The Association of Guideline Recommended Medications and Health-Related Quality of Life in Patients with Heart Failure.

By

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Abstract

THE ASSOCIATION OF GUIDELINE-RECOMMENDED MEDICATION AND QUALITY OF LIFE IN PATIENTS WITH HEART FAILURE

OBJECTIVES: This study was aimed at understanding the association of guideline recommended medications and health related quality of life in heart failure patients and predictors of guideline recommended medication utilization.

METHODS: A cross sectional as well as longitudinal analysis was conducted on a cohort of patients diagnosed with heart failure from years 2002 to 2009 identified from panels 7 to 13 of Medical Expenditure Panels Survey (MEPS) data files respectively. Anderson behavior model was used where predisposing factors, enabling factors and need factors that influenced medication utilization were determined. Here binary variables indicating use of medication (yes/no) for each medication was our dependent variable and logistic regression models were conducted to determine predictors of medication use. Two multiple linear regression models were used with PCS and MCS scores from round 4 as dependent variables while controlling for baseline PCS and MCS scores to assess the effect of medications on Health Related Quality of Life (HRQoL). PROC SURVEYLOGISTIC and PROC SURVEYREG procedures were used in SAS with significance level of 0.05.

RESULTS: Among 10.7 million individuals identified as heart failure patients, only 62% received ACE/ARBs, 58% received beta-blockers, 76% received diuretics and about 9% patients received aldosterone receptor antagonists. ACEI/ARB and beta blockers did not show any improvement in HRQoL of heart failure individuals while with unit increase in ARA use, the PCS score decreases by 2.809 (CI: -5.15 – 0.47; P-value: 0.0186) units and with unit increase in diuretics use the score increases by 3.3 units (CI: 1.57-5.03; P-value: 0.0002). Also factors like IADL limitations and CCI were associated with prescription of ACEI/ARB and beta-blockers.

Factors like age, general health status, IADL limitations and Charlson Comorbidity Index were found to be significant predictors of ACEI/ARB and beta blocker medication utilization.

CONCLUSION: Utilization of medications such as ACEI/ARBs and beta-blockers did not have an effect on HRQoL. For any chronic patient, quality of life can be correlated to medication use as well as non pharmacologic treatments. Our findings explain low utilization of these medications which may also be influenced by patient's current severity of condition.

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Chapter 1

Introduction

Congestive heart failure (CHF) is a complex clinical syndrome characterized by structural or functional impairment of the left ventricle's ability to fill with or eject blood. There are two mechanisms of reduced cardiac output and heart failure: systolic dysfunction and diastolic dysfunction. Systolic dysfunction is defined by reduced left ventricular ejection fraction (<50%). (Figueroa et al, 2006) It occurs when ability of myofibril to shorten against the load is defective. As a result, ventricles fail to pump blood into high-pressure aorta. Most common causes of systolic dysfunction are ischemic heart disease, idiopathic dilated cardiomyopathy, hypertension and valvular disease (Shammas et al, 2007 and Zile et al, 2005). Diastolic dysfunction is defined as dysfunction of left ventricular filling with preserved systolic function (Figueroa et al, 2006). It occurs when ability of myofibrils to return to their resting length is lost partially or completely due to which ventricles is unable to accept adequate volume of blood at normal diastolic pressure and at volumes sufficient to maintain stroke volume and cardiac output (Shammas et al, 2007 and Zile et al, 2005).

Thus heart failure is caused by any condition which reduces the efficiency of myocardium or the heart muscle such as myocardial infarction, hypertension and amyloidosis. These conditions cause increase in workload overtime producing changes to heart. Heart failure is progressive weakening of heart muscle and this condition develops over time.

CHF is one of the leading causes of public health concern. In 2010 more than 6.6 million population of United Stated over 18 years of age (>2.8%) was suffering from HF with incidence rate of 10 in 1000 or 670 000 new cases among patients aged more than 45 years of age. In the

Framingham study, the incidence of CHF was estimated to range from 2 per 1000 per annum in individuals aged 45–54, increasing to 40 per 1000 per annum in men aged 85–94. It is estimated that by 2030, an additional 3 million people will have HF, a 25.0% increase in prevalence from 2010 (AHA, 2012). According to the AHA estimates, overall death caused by Heart Failure was 52% in 2004. It is the largest diagnostic related group for adults greater than 65 years age in US. It is also the leading cause of hospitalization for adults in US. In 2009 HF represented 1% of all hospitalizations in United States (Will et al, 2012). In 2008, estimated direct and indirect costs associated with treatments were about $34.8 billion in US.

Classification:

Heart failure limits exercise capacity. CHF is classified based on condition severity. There are two major types of heart failure classifications:

1. The New York Heart Association (NYHA) classification: The New York Heart Association (NYHA) classification is the most commonly used system to describe the impact of heart failure on a patient's daily activities. The classification was originally developed in 1928 and subsequently revised. It classifies patients with heart failure into 4 categories (I, II, III, IV), with higher class indicating more severe symptoms, limitation in physical activity, and worse health (Holland et al, 2009).

   In general, patients with more severe functional limitations have poorer survival. Some physicians use the four tier New York Heart Association (NYHA) classification of functional capacity to estimate prognosis in clinical practice and to selectively define study populations in clinical trials. The classification scheme is described below.

   Table 1.1: NYHA Classification:

Level	Description	Simple Description
I	Cardiac disease without resulting limitations of physical	Asymptomatic.

	activity.	
II	Slight limitation of physical activity - comfortable at rest, but ordinary physical activity results in fatigue, dyspnea, or anginal pain.	Symptomatic with moderate exertion.
III	Marked limitation in physical activity - comfortable at rest, but less than ordinary physical activity causes fatigue, dyspnea, or anginal pain.	Symptomatic with minimal exertion.
IV	Inability to carry on any physical activity without discomfort of symptoms at rest.	Symptomatic at rest.

The NYHA system was originally designed for use in research. As a practical clinical tool it has limitations.

2. The ACC/AHA classification: In 2001, the ACC/AHA proposed a new stratification scheme as noted below. The American College of Cardiology/American Heart Association (ACC/AHA) categorizes HF in four stages based on symptoms, risk factors and underlying heart diseases.

Table 1.2: ACC/AHA Stages of Heart Failure, 2001 (New classification, supplement to NYHA Classification)

Stage	Description
A	Patients at high risk of developing HF because of the presence of conditions strongly associated with the development of HF. Such patients have no identified structural or functional abnormalities of the pericardium, myocardium or cardiac valves and have never shown signs or symptoms of HF.
B	Patients who have developed structural heart disease that is strongly associated with the development of HF but who have never shown signs or symptoms of HF.
C	Patients who have current or prior symptoms of HF associated with underlying structural heart disease.
D	Patients with advanced structural heart disease and marked symptoms of HF at rest despite maximal medical therapy and who require specialized interventions.

The ultimate goals of these guidelines are Quality of Care and serving the patients best interests. This system helps providers to identify patients at higher risk of developing CHF and carry out recommended therapeutic interventions to manage HF condition and prevent specific diseases or conditions (American Heart Association, 2009).

Heart Failure Management:

Management of heart failure is characterized by both pharmacologic and non-pharmacologic components. Non-pharmacologic treatment includes lifestyle changes like modifying diet for fluid intake and salt intake, weight reduction, smoking cessation, and regular exercise. Studies conducted to assess management of comorbidities have shown that heart failure can be effectively controlled by treating associated comorbidities. A study by Kostis et al., 1997, where controlling dislipidemia in coronary artery disease patients and study on hypertension patients by Kjekshus et al, 1997, shows that controlling hypertension can significantly reduce the risk of developing heart failure. Also numerous studies have shown disease management program like nurse specialist program, telemonitoring and multidisciplinary team follow-up to be effective in treatment of heart failure.

Pharmacologic treatment plays a key role in management of HF. It can help prolong life of patients and reduce symptoms of CHF. The medications recommended for treatment in ACC/AHA guidelines include ACEI, ARBs, aldosterone antagonists, beta-blockers, diuretics and digitalis glycosides. Many clinical studies have suggested that ACEI, ARBs, beta blockers and aldosterone antagonists are effective in reducing the mortality in elderly patients with CHF. ACEI, ARB and beta blockers block progression of condition and improve survival. Despite advances in treatment of CHF; Go et al, 2007 reported prevalence of disease continue to increase for CHF due to co-morbidities like hypertension, obesity and diabetes. Crude 12 month rate of readmissions for HF were found to be 42.6 per 100 person year. According to ACC/AHA treatment guidelines, recommendation of treatment in HF patients is made by severity of condition. Current guidelines issued by American College of Cardiology and American Heart Association are as follows:

Table 1.3: Medications recommended by ACC/AHA guidelines

Stage	Therapy
A **(At high risk for HF but without structural heart disease or symptoms of HF)**	ACEI or ARB as appropriate in patients
B **(Structural heart disease but without signs and symptoms of HF)**	-ACEI/ARB
C **(Structural Heart disease with prior or current symptoms of HF)**	Drugs for routine use -Diuretics for fluid retention - ACEI -Beta Blockers Drugs in selected patients -Aldosterone Receptor Antagonists -ARBs -Digitalis -Hydralazine nitrate
D **(Refractory heart function using specialized intervention)**	Specialized interventions like transplantation, mechanical assist devices and ionotropic infusions are considered along with standard care.

Health Related Quality of Life:

Quality of life has gained increased attention as an outcome measure of treatment in patients with chronic disease. It is subjective and relative to individual's expectations and is proven to be an independent factor in prognosis and hospital free survival in such conditions (Figueroa et al., 2006). Considering current increase in prevalence of chronic conditions where effectiveness of treatment cannot be assessed based on mortality alone, rising aging population due to baby boomers and increased costs of healthcare services, improving HRQoL has become an important objective for treatment (Alla et al, 2002). As life expectancy continues to increase, the rates of chronic disease also continue to grow. Depending on disease characteristics like condition severity, life situation and treatment characteristics patient-centric outcomes that include HRQoL

have become more important as individuals adjust to living with chronic conditions such as heart failure (HF) and other cardiac conditions.

Researchers consider HRQoL as an assessment of physical, psychological and social dimensions of health that are influenced by an individual's experiences, beliefs, expectations and perceptions. According to the World Health Organization Quality of Life Assessment Group (1998), health-related quality of life (HRQoL) is a broad multidimensional concept that typically encompasses not only self-reported measures of physical and mental health but also psychological and social dimensions. Due to multidimensional concept of quality of life, patient's perception of health along with functional and physical dimensions of a disease HRQoL has become an important measure of outcome of care for patients with chronic diseases (Lam et al, 1999). Assessment of health related quality of life usually focuses on the way in which physical, social, and emotional well being is affected by a disease. By assessing the impact of heart failure on patient's HRQoL can provide useful information to providers regarding decision making for treatment (Carvalho et al, 2012).

Improving quality of life is one of the major goals in management of heart failure. Health related quality of life has become an important outcome measure in patients with chronic diseases especially cardiac conditions like heart failure. Studies suggest that importance of quality of life to patients with heart failure is so high that some patients may be willing to trade survival with improved QoL (Calvert et al, 2005). Ludt et al, 2011 have reported two important reasons for measuring HRQoL for individuals at the risk of HF:

1. When the patients are asymptomatic (Stage A) or have mild symptoms (Stage B) over a long period of time, morbidity or mortality are not appropriate measures of outcome of treatment. HRQoL as outcome measure on the other hand can provide decision makers to select best therapeutic option.

2. Such patients may not understand the severity of illness and benefit of treatment, especially if side effects of the drug may impair their health status.

Studies have reported impact of heart failure on patient's HRQoL through several comparison studies with a sample of general population and patients with chronic disease. These studies indicate that failure leads to a great decline in quality of life compared to general population and patients with other serious common chronic diseases (Hobbs et al, 2002; Ekman et al, 2002; Coons et al, 2000; Juenger et al, 2002).

Two instruments have been identified to quantify and assess HRQoL of patients:

1. Generic HRQoL Instrument: These instruments can be used to compare different populations and to evaluate general quality of life of patients suffering from different diseases. Generic instruments have been further classified into two types namely, health profiles and preference measures. Health profiles measure aspects of HRQoL and preference measures determine patient preferences regarding their health (Oldrigde et al, 2003; Sansgiry et al, 2008).
2. Disease Specific HRQoL instruments: These instruments are used to compare patients suffering from same condition. These instruments are more responsive as they are designed to include items relevant to specific patient population (Oldrigde et al, 2003).

Oldridge et al, 2003 reported the SF-36 Health Survey generic HRQoL instrument which is the most commonly used survey instrument. The questionnaire consists of eight dimensions of HRQoL which can be divided into two summary or global dimensions which are the Physical Component Summary (PCS) and the Mental Component Summary (MCS). These global scores provide the clinicians with information regarding the HRQoL of patients which is summarized in the form of just two values, thereby reducing the number of statistical analyses needed to assess the data as well as easier interpretation of the data. The PCS and MCS scores have proven to

have good discriminating validity in order to differentiate and compare between two clinically important groups (Soto et al, 2005). The eight domains of the SF – 36 are as follows: physical functioning, role physical (i.e. role limitations because of physical health problems), bodily pain, general health, vitality, social functioning, role emotional (i.e. role limitations because of emotional health problems), and mental health. These domains are then used to compute the PCS and MCS scores with the help of complex algorithm which range from 0 to 100, where a higher score is attributed to a better HRQoL (Sansgiry et al, 2008).

SF-12 is a shorter version of the SF-36 introduced in order to simplify and reduce the burden on the participants as well as the investigators. Different studies have established the validity of the SF-12 instrument and it can explain up to 90 % of the variation in the SF-36 measures (Wee CC et al, 2008; Wee HL et al, 2005). It has been seen that the SF-12 measures are highly correlated with the SF-36 measures.

Statement of problem:

Congestive heart failure is common chronic condition in US. It is one of the highest rated diseases that take a toll on functions of daily life. In a report on chronic conditions among older Americans it was reported that more than half of the individuals with congestive heart failure had difficulty in performing at least one core function. ACC/AHA guidelines strongly recommend prescription of drugs like ACEI, ARBs, and Beta Blockers for heart failure. However studies have documented association between pharmacy treatment utilization and outcomes of mortality and hospitalization in specific population groups. Inadequate utilization of medications in patients has been reported in literature. There is lack of evidence on predictors of prescription of heart failure on overall US population. Thus first aim of our study is to determine predictors associated with prescription of guideline recommended medications.

Also various prospective, retrospective, clinical and pilot studies have reported decline in HRQoL in heart failure patients. Association of severity of condition and HRQoL has been studied. Although extensive studies documented HRQoL of patients with CHF there is lack of evidence on association of medication utilization and HRQoL in these patients. Hence our second aim is to study medication utilization and its effect on HRQoL in patients with CHF using nationally representative data.

Research aims:

1. To determine factors associated with prescription of guideline recommended medications for heart failure.

Hypothesis: There is underutilization of medication in patients with heart failure and there is disparity amongst demographic and socio-economic determinants regarding the utilization of these medications.

2. To determine association of prescription medication use and HRQoL in patients with heart failure.

Hypothesis: Quality of life is better for patients with heart failure who have been prescribed recommended medications compared to patients who are not on any of the recommended medications.

Chapter 2

Literature Review

This chapter contains literature overview for:

1. Prevalence of Medication
2. HRQoL

1. Prevalence and predictors of Medication:

Heart failure is prevalent in various age groups while elderly population shows greatest prevalence of HF. Literature has been published regarding common causes of HF like hypertension, coronary artery disease and valvular heart disease (Velagaleti et al, 2007). Elderly patients may respond differently to these diseases for example ventricular diastolic dysfunction, reduced maximal heart rate, lower cardiac output, increased blood pressure. Some other modifications due to age like renal dysfunction may affect appropriate use of medications like ACEI, ARBs, and aldosterone receptor antagonists (Kawaguchi et al, 2003; Chae et al, 2003). Thus very few studies were cited that were conducted on older population group.

ACC/AHA recommended medications have been reported to reduce mortality and hospitalization in patients with HF (AHA/ACC 2009). Use of ACEI has been assessed extensively. A clinical trial review by Garg et al, 1995 has reported ACEI to be effective in HF patients. In this study there was an overall statistically significant reduction in mortality (odds ratio [OR], 0.77; 95% confidence interval [CI], 0.67 to 0.88; $P < .001$) and in the combined endpoint of mortality or hospitalization for congestive heart failure was reported due to ACEI use (OR, 0.65; 95% CI, 0.57 to 0.74; $P < .001$).

Mujumdar et al in 1999 studied one year outcome data of ATLAS study where high dose treatment with ACEI, beta blockers and digoxin was studied to evaluate their incremental benefits over usual care. In this study reduction in morbidity and mortality was reported for high dose treatment of ACEI+Beta Blockers+digoxin. Identical results were reported in study by Schwartz et al in 2003. Compared with low-dose ACE inhibitors (n = 471), the composite end point decreased incrementally with the use of high-dose ACE inhibitors (n = 475) (adjusted odds ratio [OR], 0.93; *P* = NS), high-dose ACE inhibitors plus beta-blockers (n = 72) (OR, 0.89; *P* = NS), and high-dose ACE inhibitors plus beta-blockers plus digoxin (n = 77) (OR, 0.47; *P* = 0.006). In absolute proportions, patients receiving high-dose ACE inhibitors plus beta-blocker plus digoxin for 1 year had 12% fewer deaths and hospitalizations than patients receiving low-dose ACE inhibitors alone.

A study by Schmedtje et al in 2003 use of recommended medications in a claims database was determined. In this study it was found that more than 50% of the patients were not prescribed ACEI and about 75 % of patients did not receive beta blockers, although both medications have been strongly recommended for heart failure.

Some recent articles have indicated that use of ACEI and ARB initiated after hospitalization in patients with HF reduce risk of rehopsitalization and higher the compliance lowers is the risk of rehospitalization. In a retrospective claims data study by Hess et al, 2009, rehospitalization rates for MI or HF patients with mean age 67 years was compared between patients receiving recommended treatment (ACEI/ARB) vs. patients not receiving the treatment. Rehospitalization for MI or HF was lower in patients on recommended treatment with high compliance (MI: OR=0.53 $p<0.001$; HF OR=0.52, $p<0.001$).

Also studies like Schmedtje et al, 2003 and the Atlas Study have reported inappropriate utilization of these medications. However there is lack of evidence on predictors of utilization of these medications.

Studies have been conducted on association of pharmacy treatment of pharmacy treatment and outcomes in patients with CHF. Study by Shah et al., 2008 documented association between pharmacy treatment and outcomes in VA patients with CHF. Beta blockers and ACEI therapies were found to increase total cost in CHF patients. Comparative effectiveness study on ACEI and ARB by Sharma et al., 2008 suggest both therapies to possess similar effectiveness in reducing risk of mortality in HF patients from VA data. Chitnis et al., 2009 studied comparative effectiveness of individual ACEI in heart failure. The results from this study show that ACEI differ in reducing risk of mortality; however these agents do not differ in reducing hospitalization due to HF.

Few studies were found on utilization of healthcare in HF patients. A pilot study on home care utilization by Anderson et al., in 1998 suggest more than half of the patients required care givers and a need for skilled nursing.

Summary:

Since aging and presence of multiple comorbidities cause physiological changes, many important clinical features of HF and management of HF differ in elderly patients as compared to other age groups. Most studies on utilization of medications were clinical studies that determined dose effect or adverse events of drugs or retrospective studies that help understand the effectiveness of certain class of drugs (mostly ACEI/ARBs) in selective population. Also these studies were done on select population and cannot be generalized to US population. Further there is very less information available on predictors of medication prevalence in this population.

This brings us to our first objective: To determine guideline recommended medication use in adult HF patients and predictors of theses medication use.

2. **Impact of Medication on HRQoL:**

There have been studies that reported utilization of healthcare services and drugs in heart failure patients. Study by Philbin et al provided influence of insurance payer status on process of care and resource utilization among patients hospitalized for congestive heart failure. In this study Medicaid patients were found to have longest length of stay, highest hospital charges and CHF readmissions. Managed care plans provided similar access to clinical services while generating fewer expenses. Liao et al examined long-term costs and resource use of elderly patients with CHF. In this prospective, longitudinal cohort study patients with heart failure were found to consume substantially more health care resources than other elderly patients without heart failure and these costs persist through 10 years follow up. Bharmal et al., examined resource utilization, charges and mortality among CHF patients over the course of one year following initial hospital discharge for CHF. In this study it was found that 50% patients had at least one all-cause readmission and 20% had at least one CHF-related readmission and mean total charges among all patients was $36,230. Another study by de Lissovoy et al., determined patient level annual expenditures and resource use of heart failure and change in annual expenditure after hospital admission in HF. This study reported hospital admission to be associated with substantial increase treatment intensity and annual average expenditure.

Few studies were found on determination of HRQoL of HF patients. In 2004, Calvert et al, reported a CARE-HF study where quality of care of patients with HF were determined in NYHA classified III and IV class patients. This study reported that heart failure had an

important impact on QoL. In a study by Ekman et al, 2002 patients hospitalized for NYHA class III and IV with mean age of 81 were selected and compared with controls to describe HRQoL and sense of coherence in this group. Findings of this study indicate that old age and severe condition of HF were associated with impaired HRQoL in these patients.

In a cross-sectional study Peters-Klimm et al, 2010 determined predictors of HRQoL (generic and disease specific) in HF patients. Data from 318 patients were evaluated and findings suggest that from the population predominant were males (71.4%) with mean age of 69 years and 13% with depression. Significant predictors of HRQoL were age, depression, comorbidity, NYHA class, presence of COPD, aldosterone antagonist medication and self care. A cross sectional study by Bosch et al, in 2009 determined the association of HRQoL and structured care characteristics of 357 patients diagnosed with HF in 42 primary care practices. In this study it was found that optimal pharmacological treatment which includes ACEI/ARB, beta-blockers in patients with previous MI or NYHA class ≥ II or spironolactone in patients with NYHA class ≥ III was related to better quality of life (β= -11.5, P<0.0001).

Iqbal et al, 2010 conducted a survey on academic hospital setting where 179 patients 131 carers' QoL was evaluated. Chronic heart failure patients had poor QoL with a mean QoL score of 50 +2 on MLHFQ and 0.57 +0.03 on EQ-5D questionnaire. Severity of heart failure, anemia, and cancer co-morbidity in CHF patients were associated with poor QoL in carers. Chronic heart failure patients with poor baseline QoL were at increased risk of hospital admissions [hazard ratios (HR) 7.3, P < 0.001] and death (HR 1.5, P = 0.09). Mortality was also independently associated with repeat hospitalization (HR 6.0, P <0.001) and lack of beta-blocker therapy (HR 1.8, P= 0.03).

Summary:

Many pilot studies have been cited related to HRQoL on specific patient populations. Most of these studies were cross-sectional surveys or clinical studies. Thus there is no study evaluating quality of life of patients using recommended medications in real life. There has not been any study that has determined association of HRQoL for patient receiving/not receiving medications recommended by guidelines on national level.

This brings us to Second Objective of our study: To determine association of prescription medication use and HRQoL in patients with heart failure.

Chapter 3

Methods

Data Source:

The Medical Expenditure Panel Survey (MEPS) is a nationally representative self-administered survey which provides information on health expenditure, medical utilization, payment sources, health status as well as insurance coverage. Since 1996, Agency of Healthcare Research and Quality (AHRQ) in collaboration with the National Center for Health Statistics (NCHS) conducts these surveys to gather information from the non-institutionalized and nonmilitary population within United States. . The survey is carried out using the probability sampling technique and it collects data on the health services that Americans use, frequency and cost of use, and payment of the services as well as data on the private health insurance available to the US population. It is a set of large-scale surveys of families and individuals along with their medical providers as well as employers across the United States. MEPS is a widely used database for evaluating disparities, health care utilization as well as conducting economic studies due to the richness of data especially with respect to health status, health care access, utilization and costs associated with health care. Data collected by MEPS is available for public use at http://www.meps.ahrq.gov/mepsweb.

MEPS include several survey components which are as follows: the Household Component (HC), the Medical Provider component (MPC), the Insurance Component (IC) and the Nursing Home component. The HC is one of the major components of MEPS, which provides the source for the MPC and some part of the IC. HC sample is actually a subsample which is drawn from a

nationally representative sample of households that participated in the previous year's National Health Interview Survey (NHIS) conducted by the National Center for Health Statistics (NCHS). HC provides information on demographic characteristics, health condition, health status, use of medical care services, charges and payments, access to care, satisfaction with care, health insurance coverage, income and employment. HC collects data at individual as well as family level in selected communities across the United States.

The Medical Provider component (MPC) of MEPS collects data from a sample of providers which include physicians, hospitals, home healthcare providers and pharmacies that provided care to the MEPS-HC respondents. MEPS-MPC is mainly used to confirm or supplement information gathered from MEPS-HC participants. The data collected includes financial and medical characteristics of healthcare and pharmacy events as reported by the MEPS-HC respondents. It consists of dates of visits, procedure codes and diagnoses, charges, and payments. MPC data is collected through telephone contacts with the providers as well as mailed or faxed questionnaires.

The Insurance component (IC) collects data from private and public employers on the health insurance plans available to their employees. MEPS-IC selects the establishment based on U.S census bureau list from the Government census. IC collects data on number and types of private health insurance plans offered, benefits associated with these plans, premiums, contributions by employers and employees, eligibility requirements, and employer characteristics.

The nursing home component (NHC) of MEPS was collected only in 1996 on a sample of nursing homes in the U.S., as well as nursing home residents. Information gathered consisted of the characteristics of the facilities and services offered, expenditures and sources of payment on an individual resident level, and resident characteristics, including functional limitation,

cognitive impairment, age, income, and insurance coverage. It also collected data on the availability and use of community based care prior to admission into the nursing home.

MEPS consist of a complex survey design which involves a new panel of sample households selected each year and data is collected for a period of two full calendar years. Each panel consists of data collected through five rounds of interviews carried out for two years. This results in provision of continuous and current estimates of health care expenditures at personal level as well as household level for two panels for each calendar year period. Computer-assisted personal interviewing (CAPI) technology is used to collect data from each household.

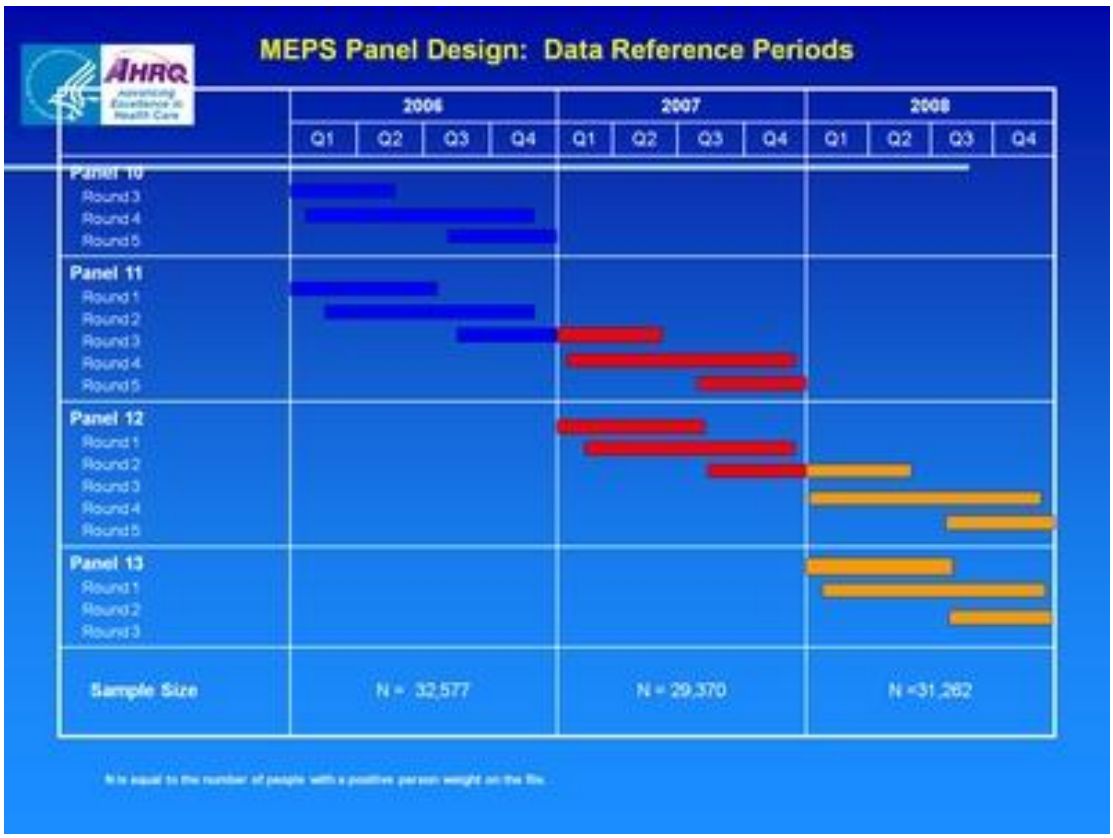

Figure 3.1: MEPS Panel Design.

Annual and Longitudinal Analysis in MEPS:

The data files of MEPS contain data collected from respondents during one calendar year, from January to December. Each respondent is assigned a unique identifier which is also assigned to their reported events. These yearly files can be used for cross-sectional as well as longitudinal analysis. MEPS collects 2 year follow up information for each respondent due to which it can be analyzed for even longer periods, for generating estimates on a national level. For a larger analytical sample size multiple years of MEPS data can be combined for both cross-sectional as well as longitudinal analysis.

Study design and Sample:

A non-experimental retrospective cross-sectional study design was used in order to examine (1) the prevalence and predictors of the utilization of pharmacotherapy among adults with HF diagnosis (2) the differences in HRQoL among adults who follow pharmacotherapy after diagnosis of HF and those who do not. The study sample consisted of individuals greater than 18 years of age who had suffered from an episode of heart failure. The cohort for this study comprised of participants of panel 7 to 13 collected from 2002 to 2009 respectively. MEPS suggest an un-weighted sample size of 100 or greater and a relative standard error no greater than 30% in any domain analysis for reliable national estimates.

Specific Aim 1:

1. To determine factors associated with prescription of guideline recommended medications for heart failure.

   This was a retrospective, cross-sectional design.

   Inclusion Criteria:

   - Patients with diagnosis of Heart failure using Clinical Classification Code ‘108’ for heart failure in MEPS.

- Patients aged 18 years and above.

2. To determine association of prescription medication use and HRQoL in patients with heart failure.

   Inclusion Criteria:

   This is a retrospective cohort study.

   - Patients with diagnosis of Heart Failure in first or second round of each panel.
   - Patients aged 18 years and older.

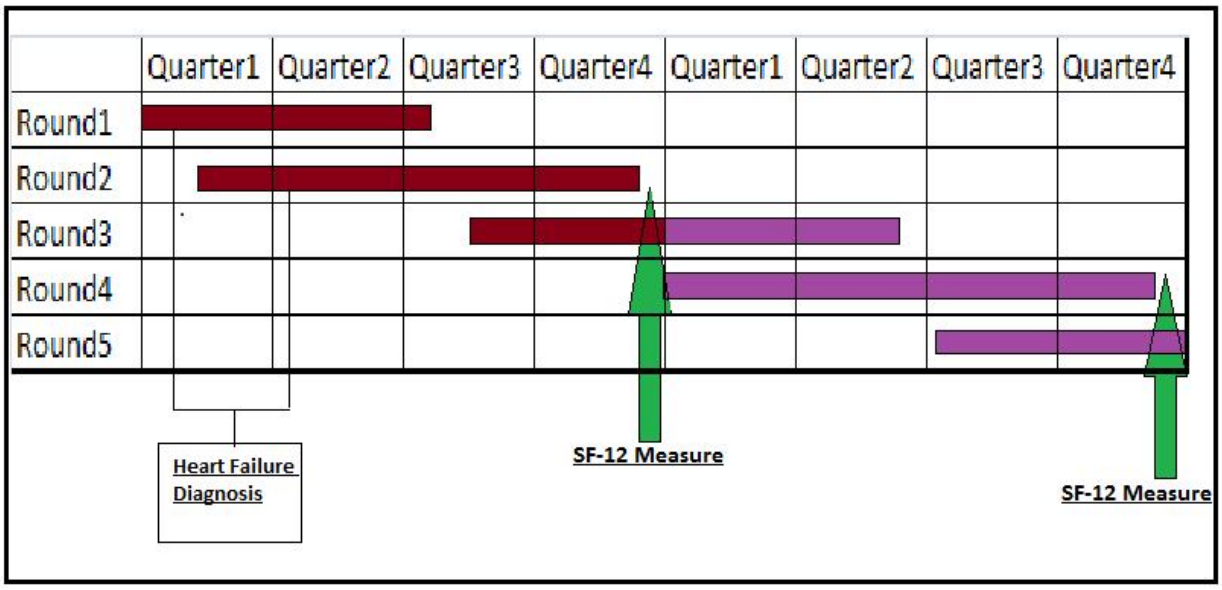

Figure 3.2: Study Design

Conceptual model used to determine utilization of Medication:

Anderson Behavior Model:

To study utilization of medication, Anderson Behavior Model was used (ABM). The model was developed initially in late 1960s to understand the health service use by families and to measure access to healthcare so as to assist in developing policies and

promote equitable access. According to this model, three factors determine use of healthcare services:

1. Predisposing factor: Consist of demographics, social structure and health beliefs
2. Enabling factor: Consist of personal/family and community
3. Need factor: Perceived and evaluated.

Analysis approach:

MEPS public use data files for the analysis was downloaded from http:/www.meps.ahrq.gov and used. SAS version 9.2 (SAS Institute Inc., Cary, North Carolina) was used for data analysis. MEPS undertake a complex probability sampling technique for surveying the population. Weights are assigned to each patient in order to facilitate generalizability of the results to a national level. A weight can be defined as the inverse probability of selection of a given participant of the survey. SAS enables such complex survey data analyses, while accounting for weights and thus providing weighted estimates. A significance level of a = 0.05 was used for all analyses.

Objective 1:

To determine factors associated with prescription of guideline recommended medications for heart failure.

Dependent Variable:

1. A dichotomous variable was used for patients who had utilized ACEI/ARB medications in entire panel at least once coded as 1 otherwise 0.
2. A dichotomous variable was used for patients who had utilized beta-blockers medications in entire panel at least once coded as 1 otherwise 0.
3. A dichotomous variable was used for patients who had utilized diuretics medications in entire panel at least once coded as 1 otherwise 0.

4. A dichotomous variable was used for patients who had utilized aldosterone antagonists medications in entire panel at least once coded as 1 otherwise 0.

These medications were defined using therapeutic classification of Multum Lexicon Code system used in MEPS

Independent Variables: Anderson behavior model was used to determine utilization of guideline recommended medications. Descriptive analysis of medication utilization was performed using domain analysis among patients who were diagnosed with heart failure. This provided us with national estimates of prevalence of medication utilization using national level estimates. Frequency and percentages were calculated for all factors using Chi Square test for categorical variables and ttest were performed for continuous variables. PROC SURVEYFREQ was used in SAS.

Factors predicting utilization of medications were determined using multivariate logistic models. Two models were used first for ACEI/ARB coded 1 if prescribed and 0 otherwise similarly second model for beta-blockers use coded as 1 and 0 otherwise. PROC SURVEYLOGISTIC procedure was used for these analyses.

Objective 2:

To determine association of prescription medication use and HRQoL in patients with heart failure.

Two multiple linear regression models were used with PCS and MCS scores from round 4 as dependent variables while controlling for baseline PCS and MCS scores to assess the effect of medications on HRQoL. Primary independent variables include medication utilization in heart failure patients in round 2 to round 4 as well as predictors of utilization of medications obtained in first objective while adjusting for predisposing, enabling and need factors in the model along

with baseline PCS and MCS scores. This analysis was performed using PROC SURVEYREG procedure in SAS.

Chapter Four
Results

There were total 164,387 survey responses obtained during 2002 to 2009 MEPS data collection with a weighted frequency of 1,394,592,324. Out of these 1110 individuals with a weighted sample size of 10692170 were identified to have heart failure diagnosis during round 1 and 2.

Medication Use Prevalence:

Prevalence of medication utilization among heart failure patients from 2002 to 2009 are shown in following table. It was seen that 62% patients received ACEI/ARB, 58% patients received beta-blockers, 77% patients received diuretics and there were only 9% heart failure patients who received aldosterone receptor antagonists.

Table 4.1: Medication Prevalence

Medication	Number of patients receiving medication in millions (%)	CI
ACEI/ARB	6.6 (61.96%)	59.11 – 64.81
ARA	0.99 (9.24%)	7.65 – 10.83
Beta Blockers	6.2 (58.29%)	55.47 – 67.13
Diuretics	8.2 (76.59%)	73.98 – 75.19

Determinants of Medications:

Following table shows characteristics of patients who received either ACEI/ARB or beta-blockers in whole year. Patients who received ACEI/ARB medications were mostly whites, residing in MSA, having public insurance and no prescription drug insurance. Majority of heart failure patients receiving ACEI/ARBs reported to have usual source of care, dwelling in southern region. Most of these patients were reported to have fair or poor general health status with 3.01 mean Charlson Comorbidity Index but were reported to require no help in activities of daily life. Patients receiving beta-blocker therapy were seen to have similar characteristics as that of patients receiving ACEI/ARBs.

Table 4.2: Characteristics of patients receiving ACEI/ARB and Beta-blockers.

Characteristics	ACEI-ARB	Beta-Blockers
All adults	61.26%	56.48%
Sex		
Male	41.18	43.86
Female	58.82	56.14
Age (Mean)	70.73 (0.4377)	70.77 (0.3877)
Race		
White	73.23	74.64
Black	22.94	21.37
Others	3.8	3.99
Education		
<12 year	41.32	38.19
12-15 years	46.76	49.76
>15 years	11.92	12.12
Marital status		
Married	58.68	54.54
Single	41.32	45.45
Income		
Poor, Near Poor or Low Income	55.29	51.51
Middle or High Income	44.7	48.49
MSA		
Yes	65.88	
No	34.12	
Health Insurance		
Uninsured	3.97	4.47
Private	42.35	43.54
Public	53.68	51.99
Prescription Insurance		
Yes	26.32	26.13
No	65.15	64.75
Usual Source of Care		
No	12.2	12.28
Yes	87.79	87.72
Region		
Northeast	11.76%	12.12
Midwest	23.08%	25.52
South	43.08%	41.94
West	13.53%	11.48
General Health Status		
Fair/Poor	78.82%	78.63
Good/Very Good/ Excellent	19.26%	20.25
ADL-Limitations		
Yes	27.5%	26.95

No	72.5%	71.93
IADL-Limitations Yes No	 46.03% 52.06%	 44.97 53.91
CCI	3.01 (0.0692)	3.13 (0.0748)

Following table shows adjusted and unadjusted odds ratio for predicting the determinants of receiving ACEI/ARB. There were significant differences in patients receiving ACEI/ARB and patients not receiving ACEI/ARB. Adjusted analysis showed significant differences in two groups for predisposing factors age and marital status. Single individuals were 24.3% less likely (OR: 0.757; CI: 0.602 – 0.951) to receive ACEI/ARB compared to married individuals. For every unit increase in age the odds of getting ACEI/ARB increases by 4.3% (OR: 1.043; CI: 1.035 – 1.051). Enabling factors like general health status, usual source of care and region were found to be significantly different in the two groups. The odds of receiving ACEI/ARB in individuals who reported to have good, very good or excellent general health status were less by 73.9% (OR: 0.261; CI: 0.199 – 0.343) compared to those who reported to have poor or fair general health status. People who had usual source of care were about 84.5% more likely (OR: 1.77; CI: 1.071 – 3.179) to receive ACEI/ARB compared to individuals who reported to have no usual source of care. Also individuals belonging to Midwest region were 64.6% more likely to receive the medications compared to northeastern individuals. Need characteristics that were found to be statistically significant were needed help in instrumental activities of daily life (IADL) and Charlson Comorbidity Index (CCI). Individuals who needed help with IADL were twice as likely (OR: 2.034; CI: 1.566-2.641) to get ACEI/ARB as compared to others.

Table 4.3: Logistic Regression for ACEI/ARB

CHARACTRISTICS	UNADJUSTED ODDS RATIO	P VALUE	ADJUSTED ODDS RATIO	P VALUE
Sex				
Male	Reference		Reference	
Female	1.230	0.029*	0.867	0.1751
Age	1.049	<0.0001*	1.043	<0.0001*
Race				
White	Reference		Reference	
Black	0.994	0.9541	1.090	0.4989
Others	0.419	<0.0001*	0.706	0.1238
Education				
<12 year	Reference		Reference	
12-15 years	1.391	0.0009*	1.190	0.1516
>15 years	0.874	0.2481	1.150	0.4206
Marital status				
Married	Reference		Reference	
Single	1.041	0.6620	0.757	0.0170*
Income				
Poor, Near Poor or Low Income	Reference		Reference	
Middle or High Income	0.481	<0.0001*	0.865	0.2034
Health Insurance				
Uninsured	Reference		Reference	
Private	2.567	0.0004*	0.930	0.8060
Public	8.942	<0.0001*	1.127	0.6636
Prescription Insurance				
No	Reference		Reference	
Yes	0.331	<0.0001*	0.926	0.6236
Usual Source of Care				
No	Reference		Reference	
Yes	1.626	0.0007*	1.845	0.0274*
Region				
Northeast	Reference		Reference	
Midwest	1.357	0.0773	1.646	0.0057*
South	1.265	0.1321	1.305	0.0994
West	0.805	0.2976	1.047	0.8280
MSA				
NO	Reference		Reference	
YES	0.467	<0.0001*	0.905	0.4134
General Health Status				
Fair/Poor	Reference		Reference	
Good/Very Good/ Excellent	0.062	<0.0001*	0.261	<0.0001*
ADL-Limitations				
No	Reference		Reference	
Yes	14.398	<0.0001*	0.865	0.3290

IADL-Limitations				
No	Reference		Reference	
Yes	18.237	<0.0001*	2.034	<0.0001*
CCI (Mean)	2.251	<0.0001*	1.444	<0.0001*
Year				
2002	Reference		Reference	
2003	1.109	0.5904	0.995	0.9796
2004	1.555	0.0281*	1.422	0.0783
2005	1.181	0.3768	1.171	0.4070
2006	1.147	0.4900	1.119	0.5787
2007	1.070	0.7260	0.907	0.6239
2008	1.114	0.6311	0.722	0.1677
2009	1.024	0.8972	0.764	0.1425

Adjusted and unadjusted odds ratios for predicting determinants of beta-blocker users are given in Table 4.4 Predisposing characteristics age and education were found to be statistically significant. Unit increase in age resulted to increase the chance of getting beta-blockers by 4.2% (OR: 1.042; CI: 1.034 – 1.050). Individuals having 12 to 15 years of education were found to be 33.2% more likely (OR: 1.332; CI: 1.045 – 1.700) than individuals with less than 12 years of education. Enabling characteristics general health status and region were statistically significant. Individuals reporting good, very good or excellent general health status were seen to be 73.1% less likely (OR: 0.269; CI: 0.200 – 0.362) to receive medications compared to individuals with poor or fair general health status. Individuals from mid-west region were 37.1% less likely to receive beta-blockers. Need characteristics that were statistically significant were needed help with IADL, CCI and year. Patients who needed help with IADL were 94.7% more likely to receive beta-blockers and every unit increase in CCI result in 46.1% increase in CCI. Patients in 2004 year were found to be 71.6% more likely and patients in 2005 were found to be 58.3% more likely to receive beta-blockers.

Table 4.4: Logistic regression for Beta Blockers

CHARACTRISTICS	UNADJUSTED ODDS RATIO	P VALUE	ADJUSTED ODDS RATIO	P VALUE
Sex				
Male	Reference		Reference	
Female	1.163	0.1245	0.880	0.2425
Age	1.049	<0.0001*	1.042	<0.0001*
Race				
White	Reference		Reference	
Black	0.915	0.4325	0.983	0.8994
Others	0.419	<0.0001*	0.739	0.2085
Education				
<12 year	Reference		Reference	
12-15 years	1.683	<0.0001*	1.332	0.0208*
>15 years	1.005	0.9727	1.242	0.2471
Marital status				
Married	Reference		Reference	
Single	1.185	0.0771	0.842	0.1661
Income				
Poor, Near Poor or Low Income	Reference		Reference	
Middle or High Income	0.574	<0.0001*	1.021	0.8286
Health Insurance				
Uninsured	Reference		Reference	
Private	2.650	0.0002*	1.089	0.7798
Public	9.353	<0.0001*	1.295	0.3606
Prescription Insurance				
Yes	Reference		Reference	
No	0.324	<0.0001*	0.771	0.0924
Usual Source of Care				
No	Reference		Reference	
Yes	1.668	0.0065*	1.852	0.0736
Region				
Northeast	Reference		Reference	
Midwest	1.496	0.0142*	1.861	0.0003
South	1.192	0.2542	1.271	0.1264
West	0.656	0.0410*	0.830	0.3654
MSA				
NO	Reference		Reference	
YES	0.533	<0.0001*	1.091	0.4820
General Health Status				
Fair/Poor	Reference		Reference	
Good/Very Good/ Excellent	0.066	<0.0001*	0.269	<0.0001*
ADL-Limitations				
No	Reference		Reference	
Yes	13.097	<0.0001*	0.849	0.3203
IADL-Limitations				

No	Reference		Reference	
Yes	17.092	<0.0001*	1.947	<0.0001*
CCI (Mean)	2.317	<0.0001*	1.461	<0.0001*
Year				
2002	Reference		Reference	
2003	0.942	0.8038	0.914	0.7393
2004	1.797	0.0078*	1.716	0.0275*
2005	1.510	0.0613	1.583	0.0493*
2006	1.682	0.0233*	1.623	0.0503*
2007	1.464	0.0867	1.341	0.3182
2008	1.867	0.0103*	1.332	0.3938
2009	1.619	0.0217*	1.228	0.5558

Health related quality of life and medications:

There were 154900 survey participants from panels 7 to 13 of MEPS data. Of these, 906 individuals reported having heart failure diagnosis in round one of each panel. After applying inclusion and exclusion criteria and the longitudinal weights, the sample size was 792.

Table 4.5 displays multiple linear regressions for physical and mental component summary scores used to assess HRQoL of patients measured with the survey instrument SF-12 at round 4. The baseline quality of life at round 2 was controlled for in these models and was found to be statistically significant with outcome physical and mental component summary scores in round 4. This shows that better quality of life at baseline was associated with better quality of life at outcome. With every unit increase in baseline PCS the HRQoL increases by 0.43 units and MCS increased by 0.41 units. ACEI/ARB and beta-blockers use were not significantly associated with PCS and MCS while ARA and diuretics were significantly associated with PCS scores. With unit increase in ARA use, the PCS score decreases by 2.809 units and with unit increase in diuretics use the score increases by 3.3 units.

Other components that were significantly associated with MCS were age, sex, marital status, income, prescription insurance, general health status, CCI, needed help with ADL and IADL. Of these, age, sex, marital status, prescription drug insurance, ADL and IADL limitations had positive effect on MCS while income, general health status and CCI had negative effect on MCS.

There was significant difference in MCS scores of patients with private health insurance and public insurance.

Components like age, sex, education, income, prescription insurance, usual source of care, MSA, general health status, CCI, needed help with ADL and IADL were significantly associated with PCS score. Sex, usual source of care, ADL and IADL limitations had increasing effect on PCS scores while age, education, low income, having prescription drug insurance, non-MSA, poor or fair general health status and CCI had decreasing effect on PCS score.

Table 4.5: Multiple Linear Regressions of HRQoL and Medications:

	MCS			**PCS**		
Parameters	**Beta-estimate**	**CI**	**P value**	**Beta-estimate**	**CI**	**P value**
Intercept	24.045	21.29-26.81	<0.0001*	24.78	22.56-26.97	<0.0001*
Baseline HRQOL						
PCS	NA	NA	NA	0.41	0.39-0.42	<0.0001*
MCS	0.43	0.42-0.45	<0.0001*	NA	NA	NA
ACEI/ARBS						
No	-1.31	-3.77 – 1.15	0.2946	0.7001	-0.98 – 2.38	0.4149
Yes	Reference	Reference	Reference	Reference	Reference	Reference
Beta Blockers						
No	-0.51	-3.19-2.17	0.709	-1.327	-3.08 – 0.42	0.1367
Yes	Reference	Reference	Reference	Reference	Reference	Reference
ARA						
No	-1.33	-4.33-1.67	0.3844	-2.809	-5.15 – 0.47	0.0186*
Yes	Reference	Reference	Reference	Reference	Reference	Reference
Diuretics						
No	2.65	-0.41-5.71	0.0896	3.303	1.57-5.03	0.0002*
Yes	Reference	Reference	Reference	Reference	Reference	Reference
Sex						
Male	0.6788	0.53-0.83	<0.0001*	0.1301	0.07-0.29	0.0019*
Female	Reference	Reference	Reference	Reference	Reference	Reference
Age	0.0184	0.01-0.02	<0.0001*	-0.04727	-0.05 - -0.04	<0.0001*
Race						
White	-0.1074	-0.39-0.18	0.4667	-0.0041	-0.27 – 0.26	0.9760
Black	0.36	-0.002-0.714	0.0516	0.1304	-0.19 – 0.45	0.4322
Others	Reference	Reference	Reference	Reference	Reference	Reference
Education						
<12 year	-0.1313	-0.39-0.18	0.4667	-0.9469	-1.16 - -0.73	<0.0001*
12-15 years	0.0873	-0.09-0.24	0.3312	-0.8128	-0.97 - -0.65	<0.0001*

>15 years	Reference	Reference	Reference	Reference	Reference	Reference
Marital status						
Married	0.5789	0.42 – 0.74	<0.0001*	-0.0488	-0.18 – 0.08	0.4630
Single	Reference	Reference	Reference	Reference	Reference	Reference
Income						
Poor, Near Poor or Low Income	-0.9029	-1.11 - -0.69	<0.0001*	-0.5387	-0.71 - -0.36	<0.0001*
Middle or High Income	Reference	Reference	Reference	Reference	Reference	Reference
Health Insurance						
Uninsured	0.2907	-0.025-0.61	0.0716	1.27	0.99 – 1.54	<0.0001*
Private	0.8805	0.53-1.22	<0.0001*	0.8364	0.53 – 1.14	<0.0001*
Public	Reference	Reference	Reference	Reference	Reference	Reference
Prescription Insurance						
Yes	0.3233	0.055-0.591	0.0181*	-0.6002	-0.84 - -0.36	<0.0001*
No	Reference	Reference	Reference	Reference	Reference	Reference
Usual Source of Care						
Yes	0.0862	-0.11-0.28	0.3858	0.6998	0.55 – 0.85	<0.0001*
No	Reference	Reference		Reference	Reference	Reference
Region						
Northeast	0.1178	-0.13 – 0.37	0.3579	0.3477	0.12 – 0.57	0.0024*
Midwest	0.0971	-0.12 – 0.31	0.3808	-0.0633	-0.27 – 0.14	0.5487
South	0.0294	-0.17 – 0.23	0.7748	-0.295	-0.48 - -0.11	0.0016*
West	Reference	Reference	Reference	Reference	Reference	Reference
MSA						
NO	0.0684	-0.14-0.28	0.5292	-0.3782	-0.57 - -0.19	<0.0001*
YES	Reference	Reference	Reference	Reference	Reference	Reference
General Health Status						
Fair/Poor	-4.19	-4.41 - -3.97	<0.0001*	-6.5095	-6.75 - -6.25	<0.0001*
Good/Very Good/ Excellent	Reference	Reference	Reference	Reference	Reference	Reference
ADL-Limitations						
No	2.7502	1.96 – 3.53	<0.0001*	3.698	3.04 – 4.36	<0.0001*
Yes	Reference	Reference	Reference	Reference	Reference	Reference
IADL-						

Limitations No Yes	2.58 Reference	2.08-3.07 Reference	<0.0001* Reference	4.776 Reference	4.31 – 5.24 Reference	<0.0001* Reference
CCI	-0.1453	-0.24 - -0.05	0.0024*	-0.8256	-0.91 - -0.74	<0.0001*
Year 2002 2003 2004 2005 2006 2007 2008 2009	 21.66 -0.2787 -0.2287 -0.0203 -0.0845 -0.2295 -0.0221 Reference	 20.8 - 22.51 -0.56-0.00 -0.51-0.05 -0.29-0.26 -0.37-0.20 -0.50-0.05 -0.34-0.29 Reference	 <.0001* 0.0509 0.1110 0.8847 0.5610 0.1022 0.8915 Reference	 19.63 0.5692 0.0296 -0.0199 -0.0691 0.0321 0.105 Reference	 18.81-20.44 0.33 – 0.81 -0.21- 0.27 -0.27 – 0.23 -0.31 – 0.18 -0.22-0.28 -0.13-0.34 Reference	 <0.0001* <0.0001* 0.8086 0.8766 0.5804 0.8006 0.3835 Reference

Chapter Five
Discussion

Prevalence of guideline recommended medications:

The recent ACC/AHA guidelines recommended that patients with mild disease (Stage A), must receive ACEI/ARB therapy. Patients in Stage B (mild to moderate disease), which includes structural heart disease, beta-blockers should also be prescribed. Patients with severe disease (Stage C), additional drug therapy of diuretics and in some selected patients aldosterone antagonists was recommended. In our study, it was seen that only 61.96% of the patients received ACEI/ARB, 58.29% of the patients received beta-blockers while about 9% patients received aldosterone antagonists. These numbers are consistent with previous literature (Schmedtje et al. 2003 and Bosch et al., 2009); however these numbers reflect immense scope in utilization of medications.

Determinants of Pharmacotherapy:

In this study, single patients having higher age were more likely to receive ACEI/ARB. Patients having usual source of care were more likely to receive medications. This is in accordance with a finding by Stroupe et al., which states that higher number of visits to primary healthcare provider is associated with higher chances of receiving ACEI/ARB. One plausible explanation for this could be that patients having a usual source of care have higher adherence to medications due to their regular interaction with their healthcare provider. Patients who were more likely to be prescribed medication were the ones who reported poor/fair functional status. A possible explanation for this could be the fact that guideline based treatment strategies are considered to be more aggressive and shown to improve patient health status. This result is in correspondence with previous study by Masoudi et al., 2004. Although these traditional interventions have shown

to reduce mortality and hospitalization (Garg et al., 1995 and Mujumdar et al., 1999) it is observed that the perceived health status of patients does not change with guideline recommended treatments (Hoe et al., 2008). This could be possible due to the fact that the health status recorded in such studies was reported by patient and hence did not change. Patients who needed help with instrumental activities of daily life however had twice increased likelihood of medication prescription. Previous studies show that ACEI/ARB as well as beta blockers maintain or improve functional status (Erhardt et al., 1995 and Edelman et al., 2011). Use of ACEI/ARB and beta-blockers was also significantly associated with CCI which showed that increase in CCI increases the chances of receiving ACEI/ARB. This could be due to individual comorbid conditions which may influence physicians to prescribe ACEI/ARBs (Yang et. Al., 2010).

The likelihood of receiving beta-blockers was found to increase with increase in CCI, age and limitations of performing IADL. Heart failure is shown to be associated with diseases like diabetes and hypertension. In patients with such co morbidities both ACEI/ARBs and beta-blockers have been shown to reduce mortality and hospitalization and also improve functional status (Edelman et al., 2011, Majumdar et., 2004 and Hess et al., 2009).

Health Related Quality of Life and Guideline Recommended Medications:

Our study did not show any improvement in HRQoL scores of patients who did not take ACEI/ARB and beta-blockers and who took these medications. These results are consistent with previous studies like Kato et al., 2011, Morgan et al. and Saleem et al., 2012. In these studies it was concluded that medication use is not associated with HRQoL of patients. There are various possible explanations for this. Firstly medication adherence is one phase of entire disease management process while HRQoL is a complex measurement of various psychosocial characteristics that impact patient's eligibility to manage disease by patients. HRQoL is affected by number of factors and is not limited to medication use only. Also we are using SF-12

questionnaire which is a generic measurement tool of HRQoL. Since there is no gold standard of HRQoL measurement it is always advised that disease-specific instruments be used in order to find stronger association in HRQoL and medication use. One more important aspect to be considered here is the duration of study which is very important in interpreting the association of HRQoL and medication use. In our study medications prescribed from round 2 to round 4 of a panel were taken into analysis and the HRQoL was measured in round 2 and round 4. A longer duration for this kind of study will give better results on HRQoL.

Implications:

This study shows that HRQoL is not improved by either of the medications recommended for routine use in heart failure patients. This is a matter of great concern as in patients with heart failure quality of life is more important than survival. In order to improve association of HRQoL considerable efforts are required to be implemented. Severity of disease in such patients could be one of the major causes of low HRQoL. Thus while studying HRQoL it is important to take severity aspect into consideration. Certain aspects of healthcare like organizational management in patients practice setting may have an impact on patients HRQoL. An effective patient and physician interaction is an important intervention that needs to be implemented. When a physician can suitably explain to a patient disease condition, its clinical impact on patients health and various drugs and their effect on these patients it may result in great healthcare service access satisfaction in patients. This can lead to better utilization of medication and thus improvement in HRQoL. Also there was variability observed in utilization of guideline recommended medications which may be reduced by physician’s effective interaction with patients.

Future Research

The study findings for the prevalence of guideline recommended medications should be assessed using other databases while also taking into consideration provider level factors and severity of patients.

Future studies can evaluate the effect of guideline recommended medications on

the HRQoL of heart failure patients using disease-specific instruments such as the Living with Heart Failure Questionnaire and Chronic Heart Failure Questionnaire. It would also be interesting to determine the association HRQoL with non-pharmacologic treatment factors like diet modification, weight reduction, smoking cessation and exercise. These factors will also help understand the variation in medication utilization of heart failure patients.

Limitations

This study demonstrated on some important findings, they are limited to the population, data source and operational definitions which were used in the study. A causal effect cannot be determined due to the observational nature of the study. Another limitation is that the database did not have the severity of disease. Thus we cannot determine the medication utilization pattern with respect to condition. Another limitation of the study was same medications (ACEI/ARB, Diuretics and Beta-blockers) used by patients for other comorbidities like hypertension and myocardial infarction was not considered which led to confounding by indication. Also, the patient's medical conditions as well as medications currently taken by the patient were self - reported due to which there is a possibility of recall bias. We did not take into account incident use of medications due to the low sample size. This might have affected our final result. Several characteristics such as severity of illness, physician's characteristics and prescribing patterns

were not taken into consideration which might have influenced the use of medications. Also, the study focused on short term impact of medication use on HRQoL of the patients. More research needs to be conducted in order to assess the long term impact of these measures on HRQoL.

CHAPTER SIX

SUMMARY AND CONCLUSION

This study examined the utilization of guideline recommended medications among heart failure patients and the effect of these medications on their HRQoL. Heart failure is one of the leading causes of death in both men and women in the United States and still remains a major public health concern. The American college of cardiology and the American Heart Association jointly issue guidelines from time to time regarding the implementation of the medication use for heart failure patients according to their stage of condition. For this study we assessed the prevalence of pharmacotherapy such as ACEI/ARBs, beta-blockers, diuretics and aldosterone antagonists. Predictors for receiving medications and pharmacotherapy were also determined using the Andersen Behavior Model. These medications have been shown to reduce the risk of morbidity and mortality in heart failure patients. Considering the beneficial effects of medications it is proposed that these measures will have a positive effect on the HRQoL. There are few studies which have assessed the prevalence and predictors of medication utilization and have conflicting results for the same. Also, there is a lack of studies which have determined the effect of medication utilization on the HRQoL of heart failure patients. Most of these studies have been carried out specific populations and thus lack generalizability.

Our study objectives were:

1. To determine factors associated with prescription of guideline recommended medications for heart failure.
2. To determine association of prescription medication use and HRQoL in patients with heart failure.

SAS 9.2 survey procedures were used for all the analyses. The prevalence and determinants were determined using descriptive statistics and multivariate regression respectively. Effect of medication utilization on HRQoL was assessed using the SF-12 summary scores using multiple linear regressions. We adjusted our model for predisposing, enabling and need factors in order to control for their confounding effects.

Results of our study show that only 62% heart failure patients received ACE/ARBs, 58% received beta-blockers, 76% received diuretics and about 9% patients received aldosterone receptor antagonists. Diuretics were seen to improve physical component summary scores. Also factors like IADL limitations and CCI were associated with prescription of ACEI/ARB and beta-blockers.

Conclusion

In summary, our study revealed that even though there are extensive guidelines issued from time to time regarding the implementation of medication utilization for heart failure patients there is under utilization. Considerable efforts need to be made for the successful implementation of utilization of medications in chronic conditions like heart failure. Utilization of medications such as ACEI/ARBs and beta-blockers did not have an effect on HRQoL. For any chronic patient, quality of life can be correlated to medication use as well as non pharmacologic treatments. Our findings explain low utilization of these medications which may also be influenced by patient's current severity of condition.

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