses.

Heart failure treatment in the last decade has evolved as a strategy of prevention and symptom management (Gomberg-Maitland, Baran, & Fuster, 2001), with improved functional status and improved quality of life as major goals of therapy (Todero, La Framboise & Zimmerman, 2002). The focus of home-based heart failure programs is controlling and managing cardiac symptoms to prevent recurrent hospitalizations for heart failure exacerbations and improving an individual's health related quality of life. Nonetheless, the knowledge related to the frequency of symptoms in a heart failure patient is scarce (Nordgren & Sorensen, 2003).

The Agency for Health Care Policy and Research (AHRQ) guidelines recommend that discharge from the hospital be contingent on the patient's and family's ability to monitor and manage symptoms (Toman, Harrison, & Logan, 2001). The education of

patients and families regarding recognition and monitoring of symptoms is a major component of heart failure programs. However, there is a lack of symptom assessment tools that the patient can use to facilitate early intervention.

Symptom Measurement

The subjective nature of symptoms presents some challenges for accurate and comprehensive measurement. Health care providers often make clinical judgment about the decline or improvement in the patient's condition based upon the patient's report of symptoms. However, the objective indicators used by clinicians do not often correlate with the subjective indicators, or the actual experience of the patient. The health care providers' rating of the symptom is based on clinical observation. Dyspnea, for example, is a common term used by health care providers to describe patient's complaints of breathlessness, shortness of breath or difficulty of breathing, even though the patient may not understand or use the term to describe the symptom. This does not provide an accurate picture of the patient's experience of the problems with breathing. Many studies reveal that there is a discrepancy between the health care providers' and patient's rating of symptom experience and intensity. Rhodes and colleagues (1998) found that nurses working in hospice settings overestimated their patient's description of symptoms, whereas nurses in other settings underestimated their patient's symptoms particularly pain and dyspnea.

In heart failure there is frequently little clinical correlation between cardiac performance and disease producing symptoms (Hunt, et al. 2005). Patients with very low

ejection fractions may be asymptomatic, whereas patients with preserved left ventricular systolic function may have severe symptoms. The value of a physical examination has considerable limitations in heart failure patients, particularly those in the early stages of the disease, as many patients with less severe heart failure have few abnormal signs. For example, lower extremity edema, a common symptom of heart failure, in the elderly can be of multifactorial etiology such as immobility, malnutrition, or problems with venous circulation.

Changes in the severity of symptoms over a specified time period or after modification of treatment allow healthcare providers to determine clinical progress. Patients with heart failure often continue to experience symptoms that limit physical activities contributing to a decreased quality of life despite treatment (Hunt, et al. 2005). The heart failure patient has stable periods without symptoms which are frequently interrupted with exacerbations resulting in hospitalization. The New York Heart Association (NYHA) functional classification is frequently used by clinicians to assess patients' functional status and functional response to treatment.

New York Heart Association (NYHA) Functional Classification

The New York Heart Association (NYHA) functional classification was originally developed in 1928 to help practicing physicians evaluate the effect of cardiac symptoms on patient's daily activities. In 1964, the criteria committee for NYHA revised the classification system and described it "as only approximate, for it is derived largely by inference from the history, by observation of the patient in certain forms of physical

activity, and occasionally by direct or indirect measurements of cardiac function in response to standardized exercises".

Traditionally, health care providers would use the New York Heart Association classification to assess functional status, a combination of physical limitations and symptoms. The NYHA functional classification has been used in research studies as an evaluative measure of change in the patient's condition over time. Four classes of functional capacity comprise the NYHA classification of symptom measurement as depicted in Table 1.

Table 1

The New York Heart Association (NYHA) Functional Classification

NYHA Class	Patient Symptoms
I	No limitations of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, or dyspnea.
II	Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in fatigue, palpitations or dyspnea.
III	Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity causes fatigue, palpitation or dyspnea.
IV	Unable to carry out physical activity without discomfort. Symptoms of cardiac insufficiency at rest. If any physical activity is undertaken, discomfort is increased.

Multiple studies (Rostagno,Galanti, Comeglio, Boddi, Olivo & Gastoni, 2000; Bennett, Riegel, Bittner, & Nichols, 2002) showed that NYHA functional classification is moderately correlated with the 6-minute walk test, Specific Activity Scale (SAS), cardiopulmonary exercise test (VO_2 max exercise capacity), providing adequate evidence of validity of the NYHA classes as a measure of functional status. The reliability of the NYHA functional classification system has not been established in the literature.

The NYHA functional classification is simple to use in clinical practice, has been in use for a long period of time, and is included in most published studies in heart failure. However, the use of the NYHA classification has a few drawbacks. First, it is a subjective assessment by the provider based on his or her interpretation of the degree of the patient's exertion. Also, the interpretation of the patient's response varies from one physician to another, despite the fact that the NYHA classification should be routinely used by any physician.

The NYHA classification is not easily reproducible (Gibelin, 2001). According to a study by Goldman and colleagues (1981), the opinion of two independent observers is concordant in only 56% of cases; a discrepancy of one class was recorded in 37% of cases, two classes in 5% and three classes in 1% of cases. The discrepancies occur mainly in classes II and III.

In 2001, the American College of Cardiology (ACC) and the American Heart Association (AHA) adopted a new approach for the classification of heart failure, which

emphasized the evolution and progression of the disease, which are divided into four stages: Stage A identifies patients who are at high risk for developing heart failure (such as those with hypertension, coronary artery disease, diabetes mellitus, history of cardiotoxic drug therapy or alcohol abuse, or family history of cardiomyopathy); Stage B includes those patients with a structural disorder of the heart (asymptomatic valvular heart disease, history of myocardial infarction, left ventricular hypertrophy, etc), but who never developed symptoms; Stage C refers to those patients with underlying structural heart disease who developed symptoms currently or in the past (left ventricular dysfunction with symptoms of dyspnea, fatigue, and edema; or asymptomatic patients who are receiving treatment for prior symptoms of heart failure); and Stage D includes patients with end stage heart failure who required specialized treatments such as mechanical support devices, continuous or intermittent inotropic infusions, cardiac transplantation, or hospice care. This classification system is intended to complement but not replace the NYHA functional classification, which primarily categorizes the severity of symptoms in patients who are in Stage C or D. The classification recognizes that there are established risk factors and structural precipitating factors for the development of heart failure, and that the initiation of therapeutic interventions before the appearance of heart failure symptoms reduces the morbidity and mortality of heart failure (ACC/AHA Practice Guidelines, 2001).

Several symptom assessment instruments are available for patients with heart failure, many of which are embedded in the quality of life measurement tools. The most commonly used general symptom measures for heart failure are outlined in Table 2.

Table 2.

Most Commonly Used General Symptoms Measure for Heart Failure

Instrument (Author)	Purpose	Domains; number of items; response format	Method of administration	Reliability	Validity
Minnesota Living with Heart Failure Questionnaire (MLHFQ) Rector, Kubo, & Cohn(1987)	Disease specific instrument	Disease specific instrument; 21 items with 6 point response scale of 0-5; physical dimension (8 items) emotional dimension (5 items) social and economic impairments on overall score on health related quality of life (8 items).	Self-administered	ICR: $\alpha = .95$ (overall), 0.94 (physical dimension), 0.89 (emotional dimension) Bennett, et al., 2002	Construct: multitrait – multimethod analysis showed convergent validity coefficient, 0.59-0.73 for physical dimension; 0.39-0.69 for emotional dimension (Middel, et al.2001).

(table continues)

Table 2. *(continued)*

Instrument (Author)	Purpose	Domains; number of items; response format	Method of administration	Reliability	Validity
The Medical Outcomes study 36-item short health form survey (SF-36) Ware & Sherbourne, 1992.	General measure of health status and quality of life	32 items with response scale from 2-6; physical functioning (10 items); role limitations associated with physical problems (4items); bodily pains (2 items); general health perceptions (5 items), vitality (4 items); social functioning (2 items) ; role limitations associated with emotional problems (3 items); general mental health	Self administered	Chronbach's α = .80	Content: Not available Construct: Not available

(table continues)

Table 2. *(continued)*

Instrument (Author)	Purpose	Domains; number of items; response format	Method of administration	Reliability	Validity
		(5 items); change in health status (1 item).			
General Health Survey Short Form (SF-12) Ware, et al (1992)	Generic health related quality of life measure	12 items with response scale from 2-6; physical health (7 items); mental health (5 items)	Self rated by patients	ICR: $\alpha = .80$	High correlations (r=.67physical component , r=.97 mental component)
Chronic Heart Failure Questionnaire (CHFQ) Guyatt,	Patients with heart failure	16 items with response scale of 1-7; Physical and emotional symptoms of heart failure; 3 subscales: dyspnea	Self administered	ICR: (Guyatt, et al., 1989; Bennett, et al .2001)	Content: No data available Construct: No data

(table continues)

Table 2. *(continued)*

Instrument (Author)	Purpose	Domains; number of items; response format	Method of administration	Reliability	Validity
et al (1989)		(5 items); fatigue (4 items); emotional function (7 items).			available
Kansas City Cardiomyopathy Questionnaire (KCCQ) Green, Porter, et.al. (2000)	Patients with cardiomyopathy and heart failure	23 items with response scale from 1-7; results in two summary scores: functional status score (physical limitations and symptoms domain); and clinical summary score (combination of functional status with self-efficacy, knowledge, social	Self-administered	ICR: α = .90(physical limitation); .88 (symptoms); .78(QOL); .86(social limitation); .62(self-efficacy)	Convergent: (*r =0.46 – 0.74; p<0.001).* Content: No data available Construct: No data available

(table continues)

Table 2. *(continued)*

Instrument (Author)	Purpose	Domains; number of items; response format	Method of administration	Reliability	Validity
		interference and quality of life).			

Legend: r = correlation coefficient; α = Cronbach's alpha coefficient; ICR = Internal Consistency Reliability; QOL=Quality of Life

In patients with cancer, the most commonly used assessment tool to evaluate the functional response to treatment is the Eastern Cooperative Oncology Group (ECOG) Performance Status. The ECOG instrument is used by clinicians and researchers to assess how a patient's disease is progressing, and how the disease affects the daily living activities of the patient.

The Eastern Cooperative Oncology Group (ECOG) Criteria

The Eastern Cooperative Oncology Group (ECOG) developed a set of standardized guidelines for toxicity criteria in 1974, subsequently modified and used in clinical trials and publications related to cancer. The goal of these guidelines is to standardize the evaluation of the severity of toxicity for ECOG studies. The determination of whether an observed toxicity is a result of the treatment or of the disease relies on the judgment of the clinician. A 0-5 scale is used to grade the toxicity with 0 = none; 1= mild; 2 = moderate; 3 = severe; 4 = life threatening; 5 = lethal. In the toxicity criteria, mild congestive heart failure (CHF), multifocal premature ventricular contractions (PVC's), and pericarditis are graded as 3, while severe or refractory CHF, ventricular tachycardia, and pericardial tamponade are graded as 4. The performance status is divided into five grades as shown in Table 3.

Table 3

ECOG Performance Status

Grade	ECOG
0	Fully active, able to carry on all pre-disease performance without restriction
1	Restricted in physically strenuous activity but ambulatory and able to carry out work of a light or sedentary nature, e.g., light housework, office work
2	Ambulatory and capable of all self-care but unable to carry out any work activities. Up and about more than 50% of waking hours
3	Capable of only limited self-care, confined to bed or chair more than 50% of waking hours
4	Completely disabled. Cannot carry on any self-care. Totally confined to bed or chair.
5	Dead

There are multiple instruments to assess symptoms in patients with cancer per se. The instruments reviewed consist of a list of symptoms commonly reported by patients. Most of the instruments ask participants to self-report the presence of symptoms. The most commonly used instruments for patient assessment and in clinical trials for patients with cancer are shown in Table 4.

Table 4

Most Commonly Used General Symptoms Measure for Cancer

Instrument (Author)	Target Population	Domains; number of items; response format	Method of administration	Reliability	Validity
The Symptom Distress Scale (SDS) McCorkle & Young (1978); modified by Munkres et al. (1992) and Sutcliffe-	Patients with cancer	Symptom distress; 10 items (nausea, mood, appetite, insomnia, pain, mobility, fatigue, bowel pattern, concentration, and appearance) 5-point numeric rating scale (Mc Corkle & Young, 1978; Sutcliffe-Chidgey & Holmes, 1996) or VAS (Munkres, et al,	Self-administered	ICR: $\alpha = .82$ to .85 in patients with cancer (Munkres et al., 1992; Mc Corkle & Young , 1978	Construct validity: correlated with affective mood of patients receiving chemotherapy (Munkres et al., 1992); scores differed between

(table continues)

Table 4 *(continued)*

Instrument (Author)	Target Population	Domains; number of items; response format	Method of administration	Reliability	Validity
Chidgey & Holmes (1996)		1992)			patients with cancer with and without metastasis (Mc Corkel &Young, 1978). Content validity: No information provided.

(table continues)

Table 4 *(continued)*

Instrument (Author)	Target Population	Domains; number of items; response format	Method of administration	Reliability	Validity
The Rotterdam Symptom Checklist (RSCL) de Haes, et al. (1990)	3 groups of cancer patients (a. during chemotherapy or follow-up, b. undergoing chemotherapy for advanced ovarian cancer, and c)under	Psychological and physical distress; 31 items	Self administered	Chronbach's $\alpha = 0.88$ (Psychological distress); $\alpha =$ 0.82 (Physical distress) de Haes, van Knippenberg, & Nejit, 1990)	Content: No data available Construct: Not available

(table continues)

Table 4 *(continued)*

Instrument (Author)	Target Population	Domains; number of items; response format	Method of administration	Reliability	Validity
	treatment, "disease –free" patients and "normal" controls				
The Memorial System Assessment Scale (MSAS) Portenoy, et al.	Patients with cancer	Physical (high prevalence "PHYS H" and low prevalence "PHYS L"); and psychological symptoms; 32 items	Self rated by patients	ICR: Cronbach's α= 0.88 (PYHS H group); α= 0.83 (psychological	High correlations (*r= 0.80*) between mean severity scores and mean frequency scores

(table continues)

Table 4 *(continued)*

Instrument (Author)	Target Population	Domains; number of items; response format	Method of administration	Reliability	Validity
(1994)				symptoms); and α= 0.58 (PHYS L group)	across symptoms; and (*r=.70)* between mean severity scores and mean distress scores. (Portenoy, et al. 1994)
Symptom Distress Scale Rhodes et al.	Patients in hospice care or patients with	Symptoms (nausea, pain, anorexia, sleep disturbances, fatigue, difficulty breathing,	Self administered	ICR: No information provided	Content: No data available

(table continues)

Table 4 *(continued)*

Instrument (Author)	Target Population	Domains; number of items; response format	Method of administration	Reliability	Validity
(1998)	cancer	coughing, impaired concentration, change in body temperature and in appearance, and restlessness); 31 items; 5-point Likert scale			Construct: No data available
Breast Cancer Prevention Trial Symptom checklist (Gantz et al., 1995)	Women with breast cancer receiving adjuvant chemotherapy	Symptoms associated with menopause and tamoxifen use (e.g. vaginal symptoms, hot flashes, urinary symptoms; 43 items; 5-point Likert Scale	Self-administered	ICR: $\alpha = .73$ for vaginal subscale, .76 for hot flashes subscale, .76 for	Content: No data available

(table continues)

Table 4 *(continued)*

Instrument (Author)	Target Population	Domains; number of items; response format	Method of administration	Reliability	Validity
				urinary subscale, and .50 for total scale (Gantz et al., 2000)	Construct: No data available
Edmonton Symptom Assessment System (ESAS)	Patients in palliative care	Twelve core symptoms (pain, mouth discomfort, anorexia, nausea, vomiting, constipation, breathlessness, depression,	Self administered or completed by the health care	ICR: Not applicable	Content: Core symptoms selected based on clinician's input.\

(table continues)

Table 4 *(continued)*

Instrument (Author)	Target Population	Domains; number of items; response format	Method of administration	Reliability	Validity
(Bruera, et al, 1991)		agitation, confusion, psychological distress, and family anxiety); 12 items; 4 point rating	provider based on the clinical assessment of the patient's condition		Construct: No data available
The MD Anderson Symptom Inventory (MDASI)	Patients with cancer	13 "core" symptoms and 6 interference symptoms. Core symptoms (pain, fatigue, nausea, disturbed sleep, emotional distress, shortness of	Self administered by patients	ICR: $\alpha = 0.85$ for general symptom severity factor, .82 for	Construct: Significant difference in mean symptom severity (2.36 vs.

(table continues)

Table 4 *(continued)*

Instrument (Author)	Target Population	Domains; number of items; response format	Method of administration	Reliability	Validity
(Cleeland, et al, 2000)		breath, difficulty remembering things, lack of appetite, drowsy, sad, vomiting, and numbness or tingling). Interference items (general activity, mood, and relations with other people, walking, and enjoyment of life). Rating 11 point scale (0-10).		gastrointestinal factor, .91 for interference scale Sensitivity established using the ECOG performance status.	3.62; *p<0.0001)* and mean symptom interference (2.95 vs. 5.31; *p<0.001).*

Legend: r = correlation coefficient; α = Cronbach's alpha coefficient; ICR = Internal Consistency Reliability

From the review of literature, the symptom assessment tools that are validated and published are disease specific, either for cancer or heart failure. However, a symptom assessment instrument specific for patients with both diagnosis of cancer and heart failure is lacking, hence the necessity to develop the MD Anderson Symptom Inventory – Heart Failure (MDASI-HF).

Development of the MD Anderson Symptom Inventory- Heart Failure (MDASI-HF)

The MD Anderson Symptom Inventory (MDASI) is the core symptom and symptom interference measure for cancer patients in general. The core symptoms included in the MDASI did not include symptoms specific to patients with other comorbid conditions such as heart failure. The need to develop a symptom inventory tool for cancer patients with a concurrent diagnosis of heart failure resulted in the development of the MDASI-HF.

Item Generation for the MDASI-HF

The following steps outlined the approach for selecting valid symptoms specific for heart failure for inclusion in the MDASI-HF. 1) Establishing content and domain specification. Items for the heart failure component were based on the review of literature on heart failure, provider and patient interviews. 2) Formulating conceptual and operational definitions. Dimensions identified for inclusion in symptom measurement include the physiologic and psychological symptoms associated with heart failure. 3) Generating items that represent each domain. The items for each domain were generated from the literature review, personal experience with management of heart failure patients, and patient's interview. Thirty heart failure symptom items were generated for the

questionnaire. The physiologic symptoms include abdominal bloating, ankle swelling, chest pain, difficulty sleeping with head of bed flat (orthopnea), dizziness, fatigue, loss of appetite, lack of energy, limitation in physical activity, lower extremity swelling, nausea, rapid heartbeat (palpitations), nighttime cough, shortness of breath, sleep problems, thirst, urinary incontinence, headache, waking up at night due to shortness of breath (paroxysmal nocturnal dyspnea), waking up at night to urinate and sudden weight gain. The psychological symptoms include anxiety, confusion, depression, fear of disability, fear of sudden death, fear of loss of control, fear of loss of independence, forgetfulness, and mood disturbances. 4) Obtaining judgmental evidence. Judgmental content validation utilized the opinions of 20 content experts comprised of 10 nurses with extensive experience in heart failure management and 10 cardiologists, who subjectively rate the quality of items. Five of the 10 cardiologists and all 10 heart failure nurses completed the survey resulting in a 75% return rate. The panel of experts met the following guidelines: has worked in cardiology for at least 5 years, had at least one publication related to the management of heart failure patients, and were considered experts by the heart failure community.

Establishing the Content Validity Index

The content validity index (CVI) for each item was calculated from the completed survey. With this method, a 4-point Likert scale was used with a range from 1 equals not relevant to 4 equals very relevant. The CVI represents the proportion of items on an instrument that achieved a rating of 3 or 4 by the experts. A CVI of at least .80 has been suggested to be a good criterion for accepting an item as valid beyond the 0.05 level of

significance. The final instrument consists of items that received a rating of 3 or 4 by the experts (Waltz & Bausel, 1983).

There were a total of 16 items with CVI of .80 or greater that were endorsed by the content experts, 8 symptoms were endorsed by both the cardiologists and heart failure nurses, and 8 symptoms endorsed by nurses only. Eight symptoms endorsed by both the cardiologists and heart failure nurses comprised the following items: ankle swelling, difficulty sleeping without adding pillows under your head (orthopnea), fatigue, limitation in physical activity, lower extremity swelling, shortness of breath, waking up at night due to shortness of breath (paroxysmal nocturnal dyspnea), and sudden weight gain. The remaining eight symptoms endorsed by nurses only are abdominal bloating, anxiety, depression, loss of appetite, lack of energy, racing heartbeat (palpitations), nighttime cough (persistent cough at night), and sleep problems. The symptoms of fatigue, disturbed sleep, shortness of breath, and lack of appetite were already part of the core MDASI instrument. Lower extremity swelling and ankle swelling are combined under the item of ankle swelling, as suggested by the content experts, for easy understanding by patients. This resulted in 11 heart failure specific items that were added to the 13 core symptom items and six interference items of the MDASI instrument, resulting in a total of 30 items for the MDASI-HF.

Reliability

Reliability refers to the consistency of the instrument (Lo-Biondo-Wood, & Haber, 2002), and is concerned with how consistently the measurement technique measures the concept of interest (Burns & Grove, 2001). Reliability also connotes

accuracy. An instrument is reliable if the measurement result accurately reflects the true measures of the attribute (Polit, Beck & Hungler, 2001). A reliable instrument will yield the same results when administered repeatedly to the same population at different time intervals.

However, the reliability of the instrument varies in different degrees every time the instrument is administered because of random error in the measurement technique. Therefore it is important to minimize the amount of error, so the result of the observed score closely reflects the true score. The random error is based on the assumption of the classical test theory that the observed score consists of the true and error score (Gliner, & Morgan, 2000). The most commonly reported measure of the degree of reliability is expressed as a correlation coefficient (*r)* with 1.00 reflecting perfect correlation between sample scores and true scores, and .00 reflecting no correlation. The higher the value, the more reliable is the instrument. A reliability of 0.70 is considered acceptable for a newly developed instrument, and a reliability of 0.80 for an established instrument (Gliner & Morgan, 2000). Estimates of reliability are specific to the samples being tested; therefore reliability testing is required before an instrument is incorporated into a study.

Reliability testing consists of three types: equivalence, stability, and internal consistency (Polit, Beck & Hungler, 2001). Equivalence is used to compare two instruments that measure the same concept and is calculated using the Pearson's Product-Moment Correlation Coefficient. A value of .80 indicates equivalence of the two instruments (Summers, 1993).

The aspect of stability is determined by using the test-retest reliability procedure to determine the consistency of an instrument. The instrument is administered to a group of subjects, on two separate occasions and the scores are compared. Scores between the two tests are analyzed using the Pearson correlation coefficient, and a minimum value of .80 is desired (Polit, Beck, & Hungler, 2001). The major disadvantage of the test-retest approach is that the traits of the subjects can change over time, which can affect the instrument's stability.

Internal consistency reliability evaluates the extent to which all the items in the instrument measure the same attribute of a construct (Polit, Beck & Hungler, 2001). The statistical procedure used for this process is the Cronbach's alpha or coefficient alpha, which utilizes the split-half technique for assessing internal consistency. In this method, the test is split into two groups, and the scores of the two half tests are used to compute a reliability coefficient. A reliability coefficient of 1.00 indicates a high internal consistency and .00 signifies lack of internal consistency reliability.

Validity

Establishing validity is critical in instrument development because reliability cannot be measured unless the instrument is first considered valid. Validity is the extent to which an instrument measures what it is intended to measure. Establishing validity requires that the instrument measures the construct of interest and is appropriate for the population and the setting (Davis, 2004). The three types of validity that are commonly used in instrument development include content, criterion-related and construct validity.

Content validity

Content validity is considered the most critical initial step in instrument development (Beck & Gable, 2001). This determines the relevance of the elements of the items of an instrument to the construct being measured. Content validation is a rigorous assessment consisting of a two- stage process: development and judgment quantification (Lynn, 1986). The developmental stage involves three steps: domain identification, item generation, and instrument formation (Nunnaly & Bernstein, 1994).

Domain identification includes delineating the instrument's content area that relates to the variable of interest (Gable & Wolfe, 1993; Lynn, 1986; Nunnaly & Bernstein, 1994). The conceptual and operational definitions of the concept being measured must be clear. Conceptual definitions are based on a combination of theory, literature review, qualitative investigations and the researcher's experience (Beck & Gable, 2001). The process of domain identification and item generation is different for a cognitive instrument versus an affective measure. For a cognitive measure, a blueprint is typically used to identify the full content domain and items are generated from the representative areas (Lynn, 1986). Whereas, for the affective measure, domain identification is accomplished through a thorough literature review and dimensions of a construct are identified and items are developed to measure the construct (Lynn, 1986; Gable & Wolf, 1993). The use of qualitative data provides a strong foundation for establishing content validity. Instrument construction which includes organizing the items in appropriate sequence and format is the same for both affective and cognitive measures

(Lynn, 1986). After the items are generated, assembled, and refined, the instrument is finalized for the judgment quantification stage.

The judgment quantification stage has two steps which are the same for both cognitive and affective instruments (Lynn, 1986). The first step entails asking a specific number of experts to evaluate the validity of items individually and the second step is evaluating the items as a set in an instrument (Gable & Wolfe, 1993; Lynn, 1986). A minimum of five experts is recommended to provide a sufficient level of control for agreement. The maximum number has not been established, but unlikely to exceed ten (Lynn, 1986). Regardless of the number of experts used, a structured procedure for evaluation of the content validity must be given to the experts.

A 4-point Likert scale is usually used for rating the content relevance of the items of an instrument, where 1 connotes an irrelevant item and 4 an extremely relevant item. The ratings of the experts are quantified by calculating the content validity index (CVI). Content validity index (CVI) is a widely used method originally described by Hambleton, Swawinathan, Algina & Coulson (1975). Content validity is determined by the proportion of experts who score items as relevant with either a 3 or 4. According to Lynn (1986), at least 80% of the experts should rate an item as a 3 or 4 for the item to be considered valid. The CVI for an entire instrument is the percentage of total items judged as content valid by receiving a score of either 3 or 4. A content valid instrument should have a minimum CVI of .80 (Summers, 1993; Davis, 1992). Items that do not achieve the required minimum agreement of the experts are eliminated or revised.

Criterion validity

Criterion validity refers to validating an instrument against a suitable criterion to measure the concept of interest. An appropriate external criterion is identified and a correlation between the instrument and the external criterion will provide the evidence to judge the validity of the instrument (Davis, 2004). Criterion validity consists of predictive and concurrent validity. Predictive validity is used to predict the future performance of an instrument, and concurrent validity is used to test the present or current performance (Summers, 1993).

Construct validity

Construct validity determines the extent to which the instrument items measure the concept of interest. Constructs are not directly observable, but believed to exist because of observable behavior (Gliner & Morgan, 2000). During instrument development these observable behaviors should be described adequately by the items to represent the concept. Convergent, discriminant, and factorial evidence are different strategies for determining construct validity (LoBiondo-Wood & Haber, 2005) after the instrument is administered to the subjects. This study examined the construct validity by using exploratory factor analysis. Exploratory factor analysis will reduce the data to a meaningful set to determine which items best represent the concept of interest (Nunnaly & Bernstein, 1994). A matrix of item intercorrelations is factored to determine whether items cluster together in patterns or groups in light of the theoretical framework of the construct of interest. When analyzing how each item is correlated to a factor, a minimum criteria of $\geq .40$ is acceptable for each loading (Summers, 1993).

Summary

The concept of symptoms and symptom measurement in patients with cancer and heart failure is reviewed. The review of literature revealed the tremendous impact of symptoms on the patient's quality of life and the complexity of symptom assessment in patients diagnosed with cancer and heart failure. Research related to symptom assessment instruments commonly used for clinical trials and management of heart failure or cancer was presented. The stages of the instrument development based upon the principles of psychometric theory were discussed. This review of literature provided support for the necessity of developing a symptom inventory instrument to improve symptom management of cancer patients with heart failure.

CHAPTER 3

PROCEDURE FOR COLLECTION AND TREATMENT OF DATA

The research design for the study is a cross- sectional, nonexperimental design to examine the reliability and validity of the MD Anderson Symptom Inventory – Heart Failure (MDASI-HF) instrument. The tool quantitatively measures the theoretical construct of symptoms in cancer patients with concomitant heart failure.

Setting

The study was conducted at the world-renowned cancer center, located within a multi-institutional medical center of Texas. The facility is partially funded by the state of Texas, and is affiliated with the University of Texas Health Science Center in Houston. In 2005, there were approximately more than 20,000 hospital discharges with cancer diagnosis, and about 835, 099 were provided care in the outpatient clinics. Of those in patient discharges, approximately 1,139 (5.5%) cancer patients had a concurrent diagnosis of heart failure. The completion of the MDASI-HF questionnaire was conducted in the clinical units where the patient was located at the time of data collection, either in the inpatient setting or the outpatient heart failure clinic located in the cardiopulmonary department of the institution.

Population and Sample

The target population for this study consisted of patients with cancer and a concurrent diagnosis of heart failure who were 18 years and older, and able to give

written informed consent to participate. These patients may have been admitted to the hospital for medical management, or in the outpatient cardiology clinic.

Exclusion criteria included patients who were: a) younger than 18 years old, b) with a known diagnosis of dementia or Alzheimer's disease, and c) not familiar with the English language. The MDASI-HF is currently available in the English language only. The demographic characteristics of patients admitted to the study institution were representative of the heterogeneous population, and were culturally diverse, originating from different sections of the country and different parts of the world.

A convenience sampling method was used to identify available subjects for inclusion in the study. Due to time and resource limitations in developing a large sample size, true random selection was not feasible for this study. Despite the disadvantages of non probability sampling, including the risk of bias, this type of sampling design has reported advantages of being economical and practical (Polit, Beck & Hungler, 2001) especially in questionnaire testing during the developmental stage of a survey.

The sample size of 156 participants was based on statistical recommendations which place the desired number of subjects at 5-10 subjects per instrument item as minimally sufficient for initial instrument development and instrument testing using factor analysis (Munro & Page, 1993; Nunnally & Bernstein, 1994). Sample size was based on the ability of the MDASI-HF to distinguish between patients with poor and good performance status as a measure of predictive criterion validity. In order to ascertain whether or not the MDASI-HF was sensitive enough to differentiate between patients based on their performance status, a global symptom score (average of all the

symptom items) should be significantly different between patients who are completely disabled and those fully active based on the Eastern Cooperative Oncology Group (ECOG) performance status measurement scale (Oken, Creech, Tormey, Horton, Davis, Mc Fadden, & Carbone, 1982), and the New York Heart Association (NYHA) functional classification (Bennett, Riegel, Bittner, & Nichols, 2002) . A one-point difference between patients with good and poor performance status in a global symptom score is deemed to be clinically important. This one point difference corresponds to an effect size of 0.50 using the Cohen's criteria (Cohen, 1988) based on a standard deviation of 2.0 from a previous study (Cleeland, et al, 2000) in validating the core items of the MDASI. The standard deviation estimate using the core items of the MDASI is considered conservative in that patients with heart failure are expected to respond with less variability to the additional items specific to heart failure in the MDASI-HF. The sample size will reveal a moderate effect size for the study.

Protection of Human Subjects

The guidelines for the Institutional Review Boards at Texas Woman's University (TWU) and the University of Texas MD Anderson Cancer Center were followed to assure protection of study participants. Study approval was obtained from both institutions prior to conducting the study (Appendix B and C).

The study participants completed the questionnaire using a self rating method. Completion of the questionnaire by the participants implied consent to participate in the study. In cases where the patient agrees to participate, but was too weak to complete the

questionnaire, a family member or a caregiver assisted the patient by writing the patient's answers on the questionnaire.

Potential risks of study participants included the loss of confidentiality. To reduce the risk of loss of confidentiality, code numbers were used on the demographic data form and the MDASI-HF questionnaire. Other potential risk to the subjects included increased fatigue during completion of the questionnaire. If this were to occur the patient was encouraged to rest and resume completion of the questionnaire at a later time. The rights of the participants in the study were protected by: a) reporting results of the study as aggregate data, b) keeping research data confidential and stored in a secured location accessible only to the researcher and data entry personnel until the completion of the study. All forms were destroyed upon completion of the study.

Instruments

The intent of this study was to test the reliability and validity of the MD Anderson Symptom Inventory-Heart Failure (MDASI-HF). Two instruments were administered to each participant in the study: biographical information data (Appendix D), and MDASI-HF questionnaire (Appendix E).

The demographic section of the data collection tool was used to collect biographical information of the subjects including age, gender, marital status, educational attainment, and current job status. This information was used for descriptive analysis for comparison with existing data in the general population. The MDASI-HF was completed by patients to describe actual symptoms experienced by patients in the last 24 hours, and how the symptoms have interfered with the patient's life.

Clinical Checklist

The primary investigator completed the clinical checklist for each of the subjects in the study (Appendix F). The clinical checklist section included clinical information that may affect the occurrence and severity of symptoms. This included cancer and heart failure disease information, ejection fraction, existing comorbid conditions, cancer treatment, heart failure medications, and clinical conditions in the past week assessed by the ECOG performance status and the NYHA functional classification, evidence of current infection, evidence of weight gain, symptom management and emergency room visits in the past week, and laboratory results. The information from the clinical checklist was used in the data analysis to determine the factors that may affect the severity of symptoms and symptom interference in the patient's life.

MD Anderson Symptom Inventory- Heart Failure (MDASI-HF)

The M.D. Anderson Symptom Inventory (MDASI), developed by Cleeland and colleagues (2000), is a brief measure of the severity and impact of cancer related symptoms. It is comprised of a 19-item symptom inventory scale consisting of 13 symptoms frequently reported by cancer patients, and six items that describe how much the symptoms have interfered with the different aspects of the patient's life over the past 24 hours. The "core symptoms" include pain, fatigue, nausea, disturbed sleep, emotional distress, shortness of breath, lack of appetite, drowsiness, dry mouth, sadness, vomiting, remembering, and numbness or tingling. The aspects of patient's life affected by the symptoms include: general activity, mood, walking ability, normal work, and relations with other people, and enjoyment of life.

The heart failure component of the MDASI-HF was developed by the researcher and symptom items specific to heart failure were added to the core MDASI instrument. Instrument development of the MDASI-HF consisted of three sequential stages: developmental phase, judgment quantification phase, and instrument testing and analysis. The developmental stage involved identification of the domain of interest, and defining the dimensions of the construct. According to Lynn (1986), a thorough review of literature related to the topic helps ensure that all the dimensions of the domain are covered. The content domains for measuring heart failure symptoms identified from the literature include the physiological, psychological and cognitive aspects. After the construct of interest and its dimensions are identified, items are generated representing each of the dimensions. The items related to heart failure symptoms were generated through a comprehensive review of qualitative and quantitative literature, clinical experience and patient interviews. The item generation resulted in 30 heart failure symptom questions. The questions were reviewed with patients in the outpatient heart failure clinic for clarity and precision.

Content validation

The 30-item draft instrument for heart failure specific items was revised and validated based on a panel of identified heart failure experts, who were asked to review the heart failure symptom questions for content validation. A person may be considered a content expert if they have experienced the concept of interest firsthand or they are caring for people diagnosed with the concept of interest, in this case, heart failure. Grant and Davis (1997) recommended certain criteria when selecting content experts. Content

experts should have published in refereed journals, and have conducted research or presented at a national level on the concept of interest. The recommended number of experts to review an instrument varies from two to twenty (Grant & Davis, 1997). The 10 cardiologists and 10 nurses and nurse practitioners who were invited to serve as content experts for this purpose had met the criteria as described. In addition, they are all members and presenters at the Heart Failure Society of America conferences. A guideline for reviewing items was included in the list of heart failure symptom questions that were sent to the content experts.

The 30 item MDASI-HF draft instrument was sent to the panel of content experts. The survey was completed and returned by 100% (n=10) of the nurse heart failure experts and 50% (n=10) of the cardiologists specializing in the treatment of heart failure patients. The content validity index (CVI) was then calculated from the content expert's ratings of the content relevance of the items to the instrument. The items were rated on a four point Likert scale with 1(least relevant) to 4 (very relevant). The items rated as three or four by the experts were included in the instrument for validation testing. A CVI of at least .80 is considered to be a good criterion for accepting the item as valid beyond the .05 level of significance (Davis, 1992). Beck & Gable (2001) suggested including incongruent items on the instrument and assessing the content expert's ability to detect these items. Inability to detect these items will result in disregarding the content experts' opinion. An incongruent symptom (headache) was included in the questionnaire to assess expert's ability to evaluate this item as incongruent with other heart failure symptoms. All of the experts that responded rated the item as irrelevant.

As a result, 16 of the 30 heart failure symptoms were endorsed by the content experts (Table 5). Eight of those symptoms were endorsed by nurses only, and eight symptoms were endorsed by both cardiologists and nurse experts. Four of the endorsed heart failure symptoms (fatigue, disturbed sleep, shortness of breath, and lack of appetite) are already part of the MDASI core symptom instrument. As suggested by the expert panel, ankle swelling and lower extremity swelling were combined as one item and listed as ankle swelling.

Table 5

Content Validity Index (CVI) Results

Heart Failure Symptoms	Heart Failure Nurses	Cardiologists
Abdominal bloating	.93	.70
Anxiety	.85	.65
Ankle swelling	.93	.80
Chest Pain	.60	.75
Confusion	.55	.50
Depression	.83	.65
Difficulty sleeping with head of bed flat	.95	.80
Dizziness	.73	.65
Fatigue	.98	.80
Fear of disability	.55	.60

(table continues)

Table 5 *(continued)*

Heart Failure Symptoms	Heart Failure Nurses	Cardiologists
Fear of sudden death	.63	.75
Fear of loss of control	.55	.55
Fear of loss of independence	.63	.65
Forgetfulness	.55	.45
Headache	.30	.35
Loss of appetite	.90	.75
Lack of energy	.98	.75
Limitation in physical activity	.93	.85
Lower extremity swelling	.95	.85
Mood disturbances	.60	.60
Nausea	.70	.60
Rapid heartbeat (Palpitations)	.93	.65
Nighttime cough (Persistent cough)	.88	.65
Shortness of breath	.98	1.0
Sleep problems	.83	.70
Thirst	.68	.55
Urinary incontinence	.45	.50

(table continues)

Table 5 *(continued)*

Heart Failure Symptoms	Heart Failure Nurses	Cardiologists
Waking up at night due to shortness of breath	.88	.90
Waking up at night to urinate	.75	.70
Sudden weight gain (Weight gain)	.98	.85

BOLD = Endorsed by both groups

ITALICS = Endorsed by nurses only

After extensive review and content experts' recommendations, a total of 11 new questions for heart failure symptom questions were generated. These heart failure symptom questions included abdominal bloating, anxiety, ankle swelling, depression, difficulty sleeping without adding more pillows under your head, lack of energy, limitation in physical activity, racing heartbeat (palpitations), nighttime cough, waking up at night with difficulty breathing, and sudden weight gain. The heart failure questions were then added to the 13 "core symptoms" which included pain, fatigue, nausea, disturbed sleep, emotional distress, shortness of breath, lack of appetite, drowsiness, dry mouth, sadness, vomiting, difficulty remembering, and numbness or tingling.

The six "interference" questions describe how much the symptoms have interfered with the different aspects of the patient's life over the past 24 hours. This includes general activity, mood, walking ability, normal work, relations with other people, and enjoyment of life. A total of 11 heart failure symptoms were added to the 13

core cancer symptoms and six interference questions in the MDASI, resulting in a total of 30 questions for the MDASI-HF.

Pilot Study

A pilot study was conducted on 32 participants to examine the initial reliability and validity of the MDASI-HF. Preliminary analysis of the data from the pilot study was done using the Statistical Package for Social Sciences statistical software (SPSS, Chicago, IL). The majority of patients (53%, *n=17*) were 60 years and older, similar to the prevalence of heart failure in the general population (American Heart Association, 2006). Most of the patients were female (56.3%, *n=18)* and 43.8 % male. Fifty three percent (*n=17)* were Caucasians, 31.3 %(*n= 10)* Black non-Hispanic, 6.3 %(*n=2*) Hispanic, 6.3 % (*n=2)* Native Americans, and 3.1% (*n=1)* Asian or Pacific Islander. Most of the patients (53.6%, *n=18*) had solid tumor, while 43.8% (*n=14)* had hematological tumors. The heart failure diagnosis identified 75% (*n= 24)* with systolic dysfunction (EF<40%), while 25% (*n= 8)* had diastolic dysfunction (EF>40%). Only 21.9% (*n= 7)* had received chemotherapy in the past week prior to the assessment. The predominant comorbid conditions were: hypertension (53.1%, *n=17*), anemia (40.6%, *n= 13*), diabetes mellitus (31.3%, *n=10*), hyperlipidemia (31.3%, *n=10*), and history of smoking (31.3%, *n=10*). It is surprising that coronary artery disease (25%, *n= 8*) and ischemic cardiomyopathy (21.9%, *n=7*) were not the principal comorbid conditions as compared to patients with heart failure in the general population.

Internal consistency reliability of the MDASI-HF was estimated by calculating the Cronbach's coefficient alpha. The total alpha scale for the 24 cancer and heart failure

severity items was .936, 13 core items of the MDASI α= .891, 11 heart failure items α= .882, and the six interference items α=.906. The Cronbach's alpha for all items of the MDASI-HF exceeded the usual minimum criterion for internal consistency reliability of .70 for a new instrument (Nunally & Bernstein, 1994). Thus, there is evidence that the 24 items consistently measured the same construct.

Validity was evaluated by calculating Pearson correlations which ranged from r=0.36 to r = 0. 86 (r value $\geq$0.35 considered significant). The symptoms of pain and numbness have low correlations with r = < 0.35. The interference item (physical activity) had an r => 0.9. This suggested that the 22 items (except for pain and numbness) of the MDASI-HF consistently measured the same construct.

The principal factor analysis with oblimin rotation was used in this study to validate the severity items of the MDASI-HF. The principal factor analysis or exploratory factor analysis yielded a six factor solution accounting for 80% of the cumulative variance with a 24-item model. The factor loading ranged from .334 to .832. suggesting that the severity items measure the domains (physiological, psychological, and cognitive factors) that described the underlying construct of symptoms in cancer patients with heart failure. The sample of the pilot study was representative of a minimal number of subjects.

A high Cronbach's alpha (α = .936) for all the twenty four severity items of the MDASI-HF indicated that this instrument consistently measures the same construct, which supported the internal consistency reliability. Moreover, the Cronbach alpha for the 13 core items (α = .891), 11 heart failure items (α = .882), and the six interference

items ($\alpha = .906$), were consistently high when they were evaluated separately which strengthens the reliability of the instrument.

There is moderate inter-item correlation ($r=0.36$ - 0.86) between the heart failure and cancer symptoms in this new instrument, except for the symptoms of pain and numbness which revealed a low correlation ($r=<0.35$). The low correlation of the symptom "pain" is contradictory to the data found in the SUPPORT study wherein 41% patients with heart failure in the later stage of the disease experience pain as a symptom (Levenson, Mc Carthy, Lynn, Davis, & Phillips, 2000). However, the five most severe symptoms identified in this study (fatigue, disturbed sleep, shortness of breath, lack of energy, and limitation of activity) are in concordance with the findings in the literature and what is observed in clinical practice.

Although the pilot study of this instrument has shown an adequate degree of reliability, and moderate inter item correlation, the three factor measurement model (physiological, psychological, and cognitive) was not supported by the exploratory factor analysis. The six factor solution was not categorically loaded as purely psychological, physiological, or cognitive symptoms. However, it supports the assumption behind the theory of unpleasant symptoms that there are sufficient commonalities among symptoms (Lenz et al., 1997). This also supports the fact that the symptoms in cancer patients with heart failure arise from the complex interplay of physical, emotional, cognitive, environmental, physiologic, and pathologic factors. Although the pathological basis for the symptoms may be different for each disease condition, the impact on the psychological and cognitive functioning may be similar.

Procedure for Data Collection

For purposes of the study, data was collected to examine the reliability and validity of the MDASI-HF instrument. A sample of 156 subjects was recruited from the inpatient nursing units and the outpatient clinic. Prior to data collection, approval to conduct the study was obtained from the Institutional Review Board of the University of Texas MD Anderson Cancer Center and Texas Woman's University. After approval was obtained, the participants were approached to obtain informed consent. The investigator complied with Health Insurance Portability and Accountability Act (HIPAA) guidelines at all times. Medical record numbers were used for patient identification, which were discarded after completion of the study.

The following steps were used for the data collection process.

1) Identify cancer patients with a concurrent diagnosis of heart failure from the inpatient units and outpatient clinic.

2) Screen potential participants if they meet the inclusion criteria to participate in the study.

3) Principal investigator explained the purpose of the study and instructions for completing the survey to eligible patients.

4) Outpatients completed the survey on the day of the clinic visit, while inpatients completed survey forms while in the inpatient care unit.

5) Principal investigator was available to answer questions and assist with the completion of surveys as necessary.

6) A clinical checklist form was completed by the investigator for each enrolled subject via patient interview and medical record review.

7) The completed clinical checklist, biographical information, and MDASI-HF questionnaire were sent to data management in Symptom Research Department for verification, analysis, and storage.

Treatment of Data

Analysis of the research data utilized descriptive and inferential statistics using the Statistical Package for Social Sciences (SPSS) Version 12 for Windows (2003). Descriptive statistics was used to describe the characteristics of the study population and was reported in the form of frequencies and percentages, means and standard deviations, or medians depending on the level of measurement. Nominal level data such as gender, race, diagnosis and medications were described using frequency distributions and percentages. Interval level data such as age and performance status were described using frequency distributions, percentages, means, ranges, and standard deviations. Potential differences between patients based on demographic variables were explored using a chi square or t-test.

Inferential statistics were used to answer the first research question as to whether the MDASI-HF demonstrates acceptable level of reliability. Internal consistency reliability was examined using a Cronbach's alpha. The alpha coefficient is the preferred index of internal consistency reliability because alpha represents the extent to which performance on any one item on an instrument is a good indicator of performance on any other item in the same instrument (Waltz, Strickland & Lenz, 2005). Alpha coefficients

of 0.70 or higher are acceptable for newly developed instruments (Nunnally & Bernstein, 1994).

The second research question exploring the interrelationships of the items in measuring the concept of symptoms in cancer patients with heart failure was assessed using the principal factor analysis. This test assesses the various dimensions or subcomponents of a phenomenon of interest and results in a linear combination of items called factors (Waltz, et al 2005). Each factor was correlated with each item to produce factor loadings (Waltz & Baussell, 1983).

An exploratory factor analysis or principal component analysis provides initial information about eigen values, each factor's explained variance, and each item's weight on a factor (Munro & Page, 1993). A level of 1.0 or higher is the standard acceptance criterion for eigen values which reflects the amount of explained variance for each factor (Crocker & Algina, 1986). Varimax rotation or orthogonal factor analysis was performed following the initial principal component analysis. Varimax rotates the factors until the best fit or separation of factors was obtained and better interpretability is achieved. At least three items loading at 0.40 or two loadings with a difference of 0.20 between loadings is necessary for retention of extraction factors (Kline, 1994). Waltz and Basel (1981) recommended that before analysis is attempted, factors should load between 0.30 and 0.50.

The third and fourth questions were designed to evaluate and compare the criterion related validity of the MDASI-HF to the standard assessment tools used in clinical practice to grade the patient's functional status based on symptom assessment.

Disease severity related to cancer was measured by the ECOG performance status, while the NYHA functional classification was used to grade heart failure severity based on symptoms. In order for the MDASI-HF instrument to be clinically relevant, it should be sensitive to detect early changes in the patient's symptoms and clinical status, and should correlate with the standard assessment of symptoms used in clinical practice. The reliability and validity of NYHA (Bennett, Riegel, Bittner, & Nichols, 2002) and ECOG (Oken, Creech, Tormey, Horton, Davis, Mc Fadden, & Carbone, 1982) have been established.

Summary

Although there are multiple instruments for assessment of symptoms for patients with cancer, and patients with heart failure, there is no validated instrument for symptom assessment in cancer patients with concurrent heart failure. The MDASI-HF instrument is a brief subjective measure of the symptoms developed from the perspective of patients diagnosed with heart failure, cancer, and those with concurrent diagnosis of both cancer and heart failure. The heart failure symptom questions were included in the instrument after content validity was established through quantification of content experts' opinion.

Preliminary analysis of the pilot study data revelead a high Cronbach's alpha (α = .936) for all the twenty four severity items of the MDASI-HF indicating internal consistency reliability of the instrument. Moreover, the Cronbach alpha for the 13 core items (α = .891), 11 heart failure items (α = .882), and the six interference items (α = .906), were consistently high when they were evaluated separately which strengthens the reliability of the instrument.

Although the pilot study of this instrument has shown an adequate degree of reliability, and moderate inter item correlation, the six factor solution in the exploratory factor analysis were not categorically loaded as purely psychological, physiological, or cognitive symptoms. However, it supports the assumption behind the theory of unpleasant symptoms that there are sufficient commonalities among symptoms (Lenz et al., 1997). This also supports the fact that the symptoms in cancer patients with heart failure arises from the complex interplay of physical, emotional, cognitive, environmental, physiologic, and pathologic factors. Although the pathological basis for the symptoms may be different for each disease condition, the impact on the psychological and cognitive functioning may be similar.

Patients with cancer and heart failure experience an unacceptable level of symptoms and symptom burden. Inadequate management of these symptoms may result in frequent unnecessary hospitalization and poor quality of life for this patient population. A valid and reliable symptom assessment instrument will provide more accurate communication between patients and clinicians regarding symptom assessment, thereby resulting in better patient management.

CHAPTER 4

ANALYSIS OF DATA

The associated symptoms of cancer and heart failure can generally be viewed as subjective experiences reflecting change in a person's biopsychosocial function, sensation and cognition. For purposes of this quantitative study, establishing reliability and validity of the MD Anderson Symptom Inventory –Heart Failure (MDASI-HF) instrument was undertaken. The instrument is a 30 item self –administered questionnaire, with 24 symptom items and six interference items which measure the symptom burden.

The 24 symptom items of the MDASI-HF measure three underlying constructs: 1) physiologic symptoms comprised of pain, fatigue, shortness of breath, drowsiness, dry mouth, numbness or tingling, abdominal bloating, difficulty sleeping without adding pillows under the head (orthopnea), limitation in physical activity, racing heartbeat (palpitation), nighttime cough, waking up at night with difficulty breathing (paroxysmal nocturnal dyspnea), and sudden weight gain; 2) psychological symptoms consisting of disturbed sleep, distress, problem with remembering, sadness, anxiety, depression, and lack of energy; and 3) gastrointestinal symptoms such as nausea, lack of appetite, and vomiting.

Each symptom is rated on an 11-point scale (0-10) to indicate the presence and severity of the symptom, with 0 meaning "not present" and 10 meaning "as bad as you can imagine." Each symptom is rated at its worst in the last 24 hours. The MDASI-HF

also includes ratings on how much symptoms may have interfered with the different aspects of a patient's life within the last 24 hours. These interference symptoms include general activity, mood, work (includes both work outside the home and housework), relations with other people, walking, and enjoyment of life. The interference items are also measured on a 0-10 scale, with 0 indicating "did not interfere," and 10 meaning "interfered completely". The mean of all the symptom interference items was used as a measure of overall distress.

This study used a descriptive, cross-sectional design focused on establishing the reliability and validity of the MD Anderson Symptom Inventory – Heart Failure (MDASI-HF) instrument, and described the symptoms in cancer patients with concurrent heart failure diagnosis. The statistical analysis of the data included: a) descriptive statistics to describe the demographic data of the participants; b) Cronbach's alpha for internal consistency reliability; c) Pearson correlation for interrater reliability and for measures of criterion validity; and d) factor analysis for construct validity. Through analyses of the descriptive and statistical data, the participants were characterized, the questions were evaluated, and the findings were examined.

Description of the Sample

The sample was comprised of 156 subjects with a known diagnosis of both cancer and heart failure, who were 18 years and older, and who were able to give informed consent for study participation. The subjects were recruited from a not for profit, university affiliated cancer center, who were treated either in the hospital setting or in the outpatient cardiology clinic. Patients excluded from the study were those who were: a)

younger than 18 years old, b) with a known diagnosis of dementia or Alzheimer's disease, and c) not familiar with the English language. The latter exclusion criterion was related to the availability of the instrument only in the English language.

The overall sample of 156 subjects consisted of 56.4 % (n=88) males and 43.6% (n = 68) females. The mean age of the subjects was 63.33 years old (range 23-97 years), of which 50.6% (n=79) were older than 65 years, while 49.4% (n=77) were below 65 years of age. Fifty three percent of the female subjects were younger than 65 years old, while most of the male subjects (53.4%) were older than 65 years. Five percent (n=8) of the subjects had completed sixth grade education, 45.5% (n=71) had completed high school, 32.8% (n=51) had completed college, 16.7% (n=26) had post graduate degrees. Sixty two percent (n=97) of the participants were Caucasians, while 37.8% (n=59) were of the minority population. Table 6 reflects the demographic characteristics of the overall sample.

Table 6

Demographics of Overall Sample (N=156)

Variable	Number	(%) or $M \pm$S.D.
Age (years)		
Mean	63.3 $\pm$ 13.2	(range 23-97)
<65 years	77	(49.4)
>65 years	79	(50.6)

(table continues)

Table 6 *(continued)*

Variable	Number	(%) or $M \pm$ S.D.
Gender		
Male	88	(56.4)
Female	68	(43.6)
Ethnicity		
White Non-Hispanic	97	(62.2)
Black Non-Hispanic	41	(26.3)
Hispanic	13	(8.3)
Asian/ Pacific Islander	3	(1.9)
Native American/ Alaskan	2	(1.3)
Level of Education		
Grade 1-6	8	(5.0)
Grade 7-12	71	(45.5)
College education	51	(32.8)
Post graduate	26	(16.7)
Marital Status		
Married	102	(65.4)
Widowed	18	(11.5)
Divorced	12	(7.7)

(table continues)

Table 6 *(continued)*

Variable	Number	(%) or $M \pm$ S.D.
Single (living with another adult)	12	(7.7)
Single, living alone	11	(7.1)
Separated	1	(0.6)
Tumor type		
Solid tumor	94	(60.3)
Hematological	62	(39.7)
Current Cancer Treatment		
Chemotherapy	42	(26.9)
Surgery	4	(2.6)
Radiation therapy	1	(0.6)
Cardiac Medications		
Beta blockers	141	(90.4)
*ACE Inhibitors	98	(62.8)
Diuretics	87	(55.8)
Statins	77	(49.4)
Aldosterone Antagonist	20	(12.8)
Digoxin	87	(55.8)

*ACE I= angiotensin-concerting enzyme inhibitor

The subjects in the study had various types of cancer diagnoses. The majority of the subjects (60.3%, *n=94*) had solid tumors, while 39.7% (n=62) participants had

hematological cancers (Table 7). All of the participants had concurrent heart failure, 65% *(n=102)* with systolic dysfunction (EF<40%), while 34.6% *(n=54)* had diastolic dysfunction (EF> 40%).

Table 7

Frequency Distribution of the Types of Cancer Diagnosis

Type of Cancer Diagnosis	Frequency	Percent
Solid Tumors	94	60.3
Breast	26	16.7
Genitourinary	18	11.5
Lung	14	9
Gastrointestinal	14	9
Head & Neck	10	6.4
Renal cell carcinoma	8	5
Hematological Cancers	62	39.7
Leukemia	27	17.3
Lymphoma	27	17.3
Other	17	10.9

There were frequent comorbid conditions in addition to cancer and heart failure that were likewise present in the patient population (Table 8). Two percent (n=3) had eight comorbid conditions, 9% (n=14) patients had seven, and 11.5% (n=15) patients had

six comorbid conditions. Many of the patients had at least five comorbidities (19.2%, n=30) and only 1.9% (n=3) did not have any associated co morbidity.

Table 8

Frequency Distribution of Comorbid Condition

Comorbidities	Frequency	Percent
Hypertension	97	62.2
Former smoker	62	39.7
Coronary artery disease	58	37.2
Anemia	55	35.3
Dyslipidemia	53	34
Diabetes Mellitus	42	26.9
Ischemic cardiomyopathy	42	26.9
Myocardial infarction	30	19.2
Renal insufficiency	27	17.3
Atrial Fibrillation	24	15.4
Pulmonary disease	23	14.7
Thyroid disease	21	13.5
Current smoker	12	7.7
Ventricular arrhythmias	10	6.4
Syncope	4	2.6

(table continues)

Table 8 *(continued)*

Comorbidities	Frequency	Percent
Cerebrovascular accident/TIA	4	2.6
Associated comorbidities	38	24.4

Thirty per cent (n = 47) of patients received some form of cancer treatment (chemotherapy, radiation or surgery), and eight percent (n=13) of patients had been to the emergency department for symptom management in the week prior to study participation. The treatment modalities received in the emergency room to manage patient symptoms included: diuretics 32% (*n*=50); oxygen 24.4% (*n*=38); opiates 24.4% (*n*=38), and antibiotics 23.7% (n=37). Sixty three percent (*n*=98) of patients were receiving ACE-Inhibitors, 90.4% (*n*=141) on beta blockers, 55.8% (*n*=87) on diuretics, 9.6% (*n*=15) on digoxin, and 49.4% (*n*=77) on statin therapy. The patient's weight during data collection when compared to baseline weight showed that 50.6% (n=79) had gained weight, while 49.4 % (n=77) had either lost or had no change in weight.

Fifty one percent (n=80) had poor performance status based on the Eastern Cooperative Oncology Group (ECOG) performance criteria (grade 2-4), while 41% (n = 64) patients had moderate to severe (NYHA Class 3-4) functional status based on the New York Heart Association (NYHA) functional classification. The ECOG instrument is the most commonly used assessment tool for cancer patients to evaluate the functional response to treatment, and how the disease affects the individual's activities of daily living. The NYHA functional classification has been commonly used in the clinical

settings and research studies as an evaluative measure of change in the condition of cardiac patients over time based on symptoms. Table 9 presents the frequency distribution of the functional classification and performance status of the study sample.

Table 9

Frequency Distribution of the Performance Status and Functional Classification of the Sample (N=156)

Performance Status	Frequency	Percent
ECOG Criteria		
Grade 0 (Good)	18	11.5
Grade 1 (Good)	58	37.2
Grade 2 (Poor)	32	20.5
Grade 3 (Poor)	27	17.3
Grade 4 (Poor)	21	13.5
NYHA Classification		
Class 1 (No limitation)	30	19.2
Class 2 (Mild)	62	39.7
Class 3 (Moderate)	42	26.9
Class 4 (Severe)	22	14.1

Data Analysis

Data analysis was carried out using the Statistical Package for Social Sciences statistical software (SPSS, Chicago, IL). The research questions addressed in this study were:

1. Does the MD Anderson Symptom Inventory –Heart Failure (MDASI – HF) demonstrate an internal consistency of .70 or greater?

2. Do all items of the MD Anderson Symptom Inventory –Heart Failure (MDASI-HF) interrelate in measuring the concept of symptoms in cancer patients with heart failure at a level of at least .50 or greater?

3. Do the scores of the MD Anderson Symptom Inventory –Heart Failure (MDASI-HF) correlate with the Eastern Cooperative Oncology Group (ECOG) performance status at the level of .70 or greater?

4. Do the scores of the MD Anderson Symptom Inventory –Heart Failure (MDASI-HF) correlate with the New York Heart Association (NYHA) functional classification of cardiac disabilities at the level of .70 or greater?

Severity of the 24 Symptom Items

Patients with cancer and heart failure experience a wide variety of symptoms. The 24 symptom items of the MDASI-HF were rank- ordered from highest to lowest in terms of mean severity as reported by patients. The severity ratings of symptoms were categorized as moderate (ratings of 5 or 6) or severe (ratings of 7 or greater) based on the previous categorization of symptoms with pain (Serlin, Mendoza, Nakamura, Edwards, &

Cleeland, 1995) and fatigue (Mendoza,Wang, Cleeland, Morrissey, Johnson, & Wendt, et al 1999) in cancer patients. The percentages of patients reporting the severity of each symptom as moderate or severe, based on the provisional classification is presented in Table 10. Seven symptoms (limitation of physical activity, fatigue, lack of energy, disturbed sleep, drowsy, shortness of breath, and dry mouth) were rated as moderate or severe by >25% of patients in this sample.

Table 10

Mean Symptom Severity Scores

Symptom	Mean Score	% (score >4) Moderate	% (score>6) Severe	Standard deviation
Limitation of physical activity	4.95	55.3	40	3.57
Fatigue	4.51	52.9	29	3.13
Lack of energy	4.39	44.9	32.1	3.35
Disturbed sleep	3.86	43.2	25.2	3.42
Drowsy	3.79	37.9	23.5	3.31
Shortness of breath	3.55	35.5	25.8	3.54
Dry mouth	3.43	36.1	25.2	3.66
Lack of appetite	3.08	30.8	23.7	3.46
Distress	2.85	28.4	18.1	3.26
Difficulty remembering	2.82	26.6	13.6	3.06
Ankle swelling	2.61	28.4	16.8	3.39

(table continues)

Table 10 *(continued)*

Symptom	Mean Score	% (score >4) Moderate	% (score>6) Severe	Standard deviation
Anxiety	2.38	20.5	16	3.12
Abdominal bloating	2.32	22.4	14.7	3.27
Sad	2.30	21.9	14.8	3.19
Difficulty lying flat in bed	2.29	23.1	14.7	3.19
Pain	2.22	20.6	12.9	3.03
Depression	1.93	16.2	10.4	2.85
Numbness	1.86	16.2	9.1	2.69
Night time coughing	1.82	16.7	9.6	2.82
Racing heart beat	1.50	16.3	7.8	2.56
Difficulty breathing at night	1.50	14.8	9.7	2.63
Nausea	1.46	15.5	8.4	2.77
Sudden weight gain	1.06	8.4	5.2	2.26
Vomiting	.89	9.0	5.8	2.34

Eliminating Redundant Items

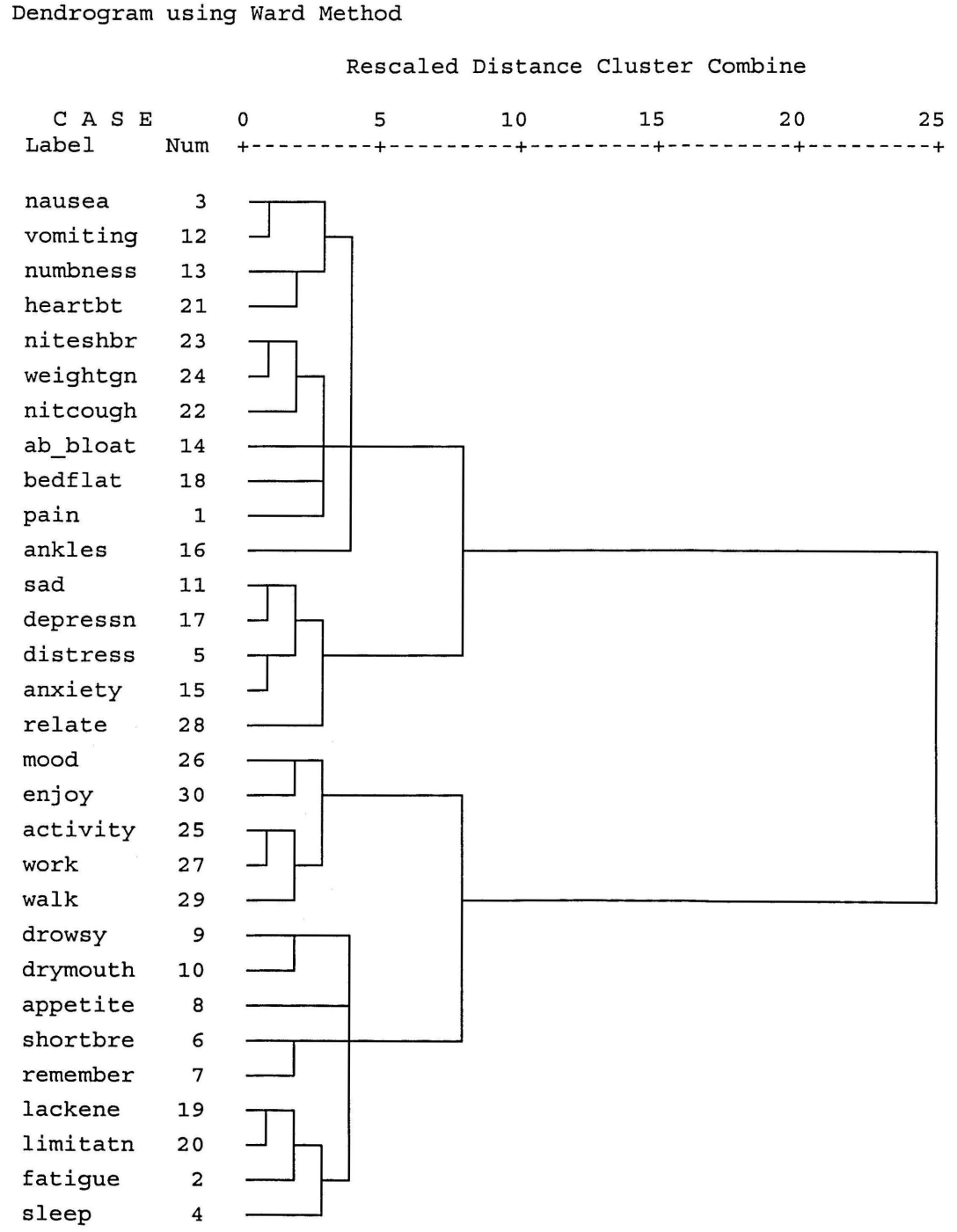
Many of the items of the original MDASI-HF represent symptoms that are intuitively similar. For example, patients rated the symptom (lack of energy) at the same level of severity as the other symptom (limitation in physical activity), and thus the results produce redundant information. Elimination of one of the redundant items may

decrease the length of the questionnaire resulting in being easier for patients to complete. To achieve this goal, a cluster analysis was performed to identify groups of similar items (Aldenderfer, & Blashfiled, 1984). Cluster analysis provides an overview of the structure of the patient responses to the total set of items. The results of the analysis are presented as a dendogram (Figure 2). Items that join together early signified that they were rated similarly from the patient's perspective. For example, the symptom items nausea and vomiting, difficulty sleeping without adding pillows (orthopnea) and weight gain, sadness and depression, distress and anxiety, activity and work, and lack of energy and limitation of physical activity formed a cluster early in the dendogram. If one of the redundant items is already part of the core items of the MDASI, and is deemed clinically relevant, those items were retained and included in the final MDASI-HF questionnaire.

Based on several criteria including clinical judgment, statistical techniques using cluster analysis, and data on symptom prevalence and severity, the following three of the eleven items specific for heart failure were eliminated from the final MDASI-HF questionnaire: anxiety, depression and limitation of physical activity. The items of distress, feeling sad and general activity that clustered with the eliminated items, were already part of the core MDASI instrument, and were retained as part of the MDASI-HF. Although the items of nausea and vomiting, difficulty sleeping at night and weight gain, activity and work, formed a cluster early, it was deemed clinically relevant that both items be included in the instrument.

Figure 1

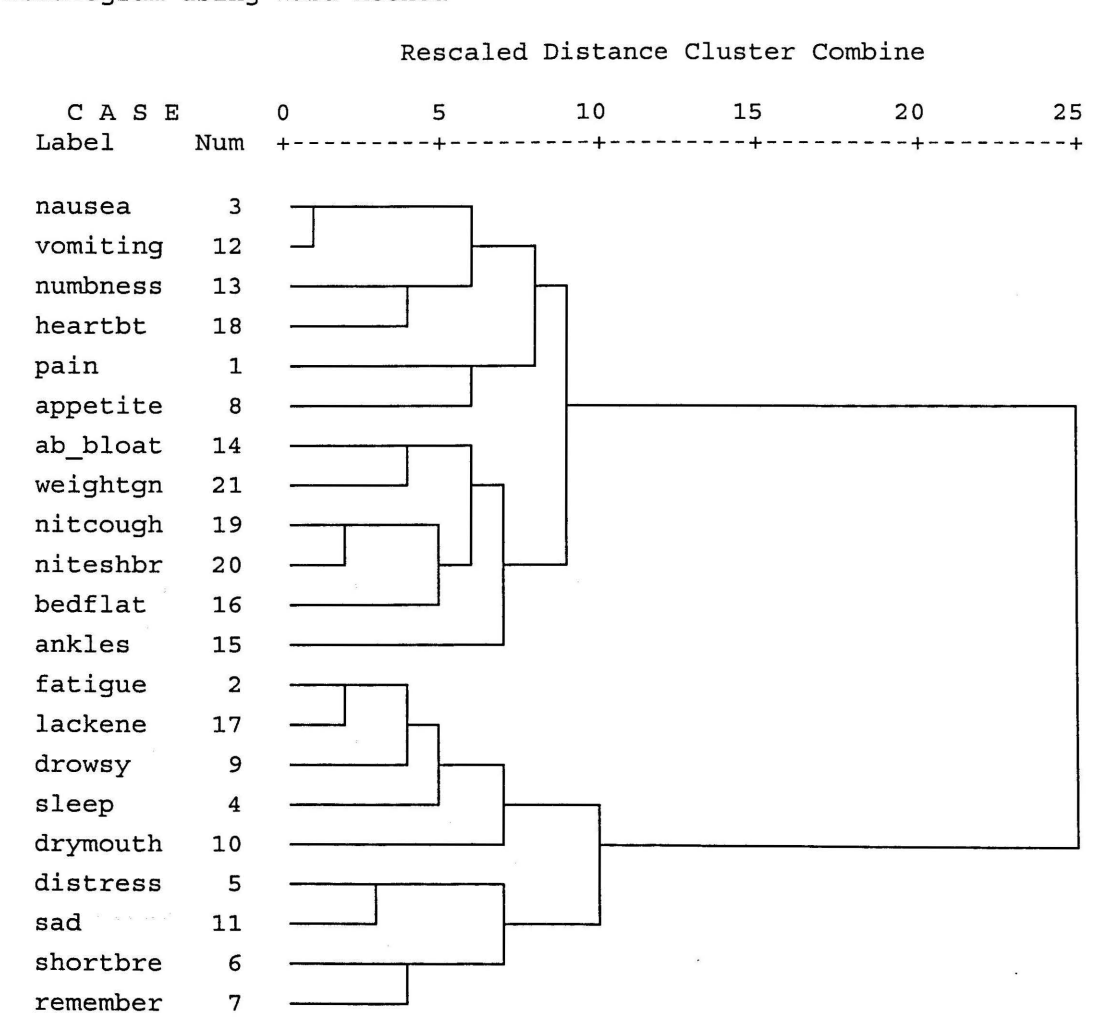
Hierarchical Cluster Analysis for the 24 MDASI-HF Symptoms



After eliminating the three redundant symptom items (anxiety, depression, and limitation in physical activity), a cluster analysis was done on the remaining 21 symptom items and six interference items of the MDASI-HF. The results of the analysis are presented as a dendogram (Figure 3).

Figure 2

Hierarchical Cluster Analysis for 21 MDASI-HF Symptoms



Findings

Reliability of the MDASI-HF

The first research question was to determine the internal consistency (reliability) or the extent to which each item of the MDASI-HF measures the concept of symptoms in cancer patients with associated heart failure. A Cronbach's coefficient alpha was calculated to determine internal consistency reliability for the MDASI-HF. The total scale alpha for all the 21 cancer and heart failure symptom severity items was $\alpha = .94$. Moreover, the Cronbach's alpha calculated separately showed a consistently high alpha ($\alpha = .886$) for 13 core items, ($\alpha = .83$) for eight heart failure symptoms, and ($\alpha = .92$) for six interference items. The Cronbach's alpha for all items of the MDASI-HF exceeded the usual minimum criterion for internal consistency reliability of .70 for a new instrument and 0.80 for a mature instrument (Nunnaly & Bernstein, 1994). The consistently high Cronbach's alpha strengthen the reliability of the instrument and supports the fact that the 21 items of the MDASI-HF consistently measured the same construct of symptoms in cancer patients who had associated heart failure.

Validation of the MDASI-HF

The second research question was directed towards the evaluation of the MDASI-HF items in measuring the concept of symptoms in cancer patients with heart failure as a means of determining construct validity through factor analysis. Principal component analysis with varimax rotation was used to determine the constructs represented by the MDASI-HF. A varimax orthogonal rotation was used as a means of maximizing independence and separateness of factors. The principal factor analyses of the sample

yielded a 6 factor solution with eigen values of 1.0 or greater, accounting for 67% of the cumulative variance for the sample. Eigen values represent the total amount of variance explained by each factor.

Table 11 identifies the pattern of the factor loadings for the 21 symptom items of the MDASI-HF. However, some of the items (lack of energy, difficulty breathing at night, dry mouth, abdominal bloating, mood, lack of appetite, and racing heartbeat) loaded on two factors, which remained unclear and ambiguous.

Table 11

Factor Analysis of the MDASI-HF Items Using a 4-Factor Solution

Pattern Matrix[a]

	Factor			
	1	2	3	4
lack of energy	**.936**	-.104		
fatigue	**.785**			-.150
drowsy	**.757**			
drymouth	**.612**	.115		
shortbreath	**.610**		.283	
distrubed sleep	**.486**		.208	-.157
night time cough	**.476**	.136	.143	.187
difficulty breathing at night	**.436**	.114	**.374**	.295
racing heartbeat	**.413**	.145		.227
sad	**.392**	.138		-.236
difficulty sleeping w/o adding pillows	**.371**		**.280**	
remember	**.299**		**.298**	-.224
nausea	-.128	**1.008**		
vomiting		**.842**		.121
lack of appetite	**.308**	**.382**		-.242
pain		**.297**	.129	-.100
numbness	.111	**.229**	.106	
sudden weight gain	-.140		**.818**	
abdominal bloating		.244	**.498**	-.125
ankles swelling	.216		**.461**	.151
distress	**.301**		**.364**	**-.456**

Extraction Method: Principal Axis Factoring

Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 8 iterations.

Factor analysis of the 21 symptom severity items was attempted with the number of factors set to four, three, and two factor solution. The two factor solution for the 21 severity items remained unclear and ambiguous (Table 12).

Table 12

Factor Analysis of the 21 severity items of the MDASI-HF Using a 2-Factor Solution

Pattern Matrix[a]

	Factor	
	1	2
shortbreath	**.871**	-.104
lackene	**.864**	
niteshbr	**.773**	
limitatn	**.730**	
fatigue	**.667**	.136
drowsy	**.596**	.127
ankles swelling	**.577**	
heartbt	**.535**	
nitcough	**.530**	.109
bedflat	**.520**	.159
sleep	**.517**	.255
drymouth	**.376**	.278
remember	**.361**	**.336**
weightgn	**.355**	.147
anxiety	-.215	**.973**
sad		**.757**
distress		**.755**
depressn		**.749**
nausea		**.553**
vomiting	.122	**.447**
appetite	.181	**.441**
ab_bloat	.290	**.407**
pain		**.390**
numbness	**.149**	**.195**

Extraction Method: Principal Axis Factoring
Rotation Method: Oblimin with Kaiser Normalization.
a. Rotation converged in 8 iterations.

However, when a factor analysis was done separately for the 13 core symptoms (Table 13) and the 8 heart failure specific symptoms (Table 14), the two factor solution showed a clear factor loading for each of the group of symptoms. Factor analysis of the 13 core symptoms with the number of factors set at two, based on minimum eigen value

of 1.0, showed a similar factor loading with the initial validation of the MDASI instrument (Cleeland, et al. 2000). This accounted for 53 % of the cumulative variance. The 13 core symptoms measures two underlying constructs: 1) general symptom severity factor comprised of the following items: fatigue, shortness of breath, drowsy, disturbed sleep, problem with remembering, feeling distress, dry mouth, feeling sad, lack of appetite, pain and numbness, and 2) gastrointestinal factor composed of two items: nausea and vomiting. The symptom lack of appetite and pain loaded on two factors.

Factor analysis of the eight heart failure specific symptoms with the number of factors set at two, based on minimum eigen value of 1.0, resulted in clear loadings for two factors, which accounted for 59% of the total variance. The eight heart failure specific symptoms measured two underlying constructs: 1) covert HF symptoms comprised of the following items: nighttime cough, waking up at night with difficulty breathing(PND), lack of energy, difficulty sleeping without adding pillows (orthopnea), and racing heartbeat, and 2) overt HF symptoms comprised of sudden weight gain, abdominal bloating, and ankle swelling.

To show model fit, the differences were examined between the reproduced correlations based on the two factor solution, and the observed correlations in the sample. Based on the Harman (1976) criteria, a solution is considered adequate if the standard deviation of the residuals is slightly less than or approximately equal to the standard error of the correlation coefficient. In this study, the two factor solution was appropriate because the standard deviation of the residuals for the 13 core symptoms is .05, and the

eight heart failure specific symptoms is .04, which is less than the standard error of the correlation coefficient which is .08.

Table 13

Factor Analysis for 13 Core Symptoms

Pattern Matrix[a]

	Factor	
	1	2
fatigue	**.860**	
shortbre	**.816**	-.179
drowsy	**.746**	
sleep	**.685**	
remember	**.657**	
distress	**.650**	.107
drymouth	**.520**	.129
sad	**.511**	.144
appetite	**.365**	.363
pain	**.266**	.228
numbness	**.248**	.111
nausea		**.977**
vomiting		**.744**

Extraction Method: Principal Axis Factoring

Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Table 14

Factor Analysis for 8 Heart Failure Specific Symptoms

Pattern Matrix[a]

	Factor	
	1	2
niteshbr	**.782**	
lackene	**.732**	
limitatn	**.695**	
ankles	**.640**	
nitcough	**.595**	
heartbt	**.576**	
bedflat	**.568**	-.136
weightgn	**.440**	-.136
ab_bloat	**.405**	-.296
anxiety		**-.932**
depressn	.164	**-.688**

a. Rotation converged in 5 iterations.

A Pearson correlation was conducted to evaluate the inter-item relationship between heart failure and the cancer symptom items in the MDASI-HF instrument. As reflected in Table 15, there is a high inter-item correlation between the heart failure and cancer symptoms in this instrument and the correlation was significant at the 0.01 level of significance.

Table 15

Inter-item Correlations between Heart Failure and Cancer Symptoms Using MDASI-HF Subscale Scores

Correlations

		Mean Severity (24 items)	Mean Core (13 items)	Mean Heart Failure (11 items)	Mean Interference (6 items)	Mean Walk-Activity-Work (Physical)	Mean Relations-Enjoy-Mood (Affective)
Mean Severity (24 items)	Pearson Correlation	1.000**	.965**	.949**	.764**	.722**	.722**
	Sig. (2-tailed)	.	.000	.000	.000	.000	.000
	N	156	156	156	156	156	156
Mean Core (13 items)	Pearson Correlation	.965**	1.000**	.833**	.706**	.662**	.672**
	Sig. (2-tailed)	.000	.	.000	.000	.000	.000
	N	156	156	156	156	156	156
Mean Heart Failure (11 items)	Pearson Correlation	.794**	.833**	1.000**	.763**	.726**	.714**
	Sig. (2-tailed)	.000	.000	.	.000	.000	.000
	N	156	156	156	156	156	156
Mean Interference (6 items)	Pearson Correlation	.764**	.706**	.763**	1.000**	.950**	.932**
	Sig. (2-tailed)	.000	.000	.000	.	.000	.000
	N	156	156	156	156	156	156
Mean Walk-Activity-Work (Physical)	Pearson Correlation	.722**	.662**	.726**	.950**	1.000**	.773**
	Sig. (2-tailed)	.000	.000	.000	.000	.	.000
	N	156	156	156	156	156	156
Mean Relations-Enjoy-Mood (Affective)	Pearson Correlation	.722**	.672**	.714**	.932**	.773**	1.000**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.
	N	156	156	156	156	156	156

** Correlation is significant at the 0.01 level (2-tailed).

The third research question was designed to evaluate criterion related validity of the MDASI-HF as compared to the Eastern Cooperative Oncology Group (ECOG) performance status. The ECOG instrument is used by clinicians and researchers to assess

disease severity related to cancer and how the disease affects the daily living activities of the patient. A Pearson product moment correlation was used to test for concurrent criterion related validity of the MDASI-HF with the ECOG Performance status. Criterion validity results indicated moderately high correlation scores with the ECOG performance status with r= .628, .622, .548 and .645 for the 21 mean severity items, core items, eight heart failure items and six interference items respectively. These correlations were significant at p= 0.01 level of significance (Table 16).

Table 16

Correlation of MDASI-HF Summary Scores with ECOG Performance Status and the NYHA Functional Classification

Correlations

		ECOG	NYHA Functional Status
Mean Severity (24 items)	Pearson Correlation	.628**	.639**
	Sig. (2-tailed)	.000	.000
	N	156	156
Mean Severity (21 items)	Pearson Correlation	.628**	.645**
	Sig. (2-tailed)	.000	.000
	N	156	156
Mean Core (13 items)	Pearson Correlation	.622**	.622**
	Sig. (2-tailed)	.000	.000
	N	156	156
Mean Heart Failure (11 items)	Pearson Correlation	.577**	.601**
	Sig. (2-tailed)	.000	.000
	N	156	156
Mean Heart Failure (8 items)	Pearson Correlation	.548**	.590**
	Sig. (2-tailed)	.000	.000
	N	156	156
Mean Interference (6 items)	Pearson Correlation	.645**	.588**
	Sig. (2-tailed)	.000	.000
	N	156	156
Mean Walk-Activity-Work (Physical)	Pearson Correlation	.651**	.589**
	Sig. (2-tailed)	.000	.000
	N	156	156
Mean Relations-Enjoy-Mood (Affective)	Pearson Correlation	.560**	.514**
	Sig. (2-tailed)	.000	.000
	N	156	156

** Correlation is significant at the 0.01 level (2-tailed).

The fourth research question evaluated the criterion validity of the MDAS-HF as compared to the New York Heart Association (NYHA) Functional Classification. The NYHA functional classification has been used in research studies and in the clinical

setting as an evaluative measure of change in the patient's condition over time and to classify heart failure severity based on symptoms. A Pearson product moment correlation was used to test for concurrent criterion related validity of the MDASI-HF with the NYHA functional classification. Criterion validity results indicated moderate correlation scores with the MDASI-HF and the NYHA functional classification (Table 16). All correlations were significant at $p= 0.01$ level of significance.

Summary of Findings

This chapter described the sample and findings from data collected. A total of 156 patients with cancer and a concurrent diagnosis of heart failure participated in the study and assessed the severity of their symptoms by completing the MDASI-HF symptom assessment tool. The majority of the subjects were Caucasians (62.2%, n=97), male (56.4 %, n=88), with a median age of 65 years, and had completed a high school education (45.5%, n=71). Most of the subjects had solid tumors (60.3%, n=94) particularly breast cancer (16.7%, n= 26), and 26.9% (n = 42) had received chemotherapy, radiation or had a surgical intervention in the past week prior to study participation. The subjects had multiple comorbid conditions in addition to cancer and heart failure, with as many as eight comorbidities in 1.9% of the sample. Hypertension (62.2%, n=97), history of smoking (39.7%, n= 62), and coronary artery disease (37.2%, n= 58) are the three major comorbid conditions noted among the participants. Sixty five percent (n=102) had systolic dysfunction (EF<40%), while 34.6% (n=54) patients had diastolic dysfunction (EF>40%).

The first research question evaluated the internal consistency (reliability) of the MDASI-HF. A Cronbach's alpha of $\alpha = .92$ (all 21 symptoms), $\alpha = .89$ (13 core cancer symptoms), $\alpha = .83$ (8 heart failure symptoms), and $\alpha = .92$ (6 interference items), exceeded the usual minimum criterion of .70 for a new instrument. The findings imply that the 21 symptom items of the MDASI-HF measure the same construct, and demonstrate reliability for a new instrument for symptom assessment in cancer patients with associated heart failure.

The second research question evaluated construct validity of the MDASI-HF instrument. The two factor solution calculated separately for the 13 core symptom and the eight heart failure specific symptoms appeared to be most appropriate, based on the Harman (1976) criteria which revealed that the standard deviation of the residuals is slightly less or approximately equal to the standard correlation coefficient.

The third and fourth research questions evaluated the criterion related validity of the MDASI-HF against the ECOG criteria and the NYHA functional classification, which are considered "gold standard" instruments for symptom assessment for patients with cancer and heart failure respectively. The clinician's assessment of symptoms revealed that 30.7 % (n= 48) of the subjects had poor performance status (ECOG grade 3-4) based on the ECOG assessment tool, and 41 % (n= 64) had moderate to severe functional status (NYHA class 2-4) based on the NYHA functional assessment classification. When compared to the patient's self-reported scores using the MDASI-HF instrument, criterion validity indicated moderate correlation scores associated with the ECOG performance status (r= .628, .622, .548 and .645 for the 21 mean severity items, 13 core items, eight

heart failure items and six interference items respectively); and the NYHA functional classification (r= .645 (21 mean severity items), r=.622 (13 core items) r=.590 (8 heart failure items), and r =.588 (6 interference items). These findings indicate that the MDASI-HF has a moderately high criterion-related validity with the ECOG performance status and the NYHA functional classification.

CHAPTER 5

SUMMARY OF THE STUDY

Symptom assessment in patients with cancer and heart failure is known to have major prognostic and therapeutic implications. Symptom assessment forms the foundation for effective management that may result in improved quality of life. There are several symptom assessment instruments with documented reliability and validity for cancer and heart failure as separate disease entities; however, a symptom assessment instrument for patients diagnosed with both cancer and heart failure is lacking. It was the intent of this study to describe the development and initial psychometric evaluation of the MDASI-HF, a symptom identification instrument for cancer patients with concurrent heart failure.

The middle range theory of unpleasant symptoms and the classical test theory formed the theoretical basis for the assumptions used in this study. The theory of unpleasant symptoms identifies the multidimensional phenomena of the symptoms and this typically assists in understanding the patient's perspective. With a better understanding of the patient's symptoms, clinicians can devise strategies for symptom management to improve the patient's quality of life. The classical test theory provided the framework for the evaluation of the psychometric properties of the instrument to assess the model fit between the conceptual models as measured by the variables in the measurement model. Based on these assumptions, research questions were formulated to

evaluate the reliability and validity of the MDASI-HF in identifying symptoms in cancer patients with heart failure.

Summary

Identifying symptoms experienced by individuals affected by cancer and concurrent heart failure was the purpose of the study. The descriptive, cross-sectional, non-experimental design study included 156 cancer patients with concurrent heart failure diagnosis who had met the inclusion criteria and completed a self assessment questionnaire for symptom assessment using the MD Anderson Symptom Inventory-Heart Failure (MDASI-HF). The subjects included in the study were receiving care in the inpatient units and the outpatient cardiology department of the study institution. The research design utilized in this investigation was structured to allow for inclusion of patients with different levels of physical performance and functional capability to represent different levels of symptom severity. The demographic characteristics of the sample was representative of only a segment of the target population, thus the generalizability of the research findings is limited to the cancer patients with heart failure with characteristics similar to those in the sample.

Analysis of the research data utilized descriptive and inferential statistics. Reliability and validity of the MDASI-HF was established through factor analysis, cluster analysis, clinical judgment, and symptom correlations. Items included in the final MDASI-HF instrument had demonstrated content, criterion, and construct validity, and internal consistency reliability.

Discussion of the Findings

The findings of the study will be discussed in relation to the demographic variables and research questions which focused on evaluating the internal consistency, criterion related, and construct validity of MDASI-HF. The discussion will draw a comparison between the findings of this study and the results from review of literature on the conceptualization and measurement of symptoms in cancer patients with heart failure.

Demographics

The sample in this study was comprised of 56.4% (n=88) male, 62.2% (n=97) Caucasians, 65% (n=102) with systolic dysfunction heart failure, with a mean age of 63.3 years. The characteristics of the sample are consistent with the demographical characteristics of the general heart failure population (American Heart Association, 2006). However, a recent study by Owan and colleagues (2006), suggest that the prevalence of heart failure with preserved ejection fraction may be changing as a result of changes in population demographics and in the treatment of risk factors for heart failure. It is established that approximately 50% to 60% percent of heart failure cases occur in the setting of preserved systolic function (Senni, & Redfield, 2001). The high prevalence of hypertension, increased survival rate from atherosclerotic heart disease, the aging of the population, the increasing problem of obesity and diabetes (Young, 2004) all contribute to the changing epidemiology of heart failure. Moreover, in cancer patients with already existing physiologic decline, multiple comorbidities, and the cardiotoxicity of anticancer agents, an increase in the prevalence of heart failure in varying age groups can be anticipated.

In this study, 43.6% (n=68) were female patients with heart failure, and 16.7% (n=26) of female subjects with breast cancer had received prior cardiotoxic chemotherapeutic agents prior to 65 years of age. According to the NHANES data (2002), the prevalence of heart failure in the general population aged 65-74 years is 6.2% in men, and 4.1% in women, but in individuals 75 years and older, the prevalence is higher in women (10.9%) as compared to men (9.8%).

Hypertension was the most common comorbid condition (62.2%, *n*=97) in the majority of patients in this study, which is comparable to the general population in which 75% of heart failure cases had antecedent hypertension (American Heart Association, 2006). About 40 % (n=62) of study participants had a history of smoking, and 26.9% (n=42) had ischemic cardiomyopathy. Ischemic heart disease was the most prevalent heart failure etiology in major heart failure trials ranging from 57.2% (Cohn, Tognoni, Glazer, & Spearman for the Val-HeFT trial, 2000) to 65% (MERIT-HF trial, 1999).

As expected, symptoms often attributed to heart failure such as fatigue and shortness of breath were rated as moderate to severe by the participants. However, surprisingly, other symptoms such as drowsiness, disturbed sleep, dry mouth, lack of appetite, and difficulty remembering were much more prevalent than symptoms thought to be more typical of heart failure, such as waking up at night with difficulty breathing (PND) and difficulty lying flat in bed (orthopnea), and racing heartbeat (palpitation) which were rated less severe by the participants.

Limitation of physical activity, fatigue, lack of energy and disturbed sleep were most distressing to patients in this study. This is similar to the previous findings in

patients awaiting cardiac transplantation, where the most distressing symptoms were tiredness, difficulty sleeping, and difficulty breathing with activity (Grady, Jalowiec, Grusk, White-Williams & Robinson, 1992).

Reliability

The first research question addressed the evaluation of internal consistency (reliability) of the MDASI-HF instrument. The findings of the study supported a high internal consistency with a Cronbach's coefficient alpha of $\alpha = .92$ (all 21 symptoms), $\alpha = .89$ (13 core cancer symptoms), $\alpha = .83$ (8 heart failure symptoms), and $\alpha = .92$(6 interference items). This exceeded the usual minimum criterion for internal consistency reliability of .70 as recommended (Nunnaly & Bernstein, 1994; Gliner & Morgan, 2000; Polit, Beck, & Hungler, 2001) for a new instrument. The data support the fact that the items of the MDASI-HF consistently measure the concept of interest (symptoms in cancer patients with heart failure) and reflect the true measure of the attribute of a construct.

Examination of the correlation matrix from which the reliability coefficient was computed revealed that most of the items except for numbness or tingling had zero order correlations (r) of 0.15 and above (≤ 0.15 considered not significant). It was felt that lack of sensitivity of the numbness or tingling item was probably due to the particular sample tested. Numbness or tingling in patients with cancer is a symptom usually associated with chemotherapy induced peripheral neuropathy (Riaz, & Tomlinson, 1996). In this study, only a small number of subjects (26.9 %, n = 42) had received chemotherapeutic agents one week prior to symptom assessment, and only a few of those agents were neurotoxic.

Further testing of this symptom with a more heterogeneous sample could help clarify its utility for the symptom assessment instrument.

Another interesting finding from the zero order correlation matrix was that fatigue was highly correlated ($r = \geq .50$) with symptoms of disturbed sleep, shortness of breath, difficulty remembering, drowsy, dry mouth, and lack of energy. The reason to explain this finding might suggest that fatigue is a symptom manifested in heart failure, cancer disease process, and is an adverse effect of cancer therapy. It could be postulated that as a patient becomes more fatigued, eating will decrease, sleeping difficulty may ensue, resulting in drowsiness, dry mouth, lack of energy, drowsiness and decrease in mental acuity.

Validity

The three types of validity that are commonly used in instrument development include content, criterion – related, and construct validity (Polit, Beck, & Hungler, 2004). In this research study, content validity was established based on the required minimum agreement of content experts (Summers, 1993; Davis, 1992). The construct validity was evaluated with the second research question, and criterion-related validity was addressed in the third and fourth research questions.

Construct validity

Construct validity determines the extent to which the instrument items measure the concept of interest (Gliner & Morgan, 2000). Construct validity of the MDASI-HF was determined by using principal factor analysis or exploratory factor analysis which resulted in a four factor solution. The exploratory factor analysis reduced the data to a

meaningful set to determine which item best represents the concept of interest (Nunnaly & Bernstein, 1994). However, the symptom items (waking up at night with difficulty breathing (PND), difficulty sleeping without adding more pillows (orthopnea), problem with remembering things, lack of appetite and distress), loaded on two factors which may be unclear and ambiguous lending to incorrect interpretation. For each item to correlate to a factor, a minimum criterion of $\geq .40$ is acceptable for each loading (Summers, 1993). The two criteria used to determine the dimensionality in factor analysis (Kaiser Criterion of eigen values >1.00 and the scree criterion of the greatest change in the trend of eigen values plotted against the number of factors) both favored a two factor solution for exploratory factor analysis for core symptoms and heart failure specific symptoms of the MDASI-HF.

The factor analysis conducted for this study revealed the MDASI-HF was measuring two separate constructs: cancer related symptoms and heart failure related symptoms. The cancer related symptoms (13 core symptoms) measured two underlying constructs: 1) general symptom severity factor, and 2) gastrointestinal factor, which yielded similar results with the initial validation of the core MDASI instrument (Cleeland, et al., 2000). Additionally, the eight heart failure specific symptoms that loaded on two factors measured two underlying constructs, the covert and overt physical symptoms of heart failure. The covert physical symptoms of heart failure included nighttime coughing, difficulty breathing at night (PND), lack of energy, difficulty sleeping without adding pillows (orthopnea), and racing heartbeat, while the overt physical symptoms included sudden weight gain, abdominal bloating, and ankle swelling.

The factor measurement model (physical, psychological, and cognitive) was not supported by exploratory factor analysis. A similar pattern has also been noted in three other cancer related instrumentation studies for the evaluation of cancer related fatigue symptom (Wu, & Mc Sweeney, 2004; Holley, 2000; Schwartz & Meek, 1999). This supports the findings that heart failure symptoms are non-specific (Watson et al. 2000), and patients with end stage heart failure have similar symptoms to patients with end-stage cancer disease (Nordgren & Sorensen, 2003; Gibbs, et al. 1998). Additionally, the theory of unpleasant symptoms supports the assumption that there are sufficient commonalities among symptoms (Lenz, 1997).

Criterion related validity

The third research question addressed the criterion related validity of the MDASI-HF as compared to the Eastern Cooperative Oncology Group (ECOG) performance status, an assessment instrument for patients with cancer. Criterion validity refers to validating an instrument against a suitable criterion to provide the evidence to judge the validity of the instrument (Davis, 2004). Criterion validity indicated moderately strong correlation scores with the ECOG performance status with r = .628, .622, .548 and .645 for the 21 mean severity items, core items, heart failure items and interference items respectively. These correlations were significant at $p<.0001$ level of significance. The moderately strong correlations between the two instruments may be related to method of completing the symptom assessment. Although both instruments were completed based on subjective assessment, the ECOG performance status was assigned based on the clinician's subjective observation of the individual's performance of the activities of

daily living, while the MDASI-HF was based on patient's self report of symptoms. The literature has shown discordance between patients and health care providers' perceptions of cancer-related symptoms in both the level of distress caused by symptoms and in the perceived attributes of the symptoms (Newell, Sanson-Fisher, Girgis, & Bonaventura, 1998; Knowles, Borthwick, Mc Namara, & Leggot, 2000; Velikova, Wright, Smith, Stark, Perrin, Brown & Selby, 2001). Patients and health care providers often may perceive cancer related symptoms differently.

The fourth research question addressed the criterion validity of the MDASI-HF as compared with the NYHA functional classification, an evaluative measure of the functional capacity of patients with heart failure. Criterion validity indicated moderately strong correlation scores with the MDASI-HF and the NYHA functional classification with r = .645 (21 mean severity items), r =.622 (13 core items) r=.590 (8 heart failure items), and r =.588 (6 interference items). All correlations were significant at $p<.0001$ level of significance. Although both the MDASI-HF and the NYHA are subjective symptom assessment instruments, the MDAS-HF is a patient self evaluation, while the NYHA is a clinician's evaluation of the patient based on observation of the patient's symptoms. The NYHA classification is subjective and is not easily reproducible (Gibelin, 2001). According to a study by Goldman and colleagues (1981), the opinion of two independent observers is concordant in only 56% of cases; a discrepancy of one functional class was recorded in 37% of cases, two functional classes in 5% and three functional classes in 1% of cases. The discrepancies occur mainly in classes II and III. In addition the NYHA predicted the exertion capacity assessed on the basis of the

duration of the test in only 16 of 44 patients in a study by Franciosa and colleagues (1979). Patterson, Naughton, Peitra, & Gunnar (1972) obtained a predictive value of 74% with two independent observers.

Conclusions

Based on the findings, and within the limitations of this study, the following conclusions were made:

1. The MDASI-HF is a valid and reliable instrument for the assessment of symptoms in cancer patients with heart failure.
2. The MDASI-HF demonstrated high levels of internal consistency in this sample of adult cancer patients with heart failure.
3. All the 21 symptom items of the MDASI-HF were found to interrelate in measuring the concept of symptoms in cancer patients with heart failure, thus establishing construct validity.
4. The MDASI-HF has moderately strong correlation with the ECOG performance status assessment for cancer and the NYHA functional classification for heart failure, supporting the criterion validity.

Implications

The implications for health care practice, based on the conclusions of this study are as follows: The use of the MDASI-HF for symptom assessment in cancer patients with heart failure may:

1. assist providers with the early identification of heart failure symptoms related to the cardiotoxic effects of cancer therapy leading to timely intervention, and preventing unnecessary hospitalization thereby improving the patient's quality of life.
2. allow for identification of specific symptom severities which can be immediately flagged and monitored with a telephone call or a more frequent follow-up visit to prevent further exacerbation of symptoms.
3. help the clinician understand the prevalence and severity of symptoms from the patient's perspective, and improve the communication between the health care providers and the patient.
4. assist providers in following the clinical status of patients over time and incorporating symptoms severity in making treatment decisions.
5. provide for the timely scoring and interpretation of the symptoms for clinical decision making at the point of care and initiate appropriate intervention.
6. identify symptoms in cancer patients with heart failure, which can supplement other indicators, such as adherence to prescribing guidelines and therapeutic monitoring to evaluate provider performance, and to evaluate the effectiveness of treatment interventions.

7. enhance the provider's understanding of patient's symptoms that will help to manage the complex condition of cancer and heart failure.

8. improve quality of care and patient satisfaction in cancer patients with concurrent heart failure.

Recommendations for Further Study

From the findings of this study, the following recommendations are proposed:

1. The MDASI-HF should be replicated in a more homogeneous population, such as having the same type of cancer diagnosis, or receiving the same type of cancer therapy, which will provide further evidence of validity for the instrument.

2. Studies should be conducted correlating various outcomes measures (e.g. frequency of hospital admission, length of stay) with the symptom severity scores to determine the predictive value of the instrument.

3. Studies for further validation of the MDASI-HF should be conducted on patients who are receiving chemotherapeutic agents with known cardiotoxic side effects to identify the timely occurrence of symptoms that will trigger the diagnostic evaluation for the occurrence of cardiomyopathy, and initiate evidence-based heart failure therapy. Currently, there is no guideline regarding the frequency of evaluation of cardiac function in patients exposed to cancer therapy with potential cardiotoxicity.

4. Studies should be conducted using the MDASI-HF to evaluate the occurrence of symptoms related to the various pharmacologic interventions used in heart failure therapy.

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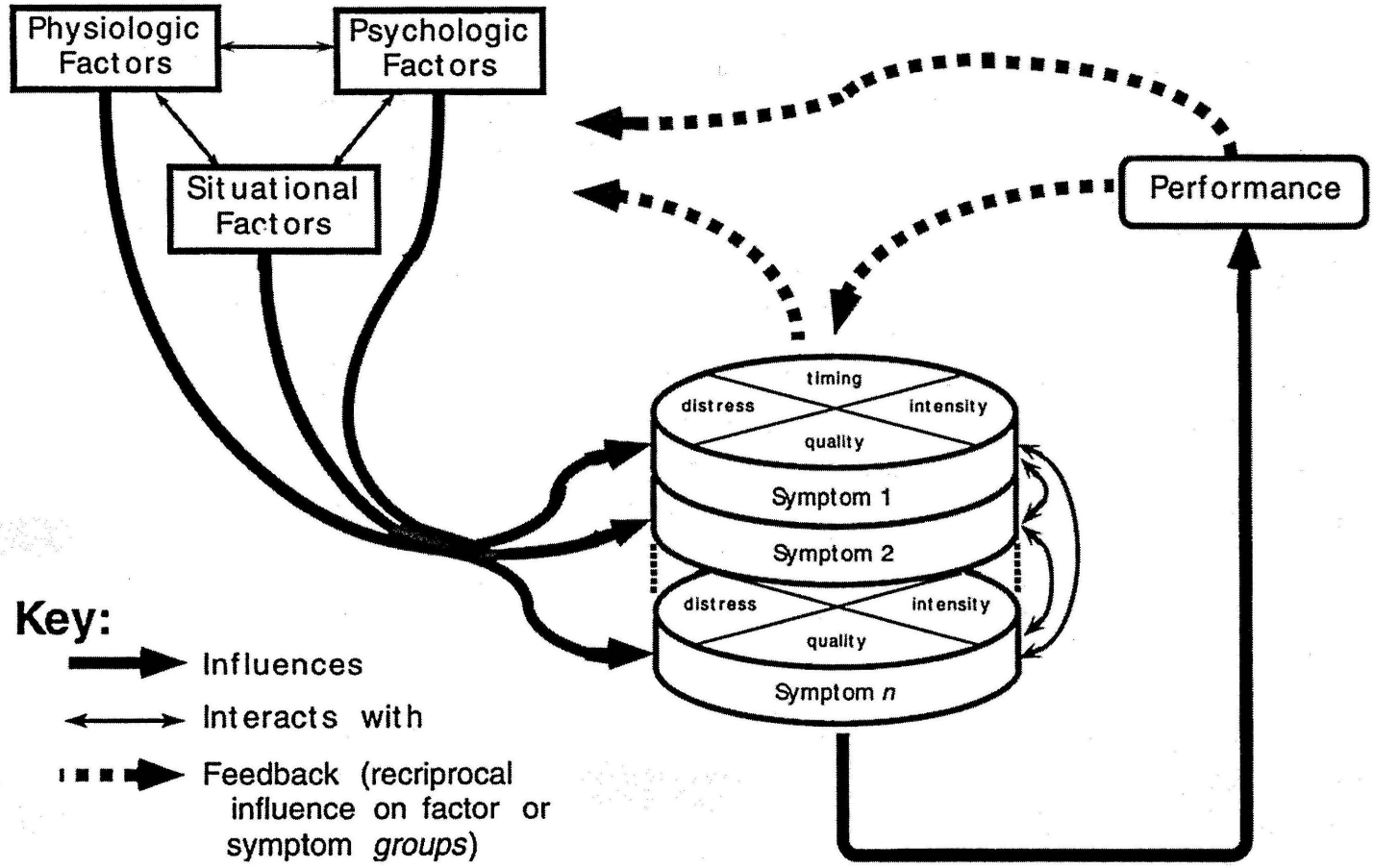
APPENDIX A

Theory of Unpleasant Symptoms

Theory of Unpleasant Symptoms



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APPENDIX B

Texas Woman's University Institutional Review Board Approval

TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON
INSTITUTIONAL REVIEW BOARD
1130 John Freeman Blvd., Houston, Texas 77030 713/794-2074

MEMORANDUM

TO: Jeanette Kernicki
Anecita Fadol Student ID # 0066423

FROM: IRB

DATE: May 31, 2006

SUBJECT: IRB Exempt Application

TITLE: Reliability and validity tesing of the MD Anderson Symptom Inventory – Heart Failure (MDASI-HF): An evaluative instrument in cancer patients with concurrent heart failure

This application is **approved.** This approval lasts for 1 year. The study may not continue after the approval period without additional IRB review and approval for continuation. It is your responsibility to assure that this study is not conducted beyond the expiration date.

Any changes in the study must receive review and approval prior to implementation unless the change is necessary for the safety of subjects. In addition, you must inform the IRB of adverse events encountered during the study or of any new and significant information that may impact a research participant's safety or willingness to continue in your study.

Gretchen Gemeinhardt, Ph.D.
Chairperson

APPENDIX C

The University of Texas M.D. Anderson Cancer Center
Institutional Review Board Approval

THE UNIVERSITY OF TEXAS
MD ANDERSON
CANCER CENTER
Office of Protocol Research

Institutional Review Board (IRB)
Box 574
Phone 713-792-2933
Fax 713-794-4589

To: Anecita Fadol 06/22/2005
From: LaKeisha M. Stredic
CC: Marilyn Morrissey
MDACC Protocol ID #: 2004-0869
Protocol Name: The MD Anderson Symptom Inventory - Heart Failure (MDASI-HF): An Evaluative Instrument for Symptoms in Cancer Patients with Concurrent Heart Failure
Status: IRB approved but not activated

Subject: Approval of Protocol Entitled "The MD Anderson Symptom Inventory - Heart Failure (MDASI-HF): An Evaluative Instrument for Symptoms in Cancer Patients with Concurrent Heart Failure"
Official Approval Date: 06/01/2005

The Institutional Review Board 1 Chairman or Designee, granted approval to the above named and numbered protocol since the contingencies outlined by the IRB 1 at the 06/01/2005 meeting have been met. It was noted that the protocol and the informed consent document are satisfactory and in compliance with federal and institutional guidelines. No patients may be entered on this protocol, however, until it has been officially activated by the Office of Protocol Research.

In keeping with the requirements outlined in 45CFR46.109(e) and 21CFR56.109(f) the IRB shall conduct continuing review of all protocols at intervals appropriate to the degree of risk, but not less than once per year.

You are responsible for promptly reporting to the Institutional Review Board:
a) any severe adverse events;
b) any death while patient is on study;
c) any unanticipated problems involving risks to subjects or others;
d) any proposed changes in the research activity (changes may not be initiated without Institutional Review Board review and approval, except where necessary to eliminate apparent immediate hazards to the subjects).

TO ACTIVATE THIS STUDY, PLEASE COMPOSE AND SEND A "REQUEST FOR ACTIVATION" MEMO IN PDOL.

The existing Informed Consent cannot be used until the protocol is Activated.

If a Material Transfer Agreement (MTA) is required, it must be obtained prior to Activation.

Please call the Office of Protocol Research at 713-792-2933 should have any questions or concerns.

Sincerely,

LaKeisha M. Stredic 06/22/2005 05:10:02 PM

This is a representation of an electronic record that was signed electronically and below is the manifestation of that electronic signature:

LaKeisha M. Stredic
06/22/2005 05:09:46 PM
IRB 1 Chair Designee
FWA #: IRB00000121

APPENDIX D

Biographical Information

34462

Date: ☐☐ / ☐☐ / ☐☐
(month) (day) (year)

Subject Initials: _____

Study Subject # ☐☐☐☐

PLEASE USE BLACK INK PEN

The MD Anderson Symptom Inventory - Heart Failure (MDASI-HF): An Evaluative Instrument for Symptoms in Cancer Patients with Concurrent Heart Failure

Protocol: 2004-0869

PI: Anecita Fadol

Revision: 01/24/05

Time: ☐ T1

BIOGRAPHICAL INFORMATION

Birth Date: ☐☐ / ☐☐ / ☐☐☐☐ (month) (day) (year)

Gender: ☐ M ☐ F

Marital Status (at present):

- ☐ Married
- ☐ Divorced
- ☐ Widowed
- ☐ Separated
- ☐ Single, living with another adult
- ☐ Single, living alone

Race:

- ☐ Asian or Pacific Islander
- ☐ Black Non-Hispanic
- ☐ Hispanic
- ☐ Native American or Alaskan Native
- ☐ White Non-Hispanic
- ☐ Other (specify) ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Education: (mark only the highest grade completed)

School Grade:

☐ 0	☐ 5	☐ 10	☐ 15
☐ 1	☐ 6	☐ 11	☐ 16
☐ 2	☐ 7	☐ 12	☐ 17 **(Post-graduate)**
☐ 3	☐ 8	☐ 13	
☐ 4	☐ 9	☐ 14	

Check one of the following that best describes your job status:

- ☐ Employed outside the home, full-time
- ☐ Employed outside the home, part-time
- ☐ Homemaker
- ☐ Retired
- ☐ Medical leave of absence
- ☐ Disabled due to illness
- ☐ Unemployed
- ☐ Other (specify) ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

APPENDIX E

MDASI-HF Instrument

64859

Date: ___ / ___ / ___
(month) (day) (year)

Subject's Initials: _____

Study Subject #

PLEASE USE BLACK INK PEN

The MD Anderson Symptom Inventory - Heart Failure (MDASI-HF): An Evaluative Instrument for Symptoms in Cancer Patients with Concurrent Heart Failure

Protocol: 2004-0888

PI: Anealia Fadol

Revision: 08/20/08

Time: ☐ T1

M. D. Anderson Symptom Inventory - Heart Failure (MDASI - HF)

Part I. How severe are your symptoms?

People with cancer frequently have symptoms that are caused by their disease or by their treatment. Patients with heart failure may have similar symptoms. We ask you to rate how severe the following symptoms have been *in the last 24 hours*. Please fill in the circle below from 0 (symptom has not been present) to 10 (the symptom was as bad as you can imagine it could be) for each item.

	NOT PRESENT 0	1	2	3	4	5	6	7	8	9	AS BAD AS YOU CAN IMAGINE 10
1. Your pain at its WORST?	○	○	○	○	○	○	○	○	○	○	○
2. Your fatigue (tiredness) at its WORST?	○	○	○	○	○	○	○	○	○	○	○
3. Your nausea at its WORST?	○	○	○	○	○	○	○	○	○	○	○
4. Your disturbed sleep at its WORST?	○	○	○	○	○	○	○	○	○	○	○
5. Your feeling of being distressed (upset) at its WORST?	○	○	○	○	○	○	○	○	○	○	○
6. Your shortness of breath at its WORST?	○	○	○	○	○	○	○	○	○	○	○
7. Your problem with remembering things at its WORST?	○	○	○	○	○	○	○	○	○	○	○
8. Your problem with lack of appetite at its WORST?	○	○	○	○	○	○	○	○	○	○	○
9. Your feeling drowsy (sleepy) at its WORST?	○	○	○	○	○	○	○	○	○	○	○
10. Your having a dry mouth at its WORST?	○	○	○	○	○	○	○	○	○	○	○
11. Your feeling sad at its WORST?	○	○	○	○	○	○	○	○	○	○	○
12. Your vomiting at its WORST?	○	○	○	○	○	○	○	○	○	○	○
13. Your numbness or tingling at its WORST?	○	○	○	○	○	○	○	○	○	○	○

Date: ___ / ___ / ___ (month) (day) (year)

Subject's initials: _____

Study Subject #

PLEASE USE BLACK INK PEN

The MD Anderson Symptom Inventory - Heart Failure (MDASI-HF): An Evaluative Instrument for Symptoms in Cancer Patients with Concurrent Heart Failure

Protocol: 2004-0868

PI: Aneelta Fadol

Revision: 05/25/06

Heart Failure (HF)

	NOT PRESENT 0	1	2	3	4	5	6	7	8	9	AS BAD AS YOU CAN IMAGINE 10
14. Your problem with abdominal bloating at its WORST?	○	○	○	○	○	○	○	○	○	○	○
15. Your problem with ankle swelling at its WORST?	○	○	○	○	○	○	○	○	○	○	○
16. Your difficulty sleeping without adding more pillows under your head at its WORST?	○	○	○	○	○	○	○	○	○	○	○
17. Your problem with lack of energy at its WORST?	○	○	○	○	○	○	○	○	○	○	○
18. Your problem with racing heartbeat (palpitation) at its WORST?	○	○	○	○	○	○	○	○	○	○	○
19. Your problem with nighttime cough at its WORST?	○	○	○	○	○	○	○	○	○	○	○
20. Your problem with waking up at night with difficulty breathing at its WORST?	○	○	○	○	○	○	○	○	○	○	○
21. Your problem with sudden weight gain at its WORST?	○	○	○	○	○	○	○	○	○	○	○

Part II. How have your symptoms interfered with your life?

Symptoms frequently interfere with how we feel and function. How much have your symptoms interfered with the following items in the last 24 hours:

	Did not Interfere 0	1	2	3	4	5	6	7	8	9	Interfered Completely 10
22. General activity?	○	○	○	○	○	○	○	○	○	○	○
23. Mood?	○	○	○	○	○	○	○	○	○	○	○
24. Work (including work around the house)?	○	○	○	○	○	○	○	○	○	○	○
25. Relations with other people?	○	○	○	○	○	○	○	○	○	○	○
26. Walking?	○	○	○	○	○	○	○	○	○	○	○
27. Enjoyment of life?	○	○	○	○	○	○	○	○	○	○	○

APPENDIX F

Clinical Checklist

56761

Date: (month) / (day) / (year)

Subject Initials: _____

Study Subject #:

PLEASE USE BLACK INK PEN

The MD Anderson Symptom Inventory - Heart Failure (MDASI-HF): An Evaluative Instrument for Symptoms in Cancer Patients with Concurrent Heart Failure

Protocol: 2004-0869

PI: Anecita Fadol

Revision: 07/11/05

Time Point: ☐ T1

Checklist - Heart Failure

A. Disease Information

Cancer Diagnosis: ☐ Solid Tumor ☐ Hematological

Specify Diagnosis: _____

B. Diagnosis of Heart Failure Information

EF Information

☐ EF ≤ 40%

☐ EF > 40%

Diagnosis Technique (check all that apply)

☐ 2-D Echocardiogram

☐ Myocardial Perfusion stress test

☐ Gated Cardiac Scan (MUGA)

C. Patient's Co-morbidities (check all that apply)

☐ Anemia (Hgb < 11.5)
☐ Atrial Fibrillation
☐ CVA/TIA
☐ Coronary Artery Disease
☐ Diabetes
☐ Ischemic Cardiomyopathy
☐ Hypertension
☐ Hyperlipidemia
☐ Myocardial Infarction
☐ Pulmonary Disease
☐ Renal Insufficiency (Creat. >1.5)
☐ Recent syncopal episodes
☐ Smoker - Former
☐ Smoker - Current
☐ Thyroid Disease
☐ Ventricular Arrhythmias
☐ Other, Specify below

_____

D. Cancer Treatment in the Past Week (Check all that apply)

☐ Chemo alone
☐ Induction Chemotherapy
☐ Surgery
☐ Concurrent chemoradiotherapy
☐ XRT Alone
☐ Follow-up

If Chemotherapy alone,

	Name of Medication :	Total Dose (mg):	Method of admnistration:
Drug 1 :		____ mg	☐ IV ☐ PO
Drug 2 :		____ mg	☐ IV ☐ PO
Drug 3 :		____ mg	☐ IV ☐ PO

E. Cardiac Medications for Heart Failure in the Past Week

	Class and Name of Medication :	Total Dose (mg):	Method of admnistration:
☐	ACE inhibitor	____.____ mg	☐ IV ☐ PO
☐	Beta blocker	____.____ mg	☐ IV ☐ PO
☐	Diuretics	____.____ mg	☐ IV ☐ PO
☐	Digoxin	____.____ mg	☐ IV ☐ PO
☐	Aldosterone Antagonist	____.____ mg	☐ IV ☐ PO
☐	Statins	____ mg	☐ IV ☐ PO

F. Current Clinical Condition in the Past Week

ECOG Performance Status

- ☐ Grade 0 - Fully active, able to carry on all pre-disease performance
- ☐ Grade 1 - Restricted, but ambulatory and able to carry out work
- ☐ Grade 2 - Ambulatory and capable of all self care, unable to carry out work
- ☐ Grade 3 - Capable of only limited self care, >50% of day in bed
- ☐ Grade 4 - Completely disabled, totally confined to bed or chair

NYHA Functional Classification

- ☐ Class I - No limitation, normal physical activity does not cause symptoms
- ☐ Class II - Slight limitation of physical activity, comfortable at rest but ordinary physical activity results in symptoms
- ☐ Class III - Marked limitation of physical activity, comfortable at rest, but less than ordinary physical activity results in symptoms
- ☐ Class IV - Inability to carry on any physical activity without discomfort, symptoms are present at rest

Evidence of current infection (e.g. fever, on antibiotics, positive signs or culture)

☐ Yes ☐ No

Evidence of Weight Gain

Usual Weight (lbs): ☐☐☐ Current Weight (lbs): ☐☐☐

G. Symptom Management

ER Visits in Past Week

Reason for visit (check all that apply)

- ☐ Cardiac
- ☐ Cognitive
- ☐ GI
- ☐ GU
- ☐ Hematological
- ☐ Infection
- ☐ Neurological
- ☐ Neutropenia
- ☐ Pain
- ☐ Psychosocial
- ☐ Respiratory
- ☐ Other, specify below

Symptom Management Provided to Patient in the Past Week (check all that apply)

- ☐ Antibiotics
- ☐ Antidepressants
- ☐ Blood Transfusion
- ☐ Diuretics
- ☐ NSAIDS
- ☐ Oxygen
- ☐ Nutritional support (TPN)
- ☐ Psychiatry consults
- ☐ Steroids
- ☐ Strong opioid
- ☐ Weak Opioid
- ☐ Tube Feeding (TF)

H. Laboratory Results

	Date (month, date, year)	Results
Hgb :	☐☐ / ☐☐ / ☐☐	☐☐☐.☐
WBC :	☐☐ / ☐☐ / ☐☐	☐☐☐.☐
Platelets :	☐☐ / ☐☐ / ☐☐	☐☐☐.☐
BNP:	☐☐ / ☐☐ / ☐☐	☐☐☐☐.☐
BUN:	☐☐ / ☐☐ / ☐☐	☐☐☐.☐
Creat:	☐☐ / ☐☐ / ☐☐	☐☐☐.☐
Glucose:	☐☐ / ☐☐ / ☐☐	☐☐☐.☐