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Impact of Congestive Heart Failure Discharge Planning on Congestive Heart Failure Re-Admission Rates

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IMPACT OF CONGESTIVE HEART FAILURE DISCHARGE PLANNING ON CONGESTIVE HEART FAILURE RE-ADMISSION RATES.

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TABLE OF CONTENTS

ACKNOWLEDGEMENTS

ABSTRACT

Background: Congestive Heart Failure (CHF) is the most common diagnosis accounting for more healthcare costs than any diagnosis. CHF readmissions contribute significantly to this expenditure. Quality of care in heart failure is linked to process based performance measures. This study evaluated the relationship between adherence to performance metrics and 30 day readmission rates.

Methods: This was a single center case-control study that evaluated 6063 consecutive patients admitted with CHF from December 2001 through December 2008. Data was collected for readmission to the hospital within 30 days and compliance to the heart failure performance measures at discharge.

Results: The rate of readmission for CHF increased steadily from 16.8% in 2002 to 24.8% in 2008. Adherence to CHF performance measures increased concurrently during the same time frame from 88.7% to 98.9%.Except for left ventricular function (LVF) assessment, 30 day readmission rate was not associated with adherence to performance measures. Readmitted patients had twice the odds of not having their LVF assessed (OR: 2.0; p<0.00005; 95% CI: 1.45-2.63)

Conclusions: Heart failure performance measures, except for the assessment of left ventricular function have little relationship with 30 day hospital readmissions after discharge. More studies need to be done to identify performance measures that correlate with quality of care in heart failure patients.

INTRODUCTION:

Congestive heart failure (CHF) is a very common and disabling health problem seen most commonly in patients above 65 years (AHA, 2005; Kannel & Belanger, 1991). The incidence of CHF increases with age. CHF is a syndrome in which the heart is not able to meet the body's metabolic demands thus resulting in a variety of symptoms where the body suffers from effects of inadequate oxygen. This leads to symptoms such as shortness of breath, fatigue, poor exercise tolerance and fluid retention in various tissues of the body. CHF is a major public health problem in the western world. In the US alone there are about 5 million Americans living with the diagnosis of heart failure. It is also estimated that another 550,000 Americans are diagnosed with this condition every year(AHA, 2005). CHF accounts for about 15 million physician office visits every year (O'Connell & Bristow, 1994). CHF is the most common Medicare discharge diagnosis accounting for more healthcare costs than any other condition in the US (Massie & Shah, 1997). The overall prevalence of heart failure is increasing as the segment of the elderly population increases. Hospitalizations with a primary diagnosis of CHF among adults (age ≥35) increased from 810,624 in 1990 to 989,500 in 1995 and to 1,088,349 in 1999 (Koelling, Chen, Lubwama, L'Italien, & Eagle, 2004).

This increase has been attributed to the aging population and the advances in the treatment of coronary artery disease (CAD) that have led to more people surviving initial events of acute myocardial infarction (Senni et al., 1999). CHF is primarily a disease of the elderly as evidenced by the fact that 80% of the patients admitted with heart failure are over the age of 65 years (Masoudi, Havranek, & Krumholz, 2002). The incidence of CHF among people aged 65 years and above is about 10 per 1000 population (Kannel &

Belanger, 1991). Congestive heart failure is very prevalent and the magnitude of the problem is such that, it is associated with high healthcare expenditure estimated to be about over $35 billion per year in the USA (Massie & Shah, 1997; O'Connell & Bristow, 1994). Most of the expenditure is due to frequent readmissions of patients with this condition. Twenty percent of all patients discharged from the hospital with heart CHF are readmitted within the first 30 days and 50 % within 6 months (Masoudi et al., 2002; Senni et al., 1999).

Risk Factors

There are many factors that predispose to heart failure. Hypertension is the commonest risk factor for heart failure followed by antecedent acute myocardial infarction (AMI) (Levy, Larson, Vasan, Kannel, & Ho, 1996). The other risk factors include diabetes, metabolic syndrome, dilated cardiomyopathy, smoking and excessive alcohol use. Diabetes mellitus increases substantially the risk of developing CHF especially among post menopausal women with established coronary artery disease. CHF incidence increases with each additional risk factor, for example, the annual incidence of CHF among non diabetic women with no risk factors was 0.4%. This risk increased to 3.4% in the non diabetic women with at least 3 traditional cardiovascular risk factors. Examples of traditional risk factors include diabetes, smoking, hyperlipidemia, and hypertension. Among diabetic persons with no additional risk factors, the annual incidence of CHF was 3.0%, compared with 8.2% among diabetics with at least 3 additional risk factors (Bibbins-Domingo et al., 2004).

Classification of Heart Failure

There are numerous ways of classifying heart failure and in many cases these categories overlap and maybe ambiguous. The basis of these definitions have varied widely and have ranged from, anatomical (right versus left sided heart failure), physiological (diastolic versus systolic), and in some instances clinical considerations (acute versus chronic). The World Health Organization (WHO) classification is based on the nature of myocardial disorder (i.e. dilated, hypertrophic, restrictive, arrhythmogenic right ventricular and unspecified cardiomyopathies) (Richardson et al., 1996).

In recognition of the fact that heart failure is a progressive disorder, the American Heart Association (AHA) and the American College of Cardiology (ACC) Societies have developed in collaboration the staging criteria that takes into account the development and progression of the disease (Hunt et al., 2001). This classification has 4 stages; A through D.

Stage A identifies patients that are at high risk for developing heart failure but have no structural abnormalities of the heart and have no symptoms of heart failure. These are patients that might have risk factors for developing heart failure such as hypertension, diabetes, and coronary artery disease, history of alcohol abuse or exposure to cardio toxins.

Stage B includes patients with structural heart abnormalities but with no overt symptoms of heart failure. Patients in this stage might have left ventricular hypertrophy (LVH), reduced left ventricular ejection fraction (LVEF), valvular disease and prior myocardial infarction but are asymptomatic.

Stage C includes patients that have all the factors in stages A and B, and in addition have symptoms of clinical heart failure. They have not only structural abnormality of the heart but manifests clinical symptoms and signs of clinical heart failure.

Stage D includes patients that are refractory to standard treatment of heart failure. These are patients that may require intravenous medications, on an outpatient basis, that help stimulate the contraction of the heart. The other modalities of treatment for this stage include mechanical assist devices, heart transplant or hospice care.

In the ACC/AHA staging of heart failure, a classification that takes into account the severity and progression of heart failure, patients can progress from one lower stage to a higher stage but never the reverse, i.e. from stage A to B and never from B to A. There is another more clinically based classification or staging of heart failure called the New York Heart Association (NYHA) classification. This classification of heart failure uses the presence or absence of symptoms of heart failure on functional capacity to classify severity of heart failure (Gibelin, 2001). There are 4 classes in this classification I through IV.

Class I   No Limitation of physical activity. Ordinary physical activity does not cause undue fatigue or dyspnea

Class II   Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in fatigue or dyspnea.

Class III   Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity results in fatigue, palpitation or dyspnea.

Class IV   Unable to carry on any physical activity without discomfort.

symptoms at rest.

Path Pathophysiology of Heart Failure

There have been numerous conceptual models that have been proposed to explain

heart failure; however, no one single model effectively explains the complexity of the

heart failure syndrome. Earlier models conceived heart failure as a result of excessive salt

and water retention leading to poor renal flow (cardio renal model) (Packer, 1992).

Following this, there was the hemodynamic model which conceived heart failure as a

problem of "pump failure" with resultant excessive peripheral vasoconstriction (Mann &

Bristow, 2005). These models could not, however explain the progression of heart failure

once the original insult causing heart failure was removed. More recently, the "neuro

hormonal model" has attempted to explain the progression of heart failure as resulting

from the effects of biochemical molecules released in response to injury of the heart

(Bristow, 1984). These biomedical chemicals include catecholamine's, through the

activation of the adrenergic nervous system (ANS); angiotensin II and aldosterone

through the activation of the rennin-angiotensin-aldosterone system (RAAS). With a

reduction in the cardiac output resulting from an insult on the heart (index event),

compensatory mechanisms are set in motion with the goal of maintaining adequate

cardiac output for tissue perfusion. An activated autonomic nervous system and rennin-

angiotensin -aldosterone system results in the over expression of catecholamine's, (also

known as the "flight hormones"), angiotensin II and aldosterone respectively. These

biochemical molecules have profound maladaptive effects on myocardial cells (Bristow,

1984). Some of these effects include loss of cardiac cells, hypertrophy and scaring of the

cardiac muscle (also known as remodeling). The overall result is that the heart configuration changes from the elliptical shape to a more spherical shape which is less efficient in pumping out blood. Patients may be asymptomatic after the index event but with persistence of these maladaptive changes, patients develop overt symptoms of heart failure. Therapeutic agents such as beta blockers (BB) and angiotensin converting enzyme inhibitors (ACEI) have been shown to improve survival in heart failure by ameliorating the effects these maladaptive changes directly through the ANS and RAAS respectively(Currie et al., 1984; Fox et al., 2001; Ikram & Fitzpatrick, 1981). This conceptual frame work helps to explain the changes in the development of systolic dysfunction (heart failure with depressed ejection fraction, less than 45%). However, the maladaptive changes in diastolic dysfunction (heart failure with preserved ejection fraction) are not very well understood.

LITERATURE REVIEW:

Review of Evidence for Medical Treatment of CHF

The treatment for heart failure is divided in to acute phase and maintenance phase. In the acute phase, the main goals are resuscitative, symptom relief and restoration of the normal physiology. The maintenance phase (or implementation phase) involves the administration of life saving treatments that have been shown to improve outcomes in patients with heart failure. There are some medications that have been shown to reduce mortality of heart failure patients and these include, angiotensin converting enzyme inhibitors (ACEI), and beta blockers (BB).Other medications that have scientifically improved outcomes are aldosterone receptor blockers (ARBS) and aldosterone antagonists.

ACE inhibitors

ACEI are a group of medications that inhibit the conversion of angiotensin I to angiotensin II. Angiotensin II has been implicated in long-term deleterious effects on the heart and hence suppression of this enzyme has important clinical implications in patients with heart failure.

The use of ACEI is recommended for most patients with stage B, C, D. These classes of medications have been shown to confer survival benefit to patients with heart failure, after myocardial infarction, improve heart failure symptoms and reverse remodeling by blunting the activity of the RAAS (Garg & Yusuf, 1995; Khalil, Basher, Brown, & Alhaddad, 2001; Munzel & Keaney, 2001). The effects of these medications are not dose dependent. The effects of low dose ACEI on mortality has not been any different than in those patients taking high dose regimens in most randomized clinical trials (Packer, 1992; Tang et al., 2002).

Beta Blockers (BB)

The other class of medications that has been shown to be beneficial in patients with heart failure are beta blockers. Beta blockers have been shown to confer clinical benefits in patients with all stages of heart failure. The benefits that beta blockers confer include survival, morbidity, and quality of life, rate of hospitalizations, remodeling and incidence of sudden cardiac death (Farrell, Foody, & Krumholz, 2002; Foody, Farrell, & Krumholz, 2002). Studies have shown improvements in the systolic function and reversal of remodeling with just 3 to 4 months of treatment with beta blockers (Bristow, 2000; Groenning et al., 2000; Krum et al., 2003). In some cases the improvement in mortality

and hospitalization were seen as early as 14 to 21 days after initiation of therapy (Krum et al., 2003).

Beta blockers are medications that reduce the effect of sympathetic activity on the heart and blood vessels by blocking the action of these "flight hormones" on the heart and blood vessels. An overactive sympathetic activity has been shown to lead to deleterious effects on the heart. Blunting the effect of these catecholamine's in patients with heart failure leads to improved outcomes in both morbidity and mortality rates.

Angiotensin receptor blockers (ARBS)

Angiotensin receptor blockers block the actions of the enzyme angiotensin II at the angiotensin II type 1 receptor site. Angiotensin receptor blocker are comparable, but not superior to angiotensin converting enzyme inhibitors (Cohn & Tognoni, 2001; McMurray, Pfeffer, Swedberg, & Dzau, 2004; Pitt et al., 2000). There are reports of increased adverse events in patients who were receiving combination of both these medications rather than one or the other (Baruch et al., 1999; McMurray et al., 2003). Angiotensin receptor blockers are therefore generally recommended in patients who are not able to tolerate angiostensin converting enzymes inhibitors,   such as cough angioedema.

Aldosterone antagonist

Aldostereone antagonists are another class of medications that have a beneficial role in heart failure (McMurray & O'Meara, 2004). Patients with heart failure have elevated levels of the hormone aldosterone which leads to salt and water retention. Salt and water retention contribute to worsening of heart failure. Aldosterone also works locally on the heart muscle inducing myocardial scaring and hypertrophy. Aldosterone

antagonist counteracts these effects thereby inhibiting the remodeling process (Weber, 2001). Randomized controlled studies have shown that adding these agents to the drug regimen of patients with advanced heart failure (New York heart classification class III or IV) improves mortality outcomes and hospital admissions for heart failure (Pitt et al., 1999).

Causes of heart failure

The most common cause of heart failure in the western world is attributed to coronary artery disease and may often be secondary to an acute myocardial infarction. Coronary artery disease accounts for about 70% of the cases of heart failure (Fox et al., 2001). Heart failure can also result from non ischemic causes such as hypertension, cardiomyopathies, heart valvular disorders, pericardial disorders or arrhythmias.

Review of evidence on CHF readmissions

Readmissions to the hospital for heart failure may be influenced by multitudinous factors such as the severity and stage of the illness, preexisting co-morbid conditions, compliance to prescribed medications, and diet. Other predictors of early readmission to the hospital include uncoordinated discharge medications, such that the patient may not be taking the newly adjusted dosages of heart failure medications initiated in the hospital and may in fact resume the preadmission medications which may have been inadequate to treat the heart failure condition to begin with. This is otherwise known as post hospital discharge medications discrepancy (Coleman, Smith, Raha, & Min, 2005). Unco-ordinated discharge plans between hospital physician and primary care physicians in the communities have been associated with the increased hospital readmission. Rich and colleagues found that nurse led multidisciplinary coordinated care reduced readmission of

heart failure by as much as 28 percent (Rich et al., 1995). Another study by Philips and colleagues showed that post discharge support in elderly patients showed favorable outcomes and reduced readmissions (Phillips et al., 2004) .

Demographic predictors

Race can be a relevant predictor of hospital readmissions. Studies have shown that Blacks in general do not seek healthcare early and are more prone to readmissions than their White counterparts (Evangelista, Dracup, & Doering, 2002; Rathore et al., 2003). The impact of gender on readmissions is unclear because some studies suggest that males are more likely to be readmitted than females (Sueta, Schenck, Chowdhury, Hall, & Simpson, 2000), while other studies suggest that females have higher rates of readmission Alonso Martinez, Llorente Diez, Echegaray Agara, Urbieta Echezarreta, & Gonzalez Arencibia, 2001). Independent of sex and gender, hospital readmissions increase with age greater than 65 years of age (Kossovsky et al., 2000; Krumholz et al., 2000).

Compliance to medications in the outpatient setting may also be related to quality of discharge planning.

Co-morbid conditions

The associated co-morbid conditions are also associated with readmission rates of heart failure. Conditions such as chronic kidney disease, pulmonary disease, hypertension and diabetes can predispose patients to readmissions (Tsuchihashi et al., 2001). A study by Brausntsein and colleagues (2003) found that about 40 % of patients with heart failure have at least 5 non cardiac co-morbidities and these account for about 80% of the healthcare cost for all patients with heart failure.

Clinical Variables

Certain clinical variables are associated with increased hospitalizations. Some of these variables include, low cardiac functional status or reserve. The lower the ejection fraction or cardiac reserve, the higher the severity of heart failure and higher the likelihood of readmissions. Another clinical variable that may impact readmissions is the NYHA classification of heart failure. Higher stages of the NYHA imply advanced disease and therefore will lead to increased length of stay of patients in the hospital (Philbin & Roerden, 1997).

Medications

Studies are conflicted on the impact of CHF medications on hospital readmissions. ACEI use have been shown to reduce readmissions (Holst et al., 2001). On the other hand, the impact of beta blockers is mixed, with some studies suggesting that, beta blockers reduce hospital readmissions while other studies suggest that, they do not impact the rates of readmissions (Cobelli, 2000; McDonald et al., 2001).

Process of care

There is evidence to suggest that the process of care of patients with CHF can affect their outcomes. Some studies have shown that involvement of the cardiologist in the care of patients while they are in the hospital reduces the length of stay in the hospital and subsequent rates of readmission (Cobelli, 2000; McDonald et al., 2001; Polanczyk, Newton, Dec, & Di Salvo, 2001). There is also data to show that the quality of outpatient management of heart failure affects the rates of readmissions (Kossovsky et al., 2000). A multidisciplinary approach to the management of patients with heart failure has been shown to lead to reduced readmissions to the hospital (Stewart, Marley, & Horowitz,

1999). This is in keeping with the complexities of variables that may affect heart failure readmissions. Variables that reduce readmissions may range from timely follow up visits with the primary care physicians and early symptom recognition (Evangelista, Dracup, & Doering, 2000). Rich and colleagues (1995) reported in their study that a nurse directed multidisciplinary intervention, involving diet education; prescription medications and follow-up coordination resulted in reduced readmissions and lower cost of care in patients with heart failure. The interventions were much more effective in the elderly patients.

McDonald and colleagues (2002) also validated these results indicating that patients receiving a multidisciplinary intervention had better outcomes in terms of readmissions and death compared to the group that had optimized medical care only.

Psychosocial factors

Patients' psychosocial conditions can also affect the readmissions to the hospital. Low social economic class, single marital status and depression have been associated with increased rates of readmissions (Philbin, Dec, Jenkins, & DiSalvo, 2001). Vansuch and colleagues reported that discharge instructions to patients with heart failure as well as patient education does reduce the number of readmissions and mortality due to CHF (VanSuch, Naessens, Stroebel, Huddleston, & Williams, 2006).

National Quality Measures

Healthcare organizations are required to collect information on the delivery of healthcare services to evaluate the quality of their services as well as report outcomes to third party payers as well as to credentialing organizations. The two most important organizations that mandate healthcare reports are the Center for Medicare Services

(CMS) and the Joint Commission on Accreditation of Healthcare organizations (JCAHO) also known as the Joint Commission. CMS is a federal government program which serves as a payer for healthcare services rendered on behalf of its Medicare and Medicaid patients. The Joint Commission on the other hand is a private sector, not for profit organization that credentials hospitals and healthcare organization in the US.

Accreditation by the Joint Commission is a requirement if the healthcare organization is to get reimbursement for services rendered on behalf of Medicare and Medicaid patients. Hospitals accredited by the Joint Commission are required to assess quality using prescribed measures called core measures for specific diseases. Heart failure is one of the diseases the hospital can choose to assess. These measures are based on peer reviewed studies which provide evidence of the association of the measure with clinical outcomes. Some of the measures are based on expert consensus opinion. For heart failure, the core measures are: Assessment of left ventricular function (LVF), Prescription of ACEI to patients with low, provision of adult smoking cessation advice for patients that smoke. The other measure is based on expert consensus opinion and is based on documentation that patients received discharge instructions or educational materials on six metrics which include: activity, weight, diet, and discharge medications, follow up appointments and worsening of symptoms (Hunt et al., 2001).

CMS in the early 1990s transitioned from merely acting as a payer of services for its clients to an insurer also focused on quality of care. This led to a series of quality initiatives aimed at improving the quality of healthcare that its beneficiaries were receiving. In 2003 the Center for Medicare Service (CMS) initiated a program called Hospital Quality Incentive Demonstration Project (HQIDP) with the goal to improving

quality of care services in the hospitals. In this program, hospitals adhering to evidence based practices are rewarded with increased payments on Medicare patients. Participating hospitals have CHF discharge teams or planners to assure adherence with evidence based guidelines in heart failure prior to discharge from the hospital. Thus hospitals are expected to monitor and report to CMS the number of patients discharged on ACEI, left ventricular function assessment, smoking cessation counseling, and discharge instructions on for heart failure. These variables constitute the "core measures" on patients discharge from the hospital with heart failure.

Early readmission of heart failure has been linked to quality of care, with suggestion that patients being readmitted have poor quality of care (Ashton, Kuykendall, Johnson, Wray, & Wu, 1995). Other studies have not shown such a link between early hospital readmissions and quality of care for patients with heart failure (Kossovsky et al., 2000). The CMS however, does not reimburse hospitals for the care of patients who are readmitted within a period of 30 days. The reimbursement is bundled up with the prior hospitalization. It is imperative therefore for hospitals to prevent early readmissions for heart failure. Most hospitals track patients with heart failure that are readmitted within this 30 days period for administrative purposes. It is important for hospitals to keep such administrative records for planning purposes to minimize non-reimbursable care.

OBJECTIVES:

The aim of this study is to:

1.   Investigate the rates of adherence to the heart failure performance measures in patients discharge with heart failure in a community hospital from 2002-2008.

2.   Study the relationship between hospital adherence to heart failure performance measures and rates of 30 day readmissions in patients discharged from the hospital with heart failure.

Study Research Question: The primary research question of this study is: Does adherence to heart failure performance measure at discharge from the hospital translate to reduced 30 day readmissions?

STUDY DESIGN:

Methods

This is a retrospective descriptive study designed to compare the rates of early readmission among patients with heart failure before and after the implementation of discharge planning strategies in 2005 at the Kettering Medical Center in Ohio. Early readmission is defined as readmission to the hospital within 30 days of discharge from the hospital. Subjects include all the patients with CHF who were readmitted at the hospital between years 2001-2008. Readmission is defined as admission to the hospital within 30 days of discharge from the hospital.

All patients admitted to the hospital between December 2001 and December 2008 were reviewed. There were total 6,065 patients admitted with the diagnosis of heart failure. These patients were identified from the heart failure registry using the diagnostic related group (DRG) codes ascribed for heart failure. From this composite, data of patients that were admitted for heart failure, and data from patients who had presented to the hospital within 30 days of discharge were discriminated by the unique medical record numbers that are assigned to patients with a 30 day readmission for heart failure.

Data were extracted from the electronic medical records for patients who had met readmission eligibility. Data collected included demographic information, co morbid conditions, diagnostic tests, pre-admission and post discharge medications and adherence to heart failure core measures at discharge. Both the Kettering Medical Center and the Wright State University's Institutional Review Boards reviewed and approved this study.

Statistical Analysis

Categorical variables are expressed as numbers and percentages while continuous variables are expressed as means. The chi-square test was used to measure association between variables, and to describe the relationship between the heart failure performance variables and the dependent variable (readmission rate). Statistical significance was set at $p<0.05$. Crude rate of readmissions were calculated by dividing the number of 30 day readmissions by the total number of heart failure admissions during the specified time interval. Data was imported into Excel worksheet for descriptive statistical analysis of categorical variables. Chi-square test using the Epi Info® program was used to identify associations between independent and dependent variables.

RESULTS:

There were 6,063 patients admitted for heart failure between December 2001 and December 2008. During this time 19.6% (1,191) of the patients were re admitted to the hospital within 30 days of discharge (see Figure 1) .The baseline characteristics of the study group are as shown Table 1. The average age of patients was 77.4 (SD 11.2). 55.6% of the patients were female.

Table1. Patient Characteristics

Female	52.6%
Male	47.4%
Age (Mean)	77.4 (SD 11.2)
HTN	76.8%
CAD	74.0%
CVA	74%
PVD	70.3%
Diabetes	73.8 %
Smokers	62.3%

The patients admitted for heart failure were more likely to have other co-morbid conditions reflecting the fact that CHF is disease of the elderly with multiple risk factors. Two-thirds (76.4%) of the study population had hypertension, while 74.0% had coronary artery disease. Another 74.0% of the study population had history of cerebrovascular accidents (CVA). Patients with a history of peripheral vascular disease comprised 70.3% of the study. Patients with a history of diabetes comprised 73.8% of all patients admitted with heart failure.
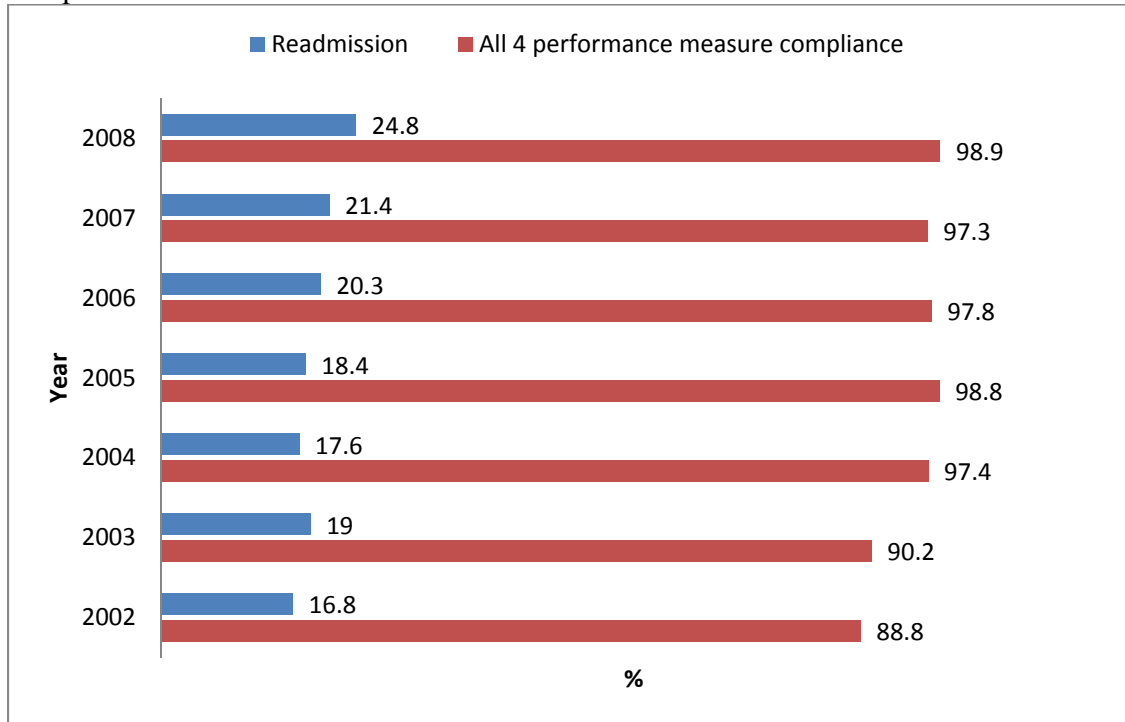
Readmissions

The number of readmissions for heart failure steadily increased over the years. In 2002 the 30 day readmission rate was 16.8% while in 2003 through 2008; the rate of readmissions was 19.0%, 17.6%, 18.4%, 21.4% and 24.8% respectively (Table 2). The average length of stay of patients admitted for CHF was 5.8 days (SD 4.2 days) with a

maximum stay of 59 days. During the time of the study, the adherence rate for all the four heart failure core measures increased steadily from 88.8% to 98.9%.The rate of 30 day readmissions for heart failure during the same time increased from 16.8% to 24.8%.

Figure 1
Temporal Trends of Adherence to Performance Measures and CHF Readmissions

Graph of the temporal trends of compliance to all the four performance measures in relation the rates of CHF readmission during the study period.

Performance Measures

Adherence to heart failure performance measures had improved overtime from 16.8% in 2002 to 24.8% through 2008. This improvement in adherence to the performance measures over the six year period may be due to a change in government policy in 2005 resulting in the CMS offering incentives of higher payments to health care providers adhering to performance measures linked to quality of care. Hospitals are rated on the quality of care based on these core measures which are also publicly reported. It is

therefore imperative for hospitals to find ways and means to adhere to these performance measures in order increase revenue on one hand and to improve their public image as centers of excellence, on the other hand. Although the general trend was overall improvement in all the performance measures over time, the smoking cessation core measure had the greatest increase with 97.8% adherence, while ACEI use core measure had a 96% adherence rate. The adherence rate for the left ventricular assessment core measure was 94%. However, the core measure of discharge instruction (at time of discharge) ranked the lowest at 77.6% over the six years of the study.

Table 2. Number of Patients not Meeting the Core Measures at Discharge

Year	Total CHF admissions	Readmissions (%)	Discharge instructions not given	Left ventricular function not assessed	ACEI not initiated at discharge	Smoking cessation not given at discharge
2008	713	177(24.8)	8	1	0	0
2007	859	184(21.4)	23	0	4	0
2006	866	177(20.3)	19	2	3	1
2005	894	165(18.4)	11	6	8	0
2004	1007	178(17.6)	26	14	11	4
2003	886	169(19.0)	86	23	14	13
2002	838	141(16.8)	94	26	8	8

Figure 2
Compliance of Core Measures from 2002-2008
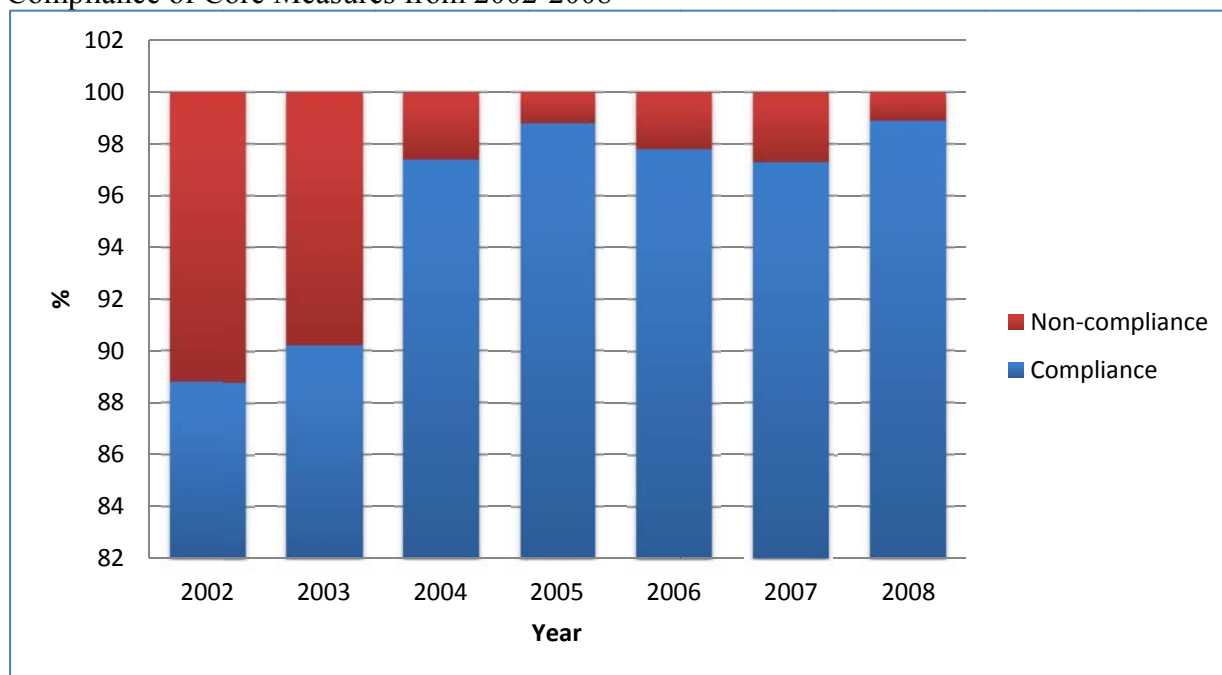
Graph of the temporal trends of compliance to all the performance measures in the study times frame

Figure 3
Non Compliance and Readmissions
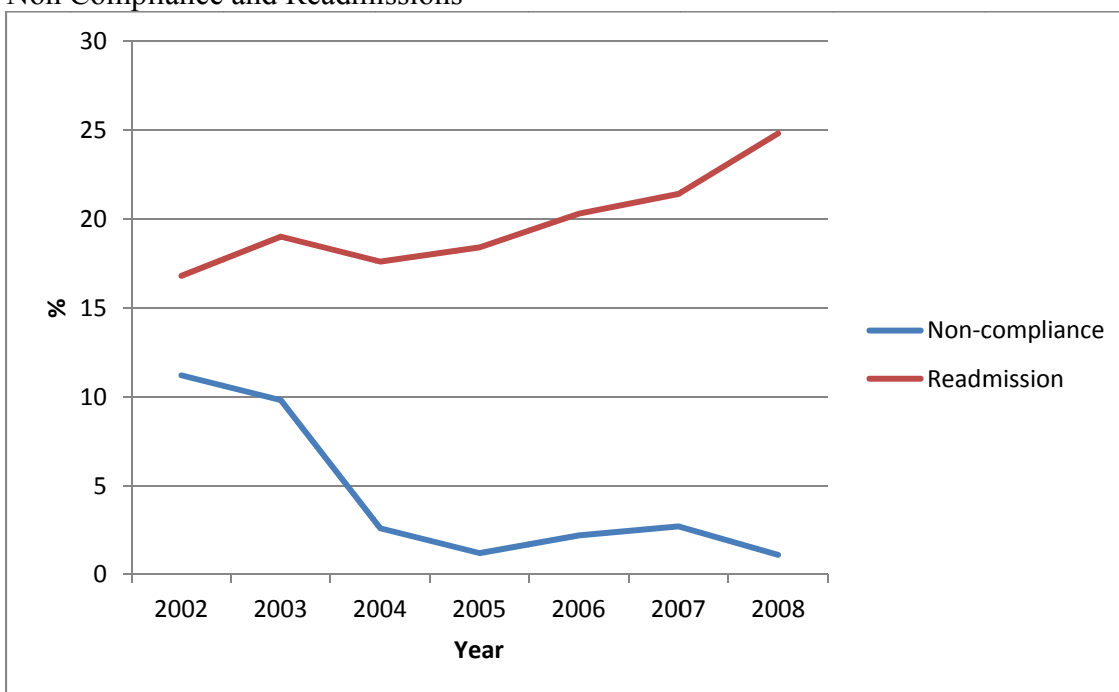
Temporal trend of non adherence to the core measures and CHF readmissions rate

Table 3. Statistical Correlations between Adherence to Performance Measures and Readmissions

Performance Variable	Odds Ratio	95% CI	P value
Left Ventricular Assessment	1.02	1.45-2.63	0.000005
Smoking Cessation	1.03	0.65-1.62	0.89
ACEI usage	1.3	0.98-1.96	0.06
Discharge Instructions	1.02	0.88-1.20	0.76

Heart failure discharge instructions and readmission

Two hundred and sixty-seven (22.3%) of the 1,191 patients readmitted for heart failure between 2002 and 2008 presented lack of compliance to discharge instructions. Those patients not readmitted within 30 days (for heart failure) had 22.1% (1071) lack of compliance to discharge instructions.

There was no significant association between readmission rates and not giving discharge instructions (OR= 1.02, 95%CI= 0.88-1.20, p= 0.76).

Correlation of smoking cessation and readmission

Among patients readmitted with heart failure during the study period, there were 2.2% (26) who had not received smoking cessation instructions before hospital discharge. On the other hand, of the 4,865 patients who were not readmitted for heart failure, there were 2.1% (103) patients who were not given discharge instructions.

There was no association between not receiving a smoking cessation plan at discharge and the 30 day readmission rate (OR=1.03, 95% CI 0.65-1.62, p=0.89).

Correlation of ACEI and readmission

In the group of patients who were readmitted for heart failure, 4% (48) did not receive ACEI therapy, while in the group of patients that were not readmitted within 30 days, 3% (143) did not receive the medications.

Despite a trend towards reduction in the 30 day readmissions associated with ACEI therapy, there was however no statistical significance in the findings (OR= 1.3, 95% CI 0.98-1.96, p=0.06).

Correlation of LV assessment and readmission

Out of the 1,191 patients readmitted with heart failure, 6% (72) did not have their left ventricles assessed prior to discharge from the hospital by their physicians. In the group that was not readmitted, 3.1% (155) did not have left ventricular assessment. There was a significant relationship between ventricular assessment and readmission (O.R=2, 95% CI 1.45-2.63, p=0.000005).

DISCUSSION:

Readmission to the hospital is influenced by a multitude of factors. Some factors can be related to social-economic factors. Philbin and colleagues (2001) reported low social economic status is related to increased readmissions. Patient compliance to treatment outlined by healthcare providers can also influence the rate of rehospitalizations (Tsuchihashi et al., 2001). Presence or absence of co-morbid conditions such as renal failure, chronic obstructive pulmonary diseases may have an effect on the heart failure readmission rates. Komukai and colleagues (2008) found that preexisting conditions such as renal failure were associated with increase readmissions to the hospital. These findings were also confirmed by Burns who reported that multiple past

hospitalizations secondary to other medical conditions were associated with readmission to the hospital with CHF (Burns & Nichols, 1991). Anemia in patients with heart failure was found to be a predictor of early readmission to the hospital and death (Felker et al., 2003).

Readmissions can also be related to process of care, for instance, when the patient is not started on evidence based therapies for heart failure. Ashton and colleagues found that readmissions to the hospital may be an indicator of poor quality care in patients being treated for heart failure. They reported that patients discharged early from the hospital prior to complete resolution of symptoms were more likely to be readmitted within 14 days from discharge (Ashton et al., 1995). Whellan and colleagues (2001) have proposed that case management in patients with heart failure improves the quality of care and outcomes. These disease management programs help guide management of patients with chronic medical conditions by offering a system of coordinated healthcare interventions.

The CMS links quality of care to 4 performance core measures for heart failure. These measures include discharge instructions, left ventricular assessment, smoking cessation counseling and administration of ACEI. In our study, these core measures had no association with the rate of readmissions to the hospital within 30 days of discharge from the hospital. The independent relationship of heart failure performance measures and readmission rate can be attributed to the heterogeneity of the factors influencing readmissions to the hospital.

Philbin and colleagues (2001) did not find any relationship between early readmission and the quality of admission work up, evaluation and treatment for heart

failure patients. In the same study, they reported an association between patient's clinical and demographic characteristics with readmissions to the hospital. Patients of lower social economic class were more likely to be readmitted for heart failure (Philbin et al., 2001). Even though this study did not show a correlation between adherence to heart failure performance measures and readmissions, there are some studies that have shown the contrary. For instance, Chung and colleagues (2008) showed that adherence to heart failure performance measures reduced all cause heart failure readmissions to the hospital, although in their study, the sample size was small and the duration of follow up was only 6 months. Even though, Chung's study showed positive correlation of adherence to the core measures with readmissions, this did not show any significant association between the adherence to heart failure performance measures and the 30 day hospital readmission rates. Some authors have argued that what may be more important is whether patients are being discharged on the optimal dosages of ACEI, instead of merely documenting that patients was discharged on an ACEI (McDonald et al., 2001). In his study, he found that patients who were discharged on the target dosages of ACEI had less readmission rate within 30 days. In another study by VanSuch and colleagues (2006), adherence to discharge instructions was associated with reduced readmissions for heart failure.

The lack of effect of the four performance measures (discharge instructions, left ventricular assessment, smoking cessation counseling and administration of ACEI) on 30 day readmissions may relate to the fact that readmissions for heart failure are influenced by a heterogeneous group of factors. Two of the four measures, use of ACEI and smoking cessation take a much longer period of time to demonstrate benefit. For example, a smoker for 20 years may be counseled on quitting the use of tobacco. The

process to eventual abstinence may be marked with episodes of recidivism and take years to attain. Even in the event that the patient has quit smoking, the clinical benefits of smoking cessation may take much longer than 30 days to realize. ACEI on the other hand inhibits the hormone angiotensin converting enzyme that has been implicated in the pathogenesis of heart failure. Inhibition of this enzyme may take weeks before clinical benefits are seen.

Assessment of left ventricular function may have implications on disease severity and guide therapy in heart failure. However merely assessing and documenting that ventricular function was performed during hospitalization does not imply that therapy for heart failure was optimized. In one study by Luzier et al. (1998), they reported that most patients discharged with ACEI medications were not on appropriate dosages. In fact, they reported that heart failure readmissions reduced by up to 28% in patients with ACEI dosages about 8-10 times higher than the commonly used dosage regimens (Luzier et al., 1998).

Limitations

There a few limitations of this study that are worthy of mention. One overarching limitation is that this is a retrospective study and hence, the myriad etiological factors responsible for readmissions in heart failure patients could not be controlled for. For instance, infection is a common cause of heart failure exacerbations which can directly affect readmission. This study did not investigate the reasons for the exacerbation of heart failure necessitating readmissions to the hospital. Poor compliance to medications is another reason for recidivism. These and many other specific reasons for heart failure were not identified in this study. For this reason, our study may have given the false

impression that heart failure readmission rates are only related to the heart failure performance measures that we have been studying. There are also patient attributable factors such as demographic variables, social economic status, coexisting medical conditions and other psychosocial factors that may influence the rates of readmissions in heart failure. Provider specific variables such as experience of the attending physician and whether a cardiologist was involved (or not) in the care of the patient are also important. These variables can influence the quality of care provided to heart failure patients and by extension the rates of readmissions. This study did not take into account the impact of any of these variables on readmissions. This study used existing administrative data to make inferences on the relationship between performance measures and readmissions. In one study by Hallerbach and colleagues (2008), they found that in as many as 50% of all the patients readmitted had been labeled incorrectly, raising serious questions about using administrative data alone to determine quality of care.

Another limitation of this study is that it was a single center study in a community hospital serving a predominantly elderly, affluent community. The findings may reflect the inherent biases of the institution and of its clientele, in which the study was conducted.

Public Health Policy Implications

This study is expected to shed more light and help us understand the factors influencing readmissions rates to the hospital in patients with CHF. This knowledge is important clinically in that it, it would shape clinical care practices that if properly implemented would lead to improved outcomes in CHF patients, and reduced healthcare cost.

There is the perennial debate about the high spiraling cost of healthcare in the US and a quest for the most effective ways of reducing these healthcare costs while at the same time ensuring that quality of healthcare is enhanced. Heart failure is the most common diagnosis with significant contribution to healthcare costs. Finding ways that improve quality of health and at the same time reduce the cost of care is extremely important. Heart failure readmissions increase significantly the burden of healthcare costs. From the public health standpoint, reducing the incidence and prevalence of heart failure is the ultimate goal. This might be done through risk factor reduction and effective public health education. However the intermediate goal would be to improve the quality of life of patients with heart failure both by using evidence based practices and by improving the process of care that enhances the lives of heart failure patients. Admission of patients to the hospital is not only an opportunity for clinicians and healthcare providers to address patients immediate health concerns (that prompted them to seek help in the first place), but it is also an opportunity for healthcare providers to coordinate healthcare resources, and to promote educational interventions proven to improve the quality of lives of patients.

CONCLUSIONS:

This study showed that there was no significant association between hospital's adherence to the heart failure performance measures and 30 day readmission rate. There was a statistically significant relationship between the lack of left ventricular assessment and readmission rate. There was also a trend towards reduced readmissions in patients with ACEI although the results were not statistically significant. Left ventricular function assessment may guide the type of therapy in heart failure patients in that patients with

low ejection fraction may be initiated on evidence based therapies known to improve outcomes. Patients with low ejection fraction (cardiac reserve) are candidates for angiotensin converting enzyme inhibitors, medications that have been shown to have improved outcomes in heart failure patients. Therefore left ventricular function assessment may be a surrogate indicator of quality of care in heart failure patients. More studies should be done to address the relationship between the current heart failure performance measures and how they relate to quality and outcomes of care in heart failure patients. Studies should also address current performance measures and whether they should continue to be used as surrogate indicators for the quality of care and how these measures impact clinical outcomes. In lieu of the findings of this study, policy makers should delineate measures that could be labeled as "good practices" for health care providers from the "core measures". "Good practices" could include among others, measures such as smoking cessation counseling and discharge instructions given to patients prior to discharge. These measures while important in guiding healthy behavior choices in heart failure patients still remain unsubstantiated in terms of hard scientific evidence in influencing outcomes. Furthermore, these measures are not only variable in how they are implemented by health care providers but how they may be adopted by patients. On the other hand, "core measures" should be substantiated to improve outcomes, measurable and reproducible.

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APPENDIX 1:

Table 1.   CHF RE-ADMISSION DATA EXTRACTION SHEET

MEDICAL RECORD NUMBER	DURATION OF HOSPITAL STAY
AGE	
SEX	SMOKING CESATION GIVEN Y/N
BMI	
PAST MEDICAL HISTORY:	
DM: HTN:CAD: CVA:CKD:PVD:	
MEDICATIONS:	
PREADMISSION MEDICATIONS	
SMOKING : Yes / No	
LABS: Creatinine: BMP: Cardiac enzymes	
2D ECHO: EF	
STRESS TEST: Positive: Neg	
CATHETERISATION	
DISCHARGE MEDICATIONS: ACEI, BB, ASA,ARB	
DISCHARGE PLANNING AT DISCHARGE	
DISCHARGE INSTRUCTIONS: Yes/No	

APPENDIX 2

Table 2.   ABBREVIATIONS

ABBREVIATIONS	MEANING
ACEI	Angiotensin converting enzyme inhibitor
AMI	Acute Myocardial infarction
ARB	Aldosterone Receptor blocker
BMI	Body Mass Index
BNP	Brain Naturetic Peptide
CAD	Coronary Artery Disease
CKD	Chronic Kidney disease
CVA	Cerebrovascular accidents
DM	Diabetes Mellitus
ECHO	Echocardiography
EF	Ejection fraction
HTN	Hypertension
PVD	Peripheral vascular Disease

APPENDIX 3

Performance measures for Left ventricular function

Performance Measure	Measure Description	Criterion Met or Acceptable Alternative	Rate Calculation
Evaluation of Left Ventricular Systolic (LVS) Function (previously called "Left Ventricular Function (LVF) Assessment**")**	Heart failure patients with documentation in the hospital record that left ventricular systolic (LVS) function was evaluated before arrival, during hospitalization, or was planned for after discharge	Documentation that left ventricular systolic function was evaluated before arrival, during hospitalization, or was planned for after discharge. Exclusions include patients with reasons documented by a physician, nurse practitioner or physician assistant for no LVS assessment.	Numerator: Heart failure patients with documentation in the hospital record that LVS was evaluated before arrival, during hospitalization, or is planned for after discharge Denominator: Heart failure patients age 18 and older

APPENDIX 4

Performance measure for ACEI

Performance Measure	Measure Description	Criterion Met or Acceptable Alternative
ACE Inhibitor or Angiotensin Receptor Blocker (ARB) for Left Ventricular Systolic Dysfunction (LVSD)	Heart failure patients with left ventricular systolic dysfunction (LVSD) and without both Angiotensin converting enzyme inhibitor (ACE inhibitor) and Angiotensin Receptor Blocker (ARB) contraindications who were prescribed an ACE inhibitor or an ARB at hospital discharge	Documentation that an ACE inhibitor or an ARB was prescribed at discharge in patients with LVSD who were not participating in an ACE inhibitor alternative clinical trial at the time of discharge and where there is no documentation of one or more of the following potential contraindication/reason for not prescribing an ACE inhibitor or an ARB at discharge: • ACE inhibitor allergy and ARB allergy • Moderate or severe aortic stenosis • Other reasons documented by a physician, nurse practitioner, or physician assistant for not prescribing an ACE inhibitor and not prescribing an ARB at discharge LVSD is defined as documentation of a left ventricular ejection fraction (LVEF) less than 40% or a narrative description of left ventricular function (LVF)

APPENDIX 5

Performance measure for Discharge instructions

Performance Measure	Measure Description	Criterion Met or Acceptable Alternative	Rate Calculation
Discharge Instructions	Heart failure patients discharged home with written instructions or educational material given to patient or care giver at discharge or during the hospital stay addressing **all** of the following: activity level, diet, discharge medications, follow-up appointment, weight monitoring, and what to do if symptoms worsen	Documentation that heart failure patients discharged to home, home care or home IV therapy, or their care givers were given written discharge instructions or other educational materials addressing all of the following: activity level, diet, discharge medications, follow-up appointment, weight monitoring, and what to do if symptoms worsen	Numerator: Heart failure patients with documentation that they or their care givers were given written discharge instructions or other educational material addressing **all** of the following: activity level, diet, discharge medications, follow-up appointment, weight monitoring, and what to do if symptoms worsen Denominator: Heart failure patients age 18 and older discharged home

APPENDIX 6

Performance measures for Smoking cessation

Performance Measure	Measure Description	Criterion Met or Acceptable Alternative	Rate Calculation
Adult Smoking Cessation Advice/ Counseling	Heart failure patients with a history of smoking cigarettes, who are given smoking cessation advice or counseling during a hospital stay	Documentation that for heart failure patients who are smokers (defined as someone who has smoked any time during the year prior to hospital arrival), smoking cessation advice or counseling was provided during the hospital stay	Numerator: Heart failure patients (cigarette smokers) who receive smoking cessation advice or counseling during the hospital stay Denominator: Heart failure patients age 18 and older with a history of smoking cigarettes anytime during the year prior to hospital arrival

APPENDIX 7

Kettering Health Network

From: "Gail.Young@khnetwork.org" <Gail.Young@khnetwork.org>
To: sulamazi@yahoo.com
Cc: Gail.Young@khnetwork.org
Sent: Tue, June 30, 2009 9:11:04 AM
Subject: Study 09-019: Impact of Congetive Heart Failure Discharge Planning on Congestive Heart Failure Re-Admission Rates

NWPRO23-09
June 24, 2009

Sula Mazimba, M.D.
South Dayton Acute Care Consultants
33 West Rahn Road, Suite 102
Dayton, Ohio 45429

RE: Your letter dated: 6/22/2009
09-019: Impact of Congetive Heart Failure Discharge Planning on Congestive Heart Failure Re-Admission Rates

Dear Dr. Mazimba:

I have reviewed your request for the new study listed above. This study qualifies as exempt from review under the following guideline: [45 CFR 46.101(b)(4)] because the research involves existing data and subjects cannot be identified. The following items are exempt from review:

o Protocol Version 1.1 (dated 6/22/2009)
o Data Collection Tool (dated 6/4/2009)

Your study has been granted a waiver from the requirement to secure authorization for the use of PHI.

Should you make any changes to the procedures or project, please submit the revisions to the KHN IRB for review and determination prior to implementation.
Upon completion of your project, please complete and submit a final report in addition to any resulting publications or reports.

You are free to conduct your study without continuing reviews by Kettering Health Network (KHN) IRB.

Thank you for keeping the Board informed of your activities. If you have any

questions or need further information, please contact Gail Young ((937) 395-8309; fax (937) 395-8185; email: Gail.Young@khnetwork.org).

Sincerely,
Douglas Lehrer, M.D.
Vice Chairperson, Institutional Review Board

Enclosure: Application for Waiver of Authorization or Altered Authorization Under the HIPAA Privacy Rule (dated 6/4/2009)
cc: IRB Files, Innovation Center

Institutional Review Board

<div style="border:1px solid black; text-align:center">

RESEARCH PROTOCOL

</div>

TO: Kettering Health Network Institutional Review Board

FROM: Principal Investigator: Sula Mazimba, M.D.

     Phone Number / Fax Number: 937-901-0215

     Mail Address: 33 W Rahn Rd, Suite 102
           Kettering, Ohio 45429

     Email Address: sulamazi@yahoo.com

DATE: 6/22/09

STUDY TITLE: Impact of Congestive Heart Failure Discharge Planning on Congestive Heart
       Failure Re-Admission Rates

VERSION # 1.1

Impact of Congestive Heart Failure Discharge Planning on Congestive Heart Failure
Re-Admission Rates

Study Summary

In this study, we hypothesize that the addition of the Congestive Heart Failure (CHF) discharge planning team has improved the rate of CHF readmission in the hospital. Via retrospective chart review, we will review the rate of readmission before and the rate of readmission after the introduction of the discharge planning for CHF.

Purpose

The purpose of this study is to assess the impact of discharge planning on the readmission rates for CHF and to assess compliance to recommended medications for CHF treatment.

Background and Significance

CHF is the most common inpatient diagnosis in the USA. It contributes to about 35 billion dollars every year in health care costs. The bulk of the cost is due to readmission of patients. Discharge planning has been shown to improve patient adherence to discharge medications and compliance, and this may have an impact on re-admissions. The CHF discharge planning team was initiated in KMC in October 2006.This study aims to evaluate the impact of this program to preventing readmissions in the hospital.

Human Subject Population

Method of Subject Identification and Recruitment

All patients between the ages of 18-89 presenting to Kettering Medical Center with a CHF diagnosis between January 1, 1999 and December 4, 2008 will be reviewed in a retrospective fashion. Records will be sourced by ICD code 428.0. Patient charts will be identified by assigning a number to the patient only if they meet the inclusion criteria. Only deidentified data will be used in this study.

Gender of Subjects

☐ **Males Only**   ☐ **Females Only**   ☒ **Both Males and Females**

Number of Subjects

Up to 2000 subjects may be enrolled at KHN.

Age Range of Participants

The age range of patients for this study will be 18-89 years old.

Inclusion/Exclusion Criteria

Inclusion Criteria

- o Patients between the ages of 18 and 89

- o Patients readmitted to Kettering Medical Center between 1999 and June 4, 2009 with a diagnosis of CHF

Exclusion Criteria

- ○ Patients under the age of 18 and over the age of 89 are excluded due to privacy concerns
- ○ No readmission for CHF to KMC

Vulnerable Subjects

N/A

Research Design and Methods

All patients between the ages 18-89 presenting to Kettering Medical Center between January 1, 1999 and December 4, 2008 will be reviewed in retrospective fashion as described above in the "Method of Subject Identification and Recruitment". Only data existing in the medical record on or before June 4, 2009 will be reviewed. Only those who fit our inclusion criteria will be considered. We will review the chart to record the following information: age, sex, BMI, past medical history of HTN, DM, CAD, CVA, CKD, PVD, Smoking, Labs like blood sugar, creatinine, cardiac enzymes, BNP, 2D Echo EF, stress test, catheterization, duration of hospital stay, preadmission and discharge medications, number of readmissions in 6 months as well as 6 months follow up (AMI, CVA, and death). The aim of the study is to look at the rate of readmissions in the patients with CHF before and after the implementation of discharge planning.

Surveys / Interviews / Questionnaires

No patient surveys, interviews, or questionnaires will need to be completed for this study.

Risks / Discomforts / Benefits

Risks: There is little-to-no risk associated with this retrospective study. The data collection and storage processes will be protected as indicated by HIPAA guidelines. The recruitment process will be limited to diagnosis code and no individual consent will be necessary. No form of deception will be used in this study.

Benefits: The potential benefit of this study will be to help understand the factors influencing readmissions in patients with CHF and would eventually help us know if implementation of proper discharge planning can reduce the rate of readmissions in them

Data Analysis and Data Monitoring

No ongoing data monitoring will occur as this is a retrospective study. All data will be analyzed by the Principal Investigator.

Data Storage and Confidentiality

All data will be stored on a password protected computer accessible only to study personnel. Data collected will be void of any identifying characteristics to prevent linking data to patients. When the data collection and study analysis is completed, all data will be permanently deleted.

Estimated Period of Time to Complete the Study

The estimated time to complete this study will be 12 months to allow time for data collection and analysis.

Informed Consent

Subjects' written, signed consent will be obtained.	**No**
Waiver of a signed consent is requested.	**No**
Waiver or alteration of consent is requested.	**Yes**

Justifications for the request to waive signed consent are listed as follows:
- The research involves no more than minimal risk to subjects as review of medical records is for limited information.
- Subjects' rights and welfare will not be affected by the waiver because the subjects are not being deprived of any clinical care in this retrospective review.
- The research could not practicably be conducted without the waiver as it is not feasible to locate approximately 2000 subjects to obtain consent what would not affect care they have already received
- Subjects will not be provided with additional information because subjects' care has already been completed for the study/condition. The research results will not benefit subjects or change what has already occurred.

Grant Application

N/A

Study Budget

For this study we request a waiver of IRB fees.

All other costs incurred for study supplies and time for data collection and analysis will be incurred by Principal Investigator.

Attachments

Data Collection Tool

References:

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6 Krumholz HM, Parent EM, Tu N, et al. Readmission after hospitalization for congestive heart failure among Medicare beneficiaries. *Arch Intern Med.* 1997;157:99 –104.

[7] http://www.cms.hhs.gov/HospitalQualityInits/