Published in final edited form as:

J Adv Nurs. 2011 May ; 67(5): 1000–1011. doi:10.1111/j.1365-2648.2010.05564.x.

Symptom Clusters and Health-related Quality of Life in Patients with Chronic Stable Angina

Laura P. Kimble, PhD, RN^a, Sandra B. Dunbar, DSN, RN^b, William S. Weintraub, MD^c, Deborah B. McGuire, PhD, RN^d, Sharon F. Manzo, MSN, RN, and Ora L. Strickland, PhD, RN^b

^a Georgia Baptist College of Nursing of Mercer University, Atlanta, Georgia ^b Nell Hodgson Woodruff School of Nursing, Emory University, Atlanta, Georgia ^c Christiana Care Health System, Newark, Delaware ^d School of Nursing, University of Maryland, Baltimore, Maryland

Abstract

Aim—This paper reports findings of a study to examine the independent contribution of chest pain, fatigue, and dyspnea to health-related quality of life in patients with chronic stable angina.

Background—Patients with chronic stable angina experience poorer quality of life in multiple areas including physical and emotional health. Emerging evidence suggests the presence of concomitant symptoms, yet there are no systematic studies examining the impact of symptom clusters on quality of life in chronic angina patients.

Method—Outpatients (n=134), recruited over a 16 month period in 2000 and 2001, with confirmed coronary heart disease and chronic angina completed reliable and valid questionnaires measuring chest pain frequency, fatigue, dyspnea and quality of life. Hierarchical multiple linear regression was used to examine the symptom cluster of chest pain frequency, fatigue, and dyspnea in predicting quality of life.

Results—The sample was predominantly white (74.6%), males (59.7%) with a mean age of 63.4 (SD 12.12) years. Controlling for age, gender, social status, and comorbidities, the symptom cluster of chest pain frequency, dyspnea, and fatigue accounted for significant increase in unadjusted R^2 , (F of Δ , $p < .05$) for the models predicting physical limitation ($R^2 \Delta 24.1\%$), disease perception ($R^2 \Delta 24.6\%$), Short Form-36 Physical Component Score ($R^2 \Delta 24.3\%$) and Mental Component Score ($R^2 \Delta 07.0\%$).

Conclusion—Symptom assessment and management of patients with chronic stable angina should involve multiple symptoms. Greater fatigue predicted poorer quality of life in multiple areas. As a possible indicator of depression, it warrants further assessment and follow-up.

Corresponding Author Contact Information: Laura P. Kimble, PhD, RN, Professor and Piedmont Healthcare Endowed Chair in Nursing, Georgia Baptist College of Nursing of Mercer University, 3001 Mercer University Drive, Atlanta, GA 30341 U.S. A. Telephone: 678-547-6781, Kimble_LP@mercer.edu.

Conflict of interest: No conflict of interest has been declared by the authors.

Author Contributions: LPK, SBD, WSW, DBM, SFM & OLS were responsible for the study conception and design

SFM performed the data collection

LPK performed the data analysis.

LPK was responsible for the drafting of the manuscript.

SBD, WSW, DBM, SFM & OLS made critical revisions to the paper for important intellectual content.

LPK provided statistical expertise.

LPK, SBD, WSW, DBM & OLS obtained funding

LPK, SBD, DBM & OLS provided administrative, technical or material support.

LPK supervised the study

INTRODUCTION

The World Health Organization estimates that 3.8 million men and 3.4 million women die each year from coronary heart disease (CHD), the leading cause of death worldwide (Mackay & Mensah 2004). The common presenting symptom of CHD is angina pectoris, i.e. chest pain or discomfort caused by imbalance between myocardial oxygen supply and demand (Jawad & Arora 2008). The prevalence of angina varies across the globe and is highest in developed and developing countries, with women having a slightly higher prevalence than men (Hemingway et al. 2008). While CHD-related chest pain can occur acutely as a symptom of acute myocardial infarction (AMI), as angina pectoris it presents in a more stable, chronic form as intermittent, reversible, chest pain episodes. A strong body of evidence supports that patients with chronic angina report poorer health-related quality of life (HRQOL) in multiple areas including emotional, social, and physical functioning and work productivity (Billing et al. 1997, Lampe et al. 2001, Goetzel et al. 2003, Reynolds et al. 2004, Melzer et al. 2005, Hemingway et al. 2007).

Although chest pain or discomfort is the primary and perhaps most specific symptom experienced by patients with chronic stable angina, it often occurs with other symptoms, in particular fatigue and dyspnea (Hagman & Wilhelmsen 1981, Berra et al. 2008, Herlitz et al. 2008). When fatigue and dyspnea occur during activities or situations that would typically elicit chest pain in a person with CHD, they are called angina equivalents (Abrams & Thadani 2005). The clustering of symptoms in patients with chronic stable angina has not been studied systematically, but previous research, primarily conducted in patients with cancer (Barsevick et al. 2006) and heart failure (Jurgens et al. 2009), has found that symptom clusters may have a more negative effect on HRQOL than symptoms that occur singularly. Consequently, a better understanding of the impact of symptom clusters in patients with chronic stable angina has the potential to inform and expand symptom management interventions focused on alleviating or eliminating symptoms and improving HRQOL. In the present study, we explored whether experiencing additional symptoms of fatigue and dyspnea had additional negative effects on HRQOL, above what could be predicted by demographic and clinical factors and chest pain frequency.

Background

For patients with chronic stable angina, chest pain is the primary focus of symptom management and chest pain frequency, particularly if occurring at least once weekly, appears to be highly salient in predicting adverse events (Clayton et al. 2005) and HRQOL (Spertus et al. 2002, Beltrame et al. 2009). The pathophysiology of AMI and chronic stable angina are different (Hemingway et al. 2003). However, both health problems are expressed similarly via pain impulses referred to the chest wall as diffuse chest pain or discomfort (Jawad & Arora 2008). While the chest pain of AMI can be intensely painful, patients can also experience intense pain with chronic episodes. Consequently, chronic angina patients report difficulty differentiating between the chest pain/discomfort of chronic angina and AMI symptoms (Kimble & Kunik 1998). Problems with angina symptom differentiation may make decision-making around chest pain difficult, especially about whether urgent medical treatment is warranted. Chest pain, along with fatigue and dyspnea may create greater symptom burden, which is a subjective experience of the totality of symptoms (Cleeland 2007). Collectively, symptoms can tax patients' ability to adapt to illness and threaten HRQOL.

Conceptual Framework

The conceptual framework that informed this report was the Symptom Interactional Framework proposed by Parker and colleagues (Parker et al. 2005). The framework delineates physiological, psychological, behavioral, and sociocultural mechanisms that lead to symptom clusters and symptom interactions. Symptoms can have additive and interactive effects on clinical health outcomes including HRQOL. Understanding the underlying mechanism for how symptoms interact with each other may lead to more effective, efficient interventions targeting a common cause or mechanism for the symptoms (Kim et al. 2005).

Sullivan and LaCroix (Sullivan et al. 2001) describe cardiac symptoms as having the potential to “mutually reinforce each other”. For patients with heart failure and acute myocardial infarction, a triad of symptoms: chest pain, fatigue, and dyspnea have been observed empirically (Denollet 1994, Ryan et al. 2007, Arnold et al. 2009) and potentially may be a key symptom cluster in predicting health outcomes in patients with chronic stable angina. Fatigue and dyspnea are less specific symptoms than chest pain but can also arise from CHD (Hagman & Wilhelmsen 1981, Abidov et al. 2005) as well as other chronic conditions such as pulmonary dysfunction and obesity (Milani et al. 2004). Comorbid chronic diseases are common in patients with chronic stable angina and are associated with poorer prognosis (Daly et al. 2006, Hemingway et al. 2006, Hjemdahl et al. 2006). One mechanism by which comorbid diseases can affect patients with chronic stable angina is through the expression of symptoms which may exacerbate or potentiate the negative impact of chest pain on functional status. For example, CHD patients with chest pain may set self-imposed limitations on normal daily activities related to fear of chest pain episodes (McGillion et al. 2004). Fear-based physical activity limitations may exacerbate deconditioning and lead to obesity (McGillion et al. 2008) that contributes to fatigue and dyspnea, which in turn can lower the angina threshold and lead to greater frequency of angina episodes.

In reviewing the literature, no studies were found that examined symptom clusters in patients with chronic stable angina. However, fatigue, dyspnea and symptom clusters have been studied in patients with AMI, percutaneous coronary intervention (PCI) and heart failure. The study of symptom clusters prior to AMI has focused on whether experiencing specific symptom clusters might result in reduced treatment seeking delay. In a secondary data analysis, Ryan and colleagues found that prior to AMI, patients could be categorized as experiencing 1 of 5 distinct symptom clusters (Ryan et al. 2007). Age, race and sex significantly predicted what symptom cluster was experienced. Interestingly, none of the symptom clusters identified in the study contained all the typical symptoms of AMI.

In studies of patients post AMI, a symptom cluster of chest pain, dyspnea, fatigue and sleep problems was observed, but was not studied in relation to health outcomes (Denollet 1994). Dyspnea in patients following AMI, controlling for angina frequency was found to predict worse HRQOL and increase the risk for adverse events (Arnold et al. 2009). In a study of the symptom cluster of fatigue, depressive symptoms, and hopelessness in patients following percutaneous coronary intervention (PCI), fatigue was found to not predict adverse events, while symptoms of depression and hopelessness were found to predict adverse events (Pedersen et al. 2007).

Studies of symptom clusters in heart failure have found specific clusters related to acute and chronic heart failure. In one study, symptoms of dyspnea, fatigue, and sleep problems clustered together, along with the cluster of depression, worry and difficulty concentrating (Jurgens et al. 2009). The final symptom cluster included swelling of lower extremities, needing to resting during the day and dyspnea on exertion (Jurgens et al. 2009). In a similar study of heart failure patients, different types of dyspnea clustered together as the first

cluster and a second cluster involved ankle swelling, fatigue, anorexia, chest discomfort and sleeping difficulty (Song et al. 2008). The presence of symptom clusters and depression was associated with the shortest event free survival (Song et al. 2008)

In summary, symptom clusters have been linked to poorer HRQOL in different patient populations with heart disease. Limited research exists examining the impact of symptom clusters on HRQOL in patients with chronic stable angina. This study sought to expand this beginning knowledge base.

THE STUDY

Aims

The primary aim of this study was to examine the independent contribution of chest pain, fatigue, and dyspnea to HRQOL in patients with chronic stable angina, controlling for relevant demographic and clinical variables.

Design

The current descriptive, correlational study reports cross-sectional baseline data from a longitudinal study exploring perceptions of change in chronic stable angina symptoms over time. Baseline questionnaires were completed in one session in the presence of a research assistant.

Participants

Participants were recruited from six outpatient cardiology clinics in the Southeastern United States. Participants were included in the study if they were outpatients, age 18 years or older, with a history of CHD documented in the medical record. An additional inclusion criterion was that participants had to be positive for angina on the supplemented Rose Questionnaire (RQ-S) (Bass et al. 1989). The RQ-S, unlike the original Rose Questionnaire, has demonstrated reliability and validity in both men and women and was used to assure patients had experienced typical angina symptoms (Bass et al. 1989). A third inclusion criterion was that participants had to be symptomatic with angina with a report of at least one chest pain episode within the previous 3 months. Finally, participants had to read the English language at the 4th grade level or higher as measured by the Slosson Oral Reading Test-Revised (SORT-R) (Slosson 1994).

Exclusion criteria were used to exclude patients who had experienced recent cardiac events and interventions as these could affect HRQOL. Consequently, patients with a history of AMI, PCI or coronary artery bypass grafting surgery (CABG) within the previous 6 months were excluded.

Data Collection

A research assistant identified and approached patients about participating in the study after reviewing the clinical record for eligibility. Following screening with the RQ-S and the SORT-R, all patients who met the eligibility criteria were invited to participate. Written informed consent was obtained and participants were interviewed to obtain demographic and clinical information. Participants then completed all study related questionnaires in one session. Recruitment and data collection for this study occurred over a 16 month period in 2000 and 2001.

Variables and Measures

Demographic and Clinical Characteristics: Demographic data and information about cardiac risk factors, previous history of cardiac events and interventions, and current medications were collected via self-report. Social status was measured with the Hollingshead Two Factor Index of Social Position (HTFI) (Hollingshead 1957). It has been used to assess the social status of cardiac patients including patients with chronic stable angina (Kimble et al. 2003) and older women with heart disease (Friedman 1997) and has demonstrated validity (Hollingshead & Redlich 1958). Information about patients' current occupation or occupation prior to retirement as well as their education was used to calculate a social position score. The possible range of scores for the HTFI is 11 to 77 with higher scores indicating persons have a social position of lower status.

The presence of co-morbidities was measured with the Charlson Co-morbidity Index (CMI) (Charlson et al. 1987). The tool quantified 19 conditions which singly or in combination contribute to patients' overall health status. Conditions such as diabetes, peripheral vascular disease, renal failure, and cancer are weighted according to the severity of the condition. The CMI was developed empirically from 604 patients admitted to a hospital medical service and then tested for its ability to predict risk of death from co-morbid conditions (Charlson et al. 1987). Completion of the index was accomplished through patient interview. Possible scores on the CMI range from 0 to 37 with higher scores indicating greater presence of co-morbid conditions.

Symptoms-Chest Pain, Fatigue and Dyspnea: The symptoms of chest pain, fatigue and dyspnea were measured with selected items from the Chest Discomfort Diary-Revised (CDD-R). The CDD-R is a reliable and valid (Kimble et al. 2001) self-report diary pertaining to chest pain episodes and other symptoms experienced over the past week. Participants were asked to indicate how "tired" and "short of breath" they had felt in the previous week on a 5 point Likert scale of 0 "did not have" to 4 "as bad as it could be". To assess chest pain, participants reported how many episodes of chest pain they had experienced in the past week.

Health-related Quality of Life: Health-related quality of life was measured with two instruments: the Seattle Angina Questionnaire (SAQ), a health survey specifically for angina patients (Spertus et al. 1994, Spertus et al. 1995, Spertus et al. 2000) and the Short Form-36 (SF-36), a general health survey (Ware et al. 1997). The SAQ is a reliable and valid self-report instrument with 19 items that yields 5 subscale scores: physical function, angina frequency, angina stability, disease perception and treatment satisfaction. Because the angina frequency and angina stability subscales had strong conceptual and measurement overlap with chest pain frequency measure, they were not used as outcomes in the study. Instead, the physical limitation and disease perception subscales were used. The physical limitation subscale (SAQ-PL) measured the extent to which common daily activities are limited by angina. Nine of the SAQ's 19 items comprise the SAQ-PL. On a 5-point Likert scale, participants indicated whether they had been "not limited" to "severely limited" in their ability to perform activities because of their angina over the previous 4 weeks. The three item disease perception subscale (SAQ-DP) measured the extent to which patients worried about having an AMI or dying suddenly. The possible range of scores for the SAQ subscales was 0 to 100 with higher scores indicating better physical function and less concern about experiencing cardiac events or dying suddenly.

The physical and mental health component summary scores of the SF-36 health survey were used to measure generic HRQOL. The SF-36 has been used extensively with large samples of patients with chronic conditions, including those with heart disease (Stewart et al. 1989, Tarlov et al. 1989, Ware & Sherbourne 1992, Morrin et al. 2000) and has demonstrated

reliability (McHorney et al. 1994) and validity (Johnson et al. 1995). The instrument measures 8 related health dimensions: physical functioning, problems with daily functioning because of physical health, bodily pain, general health, vitality, social functioning, problems with daily functioning because of emotional problems, and mental health. The eight dimensions are then standardized and weighted according to established scoring procedures to produce two separate HRQOL scores: a physical health component summary (PCS) measuring physical health and a mental health component summary (MCS) measuring mental health (Ware et al. 1994). The PCS and the MCS were scored using norm based methods such that scores greater or less than 50 were above or below the average in the general U.S. population (Ware et al. 1994). Higher scores on the PCS and the MCS indicate better quality of life.

Ethical Considerations

Approval to conduct the study was obtained from the university-affiliated institutional review board (IRB), along with the IRB's for all the clinical sites where participant recruitment occurred. Written informed consent was obtained from all study participants following a detailed description of the study that included a discussion of what participation in the study would require, assurance that participation was voluntary and that data would be handled with confidentiality, and that the participant could withdraw from the study at any time.

Data Analysis

Data were analyzed using SPSS version 16.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were performed for all continuous variables and normality assessment was conducted. The CDD measure of angina frequency was not normally distributed. A natural logarithm transformation was performed resulting in a near normal distribution. The log transformed variable was included in the regression analyses. The CMI score was also not normally distributed. For this variable a median split was conducted to create a dichotomy such that persons with a score of 0 to 1 on the CMI received a score of 0 and those with a score of 2 or greater received a score of 1. The dichotomous CMI score was used in all subsequent analyses.

Prior to conducting inferential statistics, alpha was set at $p < .05$. Multiple linear regression was the primary analytic method used in the study and data were examined to assure assumptions for this statistical technique, such as no multicollinearity, were met. Hierarchical multiple linear regression was used to examine how the different symptom variables increased R^2 . Stepwise regression was used at the last step of the regression models to examine symptoms interacted with each other to increase R^2 .

RESULTS

The 203 patients who met eligibility criteria were approached about participating in the study and the study requirements were explained in detail. One hundred and thirty four (70% of eligible patients) consented to participate. Sixty-nine patients refused, citing reasons such as being in a hurry to leave the clinic or not wanting to complete forms or answer questions.

Table 1 summarizes the descriptive statistics for the study variables for the 134 participants in the study. The sample consisted predominantly of white, educated, married/partnered men who had been diagnosed with CHD for a mean of 9.0 (SD 10.3) years. The sample was symptomatic for chest pain with over 1/3 of the sample reporting weekly episodes of chest pain within the past 30 days. History of cardiac events and interventions were common, with

the majority having experienced a prior AMI or having had a prior PCI. Almost 50% had a prior CABG.

Table 2 provides descriptive statistics for the symptom and HRQOL variables. Participants reported a range of 0 to 35 episodes of chest pain over the past 7 days with a median of 2 episodes. The severity of fatigue and dyspnea was low to moderate with severity of fatigue reported as slightly higher than severity of dyspnea. The means for the HRQOL measures were consistent with other samples of symptomatic chronic angina patients. (Aaberge et al. 2002; Moore et al. 2005).

Table 3 presents correlations among the symptom variables. Because chest pain frequency was not normally distributed, a non-parametric correlational analysis with Spearman's Rho was conducted. Greater frequency of chest pain was significantly correlated with greater severity of fatigue and dyspnea, with a stronger relationship noted between chest pain frequency and dyspnea than with chest pain frequency and fatigue. Greater dyspnea was also moderately associated with greater fatigue.

Symptom Clusters and Health-related Quality of Life

Hierarchical and stepwise multiple linear regression was used to conduct the main study analyses. Four separate regression analyses were conducted with the 2 subscales of the Seattle Angina Questionnaire and the PCS and the MCS from the SF-36 as the dependent variables. The independent variables for all 5 regression analyses were the same: age, gender, social status (HTFI score), the dichotomized co-morbidity index score, log angina frequency, and the two symptom variables of fatigue and dyspnea. In addition, 3 interaction terms were created to examine if the symptoms interacted with each other to predict HRQOL: "log angina frequency X dyspnea severity", "log angina frequency X fatigue severity", and "dyspnea severity X fatigue severity". The variables were entered in blocks, with age, gender, social status and comorbidity index entered in Block 1, log angina frequency entered in Block 2, and fatigue and dyspnea entered in Block 3. A significant increase in R^2 as a result of entering Block 3 supported that fatigue and dyspnea had an independent contribution to HRQOL, over and above what could be explained by demographic and clinical factors and chest pain frequency. Stepwise regression entry was used a step 4 to examine if any of the symptom interaction terms would significantly increase R^2 . Tables 4 through 7 present the statistically significant predictors of HRQOL, change in R^2 , model F and p values for the multiple regression analyses. The beta weights presented in the tables are the beta weights observed in the full model. The independent variables accounted for significant amounts of the variance for all of the measured HRQOL variables ranging from 18% for MCS (Table 7) to 44% for the SAQ Physical Limitation scale (Table 4). The interaction terms did not significantly increase R^2 for any of the models. When considering the impact of chest pain frequency on HRQOL, it had the greatest impact on SAQ disease perception, explaining 16% of the variance above what was explained by demographic and clinical factors (Table 5). Greater angina frequency was significantly associated with lower HRQOL with respect to worrying about having a heart attack and dying suddenly. Fatigue and dyspnea contributed significantly to all HRQOL outcomes, with the largest impact being for the SAQ physical limitation score where the two symptoms explained an additional 13% of the variance (Table 4). Greater severity of fatigue and dyspnea were significant predictors of poorer physical function (Table 4). Greater fatigue was a significant predictor of poorer outcomes across all measured areas of HRQOL (Tables 4,5,6,7). Greater chest pain frequency was a significant predictor of poorer HRQOL for all outcomes (Tables 4,5,6) except mental health. Greater dyspnea significantly predicted poorer HRQOL only for the 2 measures of physical health, the SAQ physical function measure (Table 4) and the SF-36 PCS score (Table 6).

Along with the symptom variables, demographic and clinical factors predicted HRQOL. Greater social status score (lower social status) predicted poorer SAQ physical function (Table 4) and greater comorbidity predicted poorer generic physical component score (Table 6). Age was inconsistent with predicting HRQOL outcomes. Younger patients reported poorer disease perception (Table 5) and mental health (Table 7) but greater generic physical health (Table 6).

DISCUSSION

This was a quantitative study examining the contributions of chest pain, fatigue and dyspnea to HRQOL in patients with chronic stable angina. We found the symptoms of fatigue and dyspnea significantly predicted HRQOL for all disease specific and general HRQOL outcomes above what was predicted by chest pain frequency. Certain symptoms were more salient for specific outcomes, for example chest pain frequency was particularly salient for disease perception, while fatigue was more salient for mental health outcomes.

Data from this study were collected between the years 2000 and 2001. Consequently, concerns about the age of the data are reasonable. Guidelines for bioethical publication often do not provide a specific cut-off for when data should be considered too outdated for publication, but rather focus on whether the published data represent good science obtained with scientific rigor and are not redundant with previously published work (Kempers 2002, Johnson et al. 2007). These data meet these two requirements. Thus the major consideration for readers of this report is the nature of the data (Gottlieb 2003) and whether these data examining the symptom experience of patients with CHD are still relevant for nurse researchers and clinicians in today's healthcare environment. We argue that these data are relevant for the following reasons. First, while CHD mortality rates in many areas of the world are declining (Unal et al. 2004, Ford et al. 2007, Bjorck et al. 2009), the implication of these declines is that patients with CHD will be living longer with symptoms and that chronic angina will continue to be a serious health problem. Second, despite medical advances, most notably the increased use of drug eluting stents to treat blocked coronary arteries (King et al. 2008), there are no data that substantiate a concomitant decline in chronic angina symptoms or major change in how chronic angina patients experience their symptoms. The prevalence remains high (Hemingway et al. 2008) and in the time since the data were collected, chronic angina continues to be a substantial burden in terms of lost productivity, decreased functional status and poorer quality of life (Peterson 2007). Third, while there has been a growing body of evidence around acute chest pain symptoms accompanying acute coronary syndromes (Hemingway et al. 2006), there is a paucity of empirical literature about patients' perceptions of chronic angina symptoms and data-based publications in this area are vitally important to move the science forward.

Study limitations

The study was limited by its cross-sectional design. Directionality of relationships between symptoms and HRQOL cannot be established within this design and it is highly probable that relationships among variables were bidirectional.

Another limitation of the study was each of the symptoms was measured with a single item, in a single symptom dimension (Barsevick et al. 2006) and the same symptom dimensions were not measured for all symptoms. The timing dimension was used to assess chest pain, by asking patients to report the number of chest pain episodes experienced in the previous week. In contrast, fatigue and dyspnea were measured on the intensity or severity dimension. Measuring the symptom cluster across multiple symptom dimensions would have been a stronger approach to measurement.

Discussion of Results

In the current study, the symptom cluster of chest pain, fatigue and dyspnea significantly predicted HRQOL. Greater frequency of chest pain and severity of fatigue and dyspnea were associated with poorer HRQOL. One of the most interesting findings of the study was that fatigue, rather than chest pain frequency was a significant predictor of HRQOL in all measured areas including physical health, mental health, and disease perception. Fatigue is a non-specific symptom that is challenging for symptom management in CHD patients. The symptom of fatigue can be experienced in a patient who is having sleep difficulties or is deconditioned, but can also be experienced when a patient is depressed (Casillas et al. 2006). Depression is common in patients with CHD and is an independent predictor of poorer HRQOL (Sullivan et al. 2001). Greater depression has been associated with worsening chest pain in post acute coronary syndrome patients even when controlling for cardiac severity and other clinical factors (Rumsfeld et al. 2003). Interestingly, in one study of patients post PCI that examined fatigue, depressive symptoms, and hopelessness separately, depressive symptoms and hopelessness predicted adverse events but not fatigue (Pedersen et al. 2007). This suggests that for patients with chronic stable angina, symptoms of fatigue must be differentiated from depression and if depression is identified, aggressive steps should be taken to treat the depression.

Dyspnea was a significant predictor of physical HRQOL outcomes but not disease perception as it pertains to worrying about having a heart attack or dying suddenly. This suggests that dyspnea may not be a symptom that patients view as particularly concerning. However, research indicates that dyspnea is an independent predictor of adverse cardiac events post AMI (Arnold et al. 2009) and of cardiac and all cause mortality in patients referred for cardiac stress testing (Abidov et al. 2005).

In this study, older patients had better HRQOL in the areas of disease perception and mental health but poorer HRQOL related to physical function. This finding is consistent with research by Broddadottir and colleagues who found that older women with CAD referred for coronary angiography had more positive disease perception but poorer physical functioning (Broddadottir et al. 2009) compared to younger women. This finding has implications for promoting physical function in older adults with heart disease, suggesting that fear of the cardiac events or mental health issues may not be the primary factor affecting physical function. In a study of age and barriers to cardiac rehabilitation, older patients reported different barriers to participating in CR than younger patients including: perception of exercise as tiring or painful, co-morbidities, and beliefs that cardiac rehabilitation would not improve their health (Grace et al. 2009). Promoting HRQOL in the area of physical function should be personalized and targeted to the individual with consideration of age, co-morbidities, disease perception, and perceived barriers to increasing physical activity.

CONCLUSION

As a whole, the findings of the study were consistent with the Symptom Interactional Framework (Parker et al. 2005) which suggests that examining symptoms in groups or clusters is a stronger approach to symptom-related research than examining a single symptom in isolation. In this study it was theorized that chest pain, fatigue and dyspnea would interact with each other in predicting HRQOL as all patients had documented coronary heart disease and potentially shared similar cardiovascular pathophysiology that could be expressed in all 3 symptoms. However, none of the symptom interaction terms were significant predictors of HRQOL, indicating that the presence of one symptom did not necessarily influence the effect of another symptom on HRQOL.

The study findings have implications for research, especially the need to continue symptom cluster research in cardiac populations. Symptom cluster research in the area of nursing is an emerging area of science (Kim et al. 2005) and future conceptual and methodological work is strongly needed, particularly in the areas of examining specific characteristics of symptom clusters such as how symptoms relate to each other within the cluster, the stability of symptom clusters over time, and the short-term and long-term impact of symptom clusters on patient outcomes (Kim et al. 2005). This research would be particularly valuable in CHD populations where symptoms are important diagnostic and prognostic factors for clinicians and also have important implications for patients' quality of life. Research is specifically needed to clarify how chronic angina patients view concomitant symptoms with prognostic importance, such as dyspnea, so that interventions focused on symptom management and timely and appropriate treatment seeking can be developed and tested.

The study findings also have implications for practice. Nurses caring for persons with chronic stable angina might conclude that chest pain should be the primary focus of symptom management. However, the study found that fatigue was a more pervasive symptom in predicting HRQOL. Consequently, symptom assessment of chronic stable angina patients should have a broader focus to include assessment of chest pain frequency as well as the presence and extent of fatigue and dyspnea. Fatigue, as a possible indicator of depression should be promptly evaluated and patients referred for mental health services as needed. The presence of dyspnea in chronic angina patients, especially post AMI, also warrants timely follow-up.

What is already known about this topic

- Chronic stable angina patients experience poorer health-related quality of life in multiple areas including physical, emotional, and social health and work productivity.
- The chest pain experienced by patients with chronic stable angina does not occur in isolation, but may cluster with other symptoms such as fatigue and dyspnea.
- No studies have systematically examined the impact of symptom clusters on health-related quality of life in patients with chronic stable angina, despite research in other populations suggesting that symptom clusters may have a more negative impact on health related quality of life than single symptoms.

What this paper adds

- The symptom cluster of chest pain, fatigue and dyspnea accounted for significant amounts of the variance in health-related quality of life in the areas of physical limitation, disease perception, physical health and mental health.
- Fatigue was the only symptom that significantly predicted poorer outcomes in all four health-related quality of life areas addressed in this study.

Implications for practice and/or policy

- Findings suggest nurses' clinical assessment and interventions for patients with chronic stable angina should include a more comprehensive approach to symptoms including assessment of fatigue and dyspnea rather than limiting the focus to chest pain frequency.
- Fatigue in patients with chronic stable angina is a key symptom affecting quality of life which may reflect underlying depression and thus warrants timely follow-up.

- Clinicians should be proactive in assessing for dyspnea in chronic angina patients as patients may not realize the prognostic importance of this symptom for their cardiac status.

Acknowledgments

Funding: This study was supported by grant no: NR04425 from the National Institute for Nursing Research, National Institute of Health, United States.

References

- AABERGE L, ROOTWELT K, BLOMHOFF S, SAATVEDT K, ABDELNOOR M, FORFANG K. Continued symptomatic improvement three to five years after transmyocardial revascularization with CO₂ Laser: A late clinical follow-up of the Norwegian randomized trial with transmyocardial revascularization. *Journal of the American College of Cardiology*. 2002; 39:1588–1593. [PubMed: 12020484]
- ABIDOV A, ROZANSKI A, HACHAMOVITCH R, HAYES SW, ABOUL-ENEIN F, COHEN I, FRIEDMAN JD, GERMANO G, BERMAN DS. Prognostic significance of dyspnea in patients referred for cardiac stress testing. *New England Journal of Medicine*. 2005; 353:1889–1898. [PubMed: 16267320]
- ABRAMS J, THADANI U. Therapy of stable angina pectoris: The uncomplicated patient. *Circulation*. 2005; 112:e255–e259. [PubMed: 16216965]
- ARNOLD SV, SPERTUS JA, CIECHANOWSKI PS, SOINE LA, JORDAN-KEITH K, CALDWELL JH, SULLIVAN MD. Psychosocial modulators of angina response to myocardial ischemia. *Circulation*. 2009a; 120:126–133. [PubMed: 19564560]
- ARNOLD SV, SPERTUS JA, JONES PG, XIAO L, COHEN DJ. The impact of dyspnea on health-related quality of life in patients with coronary artery disease: Results from the PREMIER registry. *American Heart Journal*. 2009b; 157:1042–1049. [PubMed: 19464415]
- BARSEVICK AM, WHITMER K, NAIL LM, BECK SL, DUDLEY WN. Symptom cluster research: Conceptual, design, measurement, and analysis issues. *Journal of Pain and Symptom Management*. 2006; 31:85–95. [PubMed: 16442485]
- BASS EB, FOLLANSBEE WP, ORCHARD TJ. Comparison of a supplemented Rose Questionnaire to exercise thallium testing in men and women. *Journal of Clinical Epidemiology*. 1989; 42:385–394. [PubMed: 2732767]
- BELTRAME JF, WEEKES AJ, MORGAN C, RAVELLA R, SPERTUS JA. The prevalence of weekly angina among patients with chronic stable angina in primary care practices- The Coronary Artery disease in General Practice (CADENCE) Study. *Archives of Internal Medicine*. 2009; 169:1491–1499. [PubMed: 19752407]
- BERRA K, FLETCHER B, HOUSTON MILLER N. Chronic stable angina: Addressing the needs of patients through risk reduction, education and support. *Clinical & Investigative medicine*. 2008; 31:E391–E399. [PubMed: 19032911]
- BILLING E, HJEMDAHL P, REHNQVIST N. Psychosocial variables in female vs male patients with stable angina pectoris and matched healthy controls. *European Heart Journal*. 1997; 18:911–918. [PubMed: 9183581]
- BJORCK L, ROSENGREN A, BENNETT K, LAPPAS G, CAPEWELL S. Modelling the decreasing coronary heart disease mortality in Sweden between 1986–2002. *European Heart Journal*. 2009; 30:1027–1029. [PubMed: 19228712]
- BRODDADOTTIR H, JENSEN L, NORRIS C, GRAHAM M. Health-related quality of life in women with coronary artery disease. *European Journal of Cardiovascular Nursing*. 2009; 8:18–25. [PubMed: 18602346]
- CASILLAS JM, DAMAK S, CHAUVET-GELINIER JC, DELEY G, ORNETTI P. Fatigue in patients with cardiovascular disease. *Annales de readaptation et de medecine physique*. 2006; 49:392–402.

- CHARLSON ME, POMPEI P, ALES KL, MACKENZIE CR. A new method of classifying prognostic co-morbidity in longitudinal studies: Development and validation. *Journal of Chronic Disease*. 1987; 40:373–383.
- CLAYTON TC, LUBSEN J, POCOCK SJ, VOKO Z, KIRWAN BA, FOX KA, POOLE-WILSON P. Risk score for predicting death, myocardial infarction, and stroke in patients with stable angina, based on a large randomised trial cohort of patients. *British Medical Journal*. 2005; 331:869. [PubMed: 16210253]
- CLEELAND CS. Symptom burden: Multiple symptoms and their impact as patient-reported outcomes. *Journal of the National Cancer Institute Monographs*. 2007; 37:16–21. [PubMed: 17951226]
- DALY CA, DE SATVOLA B, LOPEZ SENDON JL, TAVAZZI L, BOERSMA E, CLEMENS F, DANCHIN N, DELAHAYE F, GITT A, JULIAN D, MULCAHY D, RUZYLLO W, THYGESEN K, VERHEUGT F, FOX KM. Predicting prognosis in stable angina-results from the Euro heart survey of stable angina: prospective observational study. *British Medical Journal*. 2006; 332:262–267. [PubMed: 16415069]
- DENOLLET J. Health complaints and outcome assessment in coronary heart disease. *Psychosomatic Medicine*. 1994; 56:463–474. [PubMed: 7809347]
- FORD ES, AJANI UA, CROFT JB, CRITCHLEY JA, LABARTHE DR, KOTTKE TE, GILES WH, CAPEWELL S. Explaining the decrease in U.S. deaths from coronary disease 1980–2000. *New England Journal of Medicine*. 2007; 356:2388–2398. [PubMed: 17554120]
- FRIEDMAN MM. Social support sources among older women with heart failure: Continuity versus loss over time. *Research in Nursing & Health*. 1997; 20:319–327. [PubMed: 9256878]
- GOETZEL R, HAWKINS K, OZMINKOWSKI RJ, WANG S. The health and productivity cost burden of the “Top 10” physical and mental health conditions affecting six large U.S. Employers in 1999. *Journal of Occupational and Environmental Medicine*. 2003; 45:5–14. [PubMed: 12553174]
- GOTTLIEB LN. Editorial: Ageism of Knowledge: Outdated Research. *Canadian Journal of Nursing Research*. 2003; 35:3–6. [PubMed: 14603564]
- GRACE SL, SHANMUGASEGARAM S, GRAVELY-WITTE S, BRUAL J, SUSKIN N, STEWART D. Barriers to cardiac rehabilitation: Does age make a difference? *Journal of Cardiopulmonary Rehabilitation and Prevention*. 2009; 29:183–187. [PubMed: 19471138]
- HAGMAN M, WILHELMSSEN L. Relationship between dyspnea and chest pain ischemic heart disease. *ACTA Med Scand Suppl*. 1981; 644:16–18. [PubMed: 6972686]
- HEMINGWAY H, MCCALLUM A, SHIPLEY M, MANDERBACKA K, MARTIKAINEN P, KESKIMAKI I. Incidence and prognostic implications of stable angina pectoris among women and men. *Journal of the American Medical Association*. 2006; 295:1404–1411.
- HEMINGWAY H, SHIPLEY M, BRITTON A, PAGE M, MACFARLANE P, MARMOT M. Prognosis of angina with and without a diagnosis: 11 year follow-up in the Whitehall II prospective cohort study. *British Medical Journal*. 2003; 327:895–898. [PubMed: 14563744]
- HEMINGWAY H, VAHTERA J, VIRTANEN M, PENTTI J, KIVIMAKE M. Outcome of stable angina in a working population: the burden of sickness absence. *European Journal of Cardiovascular Prevention & Rehabilitation*. 2007; 14:373–379. [PubMed: 17568235]
- HEMINGWAY M, LANGENBERG C, DAMANT J, FROST C, PYORALA K, BARRETT-CONOR E. Prevalence of angina in women versus men: A systematic review and meta-analysis of international variations across 31 countries. *Circulation*. 2008; 117:1526–1536. [PubMed: 18347213]
- HERLITZ J, BRANDRUP-WOGNESEN G, CAIDAHL K, HAGLID M, HARTFORD M, KARLSON BW, KARLSSON T, SJOLAND H. Symptoms of chest pain and dyspnea and factors associated with chest pain and dyspnea 10 years after coronary artery bypass grafting. *American Heart Journal*. 2008; 156:580–587. [PubMed: 18760144]
- HJEMDAHL P, ERIKSSON SV, HELD C, FORSLUND L, NASMAN P, REHNQVIST N. Favourable long term prognosis in stable angina pectoris: an extended follow-up of the angina prognosis study in Stockholm (APSIS). *Heart*. 2006; 92:177–182. [PubMed: 15951393]
- HOLLINGSHEAD, AB. Two factor index of social position. New Haven, CT: Yale University Press; 1957.

- HOLLINGSHEAD, AB.; REDLICH, FC. Social class and mental illness. New York, NY: John Wiley & Sons; 1958.
- JAWAD E, ARORA R. Chronic stable angina pectoris. *Disease A Month*. 2008; 54:671–689. [PubMed: 18725007]
- JOHNSON JT, NIPARKO JK, LEVINE PA, KENNEDY DW, WEBER PC, WEBER RS, BENNINGER MS, ROSENFELD RM, RUBEN RJ, SMITH RJH, SATALOFF RT, WEIR N. Standards for ethical publication. *Archives of Otolaryngology, Head and Neck Surgery*. 2007; 133:7–8.
- JOHNSON PA, GOLDMAN L, ORAV EJ, GARCIA T, PEARSON SD, LEE TH. Comparison of the medical outcomes study short-form 36 item health survey in black patients and white patients with acute chest pain. *Medical Care*. 1995; 33:145–160. [PubMed: 7837823]
- JURGENS CY, MOSER DK, ARMOLA R, CARLSON B, SETHARES K, RIEGEL B. Symptom clusters of heart failure. *Research in Nursing & Health*. 2009; 32:551–560. [PubMed: 19650069]
- KEMPERS RD. Ethical issues in biomedical publications. *Fertility and Sterility*. 2002; 77:883–888. [PubMed: 12009339]
- KIM HJ, MCGUIRE DB, TULMAN L, BARSEVICK AM. Symptom clusters-concept analysis and clinical implications for cancer nursing. *Cancer Nursing*. 2005; 28:270–282. [PubMed: 16046888]
- KIMBLE LP, DUNBAR SB, MCGUIRE DB, DE A, STRICKLAND OS. Cardiac instrument development in a low literacy population: The revised Chest Discomfort Diary. *Heart & Lung*. 2001; 30:312–320. [PubMed: 11449218]
- KIMBLE, LP.; KUNIK, CL. DISEASE, I. C. O. C. A.. Angina patients' perception of symptom differentiation between chronic stable anginal symptoms and symptoms of AMI: Implications for reducing pre-hospital treatment delay (research abstract). 2nd International Congress on Coronary Artery Disease; Florence, Italy. 1998.
- KIMBLE LP, MCGUIRE DB, DUNBAR SB, FAZIO S, DE A, WEINTRAUB WS, STRICKLAND OS. Gender differences in pain characteristics of chronic stable angina and perceived physical limitation in patients with coronary artery disease. *Pain*. 2003; 101:45–53. [PubMed: 12507699]
- KING SB, MORRISON DA, SMITH SC, WILLIAMS DO, HIRSHFELD JW, JACOBS AK. 2007 Focused Update of the ACC/AHA/SCAI 2005 Guideline Update for Percutaneous Coronary Intervention. *Journal of the American College of Cardiology*. 2008; 51:172–209. [PubMed: 18191745]
- LAMPE F, WHINCUP PH, SHAPER AG, WANNAMETHEE SG, WALKER M, EBRAHIM S. Variability of angina symptoms and the risk of major ischemic heart disease events. *American Journal of Epidemiology*. 2001; 153:1173–1182. [PubMed: 11415952]
- MACKAY, J.; MENSAH, G. The Atlas of Heart Disease and Stroke. Geneva, Switzerland: World Health Organization; 2004.
- MCGILLION MH, WATT-WATSON J, KIM J, GRAHAM A. Learning by heart: A focused groups study to determine the psychoeducational needs of chronic angina patients. *Canadian Journal of Cardiovascular Nursing*. 2004; 14:12–22. [PubMed: 15230024]
- MCGILLION MH, WATT-WATSON J, STEVENS B, LEFORT SM, COYTE P, GRAHAM A. Randomized controlled trial of a psychoeducation program for the self-management of chronic cardiac pain. *Journal of Pain and Symptom Management*. 2008; 36:126–140. [PubMed: 18395397]
- MCHORNEY CA, WARE JE, LU R. The MOS 36 short-form health survey (SF-36). III Tests of data quality, scaling assumptions and reliability across diverse patient groups. *Medical Care*. 1994; 32:40. [PubMed: 8277801]
- MELZER D, GARDENER E, GURALNIK JM. Mobility disability in the middle-aged: cross-sectional associations in the English Longitudinal Study of Ageing. *Age and Ageing*. 2005; 34:594–602. [PubMed: 16267185]
- MILANI RV, LAVIE CJ, MEHRA MR. Cardiopulmonary exercise testing: How do we differentiate the cause of dyspnea. *Circulation*. 2004; 110:e27–e31. [PubMed: 15277333]
- MOORE RK, GROVES D, BATESON S, BARLOW P, HAMMOND C, LEACH AA, CHESTER MR. Health related quality of life of patients with refractory angina before and one year after enrolment onto a refractory angina program. *European Journal of Pain*. 2005; 9:305–310. [PubMed: 15862480]

- MORRIN L, BLACK S, REID S. Impact of duration in a cardiac rehabilitation program on coronary risk profile and health-related quality of life outcomes. *Journal of Cardiopulmonary Rehabilitation*. 2000; 20:115–121. [PubMed: 10763159]
- PARKER KP, KIMBLE LP, DUNBAR SB, CLARK PC. Symptom interactions as mechanisms underlying symptom pairs and clusters. *Journal of Nursing Scholarship*. 2005; 37:1–7.
- PEDERSEN S, DENOLLET J, DAEMEN J, VAN DE SANDE M, DE JAEGERE P, SERRUYS P, ERDMAN R, VAN DOMBURG R. Fatigue, depressive symptoms, and hopelessness as predictors of adverse clinical events following percutaneous coronary intervention with paclitaxel-eluting stents. *Journal of Psychosomatic Research*. 2007; 62:455–461. [PubMed: 17383497]
- PETERSON E. The burden of angina pectoris and its complications. *Clinical Cardiology*. 2007; 30:I10–I15. [PubMed: 18373325]
- REYNOLDS MW, FRAME D, SCHEYER R, ROSE ME, GEORGE S, WATSON JB, HLATKY MA. A systematic review of the economic burden of chronic angina. *American Journal of Managed Care*. 2004; 10:S347–S357. [PubMed: 15603244]
- RUMSFELD JS, MAGID DJ, PLOMONDON ME, SALES A, GRUNWALD GK, EVERY NR, SPERTUS JA. History of depression, angina and quality of life after acute coronary syndromes. *American Heart Journal*. 2003; 145:493–499. [PubMed: 12660673]
- RYAN CJ, DEVON HA, HORNE R, KING KB, MILNER K, MOSER DK, QUINN JR, ROSENFELD AG, HWAYNG SY, ZERWIC JJ. Symptom clusters in acute myocardial infarction: A secondary data analysis. *Nursing Research*. 2007; 56:72–81. [PubMed: 17356437]
- SLOSSON, RL. Slosson oral reading test SORT-R manual. East Aurora, NY: Slosson Educational Publications; 1994.
- SONG EK, RAYENS MK, LENNIE TA, MOSER DK. Distinct symptom clusters predict event-free survival in depressed and non-depressed patients with heart failure. *Circulation*. 2008; 118:S_977.
- SPERTUS JA, DEWHURST TA, DOUGHERTY CM, NICHOL P, MCDONELL M, BLIVEN B, FIHN SD. Benefits of an “angina clinic” for patients with coronary artery disease: A demonstration of health status measures as markers of health care quality. *American Heart Journal*. 2002; 143:145–150. [PubMed: 11773925]
- SPERTUS JA, MCDONELL M, WOODMAN CL, FIHN SD. Association between depression and worse disease-specific functional status in outpatients with coronary artery disease. *American Heart Journal*. 2000; 140:105–110. [PubMed: 10874270]
- SPERTUS JA, WINDER JA, DEWHURST TA. Development and evaluation of the Seattle Angina Questionnaire: A new functional status measure for coronary artery disease. *Journal of the American College of Cardiology*. 1995; 25:331–341.
- SPERTUS JA, WINDER JA, DEWHURST TA, DEYO RA, FIHN SD. Monitoring the quality of life in patients with coronary artery disease. *American Journal of Cardiology*. 1994; 74:1240–1244. [PubMed: 7977097]
- STEWART A, GREENFIELD S, HAYS RD, WELLS K, ROBERTS WH, BERRY SD, MCGLYNN EA, WARE JE. Functional status and well-being of patients with chronic conditions: Results from the medical outcomes study. *Journal of the American Medical Association*. 1989; 262:907–913. [PubMed: 2754790]
- SULLIVAN MD, LACROIX AA, RUSSO JE, WALKER EA. Depression and self-reported physical health in patients with coronary disease: Mediating and moderating factors. *Psychosomatic Medicine*. 2001; 63:248–256. [PubMed: 11292272]
- TARLOV AR, WARE JE, GREENFIELD S, NELSON EC, PERRIN E, ZUBKOFF M. The medical outcomes study: an application of methods for monitoring the results of medical care. *Journal of the American Medical Association*. 1989; 262:925–930. [PubMed: 2754793]
- UNAL B, CRITCHLEY JA, CAPEWELL S. Explaining the decline in coronary heart disease mortality in England and Wales between 1981–2000. *Circulation*. 2004; 109:1101–1107. [PubMed: 14993137]
- WARE JE, KOSINSKI M, KELLER SD. SF-36 Physical and Mental Health Summary Scales: A User’s Manual. Boston: Health Assessment Lab, New England Medical Center; 1994.
- WARE JE, SHERBOURNE CD. The MOS 36-item short-form health survey: I. conceptual framework and item selection. *Medical Care*. 1992; 30:473. [PubMed: 1593914]

WARE, JE.; SNOW, KK.; KOSINSKI, M.; GANDEK, B. SF-36 Health Survey: Manual & Interpretation Guide. Boston, MA: The Health Institute, New England Medical Center; 1997.

Table 1

Descriptive Statistics for Demographic and Clinical Variables (n=134)

Variable	Mean (SD)
Age	63.4 (12.1)
Hollingshead Two Factor Index Score	41.0 (17.6)
Years with CAD	09.0 (10.3)
	Frequency (%)
<u>Sex</u>	
Male	80 (59.7)
Female	54 (40.3)
<u>Education</u>	
% High graduate or greater	114 (83.6)
<u>Ethnicity</u>	
Caucasian	100 (74.6)
African American	31 (23.2)
Other	03 (02.2)
<u>Marital status</u>	
% Married or Partnered	103 (76.8)
<u>Co-morbidity Index Score</u>	
0–1	62 (46.3)
≥ 2	72 (53.7)
<u>Frequency of chest pain over the last 30 days</u>	
Absent	07 (05.2)
Monthly	48 (43.3)
Weekly	51 (38.1)
Daily	14(10.4)
Missing	04 (03.0)
Current smoking	18 (13.4)
Hx. Heart Failure	36 (26.9)
Hx. Diabetes	38 (28.4)
Hx. Hyperlipidemia	113 (84.3)
Hx. Hypertension	95 (70.9)
Hx. AMI	77 (57.5)
Hx. CABG	61 (45.5)

Variable	Mean (SD)
Hx. PCI	94 (70.1)
Rx. Depression	32 (23.9)
Rx. Beta blockers	81 (60.4)
Rx. ASA or other anti-platelet	103 (76.9)
Rx. Lipid lowering	95 (70.9)
Rx. Long-acting nitrate	48 (35.8)

Note: AMI- acute myocardial infarction, CABG-coronary artery bypass grafting, PCI-percutaneous coronary intervention, ASA-aspirin Rx.- Prescription for, NTG-nitroglycerin

Table 2

Descriptive Statistics for Chest Pain and Quality of Life Variables (n=134)

Variable	Potential range	Observed range	Mean	SD	Median
Chest pain frequency (#of episodes over the past 7 days)	0-∞	0-35	03.63	04.48	02.00
Fatigue (severity)	0-4	0-4	02.27	01.17	02.00
Dyspnea (severity)	0-4	0-4	01.91	01.22	02.00
SAQ-Physical Limitation	0-100	08.3-100	52.28	24.92	47.22
SAQ-Disease Perception [§]	0-100	00.0-100	50.94	23.65	50.00
SF-36 Physical Component Score	0-100	07.25-61.50	32.86	11.69	32.75
SF-36 Mental Component Score	0-100	20.21-71.55	46.93	11.88	47.00

Note: SD- standard deviation, SAQ-Seattle Angina Questionnaire, SF-Short Form

[§] n for SAQ disease perception is 132.

Table 3

Spearman's Rho Correlations among chest pain frequency, fatigue and dyspnea (n=134)

	Chest pain frequency	Fatigue severity	Disease severity
Chest pain frequency	1.0		
Fatigue severity	.25**	1.0	
Dyspnea severity	.42***	.48***	1.0

Note:

**
p < .01,***
p < .001

Table 4

Hierarchical multiple linear regression analysis for predictors of Seattle Angina Questionnaire Physical Function Score (n=134)

	Beta	% Change in R ²	Total R ²	F
Block 1		19.5% ***		
Age	−0.13			
Sex	0.07			
Hollingshead Score	−0.24 **			
Co-morbidity Index	−0.08			
Block 2		11.1% ***		
Chest pain frequency	−0.17 *			
Block 3		13.0% ***		
Fatigue	−0.26 **			
Dyspnea	−0.24 **			
			43.7%	14.0 ***
			Adjusted R ² 40.6%	

Note: Beta weights presented are those obtained at entry of the final block.

*
p < .05

**
p < .01

p < .001. Stepwise entry demonstrated that none of the symptom interaction terms significantly increased R² and thus did not enter the regression analysis.

Table 5

Hierarchical multiple linear regression analysis for predictors of Seattle Angina Questionnaire Disease Perception Score (n=132)

	Beta	% Change in R	Total R	F
Block 1		14.1% **		
Age	0.29 ***			
Sex	0.05			
Hollingshead Score	-0.05			
Co-morbidity Index	-0.08			
Block 2		15.8 ***		
Chest pain frequency	-0.28 **			
Block 3		08.8 ***		
Fatigue	-0.27 **			
Dyspnea	-0.12			
			38.7%	11.2 ***
			Adjusted R ² 35.3%	

Note: Beta weights presented are those obtained at entry of the final block.

*
p < .05

**
p < .01

p < .001. Stepwise entry demonstrated that none of the symptom interaction terms significantly increased R² and thus did not enter the regression analysis.

Table 6

Hierarchical multiple linear regression analysis for predictors of Short Form 36 Physical Component Score (n=134)

	Beta	% Change in R ²	Total R ²	F
Block 1		18.7% ***		
Age	-0.14 *			
Sex	0.02			
Hollingshead Score	-0.12			
Co-morbidity Index	-0.21 **			
Block 2		12.2 ***		
Chest pain frequency	-0.20 **			
Block 3		12.1 ***		
Fatigue	-0.29 **			
Dyspnea	-0.19 *			
			43.0%	13.6 ***
			Adjusted R ² 39.8%	

Note: Beta weights presented are those obtained at entry of the final block.

*
p < .05

**
p < .01

p < .001. Stepwise entry demonstrated that none of the symptom interaction terms significantly increased R² and thus did not enter the regression analysis.

Table 7

Hierarchical multiple linear regression analysis for predictors of Short Form 36 Mental Component Score (n=134)

	Beta	%Change in R ²	Total R ²	F
Block 1		10.7% **		
Age	.23 **			
Sex	-.05			
Hollingshead Score	-.05			
Co-morbidity Index	-.09			
Block 2		02.1%		
Chest pain frequency	-.08			
Block 3		04.9% *		
Fatigue	-.25 **			
Dyspnea	.01			
			17.7%	3.9 **
			Adjusted R ² 13.1%	

Note: Beta weights presented are those obtained at entry of the final block.

*
p < .05

**
p < .01

p < .001. Stepwise entry demonstrated that none of the symptom interaction terms significantly increased R² and thus did not enter the regression analysis.