7-1-2014

Health Related Quality of Life in Hispanic Versus Non-Hispanic White Congestive Heart Failure Patients and Predictors of Healthcare Utilization

Stanley Snowden

Recommended Citation
Snowden, Stanley. "Health Related Quality of Life in Hispanic Versus Non-Hispanic White Congestive Heart Failure Patients and Predictors of Healthcare Utilization." (2014). https://digitalrepository.unm.edu/biom_etds/86

Stanley Scott Snowden

Candidate

Biomedical Research Education Program

Department

This thesis is approved, and it is acceptable in quality and form for publication:

Approved by the Thesis Committee:

Teddy Warner, PhD , Chairperson

Matthew Borrego, PhD, BS Pharm

Joe Anderson, PharmD

James Nawarskas, PharmD

Health Related Quality of Life in Hispanic Versus Non-Hispanic White Congestive Heart Failure Patients and Predictors of Healthcare Utilization

By

Stanley Snowden

Pharm.D., University of New Mexico, 2010

THESIS

Submitted in Partial Fulfillment of the
Requirements for the Degree of

Master of Science
Biomedical Sciences

The University of New Mexico
Albuquerque, New Mexico
July, 2014

DEDICATION

Completion of this thesis and master's program is dedicated to wife, Jamie. Without her love and support this adventure would not be possible.

ACKNOWLEDGMENTS

I would like to thank Dr. Teddy Warner, my advisor and thesis chair, for all of the guidance and encouragement he has provided me over the past three years at the University of New Mexico. I would like to acknowledge his efforts and tireless hours helping me write and revise versions of this thesis.

I also thank my committee members, Dr. Matthew Borrego, Dr. Joe Anderson, and Dr. Jim Nawarskas, for their valuable recommendations pertaining to this study and assistance in my professional development as a clinician and a researcher.

To Dr. Bart Cox and the staff at the University of New Mexico Hospitals Congestive Heart Failure clinic for providing me with data and support, thank you very much.

I would also like to thank all of the faculty members and staff with the Clinical and Translational Sciences Center for providing me with feedback and encouragement regarding my thesis.

Special thanks to The New Mexico Center for the Advancement of Research Engagement and Science on Health Disparities (NM CARES HD) National Institute on Minority Health and Health Disparities of the National Institutes of Health under Award Number P20M for providing me with grant funding to pursue this degree program.

To my parents Donald and Linda, and my brothers Troy and Matthew for all their love and support, thank you. And finally to wife, Jamie, your love has been the greatest strength of all.

Health Related Quality of Life in Hispanic Versus Non-Hispanic White Congestive Heart Failure Patients and Predictors of Hospital Admissions and Emergency Department Visits

By

Stanley Snowden

Pharm.D., University of New Mexico, 2010

M.S.BIOM., University of New Mexico, 2014

ABSTRACT

Congestive heart failure (CHF) is a prevalent disease in the US. CHF diminishes health related quality of life (HRQOL) to those who have it. Evaluation of HRQOL between Hispanic and non-Hispanic White CHF patients were conducted.

OBJECTIVES: To determine if there are mean-score differences in HRQOL between Hispanic and non-Hispanic White CHF patients using the Minnesota Living with Heart Failure Questionnaire (MLHFQ). To examine the relationship of HRQOL in these two groups with: (1) hospital admissions, (2) emergency department (ED) visits, (3) CHF clinic visits, and (4) a combination of all three within a 6-month period after completing the MLHFQ. To examine the relationship between the self-reported Patient Health Questionnaire-9 (PHQ-9) depression scores and HRQOL scores in both groups. To test the ability of various conceptually constructed risk models to predict hospital admissions, ED visits, visits to the CHF clinic, and a composite of outcomes. METHODS: Cross-sectional and retrospective cohort designs were conducted. All patients evaluated in this study were from the CHF clinic at the University of New Mexico Hospitals. Non-Hispanic White patients served as the comparison group. RESULTS: No statistical differences in total MLHFQ or MLHFQ subscale scores were found between the two groups. There were no significant differences in hospital admissions, ED visits, CHF clinic visits, or composite of all three between the two groups. Hispanic patients had a stronger correlation between PHQ-9 and MLHFQ total and physical scores than non-Hispanic White patients. There was no difference between the two groups in the PHQ-9 and MLHFQ emotional scores. Only the severity of illness (3a) model predicted hospital admissions, ED visits, CHF clinic visits, and composite of all three. CONCLUSIONS: This study shows no differences between HRQOL, healthcare utilization, or ethnicity predicting healthcare utilization between Hispanic and non-Hispanic White CHF patients. While there is a difference between Hispanic and non-Hispanic White CHF patients in terms of PHQ-9 and MLHFQ total and physical subscale scores, it is unknown what, if any, clinical significance this has. A larger multi-site study measuring outcomes prospectively with more than one HRQOL instrument is necessary to provide more information on this topic.

TABLE OF CONTENTS

DISCUSSION, CONCLUSIONS, AND

LIST OF FIGURES

LIST OF TABLES

Chapter 1

Introduction

Congestive Heart Failure (CHF) is a cardiac syndrome characterized by excessive fluid overload caused by a dysfunctional ventricle that is either dilated, hypertrophied, or both (1). This syndrome represents end-stage cardiac disease with a mortality rate of approximately 50% within five-years of diagnosis (2). There are two categories of CHF based on ejection fraction (EF): (1) heart failure with reduced ejection fraction (HFrEF) includes CHF with an EF $\leq$ 40%, and (2) heart failure with preserved ejection fraction (HFpEF) includes CHF with an EF $\geq$ 50%. The pharmacologic treatment options differ between these two types of CHF. HFrEF have more treatment options including beta-blockers, specifically metoprolol succinate, carvedilol, and bisoprolol, angiotensin converting enzyme inhibitors (ACEI); angiotensin receptor blockers, specifically losartan, candesartan, and valsartan, digoxin, and mineralocorticoid receptor antagonists. HFpEF does not have any specific pharmacologic treatment options. There are numerous risk factors for CHF including myocardial infarction, hypertension, drug-induction, and diabetes.

Statement of the Problem

Two studies have evaluated differences in health related quality of life (HRQOL) between Hispanic and non-Hispanic CHF patients (3,4). These two studies evaluated the changes in HRQOL following a phone intervention in patients with CHF. They found a greater improvement in HRQOL in the Hispanic compared to the non-Hispanic White patients. No outcomes related to mortality or healthcare utilization were evaluated in these studies. The present study appears to be the first to evaluate a potential relationship between HRQOL and healthcare utilization in Hispanic versus non-Hispanic White CHF patients. Additionally, the present study will also explore a potential relationship between depressive symptoms as measured by the Patient Health Questionnaire-9 (PHQ-9) and HRQOL measured by the MLHFQ in these two patient populations.

Statement of Purpose and Research Objectives

The purpose of the study is to evaluate potential differences in self-reported HRQOL between Hispanic and non-Hispanic White CHF patients. The evaluation of these potential differences include: direct differences in HRQOL, healthcare utilization, depressive symptoms, and risk factors for healthcare utilization.

The specific research objectives for the study were:

1. To determine if there are mean-score differences in self-reported HRQOL between Hispanic and non-Hispanic White CHF patients using the Minnesota Living with Heart Failure Questionnaire (MLHFQ).
2. To examine the relationship of HRQOL in Hispanic and non-Hispanic White CHF patients with:
    a. Hospital admissions,
    b. Emergency Department visits,
    c. CHF clinic visits, and a combination of the hospital admissions,
    d. Emergency Department (ED) visits, and
    e. CHF clinic visits,

all within a 6-month period after completing the MLHFQ.

3. To examine the relationship between the reported Patient Health Questionnaire-9 (PHQ-9) (depression) scores and HRQOL scores in both Hispanic and non-Hispanic White CHF patients.
4. To test the ability of various conceptually constructed risk models to predict hospital admissions for CHF, ED visits for CHF, visits to the CHF clinic, and a composite of hospitalizations, ED visits, and clinic visits for CHF.

Chapter 2

Review of Literature

Prevalence and incidence of CHF in the general United States population

Congestive Heart Failure (CHF) is a cardiac syndrome characterized by excessive fluid overload which is caused by a dysfunctional heart ventricle that is either dilated, hypertrophied, or both (1). The most recent prevalence of CHF in the United States (US) is approximately 6.6 million people who are at least 18 years of age with an annual incidence of approximately 500,000 new cases per year (2). The annual rates have been mostly studied in the non-Hispanic White and African-American US populations. The incidence for non-Hispanic White men ages 65 to 74 are 15.2 per 1,000 persons and increases with age to 31.7 and 65.2 per 1,000 persons for ages 75 to 84 and greater than or equal to 85, respectively.

Summary

CHF is fairly common in the US population regardless of race or ethnicity. The incidence is increasing and is much more prominent as people age. The risk factors for this disease are common and many are modifiable. CHF is a public health concern that needs to be addressed in all races, ethnicities, genders, and ages.

Prevalence and incidence of CHF in the United States Hispanic population

Currently, there are approximately 45.5 million Hispanics comprising 15% of the US population (5). This percentage is expected to grow in the coming years because of immigration and higher birth rates of Hispanic Americans. Hispanic Americans have a higher prevalence of diabetes compared to non-Hispanic White Americans (2,5). In

2008, 18 million Americans lived with diabetes, and Hispanic Americans have a higher prevalence than non-Hispanic Whites (6). Diabetes has been associated as a direct cause of CHF by altering metabolism in the myocardium (5,7). Diabetes also leads to CHF indirectly by increasing the risk for myocardial infarctions (5). One study estimated the incidence of CHF in African-Americans, Hispanics, and non-Hispanic Whites (8), in which patients of at least 65 years of age were followed over a 3.5 year period. The definitions of CHF were clinical, and their application to individual patients was agreed upon by at least 2 different physicians. The overall results over a 43 month follow-up period showed an incidence of CHF of 26% in Hispanics and 27% in non-Hispanic Whites, indicating essential equivalence of incidence of CHF in these two populations.

Another study evaluated the incidence of CHF in 6,814 participants who were either non-Hispanic White, African-American, Hispanic, or Chinese American over a 4 year period (9). This multi-site study was conducted in Maryland, Illinois, North Carolina, New York, and Minnesota. The overall endpoint was the development of new onset CHF. Non-Hispanic White participants had an incident rate of 2.4 per 1,000 person-years, and Hispanic participants had an incident rate of 3.5 per 1,000 person-years. White participants were the reference group for this study. After adjustment for age, sex, hypertension, diabetes mellitus, left ventricular hypertrophy, obesity, serum cholesterol level, current cigarette smoking status, interim myocardial infarction, and left ventricular function at baseline, Hispanic participants had a hazard ratio of 1.14, 95% CI (0.46-2.80), which was not statistically significantly different from the general population. This suggests CHF incidence may not be dependent on race or ethnicity.

Based on the current literature the incidence of CHF in Hispanics is similar to the incidence of the non-Hispanic population in the US (8,9). However, given the projected increase in growth in the Hispanic population in the US, the prevalence of CHF in the Hispanic population will likely similarly increase proportionally because of the increase in CVD risk factors in the US Hispanic population.

Summary

Hispanic Americans make up a large amount of the US population. This is growing because of immigration and more Hispanic Americans than non-Hispanic Americans are being born in the US. The incidence of CHF in Hispanics is similar to the rest of the rest of the US population, but the Hispanic population does have a disproportionately higher incidence of risk factors such as diabetes than do non-Hispanic groups. Hispanic Americans have a significant amount of cardiovascular disease (CVD) burden and CVD burden for Hispanics is very likely to continue to grow.

Health Related Quality of Life in CHF patients compared to non-CHF patients

Patients who suffer from CHF have physical limitations which can affect their social, work, and home lives. The HRQOL of CHF patients is typically lower than the rest of the US population without this disease. This has been reported in a sample comprised of a total of 1,562 participants, 781 elderly CHF patients and 781 elderly people without CHF (10). This study used the Medical Outcome Study 36-item General Health Survey (SF-36) to assess HRQOL in both groups. This study compared HRQOL between the elderly with CHF and without CHF through SF-36 self-reports of 9 health domains: (1) physical functioning (Cohen's d=1.00), (2) bodily pain (d=0.50), (3) general health perception (d=0.90), (4) vitality (d=1.10), (5) social functioning (d=0.90),

(6) role limitations from emotional functioning (d=0.60), (7) mental health (d=0.40), (8) limitations physical (d=1.30) and (9) perceived health change (d=0.90). Cohen's d is a measure of effect size which is the standardized difference in the group means. The group with CHF had statistically significant lower scores on each of the health domains compared to the group without CHF indicating lower HRQOL in patients with CHF with effect sizes that ranged from 0.40 to 1.30 based on the domain evaluated. Six of nine domains have large effect sizes, and the other three domains had moderate effect sizes, indicating that the quality of life of people with CHF is much lower than those without CHF.

Another sample of 205 CHF patients compared to 906 normal healthy participants reported a decrease in HRQOL in CHF patients as measured by the SF-36 (11). The CHF patients were categorized by New York Heart Association (NYHA) classifications I through III. The NYHA classification is a measure of severity for CHF patients. As the classifications increase so does the severity of illness for CHF patients. As the NYHA class moved from I to III, a decline in SF-36 scores for each domain was observed. The CHF patients had a statistically significant difference in mean SF-36 scores in all domains compared to the normal sample, indicating HRQOL is diminished in CHF patients compared to non-CHF patients. Diminished HRQOL in CHF patients has been shown to be a predictor of both hospital admissions and death in CHF patients (12).

Summary

CHF clearly has the potential to impact a patient physically and emotionally which has been shown in the literature above. This leads to diminished HRQOL in CHF patients. The studies above used an instrument, the SF-36, which has validated data in both CHF and non-CHF patients. Given that severity of illness of CHF has been shown to relate to HRQOL above, it stands to reason patients with more physical limitations will have a lower HRQOL.

HRQOL in Hispanic versus non-Hispanic White people

Differences in HRQOL between Hispanic Americans and non-Hispanic Americans may be due to language and cultural differences. The studies that have assessed differences in HRQOL asked a single broad question such as: "compared with other people your age, would you say that your health is excellent, good, fair, or poor?" or "In general would you say your health is: excellent, very good, good, fair or poor?"(13,14). Both studies showed that Hispanic/Latino Americans had lower self-reported HRQOL compared to non-Hispanic White Americans. In one study, a higher percentage of Latino Americans considered their health to be "good" or "fair" when asked the question the first way while a higher percentage of non-Hispanic White Americans considered their health to be "excellent" or "very good"(14). The Hispanic/Latinos were healthier overall with a lower incidence of smoking, asthma, diabetes, arthritis, hypertension, heart disease, and cancer compared to non-Hispanic Whites. The Latino sample did have a higher percentage of people who had limited English proficiency compared to the non-Hispanic White sample. The limited English proficiency in the Hispanic patients may indicate a diminished capacity to fully understand the various gradations of health being asked of them, according to the investigators in that study. The Hispanic patients in this study may not have been able to articulate exactly the way they truly felt. The other study, which reported about patients with diabetes only, had similar results (13). More Hispanic participants chose their heath to be "fair" or "poor" when asked the question the second way compared to non-Hispanic White participants. More non-Hispanic White participants chose their health to be "excellent" or "good" compared to the Hispanic participants. The baseline characteristics for both groups were similar. Information related to specific co-morbid diseases were not obtained, but information regarding health status as gauged by the number of prescription medications, alcohol use, smoking status, and the number of previous hospitalizations within the past year was obtained. There were no differences in any of these characteristics between Hispanic and non-Hispanic White patients. Based on this literature, it appears Hispanic/Latino Americans have a lower HRQOL compared to non-Hispanic White Americans which could be related to a lack of English proficiency.

Summary

In non-CHF patients HRQOL appears to be lower in Hispanic/Latino patients than non-Hispanic White patients, although Hispanic patients report being healthier (12). These studies indicate a language barrier for Hispanic Americans, which could make understanding the questions and the quality of the responses difficult, leading to inconsistent results.

HRQOL in Hispanic CHF patients

Given the similar incidence in CHF in Hispanics and the general US population, it is important to know how the HRQOL in Hispanic CHF patients compares to other groups such as non-Hispanic White CHF patients. The HRQOL of Hispanic CHF patients have been reported in two studies (3,4). Both of these studies compared the HRQOL of Hispanic CHF patients to that of non-Hispanic White CHF patients.

One study evaluated 40 Hispanic and 40 non-Hispanic White CHF patients for evaluation of their HRQOL as measured by the Minnesota Living with Heart Failure Questionnaire (MLHFQ) which is a specific measure for CHF patients (4). The scoring of the MLHFQ ranges from 0 to 105 with a lower number indicating a higher HRQOL and vice versa. Patients' data were collected from a database from another study which was testing the effects of a case management telephone intervention. Patients receiving the intervention received numerous telephone calls by a case-manager with the first phone call occurring within 5 days after hospital discharge. Patients in the intervention group received, on average, 17 phone calls during the 6 month follow-up period (15). Patients were randomized to receive a phone call or not. There were more Hispanic patients (67.5 %) than non-Hispanic White patients (50 %) enrolled to receive a telephone call from case management.

The HRQOL was collected at baseline, three and six months by telephone follow-ups. Baseline total HRQOL scores were 50.02 (SD = 22.39) and 51.50 (SD = 22.39) for Hispanic and non-Hispanic White patients respectively. Hispanic patients had a statistically significant improvement over time as reflected with a decrease in the mean total score by 25 at three months and 26 at six months. This is compared to a decrease in the mean total score by 13 at three months and 16 at six months for the non-Hispanic White patients. HRQOL scores between three months and six months for either group did not significantly change for either group. The effect sizes, as measured by Cohen's d, for the improvement in total scores were (d=0.54) at 3 months and (d=0.45) at 6 months, which are both considered moderate.

The baseline HRQOL physical subscale scores were 22.09 (SD = 10.69) and 24.48 (SD = 10.69) for Hispanic and non-Hispanic White patients, respectively. The Hispanic patients showed improvement over time with a decrease in the mean physical subscale scores by 13 at three months and 12 at six months. Non-Hispanic White patients showed a decrease in mean physical subscale scores of 8 at three months and 9 at six months. The effect sizes for this subscale at three months were (d=0.4) and at six months were (d=0.28).

The baseline HRQOL emotional subscale scores were 11.77 (SD = 7.53) and 11.80 (SD = 7.53) for Hispanic and non-Hispanic White patients respectively. At three months there were decreases in this subscale by 4.40 and 2.30 for Hispanic and non-Hispanic White patients respectively. There was not much additional change at six months compared to three months as seen with decreases of 4.81 and 2.74 from baseline in Hispanic and non-Hispanic White patients respectively. Changes between these two groups in the emotional subscale were not statistically significant. The effect sizes for this subscale at three months were (d=0.28) and at six months were (d=0.27).

While this study shows greater improvement in MLHFQ scores in Hispanic versus non-Hispanic White patients over time, this sample of patients were collected from patients mainly from California who were enrolled in an intervention study and 67.5 % of Hispanic patients received the intervention therefore that may have played a role in the improvement of HRQOL in the Hispanic group. The Hispanic patients had more HFpEF, 60 %, compared to 45 % in the non-Hispanic White group. The Hispanic patients had less atrial fibrillation at discharge, 7.5 %, compared to 22.5 % of non-Hispanic White patients. Both groups were similar in terms of their NYHA classification and how they were treated. With the exceptions above, these two groups were very similar in terms of severity of illness. This study describes changes in HRQOL based on telephone interventions to Hispanic and non-Hispanic CHF patients. The current study did not use any study interventions.

In another study 767 non-Hispanic White, 231 African-American, and 214 Hispanic patients were enrolled into a study (3). These participants were acquired from a database that housed information from numerous studies, including the study described above, that were either observational or had some type of intervention; mostly psychological. Patients from an intervention study were placed into an intervention group while patients from an observational study were placed into a control group. There were equal percentages (50 % versus 50 %) of both Hispanic and non-Hispanic White patients who were in the intervention group. The MLHFQ was provided to both English and Spanish speaking patients. The scores from this questionnaire were obtained at baseline, three and six months. These scores were only presented in one figure and are represented in a graph, therefore only estimates were obtainable.

Estimated baseline total scores were around 50 for Black, Hispanic and non-Hispanic White patients. The change in total scores were significantly different between Hispanic and non-Hispanic White CHF patients, and Hispanic and African-American CHF patients. At three months the total scores were estimated to be 40, 25, and 38 and at six months were estimated to be 25, 20, and 35 for Black, Hispanic, and non-Hispanic White patients respectively.

Estimated baseline scores for the physical subscale were around 25 for all three groups. At three months the estimated scores were 15, 10, and 15 and at six months were estimated to be 20, 10, and 15 for Black, Hispanic, and non-Hispanic White patients respectively.

Estimated baseline scores for the emotional subscale were around 10 for all three groups. At three months these scores were estimated to be 8, 5, and 8 and at six months were estimated to be 10, 3, and 8 for Black, Hispanic, and non-Hispanic White patients. Hispanic patients also had significantly greater change leading to lower scores compared to White patients in the physical and emotional domains. There were no statistically significant differences between Hispanic and African American patients in the same domains. There were no significant differences in total, physical, or emotional scores between three and six months. Unfortunately, no mean scores at baseline, three and six months and no standard deviations were given making the effect sizes for the total score and physical subscale scores impossible to calculate. The Hispanic patients in this study were sicker compared to the non-Hispanic White group. There were more Hispanic patients who were classified as NYHA class IV with 40 % were placed into this classification and 23 % of non-Hispanic White patients were placed into the same class. NYHA class IV indicates a very sick patient which is related to poor outcomes. Hispanic patients may have been sicker in this study, but showed a greater response to the psychological intervention at 3 and 6 months compared to non-Hispanic patients. There were equal numbers of Hispanic and non-Hispanic patients in the intervention group, meaning the response in Hispanic patients may have been related to social structures, language discrepancies, or something else unknown at this time.

Summary

Overall, these studies show a greater improvement in HRQOL in Hispanic versus non-Hispanic White CHF patients although the interventions from the two studies (4,15) may have contributed to this finding. This may seem counter-intuitive to what people think because Hispanic patients typically have lower socioeconomics, education, other healthcare barriers, and may have worse overall health than non-Hispanic patients that may adversely affect HRQOL. There are some ideas as to why Hispanic patients have a higher HRQOL, including a stronger social and family structure, as well as having different views about chronic illness compared to non-Hispanic White patients (16).

Depressive symptoms and HRQOL in CHF patients

Depressive symptoms may alter a patient's HRQOL, making it lower than it might otherwise be. One study of 460 patients with CHF evaluated how depressive symptoms affected the HRQOL of CHF patients (17). The ethnic make-up of the samples was 67 % non-Hispanic White and 33 % Hispanic. This study used the Medical Outcomes Study-Depression (MOS-D) instrument to evaluate depressive symptoms. The MOS-D consists of eight questions with a score that ranges from 0-1. A cut-off score of 0.06 or higher indicates depressive symptoms on the MOS-D. The current study divided patients into two groups based on depressive symptoms: (1) One-hundred thirty patients had MOS-D scores greater than or equal to 0.06 and (2) those with MOS-D scores less than 0.06. The HRQOL was evaluated with the use of the Kansas City Cardiomyopathy Questionnaire (KCCQ), which is a disease specific questionnaire for CHF. It is scored on a scale from 0 to 100 with 0 being worst HRQOL and 100 being the best HRQOL. Patients completed these two questionnaires and underwent a physical examination at baseline and again at six weeks. There was no intervention in this study. There were more smokers and alcohol abusers in the group with depressive symptoms than the group with no depressive symptoms. There were no clinical or treatment differences between the two groups. Baseline KCCQ scores were lower (47.7) in the group that had depressive symptoms as compared to the non-depressed group (67.3). No additional statistical information such as confidence intervals or standard deviations were provided. At the follow-up visit, KCCQ scores in the depressive symptoms group continued to decline by 7.1 points while the non-depressed group showed improvement. The mean change in the non-depressed group was not provided, therefore an effect size was unable to be calculated.

Summary

This study demonstrated that patients who exhibit depressive symptoms have a lower HRQOL. This is not surprising because depressive symptoms are one of the biggest risk factors for impacting the HRQOL, especially in CHF patients (17).

Hospital admissions for CHF patients and their economic impact

Hospital admissions for CHF are burdensome for patients, healthcare providers, and society. There are approximately 990,000 hospitalizations in the US annually related to CHF, approximately half of these hospitalizations are from patients who are admitted to the hospital multiple times annually (6). The length of stay for these hospitalizations can vary from a couple of days to a few weeks depending on the severity of the patient's illness. The number of hospitalizations would be expected to increase in the near future because the US population is getting older, and obesity, diabetes, and heart disease are becoming more prevalent in patients of all ages. This will lead to further increases in healthcare utilization and costs. CHF is mainly seen in the elderly population because they have numerous risk factors for CHF. Around 75 to 85% of CHF hospitalizations occur in patients at least 65 years of age (18). CHF is the most frequent reason for hospital admissions in patients with Medicare and resulted in $37.2 billion for the US alone in both direct and indirect costs (19).

Risk factors for ED visits and hospital admissions in CHF patients

There are numerous factors that have been shown to be associated with hospital admissions in patients with CHF. These risk factors along with their strength of associations, in descending order, are listed below in Table 1.

Risk factors for ED visits and hospital admissions in the general population

In addition to specific risk factors for CHF there are risk factors that have been shown to effect hospital admissions in the general population. These risk factors along with their strength of associations, in descending order, are listed below in Table 2.

Table 1. Risk Factors for ED Visits and Hospital Admissions in CHF Patients

Risk Factor for CHF	Strength of Association [1] (95% CI)	References
Insulin treated diabetes	HR 2.03 (1.80-2.29)	(18)
Previous hospitalization for CHF in the past year	HR 1.88 (1.24-2.83)	(12)
MLHFQ physical summary score	HR 1.59 (1.12-2.26)	(12)
Personal history of diabetes	HR 1.47 (1.02-2.06)	(12,18)
Age (per 10 years over the age of 60)	HR 1.46 (1.38-1.54)	(18,20)
Functional status as measured by the NYHA	HR 1.38 (1.15-1.67)	(17,18)
Severity of illness as measured by a 6-minute walk test	HR 1.34 (1.01-1.80)	(17)
Increase in plasma creatinine level	HR 1.33 (1.09-1.64)	(7,12,20)
Diagnosis of CHF over 2 years ago	HR 1.31 (1.20-1.43)	(18)
Medicare insurance	RR 1.25 (1.22-1.28)	(20)
Atrial fibrillation	HR 1.16 (1.07-1.27)	(18)
Ejection fraction (per 5% decrease below 45)	HR 1.13 (1.11-1.16)	(18)
Previous MI	HR 1.11 (1.02-1.21)	(18)
DBP (per 10 mmHg decrease)	HR 1.11 (1.07-1.16)	(18)
Ischemic heart disease	RR 1.11 (1.08-1.14)	(20)
Heart rate (per 10 b.p.m. increase)	HR 1.08 (1.05-1.11)	(18)
Body mass index (per 1 kg/m2 decrease below 27.5)	HR 1.03 (1.01-1.04)	(18)
Race (Black)	RR 1.05 (1.02-1.09)	(20)
Candesartan use	HR 0.82 (0.76-0.89)	(18)
Gender (female)	HR 0.83 (0.76-0.91)	(18,20)

[1] Individuals without ED visits or hospital admissions compared to those with such.

CI = confidence interval

HR = hazard ratio

RR = relative risk

CHF = congestive heart failure

MLHFQ = Minnesota Living with Heart Failure Questionnaire

NYHA = New York Heart Association

MI = Myocardial Infarction

DBP= Diastolic Blood Pressure

Table 2. Risk Factors for ED Visits and Hosptial Admissions in Patients without CHF

Risk Factors in General	Strength of Association[1]	References
History of depression	OR 3.20 (1.40-7.90)	(15)
≥5 Comorbidities	OR 2.60 (1.50-4.70)	(15)
Number of drugs > 5	OR 2.53 (1.88-3.31)	(14)
Previous admission within 30 days	OR 2.30 (1.20-4.60)	(15)
Single marital status	OR 2.06 (1.27-3.32)	(13)
Identifiable primary care physician	OR 2.05 (1.18-3.57)	(13)
Divorced marital status	OR 1.86 (1.05-3.29)	(13)
Age 80 years or older	OR 1.80 (1.02-3.20)	(15)
Primary care physician visit in past month	OR 1.61 (1.09-2.36)	(13)
COPD	RR 1.33 (1.16-1.52)	(20,21)

[1] Individuals without ED visits or hospital admissions compared to those with such.

OR = Odds Ratio

RR = Relative Risk

COPD = Chronic Obstructive Pulmonary Disease

Summary of the Literature Review

CHF is a prevalent and deadly disease that affects millions of Americans. The disease prevalence is similar between Hispanic and non-Hispanic White patients. However, in the near future Hispanic patients may have a higher incidence of CHF than non-Hispanic White patients. This is most likely because Hispanic patients have a higher rate of CHF risk factors such as diabetes.

Studies have shown HRQOL is lower in CHF patients compared to non-CHF patients, as would be expected for people with any serious chronic disease. This may be caused by physical and/or emotional factors. It has been shown that depressive symptoms are associated with lower HRQOL in CHF patients. These studies cannot be extrapolated to all populations because of the limitations in study samples. Small studies have shown Hispanic non-CHF patients with chronic diseases to have lower HRQOL than non-Hispanic non-CHF patients. Intervention studies have shown Hispanic CHF patients have a slightly higher HRQOL and greater improvement in HRQOL than non-Hispanic White CHF patients following phone follow-up interventions after hospital discharge.

Literature Search Strategy

Searches on PubMed, PsycInfo and Web of Science were conducted, but only PubMed provided fruitful results. A PubMed search located literature surrounding the issue of quality of life in Hispanic versus non-Hispanic White congestive heart failure (CHF) patients. The first term searched using the MeSH database was "heart failure". The subheading "psychology" restricted the search to a major topic, resulting in 626 articles. After adding the following limits: Humans, English, All Adult: 19+ years, articles decreased to 456. A review of abstracts of these 456 articles revealed 105 articles that might provide relevant information. After the MeSH terms were evaluated in those 105 articles, the MeSH terms that appeared relevant were "Heart Failure/ethnology", "Hispanic Americans", "Healthcare Disparities/statistics & numerical data", "Hispanic Americans/ statistics & numerical data", and "Hispanic Americans/psychology". When the MeSH terms "Hispanic Americans were combined with "Heart Failure/ethnology" [Majr]) without the use of limits, 23 articles resulted. Evaluation of these abstracts provided two important articles (3,4). Other relevant literature was obtained by reviewing the references in the relevant articles obtained through the PubMed search.

Another PubMed search was conducted to find literature on risk factors for ED visits and hospital admissions in both CHF and non-CHF patients. For CHF patients the combination of MeSH terms, ("Quality of Life [Majr] AND "Patient Readmission" [Mesh]) AND "Heart Failure"[Mesh] with filters: Humans; English; Adult 19+ years yielded 17 results. The articles in Pubmed and review of the references at the end of the articles produced six useful articles (7,17,18,22) (12,20). For non-CHF patients the combination of MeSH terms, ("Quality of Life"[Majr]) AND "Patient Readmission"[Mesh] with filters: Humans; English; Adult: 19+ years yielded 51 results. The articles in Pubmed and review of the references at the end of the articles produced four useful articles (13-15,21).

Significance and Implications

The significance of this project is in its potential to demonstrate HRQOL differences between Hispanic and non-Hispanic White CHF patients, and to show healthcare utilization differences, as defined as ED visits and hospital admissions, between Hispanic and White Non-Hispanic patients as a function of a wide range of predictors obtained from the patient medical record that have been shown to be risk factors for CHF. Previous literature showed a relationship between HRQOL and hospital readmissions which had mostly been examined in non-Hispanic White patients, but not in Hispanic CHF patients (12).

The findings from this project may lead clinicians to have closer follow-up with at-risk patients which may lead to different therapeutic management strategies. The results of this study could increase awareness regarding potential ethnic differences for healthcare providers caring for patients with CHF when providing education and treatment options.

Specific Aims and Hypotheses

Specific Aim #1: To determine if there are mean-score differences in HRQOL between Hispanic and non-Hispanic White CHF patients using the Minnesota Living with Heart Failure Questionnaire. MLHFQ is a CHF specific measure of HRQOL.

Hypothesis: Hispanic CHF patients will show lower mean-scores in the MLHFQ which translates into better HRQOL than non-Hispanic White CHF patients.

Rationale: The current literature has shown that Hispanic CHF patients have a higher HRQOL than non-Hispanic White CHF patients (3,4). The search strategy for this study has not turned out any literature that has stated the contrary; therefore my hypothesis follows what the current literature has shown.

Specific Aim #2: To examine the relationship of HRQOL in Hispanic vs. non-Hispanic White CHF patients with hospital admissions and ED visits to the University of New Mexico Hospitals (UNMH).

Hypothesis #1: HRQOL will correlate negatively with ED visits and hospital admissions in both Hispanic and non-Hispanic White CHF patients.

Rationale: Literature has demonstrated the link between HRQOL and hospital admissions (12). This also intuitively makes sense that higher HRQOL will lead to fewer hospital admissions and vice versa.

Hypothesis #2: Hispanic CHF patients will show a stronger correlation between HRQOL and hospital admissions and ED visits than will non-Hispanic White CHF patients.

Rationale: While the literature search for this study has not produced any studies to directly support the second hypothesis, Hispanic patients have a variety of cultural beliefs about health as well as have family and group dynamics that may produce a stronger correlation between healthcare utilization and their HRQOL for Hispanic people than for non-Hispanic White patients.

Specific Aim #3: To examine the relationship between Patient Health Questionnaire-9 (PHQ-9) scores that assess depression and HRQOL scores in Hispanic vs. non-Hispanic White CHF patients.

Hypothesis: PHQ-9 scores will correlate positively with MLHFQ scores in both Hispanic and non-Hispanic White CHF patients. That is, as PHQ-9 scores increase indicating more depressive symptoms, the Minnesota Living with Heart Failure Questionnaire scores will also tend to increase, indicating worse HRQOL. Thus, depressive symptoms will correlate negatively with HRQOL.

Rationale for hypothesis: Literature shows that CHF patients with depressive symptoms have poor HRQOL compared to CHF patients without depressive symptoms.

It also makes sense logically that patients with depressive symptoms have a worse HRQOL.

<u>Specific Aim #4</u>: To test various conceptually constructed risk models in predicting ED visits, hospital admissions, CHF clinic visits, and a composite measure of ED visits, hospital admissions and CHF clinic visits, with various risk factors for CHF documented from the literature.

<u>Hypothesis:</u> The risk factors listed in Table 3 will predict ED visits and hospital admissions, as well as CHF clinic visits and a composite of those three healthcare utilization outcomes in this sample of CHF patients. Several predictor models will be conceived and tested and their effect sizes contrasted in predicting health care utilization.

<u>Rationale for hypothesis:</u> Numerous articles in the literature have listed risk factors for both ED visits and hospital admissions in both CHF and non-CHF patients. There are risk factors which overlap between these two groups of patients. Given the reproducibility of these risk factors for ED visits and hospital admissions, this study is designed to replicate the current literature and also extend the literature by examining multiple predictor risk models, which have not been reported in the CHF literature.

Table 3. Risk Factors for ED Visits and Hospital Readmissions Analyzed

Risk factors in the congestive heart failure literature	Risk factors in the general literature	Other potential risk factors
Age*	Race	Ethnicity
Gender (Female)	Marital status (Single/Divorced)	Spoken language
BMI	Insurance status (Medicaid)*	Zip Code
Diastolic blood pressure	Identifiable PCP	Systolic blood pressure
Heart rate	PCP visits within the past one month	# of CHF clinic visits missed in the past 1 year
Ejection fraction	COPD*	Pain at the clinic visit
Functional status as measured by: NYHA classification (1) Investigator measured (1) Clinician measured	History of Depression	Oxygen saturation at the clinic visit
Diagnosis of CHF >2 years	≥5 comorbid conditions	PHQ-9 scores
Ischemic heart disease	Any hospital admission within the past 30 days	ACEI/ARB
Previous myocardial infarction	>5 medications	Beta-blocker
Diabetes	Plasma serum creatinine level	Optimal Therapy
Atrial fibrillation		Pulmonary artery systolic pressure
Admission for CHF within the past 12 months		Smoker
MLWHF scores		Previous smoker (quit within previous 1 year)
		Charleson Comorbidity Index
		Number of years the patient has been in the CHF clinic

*Risk factor in both Congestive heart failure and general literature.

BMI = Body Mass Index

NYHA = New York Heart Association

CHF = Congestive Heart Failure

MLWHF = Minnesota Living with Heart Failure

PCP = Primary Care Provider

COPD = Chronic Obstructive Pulmonary Disease

PHQ-9 = Patient Health Questionnaire-9

ACEI = Angiotensin Converting Enzyme Inhibitor

ARB = Angiotensin Receptor Blocker

Chapter 3

Methods

Institutional Review Board

This study was approved by the Health Sciences Human Research Review Committee on August 29, 2012.

Site Description

This study was conducted at the University of New Mexico Hospitals (UNMH) outpatient CHF clinic. This sole CHF clinic sees all patients with CHF through the UNMH system. Approximately 45 percent of the patients were non-Hispanic White; another 45 percent were Hispanic, and the remainder of the patients were Native American, African American or Asian.

Study Sample

Four hundred four patients completed the MLHFQ and PHQ-9 from February 1, 2011 to June 30, 2012. February 1, 2011 was chosen as the starting date because this was the date the outpatient CHF clinic starting asking patients to fill out the MLHFQ and PHQ-9. June 30, 2012 was chosen as the stop date because this would provide enough time for a six month follow-up for data collection to be completed by December 31, 2012. Thirty-one of the questionnaires were in Spanish and the rest English. The proportional mix of Hispanic and non-Hispanic White patient population provided an adequate sample of about 135 individuals in each of the two groups. Because this was an exploratory study, no power calculation was conducted. Instead, we used the common rule of thumb for multiple regression of 10 cases per predictor variable that are included in any given model to be sure we had sufficient cases in each model test.

Study sample characteristics were evaluated based on whether they were categorical or continuous. Categorical characteristics such as gender, primary language, race, marital status, insurance status, current primary care provider, and New York Heart Association (NYHA) classification were evaluated by a chi-square, and continuous characteristics such as age, ejection fraction, Charlson Comorbidity Index score, distance from UNMH and the number of medications per patient were evaluated by t-tests to determine statistically significant differences between groups.

Subjects/Inclusion and Exclusion Criteria

To be eligible for the study, patients were to self-identify as either Hispanic or non-Hispanic White; they also needed to be at least 18 years of age with a diagnosis CHF as documented in their UNMH electronic medical record (EMR). All patients who visited the clinic from February 1, 2011 to June 30, 2012 and completed a MLHFQ and PHQ-9 were eligible for inclusion into the study. Data for variables listed in Table 3, were collected in a retrospective manner by the principal investigator (PI) from the patients' EMR.

Both MLHFQ and PHQ-9 questionnaires were available in English and Spanish. If patients neither read nor understand English or Spanish, they would not have filled out questionnaires and were excluded. Patients who died prior to the six-month follow-up, or who had missing CHF clinic notes from the date the patient filled out the questionnaires, or who did not complete at least 75% of both questionnaires were excluded.

Study Design

Two study designs were used in this study. A cross-sectional retrospective design and a retrospective cohort design. Non-Hispanic White CHF patients served as the comparison group for this study. For the retrospective cohort design patients were followed for 6 months from the time they filled out their MLHFQ and PHQ-9 in the outpatient CHF clinic.

Study Measures

The HRQOL measurement survey used was the MLHFQ. This questionnaire was composed of 21 questions with each question having a six point rating scale (0 to 5) for a total score ranging from 0 to 105. Assessment of the effects of CHF on a patient's HRQOL was illustrated as the higher the score, the lower the HRQOL. There are no empirically validated cut-points which indicate a good or poor score. There are two subscale scores, one which measures physical impairment with a score ranging from 0 to 40 and the other measures emotional impairment with a score ranging from 0 to 25. All three scores, total, emotional subscale, and physical subscale scores were evaluated. While the physical and emotional subscale scores can reach a max of 65 the other questions in the MLHFQ do not belong to a specific subscale. This questionnaire takes approximately 5 to 10 minutes to complete. One study found test-retest reliability after one week was r=0.93 with a total r=0.89 in the physical dimension, and r=0.88 in the emotional dimension. The Cronbach's α ranged from 0.73 to 0.93. The MLHFQ scores were correlated with four factors. Each factor comprised a group of questions that were highly interrelated which contained similar information (23). Internal consistency has been shown to be similar between Hispanic CHF patients (0.88) and non-Hispanic White CHF patients (0.90) (4).

The PHQ-9 was used to assess depressive symptoms. It takes approximately 5 minutes to complete per patient. It is composed of nine questions with each question having a four point scale (0 to 3) for a total score ranging from 0 to 27. The higher the score, the more depressive symptoms a patient may be experiencing. Only the total score was considered for this questionnaire. There are breakpoints in the relation to the severity of depressive symptoms. Breakpoint scores of 5, 10, 15, and 20 represent mild, moderate, moderately severe, and severe depression. One study found test-retest reliability within 48 hours to be $r=0.84$. Cronbach's α was 0.89 in primary care patients and 0.86 in Ob-Gyn patients (24).

Both the MLHFQ and PHQ-9 were self-administered and completed by all study participants during the same clinic visit.

<u>ED visits for CHF</u> were defined as any visit to the ED at UNMH that resulted in the formation of a financial number for that visit without admission to the hospital by an admitting medicine service and discharge occurred from the ED.

<u>Hospital admissions for CHF</u> were defined as any admission to the hospital by an admitting medicine service. This was identified by various orders written by healthcare providers regarding bed status and admission orders, such as medication plans, diet, laboratory and diagnostic testing specific for CHF.

<u>Visits to the UNMH CHF</u> clinic were defined by any visit to the clinic that resulted in vitals taken from the patient, a medical note written by the provider, and a billing sheet sent to the patient's insurance company.

<u>Healthcare utilization</u> was defined as the patient having engaged in any of the following based on medical record entries at UNMH: (1) ED visits, (2) hospital admissions, (3) visits to the UNMH CHF clinic during the six-months of follow-up.

Data Analysis

Specific Aim 1

Specific Aim 1 was to determine if mean-score differences in HRQOL between Hispanic and non-Hispanic White CHF patients using the MLHFQ were present.

Predictors and Outcome Variables

The predictor variable was the ethnicity of the patients, Hispanic vs. non-Hispanic White. Outcome variables were the patients' scores on the MLHFQ Questionnaire. The MLHFQ assesses: 1) Total score, 2) Physical component score, and 3) Emotional component score.

Data Collection

Hispanic ethnicity was previously determined through patient self-identification. This was identified by the "Patient Demographics" section where the "race" and "ethnicity" of the patient were listed in the EMR. In the event the electronic medical chart had "at least two races" listed in the "race" tab, or the ethnicity was not answered in the "ethnicity" tab, the patient's primary language was evaluated. If the patient's primary language was Spanish they were classified as being of Hispanic ethnicity. If their primary language was English and there were no other identifiers of ethnicity then they were not included into the study.

The three scores of the MLHFQ were obtained from the patients' written medical charts. Financial numbers from each patient were obtained from the face of the completed MLHFQ. These financial numbers are generated whenever a patient visits a healthcare provider's clinic for billing purposes. Each financial number is linked to a specific clinic visit and thus a specific date. This was used to determine when the patient filled out the MLHFQ and was used to determine their six-month window for follow-up for the study.

Data Analysis

Independent means t-tests were conducted between Hispanic and non-Hispanic White CHF patients for the total MLHFQ, Physical MLHFQ, and Emotional MLHFQ scores using IBM SPSS version 19.

Specific Aim 2

Specific Aim 2 is to look at relationships of HRQOL in Hispanic and non-Hispanic White CHF patients with hospital admissions, ED visits to UNMH, CHF clinic visits, and combined healthcare utilization.

Predictor and Outcome Variables

The predictor variable was the MLHFQ scores for both Hispanic and non-Hispanic White CHF participants. The outcome variables were the number of ED visits, hospital admissions, visits to the CHF clinic, and combined healthcare utilization that occur within a six month period after the participants have filled out their MLHFQ HRQOL Questionnaires. Healthcare utilization is the combination of ED visits, hospital admissions, and visits to the CHF clinic.

Data Collection

After determination of the index date the MLHFQ and PHQ-9 questionnaires were completed based on financial number, the medical records were examined electronically through the use of their medical record number and the number of ED visits, hospital admissions to UNMH, visits to the CHF clinic, and combined healthcare utilization were documented over the subsequent six months.

Patients who died during the six-month follow-up duration were counted as lost to follow-up. It was anticipated a very small number of patients would die during this study therefore it was not used as an endpoint. Since there was no way to see if they have visited an ED or have been hospitalized anywhere but UNMH, only healthcare utilization (ED visits, hospital admissions, and visits to the CHF clinic) to UNMH will be counted for this study. One patient in the Hispanic group was an outlier based on their MLHFQ total score and was excluded for the analysis of this specific aim.

Data Analysis

Pearson's correlations were computed to determine the relationship between MLHFQ total scores and ED visits and hospital admissions and CHF clinic visits and a combination of the three, separately for Hispanic and non-Hispanic White patients. Bivariate Correlations among Hispanics compared to White non-Hispanics were compared using standard Fisher's z-score transformation and the correlation comparison t-test.

Specific Aim 3

Specific Aim 3 evaluated the relationship between the reported Patient Health Questionnaire-9 (PHQ-9) scores and HRQOL scores in both Hispanic and non-Hispanic White CHF patients.

Predictor and Outcome Variables

The predictor variables were the PHQ-9 scores for both Hispanic and non-Hispanic White CHF participants. The outcome variables were the MLHFQ scores for both Hispanic and non-Hispanic White CHF participants.

Data Collection

The MLHFQ total, physical subscale and emotional subscale scores along with the PHQ-9 total scores were collected through the patients' paper medical charts. Only the PHQ-9 total scores and MLHFQ total, physical subscale and emotional subscale scores were extracted from the patients' paper medical charts because these were not scanned into the patients' EMR. All other data such as patient characteristics and items in Table 3 were extracted from the patients' EMR. The financial number on the instruments served as an identifier of when the patient filled out the questionnaires. The PHQ-9 was chosen for this study because that is what the UNMH Outpatient CHF clinic collected from their patients during the time interval of this study. Only the total PHQ-9 scores were evaluated because that is how it has been evaluated in previous literature (24). One patient in the Hispanic group was an outlier based on their MLHFQ total score and was excluded for the analysis of this specific aim. These scores were placed into the SPSS database as continuous numbers.

Data Analysis

Pearson's correlations were computed to determine the relationship between the MLHFQ and PHQ-9 scores. Correlations from the total, physical, and emotional subscale scores of the MLHFQ were compared to the PHQ-9 total scores. Correlations of Hispanics were compared to correlations of White non-Hispanics were compared using the standard Fisher's z-score transformation and the correlation comparison t-test.

Specific Aim 4

With the guidance of my Committee on Studies, I constructed five risk models to predict ED visits, hospital readmissions, visits to the CHF clinic, and healthcare utilization for CHF using multiple regression.

Predictor and Outcome variables

The predictor variables are listed in Table 3. The outcome variables were the ED visits, hospital admissions, CHF clinic visits, and a composite total of ED visits, hospital admissions, and CHF clinic visits.

Data Collection

Patient predictors for both ED visits and hospital admissions that are listed in Table 3 were evaluated using various models. The predictors listed in Table 3 have been identified in both the CHF and general population literature as being predictors. Compliance was measured by the percentage of CHF outpatient clinic visits the patient went to. This percentage was calculated by the number of CHF outpatient clinic visits attended as the numerator and the total number of CHF clinic visits scheduled as the denominator. The timeframe for the clinic visits was over six months with time starting when they filled out the MLHFQ and PHQ-9 instruments through the patients' six month follow-up for ED visits or hospital admissions. Good compliance was defined as a CHF clinic visit percentage of greater than or equal to eighty percent while poor compliance will be defined as a CHF clinic visit percentage of less than eighty percent. Optimal medication therapy will also be collected from the patients' EMRs. This was defined as the presence of an angiotensin converting enzyme inhibitor (ACEI), or angiotensin receptor blocker (ARB) and a beta blocker at optimal doses. For this study, optimal medication therapy was defined as the patient being on either any ACEI or ARB medication and one of three beta blockers (metoprolol extended release, carvedilol, or bisoprolol) at an optimal dose . An optimal dose was considered the maximum dose for CHF or maximal tolerated dose either because of side effects, a heart rate between 50 and 60 beats per minute or a low blood pressure which was defined as either a systolic blood pressure of less than 90 mmHg or a diastolic blood pressure less than 60 mmHg. All of these predictors are available in the patients' electronic medical charts which was excised and placed into a password protected SPSS spreadsheet. If the potential risk factor was not readily available in the EMR then it was not included as a risk factor to be obtained because of feasibility issues.

Data Analysis

Multiple regression models were used to determine if various a priori determined sets of conceptually related predictors accounted for clinically meaningful amounts of variance in ED visits, hospital admissions, CHF clinic visits, and a composite outcome composed of ED visits, hospital admissions, and CHF clinic visits. Five conceptually meaningful risk models were constructed with advice from my Committee on Studies and applied to each of the 4 criterion variables described above. These models are shown in the results section. Therefore each of the five conceptual models was tested four times, once for each criterion variable, for a total of 20 multiple regression models. Neither stepwise nor hierarchical regression approaches were used because these approaches tend to produce models that do not generalize (i.e., replicate) because they capitalize on chance variations among the bivariate correlations among predictors and criteria (25).

Assumptions

It is widely recognized that medical record data are not fully accurate for many reasons and that patients do not always complete assessments accurately or honestly. These factors always produce some degree of measurement error in variables analyzed. In this preliminary study, I did not attempt to estimate the degree of measurement error of predictors or criteria. In fact, multiple regression models implicitly assume that the predictors and criteria are measured "without error" – i.e., such models do not have a term for assessing the measurement error of predictors of the criterion. To estimate error of measures and incorporate that into the statistical model being tested would require assessing multiple indicators of each construct, and then analyzing those multiple indicators and constructs with structural equation models (25) . Such efforts are beyond the scope of the aims of this study.

Chapter 4

Results

Results are divided into five sections:

1. Sample characteristics.
2. Evaluation of mean-score differences in health related quality of life between Hispanic versus non-Hispanic White CHF patients.
3. Examination of relationships of health related quality of life on healthcare utilization.
4. Examination of relationships between depression scores and health related quality of life scores for both Hispanic and non-Hispanic White CHF patients.
5. Prediction of criteria with conceptually constructed risk models.

Sample Characteristics

Two cohorts of patients were evaluated for this study. The first cohort of patients were Hispanic CHF patients (n=145) and the second cohort were non-Hispanic White CHF patients (n=118). All patients were seen at the UNMH CHF outpatient clinic for routine care. The patient demographic characteristics are seen in Table 4. The distribution of length of time patients have been going to the UNMH CHF outpatient clinic are seen in Figure 1, Hispanic and non-Hispanic White patients are seen in Figure 2.

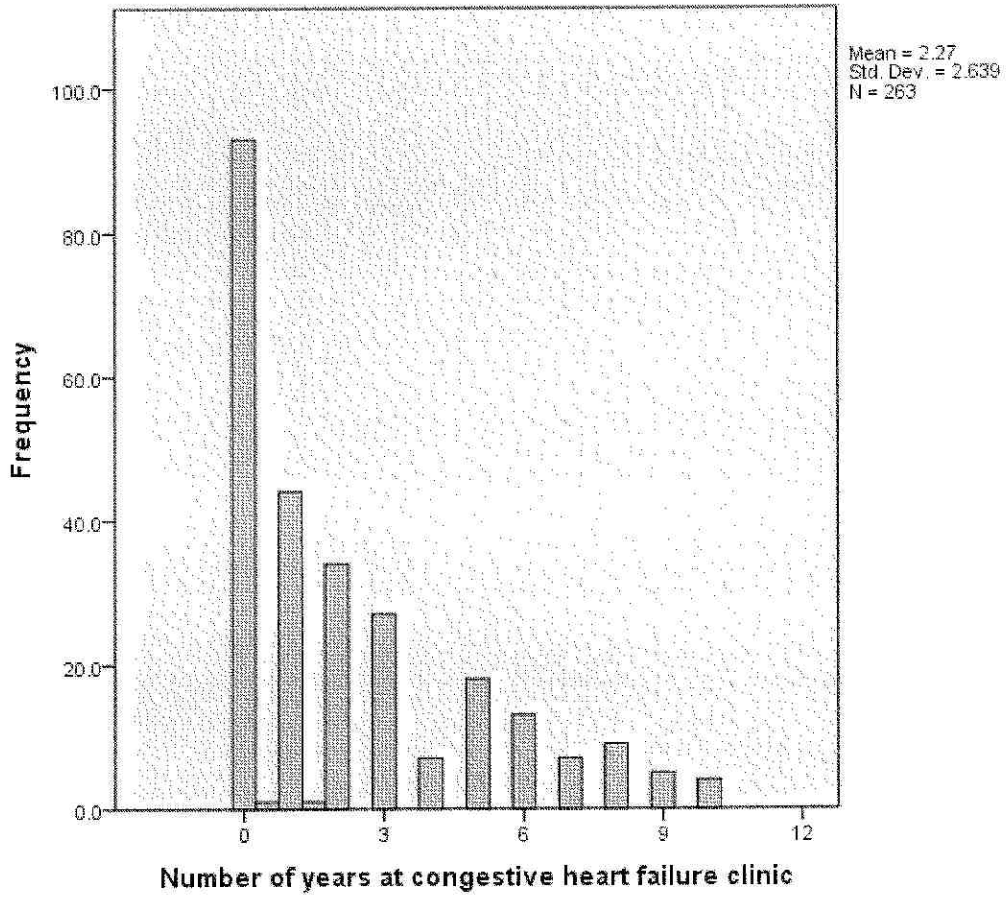
Four hundred four patients screened for inclusion into the study, based patients in the CHF clinic at UNMH from February 1st, 2011 to June 30th, 2012. The total number of patients included into this study was 263. The most common reasons for exclusion include questionnaires being filled out past June 30th, 2012, not having a diagnosis of CHF, and no ethnicity reported. To compare Hispanic patients to White non-Hispanic

Table 4. Study Patient Characteristics

Characteristic	Hispanic (n=145)	Non-Hispanic White (n=118)	p
Age, mean (SD), years	62.3 (11.7)	60.4 (12.2)	0.20
Male, number (%)	82 (56.6)	69 (58.5)	0.75
Primary language: English, number (%)	115 (79.3)	117 (99.2)	<0.001
Race, number (%)			<0.001
White	44 (61.1)	118 (100.0)	
African American	1 (1.4)	0 (0.0)	
Native Hawaiian	1 (1.4)	0 (0.0)	
Other	2 (2.8)	0 (0.0)	
>= 2 Races	24 (33.3)	0 (0.0)	
Marital status, number (%)			<0.001
Single	34 (26.8)	45 (42.9)	
Married	51 (40.2)	24 (22.9)	
Separated/Divorced	12 (9.4)	17 (16.2)	
Widowed	27 (21.3)	11 (10.5)	
Living with Partner	3 (2.4)	8 (7.6)	
Insurance, number (%)			0.14
Private	13 (10.7)	17 (16.8)	
Public	52 (42.6)	31 (30.7)	
UNM Care	41 (33.6)	40 (39.6)	
None	16 (13.1)	11 (10.9)	
Government (e.g., Medicare, Medicaid)	0 (0.0)	2 (2.0)	
Current PCP, number (%)	116 (83.5)	97 (82.2)	0.79
Ejection fraction, mean (SD)	36.8 (14.7)	39.2 (16.8)	0.22
NYHA class, number (%)			0.72
1	52 (35.8)	41 (34.7)	
2	63 (43.4)	53 (44.9)	
3-4	30 (20.7)	24 (20.3)	
Charlson Comorbidity Index, mean (SD)	2.9 (1.8)	2.9 (2.1)	0.92
Distance from hospital, mean (SD), miles	9.6 (16.3)	10.7 (18.8)	0.59
Number of medications, mean (SD)	9.2 (3.9)	9.7 (4.7)	0.33

PCP=Primary Care Provider;
NYHA=New York Heart Association

Figure 1. Histogram of Length of Time at the CHF clinic for the Total Study Population



patients in our study same, categorical characteristics such as gender, primary language, race, marital status, insurance status, current primary care provider, and New York Heart Association (NYHA) classification were evaluated by a chi-square, and continuous characteristics such as age, ejection fraction, Charlson Comorbidity Index score, distance from UNMH and the number of medications per patient were evaluated by t-tests to determine statistically significant differences between groups.

Both ethnicity groups were fairly similar with the exception of primary language, race, and marital status. Fewer Hispanic patients listed English as their primary language compared to non-Hispanic Whites (79.3% versus 99.2%, p<.001). More Hispanic patients were more racially diverse than non-Hispanic White patients (p<.001). Hispanic patients were more likely to be married and widowed, while non-Hispanic White patients were more likely to be single or separated/divorced (p<.001). Severity of disease as measured by NYHA classification status (p=0.72) and Charlson Comorbidity Index scores (p=0.92) were not statistically different between Hispanic and non-Hispanic White CHF patients.

Specific Aim 1: Comparing HRQOL between Hispanic versus Non-Hispanic White CHF Patients

Health-related quality of life (HRQOL) was assessed with MLHFQ Physical domain scores, MLHFQ Emotional domain scores, and MLHFQ Total scores. Patients with higher scores on the MLHFQ show lower HRQOL. Results are reported in Table 5. Hispanic patients showed higher MLHFQ scores (and thus lower HRQOL) for all three measures (physical, emotional, and total scores), but no statistically differences with

White Non-Hispanic patients were detected (all $p > 0.10$) and effect sizes were all small (all $d < 0.23$).

Table 5. Comparison of HRQOL of Hispanic vs. non-Hispanic White CHF Patients

HRQOL Measure	Hispanic (n=145)	Non-Hispanic White (n=118)	d *	p
MLHFQ Total Score, Mean (SD)	42.74 (30.65)	48.50 (30.40)	0.20	0.13
MLHFQ Physical Score, Mean (SD)	18.25 (13.60)	20.90 (13.02)	0.23	0.11
MLHFQ Emotional Score, Mean (SD)	9.75 (8.00)	11.18 (8.09)	0.13	0.15

MLHFQ = Minnesota Living with Heart Failure Questionnaire (CHF specific HRQOL Measure)

Specific Aim 2: Health-related quality of life and healthcare utilization

Healthcare utilization defined as ED visits for CHF, hospitalizations for CHF, CHF clinic visits, and a composite of all three were evaluated between Hispanic and non-Hispanic White CHF patients. Total events for these outcomes are shown in Table 6. Distributions of healthcare utilization in both of these groups are seen in Figures 3-6.

Table 6. Patients with Healthcare Utilization Events

Outcomes	**Hispanic** (n = 145)	**Non-Hispanic White** (n = 118)	**Risk Ratio** (95 % CI)	**p**
Emergency Dept. visits	23.5% (n=24)	30.5% (n=27)	0.72 (0.44 – 1.18)	0.20
Hospitalizations	30.3% (n=44)	36.4% (n=33)	1.09 (0.74 – 1.59)	0.67
CHF clinic visits	100% (n=145)	99.2% (n=117)	1.01 (0.99 – 1.03)	0.42
Composite outcomes	100% (n=145)	100% (n=118)	1.00 (0.99 – 1.02)	0.92

Figure 3. Histogram of ED visits

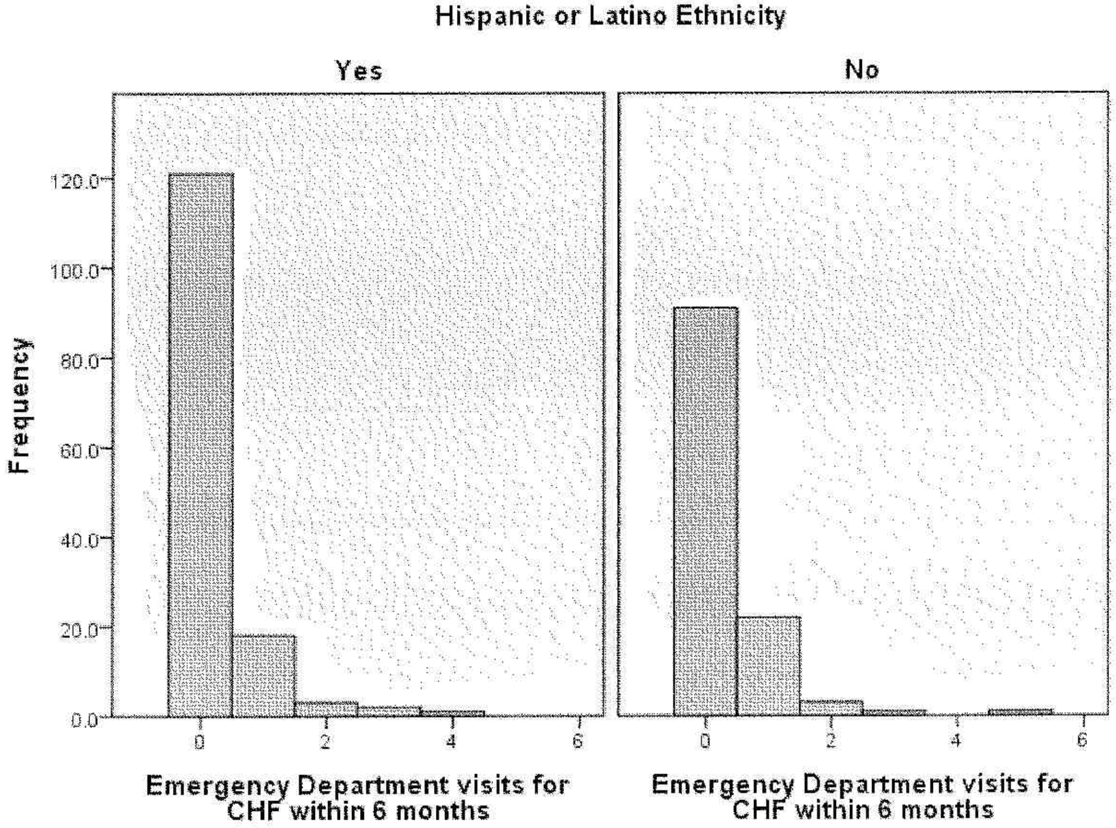


Figure 4. Histogram of Hospitalizations

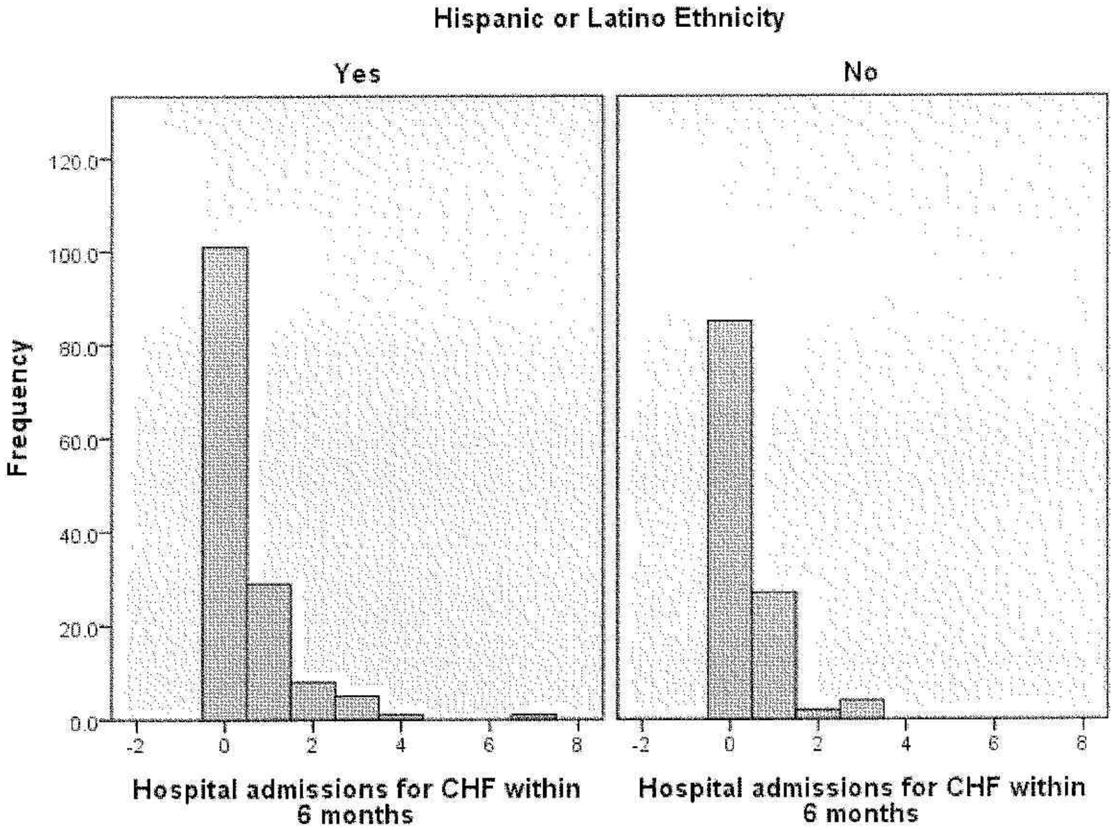


Figure 5. Histogram of CHF clinic visits

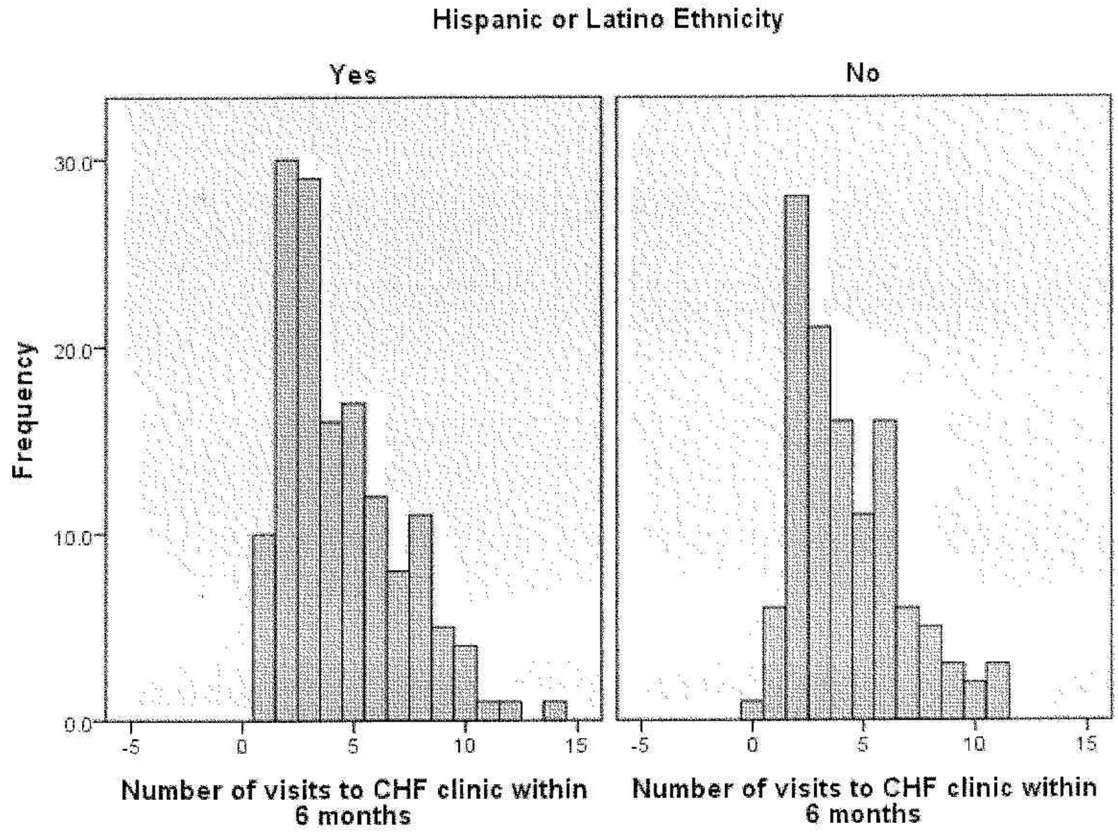
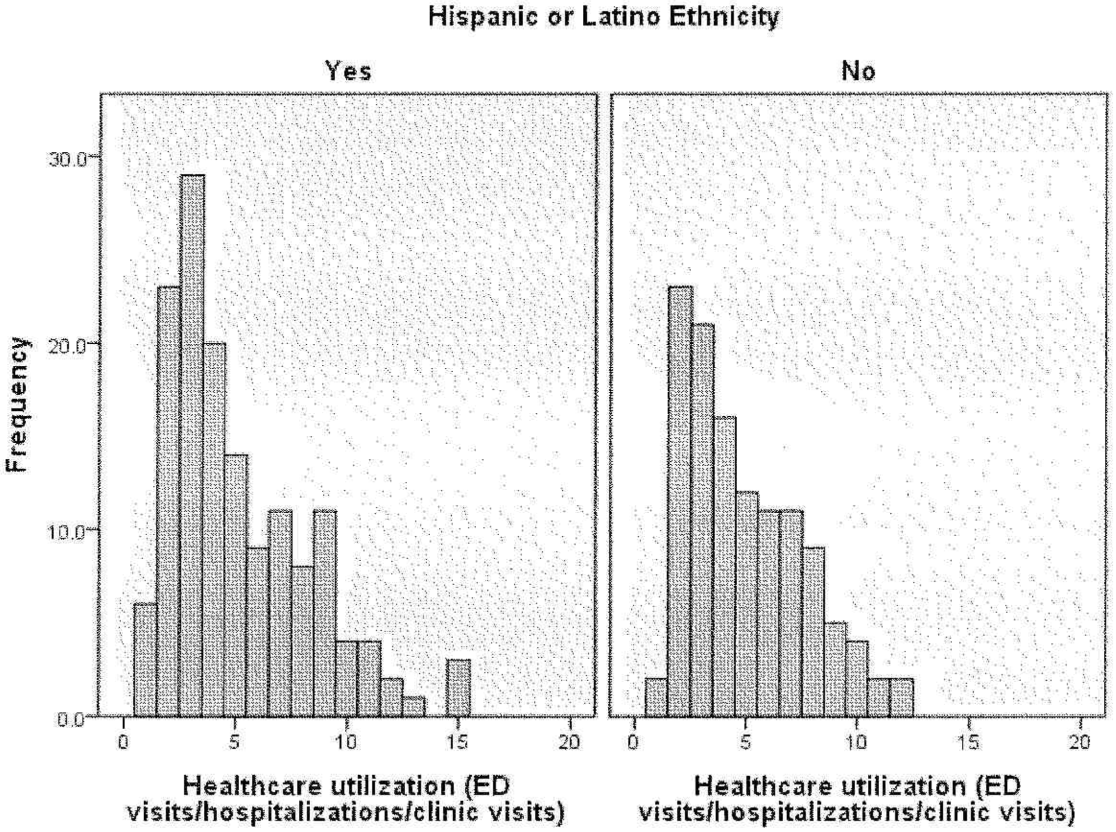


Figure 6. Histogram of Healthcare Utilization



The relationship between HRQOL and healthcare utilization was evaluated with correlations between as CHF-related hospital admissions, ED visits, CHF clinic visits, and a composite of those measures with the MLHFQ total score. Results are reported in Table 7. Hospital admissions were moderately correlated (both $r > 0.20$, $p < 0.05$) with HRQOL as measured by MLHFQ scores, but emergency department visits were not significantly correlated with MLHFQ scores in Hispanic patients ($r = 0.12$, $p = 0.15$). Emergency department for non-Hispanic Whites and clinic visits for both groups were correlated with MLHFQ (all $r > = .20$, all $p < .05$). The composite measure of healthcare utilization was correlated with MLHFQ (both $r > 0.25$; both $p < 0.01$). Correlations for

Hispanic patients and White non-Hispanic patients were not reliably different (all p > 0.34).

Table 7. Correlations between HRQOL vs. Healthcare Utilization Measures by Ethnicity

Correlations between:	Hispanic (n=144)	Non-Hispanic White (n=118)	p*
Hospital admissions vs. MLHFQ Total scores	.23 (p=0.01)	.27 (p=0.003)	.73
Emergency Dept. visits vs. MLHFQ Total scores	.12 (p=0.15)	.20 (p=0.04)	.51
Clinic visits vs. MLHFQ Total scores	.21 (p=0.01)	.23 (p=0.01)	.87
Healthcare utilization vs. MLHFQ Total scores	.27 (p=0.001)	.33 (p<0.001)	.60

* Comparison of Hispanic and non-Hispanic White correlations based on the comparing independent correlations test

MLHFQ = Minnesota Living with Heart Failure Questionnaire (CHF specific measure of HRQOL)

Healthcare utilization = hospital admissions + emergency dept. visits + clinic visits for congestive heart failure

Specific Aim 3: Health-related quality of life and depression scores

Evaluation of potential relationships between HRQOL and depression scores were divided into MLHFQ total scores, emotional domain scores, and physical domain scores with each compared to PHQ-9 total scores. Complete results are shown in Table 7.

MLHFQ total scores and PHQ-9 total scores

Correlations were created for each group and then compared against one-another. Correlations for each group alone indicate a correlation compared to a correlation coefficient of 0. Both individual correlations for both Hispanic, r(142) = .82, p < .001 and non-Hispanic White, r(116) = .71, p < .001 patients were statistically significant.

When the correlations for both groups were compared to each other they were statistically significantly different.

MLHFQ emotional domain scores and PHQ-9 total scores

Correlations for each group alone indicate a correlation compared to a correlation coefficient of 0. Both individual correlations for both Hispanic, r(142) = .83, p < .001 and non-Hispanic White, r(116) = .77, p < .001 patients were statistically significant. However, when the correlations for both groups were compared to each other they were not statistically significantly different.

MLHFQ physical domain scores and PHQ-9 scores

Correlations for each group alone indicate a correlation compared to a correlation coefficient of 0. Both individual correlations for both Hispanic, r(142) = .79, p < .001 and non-Hispanic White, r(116) = .67, p < .001 patients were statistically significant. When the correlations for both groups were compared to each other they were statistically significantly different.

Table 8. Correlations of HRQOL vs. Depression Scores by Ethnicity

Correlations between:	Hispanic (n=144)	Non-Hispanic White (n=118)	p *
PHQ-9 vs. MLHFQ Total scores	.82 (p<0.001)	.71 (p<0.001)	.03
PHQ-9 vs. MLHFQ Emotional scores	.83 (p<0.001)	.77 (p<0.001)	.18
PHQ-9 vs. MLHFQ Physical scores	.79 (p<0.001)	.67 (p<0.001)	.04

*Comparison of Hispanic and non-Hispanic White correlations based on the comparing independent correlations test

MLHFQ=Minnesota Living with Heart Failure Questionnaire (CHF specific measure of HRQOL)

PHQ-9=Patient Health Questionnaire-9 (depression measure)

Specific Aim 4: Conceptually constructed risk models of Healthcare Utilization in CHF patients

Risk factors (see Table 3 above) that might predict healthcare utilization for CHF patients in this study were analyzed for: ED visits, hospital visits, CHF clinic visits, and a composite measure totaling all 3 measures in separate regression models. Each specific risk model (i.e., set of risk predictors) was conceptualized by a committee of 3 cardiac pharmacy experts based on sets of variables they believed would be most likely to predict the outcomes above. Each healthcare use outcome was measured over a six-month period after the patient completed the MLHFQ and PHQ-9 questionnaires. Only patient visits to UNMH were assessed. Complete predictor models are described below.

Conceptual Risk Models Tested

In collaboration with my Committee on Studies, I conceived 5 conceptual models using predictor variables that could be excised from the medical record and that we believed might best predict healthcare utilization for CHF patients at UNM Hospital:

Conceptual Risk Models to Test with Multiple Regression

Model 1 – Patient Characteristic Predictors:

Ethnicity, gender, living with partner, home distance from UNM Hospital, primary language, insurance status, primary care provider presence

Model 2a -- Medical Management Predictors:

Ethnicity, gender, living with partner, on ACEI, on Beta blocker, on MRA

Model 2b – Optimal Medical Management Predictors:

Ethnicity, gender, living with partner, optimal dose ACEI, optimal dose Beta blocker

Model 3a – Severity of Illness Predictors:

Ethnicity, gender, living with partner, NYHA status, MLHFQ physical score, MLHFQ emotional score, PHQ-9 score, Charlson Comorbidity Index, length of CHF diagnosis, EF, number of medications

Model 3b: - Historical Severity of Illness Predictors:

Ethnicity, gender, living with partner, # CHF admissions within previous 12 months, # ED visits within previous 12 months, # clinic visits within the previous 12 months

Twenty standard multiple regressions were performed with SPSS to predict: ED visits, Hospital Admissions, CHF Clinic visits, and a composite criterion that is the sum of the other three healthcare utilization outcomes. Regression predictors (see risk variables shown in Table 3) were organized into five model sets (see list of conceptual models in the section just above) to represent 5 conceptual models. Results of evaluation of regression model assumptions did not lead to any transformations of the data. No outliers were detected. Mean imputation was used to substitute for missing data when feasible. Missing values for various predictors led to testing models of varying sample sizes (N = 196, 232, 171, 232, and 200, respectively, out of a total possible N of 263). Missing values imputation using a more sophisticated regression imputation approaches was deemed beyond the scope of this thesis research by the Committee on Studies.

Tables 8-12 display the correlations between the criterion and predictor variables. It is worth noting that the vast majority of correlations between predictors and healthcare utilization outcomes were small (95% of r's < 0.20, with most < 0.10). Tables 13-16 display summaries of regression model results for the 4 criteria: Hospitalizations, Emergency Department Visits, CHF Clinic Visits, and the summative composite of those three healthcare utilization measures. Tables 13 - 16 provide: (1) the unstandardized regression coefficients (b); (2) the standard error of the unstandardized regression coefficients (SE b); (3) the standardized regression coefficients (β), (4) t-values for the test of each predictor's unique contribution to predicting the criterion; (5) R^2 for the overall model including all predictors; (6) F-values for the test of the R for each overall model; and , and, (7) p-values for the t and F tests. Thus, 5 conceptual models with different sets of predictors were tested for each of 4 criteria. The main interest was which model predicted the criteria for healthcare use criteria best. Of secondary interest was which individual predictors contributed unique variance in predicting each criteria.

Predicting Emergency Department Visits

R for the overall models for predicting Emergency Department Visits was significant only for Model 3a, severity of illness, F=2.035, p=.023, $R^2 = 0.10$, and for Model 3b, historical severity of illness, F=2.875, p=.01, $R^2 = 0.08$. Thus, all 5 models revealed a rather low percentage of variance accounted for by the predictors. Only two individual predictors of the 36 used in the 4 models were statistically significant (i.e., not more than the two that would be expected to represent Type I errors: 2 / 36 = 0.056).

Predicting Hospitalizations

R for the overall models for predicting Hospitalizations was significant for: (1) Model 2a, medical management, F=2.98, $p < 0.03$, $R^2 = 0.07$; (2) for Model 2b, optimal medical management, F=2.41, $p < 0.04$, $R^2 = 0.07$; (3) for Model 3a, severity of illness, F=4.36, $p < 0.001$, $R^2 = 0.19$; and (4) for Model 3b, historical severity of illness, F=3.98, $p < 0.001$, $R^2 = 0.11$. Thus, Hospitalizations were predicted somewhat better than Emergency Department Visits were predicted. Only six individual predictors of the 36 used in the 4 models were statistically significant (i.e., little more than the two that would be expected to represent Type I errors: 6 / 36 = 0.167).

Predicting CHF clinic visits

R for the overall models for predicting CHF clinic visits was significant for: (1) for Model 2b, F=3.05, $p < 0.02$, $R^2 = 0.06$; and (2) for Model 3a, F=3.43, $p < 0.001$, $R^2 = 0.11$. Thus, prediction of CHF clinic visits was not very strong. Only 5 individual predictors of the 36 used in the 4 models were statistically significant (i.e., little more than the two that would be expected to represent Type I errors ; 5 / 36 = 0.139).

Predicting the Sum ED visits, Hospital Visits, and CHF Clinic visits

R for the overall models for predicting the summative composite criterion of all three methods of healthcare utilization was again significant for: (1) for Model 2b, F=3.61, $p < 0.02$, $R^2 = 0.10$; and (2) for Model 3a, F=5.22, $p < 0.001$, $R^2 = 0.22$. Thus, prediction of CHF clinic visits was not very strong. Only 5 individual predictors of the 36 used in the 4 models were statistically significant (i.e., little more than the two that would be expected to represent Type I errors: 5 / 36 = 0.139).

Summary of Results for Multiple Regression Models

Model 3a (Severity of Illness) was the only regression model that predicted all 4 healthcare use criteria. Model 3a had an average of 16% of variance accounted for by the predictors (i.e., an average multiple R of 0.40) (see Tables 13 – 16). However, no individual predictor from that model showed statistically significant unique contribution to the overall model prediction for all 4 criteria. Ejection fraction did show significant unique contribution for 2 of the 4 criteria and a marginally significant contribution ($p < 0.08$) for a third criteria.

Table 9. **Correlation Coefficients of Patient Characteristic Predictors with Healthcare Criteria**

Model 1: Patient Characteristics		
Predictors	**r with ED visits, r**	**p**
Ethnicity: Hispanic vs. Non-Hispanic	.05	.26
Gender	-.01	.43
Marital status	.09	.11
Distance from UNMH	-.07	.18
Primary language	-.08	.14
Insurance status	-.04	.31
Primary care provider	-.08	.12
	r with Hospitalizations	**p**
Ethnicity: Hispanic vs. Non-Hispanic	-.04	.31
Gender	-.09	.11
Marital status	-.06	.21
Distance from UNMH	-.05	.27
Primary language	.02	.41
Insurance status	.12	.05
Primary care provider	.01	.44
	r with CHF clinic visits	**p**
Ethnicity: Hispanic vs. Non-Hispanic	-.03	.33
Gender	.01	.43
Marital status	-.02	.39
Distance from UNMH	-.11	.06
Primary language	.11	.06
Insurance status	-.09	.11
Primary care provider	-.13	.04
	r with Healthcare utilization*	**p**
Ethnicity: Hispanic vs. Non-Hispanic	-.03	.35
Gender	-.02	.40
Marital status	-.02	.42
Distance from UNMH	-.13	.04
Primary language	.09	.12
Insurance status	-.05	.25
Primary care provider	-.13	.03

*Healthcare utilization = sum of CHF-related ED visits + hospitalizations + CHF clinic visits
CHF=congestive heart failure;
ED=Emergency Department;
UNMH=University of New Mexico Hospital

Table 10. Correlation Coefficients of Medical Management Predictors with Healthcare Criteria

Model 2a: Medical Management Predictors		
Predictors	**r with ED visits**	**p**
Ethnicity: Hispanic vs. Non-Hispanic	.03	.35
Gender	-.08	.12
Marital status	.02	.40
On ACEI/ARB	.08	.12
On beta-blockers	.08	.10
On MRA	.03	.34
	r with Hospitalizations	**p**
Ethnicity: Hispanic vs. Non-Hispanic	-.06	.17
Gender	-.13	.02
Marital status	-.06	.18
On ACEI/ARB	-.23	<.001
On beta-blockers	-.01	.45
On MRA	-.02	.38
	r with CHF clinic visits	**p**
Ethnicity: Hispanic vs. Non-Hispanic	-.02	.39
Gender	-.06	.20
Marital status	-.04	.26
On ACEI/ARB	.05	.24
On beta-blockers	.03	.36
On MRA	.02	.37
	r with Healthcare Utilitization*	**p**
Ethnicity: Hispanic vs. Non-Hispanic	-.03	.33
Gender	-.11	.05
Marital status	-.05	.22
On ACEI/ARB	-.01	.43
On beta-blockers	.04	.28
On MRA	.02	.39

*Healthcare utilization = sum CHF-related ED visits + hospitalizations + CHF clinic visits
CHF=congestive heart failure
ED=Emergency Department
ACEI/ARB=Angiotension converting enzyme inhibitor/angiotension receptor blocker
MRA=mineralcorticoid receptor antagonist

Table 11. Correlation Coefficients of Optimal Medical Management Predictors with Healthcare Criteria

Model 2b: Optimal Medical Management Predictors		
Predictors	**r with ED visits**	**p**
Ethnicity: Hispanic vs. Non-Hispanic	.05	.28
Gender	-.12	.05
Marital status	.01	.44
Target dose of ACEI/ARB	-.12	.07
Target dose of beta-blocker	-.11	.07
	r with Hospitalizations for CHF	**p**
Ethnicity: Hispanic vs. Non-Hispanic	.001	.49
Gender	-.21	.003
Marital status	-.14	.03
Target dose of ACEI/ARB	-.10	.09
Target dose of beta-blocker	-.05	.27
	r with CHF clinic visits	**p**
Ethnicity: Hispanic vs. Non-Hispanic	-.07	.19
Gender	-.06	.21
Marital status	-.06	.21
Target dose of ACEI/ARB	-.14	.03
Target dose of beta-blocker	-.27	<.001
	r with *Healthcare utilization	**p**
Ethnicity: Hispanic vs. Non-Hispanic	-.05	.28
Gender	-.14	.04
Marital status	-.09	.13
Target dose of ACEI/ARB	-.18	.01
Target dose of beta-blocker	-.27	<.001

*Healthcare utilization = composite variable of ED visits + hospitalizations + CHF clinic visits
CHF=congestive heart failure
ED=Emergency Department
ACEI/ARB= Angiotension converting enzyme inhibitor/angiotension receptor blocker

Table 12. Correlation Coefficients of Severity of Illness Predictors with Healthcare Criteria

Model 3a: Severity of Illness Predictors		
Predictors	**r with ED visits**	**p**
Ethnicity: Hispanic vs. Non-Hispanic	.03	.35
Gender	-.08	.12
Marital status	.02	.40
NYHA functional status	.11	.04
MLHFQ Physical scores	.09	.09
MLHFQ Emotional scores	.13	.02
PHQ-9 Total scores	.06	.20
Charlson co-morbidity index scores	.17	<.01
Length of CHF diagnosis	-.03	.33
Ejection fraction	-.08	.10
Number of medications	.20	.001
	r with Hospitalizations	**p**
Ethnicity: Hispanic vs. Non-Hispanic	-.06	.17
Gender	-.13	.02
Marital status	-.06	.18
NYHA functional status	.29	<.001
MLHFQ Physical scores	.20	.001
MLHFQ Emotional scores	.11	.05
MLHFQ Total scores	.19	.002
PHQ-9 Total scores	.12	.03
Charlson co-morbidity index scores	.32	<.001
Length of CHF diagnosis	.01	.45
Ejection fraction	-.02	.35
Number of medications	.15	.01
	r with CHF Clinic Visits	**p**
Ethnicity: Hispanic vs. Non-Hispanic	-.02	.39
Gender	-.06	.20
Marital status	-.04	.26
NYHA functional status	.26	<.001
MLHFQ Physical scores	.19	<.01
MLHFQ Emotional scores	.10	.06
MLHFQ Total scores	.18	.003
PHQ-9 Total scores	.07	.13
Charlson co-morbidity index scores	.01	.45
Length of CHF diagnosis	-.20	.001
Ejection fraction	-.22	<.001
Number of medications	.03	.32
	r with *Healthcare Utilization	**p**
Ethnicity: Hispanic vs. Non-Hispanic	-.03	.33
Gender	-.11	.05
Marital status	-.05	.22
NYHA functional status	.34	<.001
MLHFQ Physical scores	.24	<.001
MLHFQ Emotional scores	.15	.01
MLHFQ Total scores	.24	<.001
PHQ-9 Total scores	.11	.04
Charlson co-morbidity index scores	.15	.01
Length of CHF diagnosis	-.17	<.01
Ejection fraction	-.22	<.001
Number of medications	.12	.04

*Healthcare utilization = composite variable of ED visits + hospitalizations + CHF clinic visits

CHF=congestive heart failure	ED=Emergency Department
NYHA=New york heart association	MLHFQ=Minnesota Living with Heart Failure Questionnaire
PHQ-9=Patient Health Questionnaire-9	

Table 13. Correlation Coefficients of Severity of Illness-Historical Perspective Predictors with Healthcare Criteria

Model 3b: Severity of Illness-Historical Perspective Predictors		
Predictors	**r with ED visits**	**p**
Ethnicity: Hispanic vs. Non-Hispanic	.06	.22
Gender	-.12	.04
Marital status	.01	.43
ED visits for CHF in past 12 months*	.200	<.01
Hospital admits for CHF in past 12 months	.231	<.01
CHF clinic visits in past 12 months	-.020	.39
	r with Hospitalizations	**p**
Ethnicity: Hispanic vs. Non-Hispanic	-.07	.18
Gender	-.14	.02
Marital status	-.11	.07
ED visits for CHF in past 12 months	.17	.01
Hospital admits for CHF in past 12 months	.28	<.01
CHF clinic visits in past 12 months	.04	.28
	r with CHF clinic visits	**p**
Ethnicity: Hispanic vs. Non-Hispanic	.02	.39
Gender	-.06	.21
Marital status	-.04	.31
ED visits for CHF in past 12 months	-.10	.08
Hospital admits for CHF in past 12 months	-.03	.34
CHF clinic visits in past 12 months	-.06	.19
	r with *Healthcare utilization	**p**
Ethnicity: Hispanic vs. Non-Hispanic	.008	.46
Gender	-.12	.04
Marital status	-.06	.19
ED visits for CHF in past 12 months	.02	.39
Hospital admits for CHF in past 12 months	.12	.04
CHF clinic visits in past 12 months	-.04	.27

*Healthcare utilization = composite variable of ED visits + hospitalizations + CHF clinic visits
CHF = Congestive heart failure
ED = Emergency Department

Table 14. Regression Models for Predicting Emergency Dept. Visits for CHF at 6-months

Predictors for Model 1: Demographics (n=196)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	.04	.10	.03	.38	.71
Gender	-.05	.10	-.04	-.49	.63
Marital status	.17	.10	.13	1.71	.09
Distance from UNMH	-.002	.002	-.07	-.94	.35
Primary language	-.18	.15	-.09	-1.18	.24
Insurance status	-.03	.10	-.03	-.35	.73
Primary care provider	-.17	.12	-.10	-1.37	.17
R^2 = .03				**.94**	**.48**
Predictors for Model 2a: Medical Management (n=232)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	.07	.09	.05	.72	.47
Gender	-.12	.09	-.09	-1.29	.20
Marital status	.05	.09	.04	.57	.57
On ACEI	.13	.11	.08	1.12	.26
On β-blocker	.19	.16	.08	1.16	.25
On MRA	.04	.11	.02	.35	.73
R^2 = .02				**.83**	**.55**
Predictors for Model 2b: Optimal Medical Management (n=171)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	.09	.12	.06	.72	.47
Gender	-.20	.12	-.13	-1.70	.09
Marital status	.08	.12	.05	.68	.50
Optimal dose of ACEI	-.17	.13	-.11	-1.28	.20
Optimal dose of β-blocker	-.07	.13	-.05	-.55	.58
R^2 = .04				**1.30**	**.27**
Predictors for Model 3a: Severity of Illness (n=232)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	.05	.09	.03	.50	.62
Gender	-.07	.09	-.05	-.78	.44
Marital status	.04	.09	.03	.39	.70
NYHA status	.02	.07	.02	.29	.77
MLHFQ Physical score	-.02	.01	-.31	-1.18	.24
MLHFQ Emotional score	.02	.02	.17	.86	.39
PHQ-9 score	-.01	.01	-.15	-1.29	.20
Charlson Comorbidity Index	.05	.02	.14	1.95	.05
Length of CHF	.000	.001	-.02	-.28	.80
EF	-.01	.003	-.12	-1.76	.08
Number of medications*	.02	.01	.15	2.09	.04
R^2 = .10*				**2.04**	**.02**
Predictors for Model 3b: Severity of Illness-Historical Perspective (n=200)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	.10	.10	.07	.10	.32
Gender	-.18	.10	-.13	-1.92	.06
Marital status	.08	.10	.06	.83	.41
# CHF ED visits in 12 mos	.10	.09	.10	1.16	.25
# CHF hospital visits in12 mos*	.15	.07	.18	2.04	.04
# CHF clinic visits in 12 mos	-.003	.01	-.01	-.20	.84
R^2 = .08*				**2.88**	**.01**

* Indicates statistically significant,
UNMH=University of New Mexico Hospitals,
ACEI=Angiotensin converting enzyme inhibitor, MRA=Mineralcorticoid receptor antagonist,
NYHA=New York Heart Association, MLHFQ=Minnesota Living with Heart Failure,
EF=ejection fraction, CHF=congestive heart failure

Table 15. Regression models for predicting Hospitalizations for CHF at 6-months

Predictors for Model 1: Demographics (n=196)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	-.04	.13	-.02	-.30	.77
Gender	-.11	.13	-.06	-.86	.39
Marital status	-.11	.13	-.06	-.84	.41
Distance from UNMH	-.002	.003	-.05	-.74	.46
Primary language	.08	.20	.03	.38	.71
Insurance status	.21	.13	.12	1.63	.10
Primary care provider	-.03	.16	-.01	-.17	.86
R^2 = .03				.76	.63
Predictors for Model 2a: Medical Management (n=232)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	-.14	.12	-.08	-1.23	.22
Gender	-.12	.12	-.11	-1.70	.09
Marital status	-.10	.12	-.06	-.84	.40
On ACEI*	-.49	.14	-.22	-3.43	.001
On β-blocker	.02	.20	.01	.10	.92
On MRA	-.03	.14	-.01	-.20	.84
R^2 = .07*				2.98	.02
Predictors for Model 2b: Optimal Medical Management (n=171)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	-.01	.12	-.01	-.10	.92
Gender*	-.31	.12	-.21	-2.65	.01
Marital status	-.16	.12	-.10	-1.31	.19
Optimal dose of ACEI	-.19	.13	-.13	-1.46	.15
Optimal dose of β-blocker	.06	.13	.04	.43	.67
R^2 = .07*				2.41	.04
Predictors for Model 3a: Severity of Illness (n=232)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	-.12	.11	-.07	-1.04	.30
Gender	-.18	.12	-.10	-1.50	.14
Marital status	-.07	.11	-.04	-.58	.56
NYHA status*	.21	.09	.18	2.48	.01
MLHFQ Physical score	-.01	.02	-.21	-.86	.39
MLHFQ Emotional score*	-.04	.02	-.38	-1.99	.05
PHQ-9 score	.01	.01	.06	.51	.61
Charlson comorbidity index*	.12	.03	.25	3.81	<.001
Length of CHF	.000	.002	.01	.09	.93
EF	-.001	.004	-.03	-.40	.69
Number of medications	.004	.01	.02	.29	.77
R^2 = .19*				4.36	<.001
Predictors for Model 3b: Severity of Illness-Historical Perspective (n=200)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	-.13	.13	-.07	-1.02	.31
Gender	-.24	.13	-.13	-1.91	.06
Marital status	-.15	.13	-.08	-1.18	.24
# CHF ED visits w/in 12 months	-.004	.11	-.003	-.03	.98
# CHF hospital visits w/in 12 months*	.32	.10	.28	3.25	.001
# CHF clinic visits w/in 12 months	.002	.02	.01	.10	.92
R^2 = .11*				3.98	.001

* Indicates statistically significant at $p < 0.05$
UNMH=University of New Mexico Hospitals,
ACEI=Angiotensin converting enzyme inhibitor
NYHA=New York Heart Association
EF=ejection fraction

MRA=Mineral corticoid receptor antagonist
MLHFQ=Minnesota Living with Heart Failure
CHF=congestive heart failure

Table 16. Regression models for predicting CHF clinic visits at 6-months

Predictors for Model 1: Demographics (n=196)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	-.03	.38	-.01	-.08	.94
Gender	-.08	.38	-.02	-.22	.83
Marital status	-.10	.38	-.02	-.25	.81
Distance from UNMH	-.01	.01	-.10	-1.41	.16
Primary language	.79	.58	.11	1.36	.17
Insurance status	-.27	.37	-.05	-.71	.48
Primary care provider	-.78	.46	-.12	-1.68	.10
$R^2 = .04$				1.22	.29
Predictors for Model 2a: Medical Management (n=232)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	-.09	.34	-.02	-.25	.80
Gender	-.27	.34	-.05	-.80	.42
Marital status	-.19	.35	-.04	-.56	.58
On ACEI	.29	.42	.05	.69	.49
On β-blocker	.09	.59	.01	.15	.88
On MRA	.11	.41	.02	.28	.78
$R^2 = .01$				.29	.94
Predictors for Model 2b: Optimal Medical Management (n=171)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	-.45	.39	-.09	-1.18	.24
Gender	-.14	.39	-.03	-.36	.72
Marital status	-.29	.40	-.06	-.72	.47
Optimal dose of ACEI	-.09	.43	-.02	-.20	.84
Optimal dose of β-blocker*	-1.33	.43	-.26	-3.08	<.01
$R^2 = .06$*				3.05	.01
Predictors for Model 3a: Severity of Illness (n=232)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	-.12	.32	-.03	-.39	.70
Gender	-.34	.33	-.07	-1.01	.32
Marital status	-.14	.32	-.03	-.44	.66
NYHA status*	.55	.24	.17	2.29	.02
MLHFQ Physical score	-.01	.05	-.04	-.14	.89
MLHFQ Emotional score	-.09	.06	-.29	-1.51	.13
PHQ-9 score	-.01	.04	-.02	-.14	.89
Charlson comorbidity index	-.05	.09	-.04	-.60	.55
Length of CHF*	-.01	.004	-.17	-2.61	.01
EF*	-.03	.01	-.19	-2.94	.004
Number of medications	.02	.04	.04	.61	.55
$R^2 = .11$*				3.43	<.001
Predictors for Model 3b: Severity of Illness-Historical Perspective (n=200)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	-.02	.34	-.003	-.05	.96
Gender	-.24	.33	-.05	-.72	.47
Marital status	-.15	.35	-.03	-.45	.66
# CHF ED visits w/in 12 months	-.45	.30	-.13	-1.48	.14
# CHF hospital visits w/in 12 months	.15	.26	.05	.57	.57
# CHF clinic visits w/in 12 months	-.04	.05	-.06	-.87	.38
$R^2 = .02$				.65	.69

* Indicates statistically significant at $p < 0.05$
UNMH=University of New Mexico Hospitals,
ACEI=Angiotensin converting enzyme inhibitor
NYHA=New York Heart Association
EF=ejection fraction
MRA=Mineral corticoid receptor antagonist
MLHFQ=Minnesota Living with Heart Failure
CHF=congestive heart failure

Table 17. Regression models for sum of ED visits, hospitalizations, and clinic visits for CHF at 6-months

Predictors for Model 1: Demographics (n=196)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	-.03	.43	-.01	-.07	.94
Gender	-.24	.42	-.04	-.58	.56
Marital status	-.04	.43	-.01	-.08	.93
Distance from UNMH	-.02	.01	-.12	-1.70	.09
Primary language	.69	.65	.08	1.06	.29
Insurance status	-.09	.42	-.02	-.21	.84
Primary care provider	-.97	.52	-.14	-1.87	.06
$R^2 = .04$				1.19	.31
Predictors for Model 2a: Medical Management (n=232)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	-.16	.39	-.03	-.42	.68
Gender	-.59	.39	-.10	-1.50	.14
Marital status	-.24	.40	-.04	-.60	.55
On ACEI	-.08	.48	-.01	-.17	.87
On β-blocker	.29	.68	.03	.43	.67
On MRA	.12	.48	.02	.26	.80
$R^2 = .02$				.58	.75
Predictors for Model 2b: Optimal Medical Management (n=171)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	-.38	.45	-.06	-.85	.40
Gender	-.65	.45	-.11	-1.45	.15
Marital status	-.36	.46	-.06	-.78	.44
Optimal dose of ACEI	-.44	.50	-.08	-.89	.37
Optimal dose of β-blocker*	-1.34	.50	-.23	-2.69	.01
$R^2 = .10$*				3.61	<.001
Predictors for Model 3a: Severity of Illness (n=232)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	-.20	.36	-.03	-.55	.58
Gender	-.59	.37	-.10	-1.57	.12
Marital status	-.17	.36	-.03	-.48	.63
NYHA status*	.78	.27	.20	2.90	.004
MLHFQ Physical score	-.12	.07	-.33	-1.76	.08
MLHFQ Emotional score	.06	.03	.62	1.89	.06
PHQ-9 score	-.01	.04	-.03	-.29	.77
Charlson comorbidity index	.11	.10	.08	1.15	.25
Length of CHF*	-.01	.01	-.15	-2.37	.02
EF*	-.04	.01	-.20	-3.20	.002
Number of medications	.05	.04	.08	1.16	.25
$R^2 = .22$*				5.22	<.001
Predictors for Model 3b: Severity of Illness-Historical Perspective (n=200)	**b**	**SE b**	**β**	**t or F**	**p**
Ethnicity	-.05	.40	-.01	-.13	.90
Gender	-.66	.39	-.12	-1.68	.09
Marital status	-.23	.41	-.04	-.56	.58
# CHF ED visits w/in 12 months	-.35	.36	-.09	-.99	.32
# CHF hospital visits w/in 12 months*	.62	.31	.18	2.01	.05
# CHF clinic visits w/in 12 months	-.04	.06	-.06	-.76	.45
$R^2 = .04$				1.35	.24

* Indicates statistically significant at $p < 0.05$

UNMH=University of New Mexico Hospitals,
ACEI=Angiotensin converting enzyme inhibitor
NYHA=New York Heart Association
EF=ejection fraction
MRA=Mineral corticoid receptor antagonist
MLHFQ=Minnesota Living with Heart Failure
CHF=congestive heart failure

Chapter 5

Discussion, Conclusion, and Recommendations

This research study had four specific aims. The first specific aim was to determine if there are mean-score differences in HRQOL between Hispanic and non-Hispanic White CHF patients using the Minnesota Living with Heart Failure Questionnaire (MLHFQ). The second specific aim was to look at the relationship of HRQOL in Hispanic and non-Hispanic White CHF patients with hospital admissions, Emergency Department visits, CHF clinic visits, and a combination of the hospital admissions, Emergency Department (ED) visits, and CHF clinic visits within a 6-month period after completing the MLHFQ. The third specific aim was to look at the relationship between the reported Patient Health Questionnaire-9 (PHQ-9) scores and HRQOL scores in both Hispanic and non-Hispanic White CHF patients. The fourth specific aim was to test various conceptually constructed risk models abilities to predict hospital admissions for CHF, ED visits for CHF, visits to the CHF clinic, and a composite of hospitalizations, ED visits, and clinic visits for CHF.

Discussion

This study shows no difference between self-reported HRQOL as measured by MLHFQ between Hispanic and non-Hispanic White CHF patients. While the scores for the MLHFQ were lower in the Hispanic group compared to the non-Hispanic White group they were not statistically significantly different, and the size of effect was small (about $d = 0.20$). The mean total, physical domain, and emotional domain for this study were similar to scores found in previous literature (3,4,15). Studies by Reigel et al. (4,15) evaluated changes in HRQOL in Hispanic and non-Hispanic CHF patients based on a telephone intervention. While the present study did not use any interventions and only evaluated HRQOL once, it did not show reliable differences in HRQOL between Hispanic and non-Hispanic White CHF patients. If such differences exist in the populations, they appear to be small and require larger sample sizes to detect. Different studies can be done based on the Reigel studies (4,15). For example, a study using the specialized CHF clinic at UNMH as the intervention and care obtained through the patients' PCP as the control with the outcome of MLHFQ questionnaire scores at 6 and 12 months, a significant change in scores would be anticipated in the intervention group compared to the control group. It may also be hypothesized Hispanic patients would show a greater response to the intervention than non-Hispanic patients.

Previous studies have not evaluated potential differences in self-reported HRQOL and healthcare utilization between these two groups. Healthcare utilization in this study was defined as hospital visits alone, ED visits alone, CHF clinic visits alone, and a composite of all three types of visits. None of the correlations within Hispanic and non-Hispanic White patient groups were significantly different from each other for any of the healthcare utilization measures used in this study. Hospital Admissions and the composite Healthcare Utilization measure showed significant correlations with HRQOL as measured by the MLHFQ such that as HRQOL declined, the number of admissions and overall healthcare use increased. Note that increases in MLHFQ scores indicate declining HRQOL. Emergency department visits and clinic visits were not significantly correlated with HRQOL. The study by Rumsfeld et al. (17) showed a relationship between HRQOL and depressive symptoms in CHF patients. Rumsfeld's study measured depressive symptoms with the Medical Outcomes Study-Depression (MOS-D) questionnaire and HRQOL with the Kansas City Cardiomyopathy Questionnaire (KCCQ). This study measured depressive symptoms with the PHQ-9 questionnaire and HRQOL with the MLHFQ. However, the present study evaluated both depressive symptoms and HRQOL differently than the Rumsfeld study. The current study showed very strong positive correlations (all $r > 0.70$, all $p < 0.001$) in both the Hispanic and non-Hispanic White groups between PHQ-9 total scores (depression) and each of the three MLHFQ scores (HRQOL; total QOL score, emotional QOL score and physical QOL score). Thus, not surprisingly, as health related quality of life decreases, depression increases. Rumsfeld's study did not evaluate differences between any racial or ethnic groups. The present study found a statistically significantly ($p < 0.01$) stronger correlation in the Hispanic group than the non-Hispanic White group for the MLHFQ total and physical domain scores, but not the emotional domain scores.

This study evaluated four measures of healthcare utilization and found risk factors for each measure that varied slightly from each other. This is the first study to our knowledge that evaluated a priori determined groupings of predictors for healthcare utilization among CHF Hispanic vs. White non-Hispanic patients. In fact, we are also not aware of any other studies that tested the ability of various sets of risks (i.e., models) for predicting healthcare utilization. Surprisingly, Hispanic ethnicity was not a unique risk factor for any measure of healthcare utilization in any of the five models tested. That is, Hispanic vs. White Non-Hispanic ethnicity status did not uniquely predict health care utilization when controlling for the other predictors in each model. But even more surprisingly, Hispanic ethnic status did not correlated with healthcare use measures when assess as first order correlations without controlling for any other variables. However, it should be noted that this study was not able to assess educational or income levels, which were not obtainable from the medical record.

Omission of an ACEI / ARB was associated with increased hospitalizations. This finding is consistent with the current literature given that these medication classes have been shown to reduce hospitalizations (25,26). However, being on an ACEI / ARB, but not at an optimal dose, showed increased hospitalizations but was not statistically significant. Both the ATLAS (26) and the HEAAL (27) studies provide evidence that higher doses of Lisinopril (ACEI) and losartan (ARB) reduce hospitalizations for CHF compared to lower doses of the same medications. In this study the direction of this finding is consistent with the current literature, but the magnitude was lower than others given the lack of statistical significance.

Patients who were not on an optimal dose of a beta-blocker went to the CHF clinic more frequently over a 6-month period. This is an anticipated result given one of the functions of the CHF clinic is to optimize medications. Guidelines have provided appropriate optimal doses and titration schemes of beta-blockers (1). This medication class should be titrated, based on the patient's tolerability, every 2 weeks until the patient is either at the optimal dose based on guidelines or the maximum tolerated dose based on the patient. Patients who are not at the optimal dose of their beta-blocker are brought into the clinic frequently for dose titration.

Limitations

This study used a medical records review design. Both the criterion and predictor variables were not recorded for research purposes and may not be accurate. Some data were missing from the paper and electronic medical records. These missing values were either dealt with by mean imputation or exclusion of the case if it the case had missing values for multiple predictors or criteria.

This was a single-center study. Data and conclusions from this study can only be applied to the patients at the UNMH outpatient CHF clinic. It cannot be generalized to other clinics, cities, states in the US, or countries until replications have been attempted at other sites with other populations. Only one MLHFQ and PHQ-9 score was evaluated. Since each patient who filled out these questionnaires had a different duration of their disease we were unable to capture patients at the beginning of their disease and follow them over time to see if and how their scores on the questionnaires might have changed.

This study only evaluated Hispanic/Latino and non-Hispanic White CHF patients. Most of these patients were uninsured, had Medicare/Medicaid, or UNM Care which is a financial assistance program through the University of New Mexico Hospitals. This patient population may not be fully representative of other CHF patients throughout other parts of New Mexico, particularly with regard to educational and income levels and other factors related to education and income. Given the unique patient characteristics in this study it seriously limits the external validity to other CHF patient populations.

There were very few Spanish speaking CHF patients in this study. Thus, a comparison between patients with different preferred languages was not conducted.

The CHF patients in this study were treated at a specialized CHF clinic. This may not be fully representative of the treatment a majority of CHF patients receive. Most CHF patients receive treatment for their disease through their PCP, many may not have the resources available compared to specialized CHF clinics to treat their CHF patients.

Conclusions

Examining the outcomes of this study it appears Hispanic ethnicity does not differentiate HRQOL in CHF patients when comparing to non-Hispanic White patients. Hispanic patients have a stronger correlation of depressive symptoms with health related quality of life measures specific to CHF than non-Hispanic White patients. However, the difference in correlations does not appear to be strong enough to enable clinicians to help them approach and treat CHF patients differently as a function of any of the measures in this study. Results of this study show Hispanic ethnicity may not play much of a role in HRQOL and healthcare utilization for CHF patients. Goals of therapy for patients with CHF are to prolong survival, minimize ED and hospital visits, and improve HRQOL. This study shows similar HRQOL between the two groups, relationships between HRQOL and healthcare utilization, relationship between depression symptoms and HRQOL, and risk factors for healthcare utilization that do not vary significantly as a function of Hispanic vs. White Non-Hispanic ethnic status. This may help healthcare providers understand that in taking care of CHF patients that specific Hispanic ethnicity may not be an additional risk factor for diminished HRQOL and increased healthcare utilization.

Recommendations

This study only evaluated patients at one location, the UNMH outpatient CHF clinic with a retrospective design that included limited risk measures. A larger, multi-site, prospective study is needed to improve generalizability of the results. In addition, a prospective design will be necessary to minimize some of the limitations of the current study so that investigators can capture newly diagnosed CHF patients and follow them over time with evaluations of more than one HRQOL instrument and assessments of a wider range of healthcare utilization measures.

References

1. Lindenfeld J, Albert NM, Boehmer JP et al. HFSA 2010 Comprehensive Heart Failure Practice Guideline. Journal of Cardiac Failure 2010;16:e1-194.
2. Roger VL, Go AS, Lloyd-Jones DM et al. Heart disease and stroke statistics--2012 update: a report from the American Heart Association. Circulation 2012;125:e2-e220.
3. Riegel B, Moser DK, Rayens MK et al. Ethnic differences in quality of life in persons with heart failure. Journal of Cardiac Failure 2008;14:41-7.
4. Riegel B, Carlson B, Glaser D, Romero T. Changes over 6-months in health-related quality of life in a matched sample of Hispanics and non-Hispanics with heart failure. Quality of Life Research 2003;12:689-98.
5. Vivo RP, Krim SR, Cevik C, Witteles RM. Heart failure in Hispanics. Journal of the American College of Cardiology 2009;53:1167-75.
6. Roger VL, Go AS, Lloyd-Jones DM et al. Heart disease and stroke statistics--2011 update: a report from the American Heart Association. Circulation 2011;123:e18-e209.
7. Schwarz KA, Elman CS. Identification of factors predictive of hospital readmissions for patients with heart failure. Heart & lung 2003;32:88-99.
8. Aronow WS, Ahn C, Kronzon I. Comparison of incidences of congestive heart failure in older African-Americans, Hispanics, and whites. The American Journal of Cardiology 1999;84:611-2, A9.
9. Bahrami H, Kronmal R, Bluemke DA et al. Differences in the incidence of congestive heart failure by ethnicity: the multi-ethnic study of atherosclerosis. Archives of Internal Medicine 2008;168:2138-45.
10. Lesman-Leegte I, Jaarsma T, Coyne JC, Hillege HL, Van Veldhuisen DJ, Sanderman R. Quality of life and depressive symptoms in the elderly: a comparison between patients with heart failure and age- and gender-matched community controls. Journal of Cardiac Failure 2009;15:17-23.

11. Krumholz HM, Chen YT, Wang Y, Vaccarino V, Radford MJ, Horwitz RI. Predictors of readmission among elderly survivors of admission with heart failure. American Heart Journal 2000;139:72-7.

12. Rodriguez-Artalejo F, Guallar-Castillon P, Pascual CR et al. Health-related quality of life as a predictor of hospital readmission and death among patients with heart failure. Archives of Internal Medicine 2005;165:1274-9.

13. Shetterly SM, Baxter J, Mason LD, Hamman RF. Self-rated health among Hispanic vs non-Hispanic white adults: the San Luis Valley Health and Aging Study. American Journal of Public Health 1996;86:1798-801.

14. Kandula NR, Lauderdale DS, Baker DW. Differences in self-reported health among Asians, Latinos, and non-Hispanic whites: the role of language and nativity. Annals of Epidemiology 2007;17:191-8.

15. Riegel B, Carlson B, Kopp Z, LePetri B, Glaser D, Unger A. Effect of a standardized nurse case-management telephone intervention on resource use in patients with chronic heart failure. Archives of Internal Medicine 2002;162:705-12.

16. Becker G, Beyene Y, Newsom EM, Rodgers DV. Knowledge and care of chronic illness in three ethnic minority groups. Family Medicine 1998;30:173-8.

17. Rumsfeld JS, Havranek E, Masoudi FA et al. Depressive symptoms are the strongest predictors of short-term declines in health status in patients with heart failure. Journal of the American College of Cardiology 2003;42:1811-7.

18. Liao L, Allen LA, Whellan DJ. Economic burden of heart failure in the elderly. PharmacoEconomics 2008;26:447-62.

19. Lloyd-Jones D, Adams R, Carnethon M et al. Heart disease and stroke statistics--2009 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation 2009;119:e21-181.

20. Alexander M, Grumbach K, Remy L, Rowell R, Massie BM. Congestive heart failure hospitalizations and survival in California: patterns according to race/ethnicity. American Heart Journal 1999;137:919-27.

21. Juenger J, Schellberg D, Kraemer S et al. Health related quality of life in patients with congestive heart failure: comparison with other chronic diseases and relation to functional variables. Heart 2002;87:235-41.

22. Pocock SJ, Wang D, Pfeffer MA et al. Predictors of mortality and morbidity in patients with chronic heart failure. European Heart Journal 2006;27:65-75.

23. Rector TS, Cohn JN. Assessment of patient outcome with the Minnesota Living with Heart Failure questionnaire: reliability and validity during a randomized, double-blind, placebo-controlled trial of pimobendan. Pimobendan Multicenter Research Group. American Heart Journal 1992;124:1017-25.

24. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. Journal of General Internal Medicine 2001;16:606-13.

25. Tabachnick B. A Practical Approach to Using Multivariate Analyses. 6th ed: Pearson, 2013.

26. Packer M, Poole-Wilson PA, Armstrong PW et al. Comparative effects of low and high doses of the angiotensin-converting enzyme inhibitor, lisinopril, on morbidity and mortality in chronic heart failure. ATLAS Study Group. Circulation 1999;100:2312-8.

27. Konstam MA, Neaton JD, Dickstein K et al. Effects of high-dose versus low-dose losartan on clinical outcomes in patients with heart failure (HEAAL study): a randomised, double-blind trial. Lancet 2009;374:1840-8.