JIMMA UNIVERSITY

INSTITUTE OF HEALTH, FACULTY OF MEDICINE,

DEPARTMENT OF INTERNAL MEDICINE

MORTALITY AND ASSOCIATED FACTORS AMONG PATIENTS HOSPITALIZED WITH HEART FAILURE AT JIMMA UNIVERSITY MEDICAL CENTRE, JIMMA, ETHIOPIA

BY: MEIRAF DANIEL (MD)

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JIMMA, ETHIOPIA

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ABSTRACT

Back ground: The global burden of disease due to cardiovascular diseases (CVDs) is escalating. This is mainly observed in the developing countries which are experiencing rapid health transition. Heart failure is among these CVDs contributing to 3–7% of hospital admission rate in Africa. Hospitalization for heart failure is a high-risk event for patients, with death or significant adverse consequences as a common occurrence. Hospital case fatality among those with heart failure in Africa ranges from 9% to 12.5%. Integrated approach among clinicians to identify those who are at high risk and implementing specific treatment strategies is of great importance for a better outcome.

Objective: The aim of this study is to assess mortality rate and associated factors among hospitalized heart failure patients at JUMC from September 11, 2016 to September 10, 2017.

Method: A Hospital based retrospective cross-sectional study design was conducted. 252 Patients admitted with heart failure during the study period, who full fill the criteria, were sampled and enrolled in to the study. Simple random sampling technique was used to select the study participants by using their medical registration number as the sampling frame. Data were collected using pretested questionnaire. The collected data were entered into Epidata software and exported to SPSS version 20 for cleaning and analysis. Reports are presented using percentages and frequency. To identify independent associated factors of mortality, binary logistic regression model was used. Adjusted and crude odds ratio with 95% CI was used. P-value less than 0.05 were used to declare statistical significance.

Result: The prevalence of in-hospital mortality was found to be 21.29%. Cardiogenic shock AOR: 0.016 (95% CI: 0.001-0.267), complication at admission AOR: 5.25 (95% CI: 1.28-21.6) and ejection fraction(<30) AOR: 0.112(95% CI: 0.022-0.562) were found to be significantly associated factors.

Conclusion & Recommendation: The in-hospital mortality rate among admitted heart failure patients is unacceptably high. Due emphasis should be given on identified associated factors to reduce the mortality.

Key words: Heart Failure, Mortality, Hospitalization; Retrospective study, Jimma

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Abbreviations

ACE Angiotensin Converting Enzyme

ACS Acute Coronary Syndrome

AF Atrial Fibrillation

ADHF Acutely decompensated heart failure

AHF Acute heart failure

AKI Acute kidney injury

ALP Alkaline phosphatase

ALT Alanine transaminase

AMI Acute myocardial infarction

AST Aspartate transaminase

AV Atrio-ventricular

BNP Brain natriuretic peptide

BUN Blood Urea Nitrogen

CKD Chronic kidney injury

COPD Chronic obstructive pulmonary disease

Cr Creatinine

CVD Cardiovascular diseases

DCM Dilated Cardiomyopathy

EF Ejection Fraction

eGFR Estimated Glomerular Filtration Rate

HF Heart Failure

HHD Hypertensive Heart Disease

IHD Ischemic Heart Disease

JUMC Jimma University Medical Centre

LVH Left Ventricular Hypertrophy

NSTEMI Non ST Elevation Myocardial Infarction

NYHA Newyork Heart Association

SBP Systolic Blood Pressure

SPSS Statistical Package for Social Science

STEMI ST Elevation Myocardial Infarction

TIA Transient ischemic attack

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1. Introduction

1.1 Background

The global burden of disease due to cardiovascular diseases (CVDs) is escalating, principally due to a sharp rise in the developing countries which are experiencing rapid health transition.[1] Heart failure is among these CVDs contributing to 3–7% of hospital admission rate in Africa.[2]

HF is a clinical syndrome characterized by typical symptoms(e.g. breathlessness, ankle swelling and fatigue) that may be accompanied by signs (e.g. elevated jugular venous pressure, pulmonary crackles and peripheral edema) caused by a structural and/or functional cardiac abnormality, resulting in a reduced cardiac output and/or elevated intra-cardiac pressures at rest or during stress.[3]

Hospitalization for HF can be due to a sudden or gradual deterioration of a stable HF, described as 'decompensated', or can be New-onset ('de novo') HF in which patients are diagnosed with heart failure for the first time after an acute or sub acute course.[3] Whichever the scenario is, admission for heart failure is a high-risk event for patients, with death or significant adverse consequences a common occurrence.[4]Hospital case fatality among those with heart failure in Africa ranges from 9% to 12.5%.[5]

Regardless, the integrated approach among clinicians to identify those which are at high risk and implementation of specific treatment strategies is of great importance as it can lead towards a better outcome. The goals of treatment include; improving the hemodynamic status, organ perfusion & oxygenation urgently, limiting further organ damage, treating acute precipitants, preventing the development of complications and initiation of the long term, evidence based disease modifying agents that can alter the natural course of the illness.

1.2 Statement of the problem

In 2015, an estimated 17.7 million deaths occurred due to cardiovascular diseases, accounting for more than 30% of the overall total of 56 million deaths.[6] Heart Failure (HF) is among these cardiovascular diseases with a major contribution in the public health problems worldwide. The prevalence of HF is approximately 1–2% of the adult population in developed countries, rising to ≥10% among people >70 years of age.[3] Approximately 5 million patients in America have HF, and over 550 000 patients are diagnosed with HF for the first time each year.[7]

HF is one of the leading causes of hospital admission in the world. In Africa, previous studies have revealed that heart failure accounts for over 30% of hospital admission in specialized cardiovascular units and 3%–7% in general internal medicine wards which is similar to the rate in developed countries of Western Europe and America.[5] In Zimbabwe, patients with heart failure contribute to about 6% of hospital admission; more importantly, over the same period, the proportion of death resulting from heart failure has significantly increased.[8] Compared to studies from other part of the world, heart failure in Africa tends to occur at a much younger age with most cases recorded around the 5th and 6th decade. [5]

Admission for heart failure is a high-risk event for patients, with death or significant adverse consequences as a common occurrence. A study from USA, revealed an in-hospital mortality for hospitalized HF patients of 4%.[4] A rate of 6.7% was reported from Europe.[9] A report from THESUS–HF done in 9 sub Saharan African countries found an in hospital mortality rate of 4.2%, similar to registries in US & Europe despite differences in cause of HF and age at presentation.[10]

Hospital case fatality among those with heart failure in Africa ranges from 9% to 12.5%. This consistent death rate ranks heart failure among the major causes of death of cardiovascular origin in Africa.[5]

In Ethiopia there are no adequate studies to describe the rates of mortality in hospitalized patients with heart failure. Furthermore important factors associated with in-hospital mortality, have not been evaluated in this specific population. As there are major genetic and environmental influences which affect the course of any disease process including HF, a study specifically designed to a subgroup of population can reveal major differences in this

aspect. This study aims at describing the in-hospital mortality rates and important related factors in heart failure patients residing in the catchment area of Jimma University Medical Centre, Jimma, Ethiopia, with an effort to explore this relatively uncovered research area.

2. Literature review

2.1 Mortality rate in hospitalized heart failure patients

Mortality rate in hospitalized heart failure patients varies among different contexts. A report from the ADHERE registry which included 52,047 patients hospitalized with ADHF in a one year period from 2002-2003 in US, had an in-hospital mortality rate of 4%.[4] Another study in 2008, registered 48,612 patients hospitalized with HF in 259 U.S. hospitals and in-hospital mortality occurred in 1,834 (3.8%).[11]In Europe, the EuroHeart Failure Survey II, which recruited 3580 Patients hospitalized for AHF from 133 centers in 30 European countries reported an in-hospital mortality rate of 6.7% with the De novo AHF patients having a higher in-hospital mortality compared with ADHF patients (8.1 vs. 5.8%).[9]

A Cross-sectional observational study, from Japan including a total of 19 926 patients with AHF found an in-hospital mortality of 8.7%.[12]On the other hand, a study from Brazil of 816 patients hospitalized with HF, between June 2010 and May 2014 found an in-hospital mortality rate of 11.2%.[13] Similarly, a prospective study carried out in India from May 2016 – July 2016 including 100 patients who were hospitalized for ADHF found an in-hospital mortality rate of 11%.[14]

The Sub-Saharan Africa Survey of Heart Failure (THESUS–HF) conducted a prospective, multicenter, observational survey of 1006 patients with AHF admitted to 12 university hospitals in 9 countries from July 1, 2007 to June 30, 2010 and the in-hospital mortality rate was 4.2%.[10] In a study from Cameroon at Yaoundé General Hospital, which was performed in 167 admitted patients, heart failure accounted for 5.8% of all hospital admissions, and the overall in-hospital mortality rate was 9%.[15] A retrospective, descriptive study conducted in MMSH, Kano, Nigeria between January 2016 to December 2016, 16.2% of total admissions were due to HF and there was a higher in hospital mortality rate of 15.7% due to HF.[16]

2.2 Factors associated with mortality in hospitalized HF patients

Socio-demographic factors

A prospective, multicentre, observational, nationwide study from Italy involving 61 Italian Cardiology Centers with 1855 patients who were admitted for AHF found that older age was among important markers of a poor in-hospital outcome.[17]

A study done in Brazil, including 816 patients admitted at Instituto de Cardiologia de Santa Catarina (ICSC) between June 2010 and May 2014 showed that the non-survivor group were significantly older; the mean age was 66.5 ± 13.8 years in those who survived the hospitalization period, being significantly older(70.4 ± 14.2) among non-surviving patients. This study also showed that there was a higher prevalence of males in both groups (52.2% of survivors and 62% of non- survivors), but it was not statistically significant.[13]

On the other hand, a report from a prospective study carried out in India involving 100 patients who were hospitalized for ADHF from May 2016 – July 2016, age has not emerged as a significant factor for mortality prediction in ADHF patients. This study again found no significant relationship between sex and in-hospital outcome.[14]

A retrospective, study conducted in MMSH, Kano, Nigeria between January 2016 & December 2016, including 268 patients admitted for HF, found a mortality rate of 69% for females and 31% for males, which was statistically significant.[16]

The hospitalization mortality rate was slightly higher for males(4.9%) than females(4.2%) in the Sub-Saharan Africa Survey of Heart Failure (THESUS–HF) which was a prospective, multicenter, observational survey of 1006 patients with AHF admitted to 12 university hospitals in 9 countries from July 1, 2007 to June 30, 2010.[10]

Clinical characteristics of patients

A study from OPTIMIZE-HF registry found that a higher SBP at admission was associated with substantially lower in-hospital mortality rate: 7.2% (<120 mm Hg), 3.6% (120-139 mmHg), 2.5% (140-161mmHg), and 1.7% (>161mmHg) (*P*<001). The odds of in-hospital death increased 21% for each 10 mm Hg decrease in SBP below 160mm Hg. [18]
Another study from the same registry showed that lower serum sodium at admission was also associated with higher in-hospital mortality; a 6.0% in-hospital mortality rate was seen for the lower sodium group as compared to 3.2% for those patients with higher serum sodium. The risk of mortality begins to significantly rise at serum sodium <138 mmol/L and is more than double for the patients with serum sodium levels in the 132–135 mmol/L range. [19]

A study from Italy on inpatient outcome of AHF, patients with cardiogenic shock had the highest mortality rate (23.8%), followed by those with acute coronary syndrome (13.0%), while patients with hypertensive HF had the lowest death rate (3.2%). Strong association was also found between in-hospital mortality and SBP & eGFR. Overall hypotension, cardiogenic shock, pulmonary edema, symptoms of hypoperfusion, hyponatraemia, and elevated creatinine were independent predictors of death. [17]

The EuroHeart Failure Survey II found that De novo AHF patients had a higher in-hospital mortality compared with ADHF patients (8.1 vs. 5.8%) and among clinical groups, in-hospital mortality was extremely high in cardiogenic shock patients (39.6%). In pulmonary edema and right HF, prognosis was also worse than average. The best survival was seen in hypertensive HF, as almost all patients were discharged alive.[9]Another study from 8 Europe countries assessed the effect of worsening of renal failure on mortality and found a similar mortality trend despite the presence or absence of worsening of renal failure (if patients experiencing a major in-hospital complication are excluded).[20]

A study done in Brazil, including 816 patients admitted with HF, showed that the non-survivor group were significantly older. This study also showed that the non survivor group had worse New York Heart Association (NYHA) class at hospital admission , higher number of previous hospitalizations and longer hospitalizations. The non-survivors had more coronary artery disease and chronic atrial fibrillation and sustained more complications during hospitalization, such as pulmonary thromboembolism , unstable angina, AMI , AF,

need for dialysis and respiratory infection. In this study, among the laboratory variables collected at admission, a urea > 40 mg/dl, serum creatinine > 1.4 mg /dL, potassium >5.0 meq/L and BNP > 1000 pg /mL increased hospital mortality. But there were more smokers among the survivors. Moreover, the presence of previous AMI, hypothyroidism, chronic obstructive pulmonary disease (COPD), diabetes and alcohol consumption did not show significant differences between the groups.[13]

A report from India found that NYHA class, severity of systolic dysfunction and hemoglobin level on admission were strong predictors of in-hospital mortality. In this study, smoking, previous histories of admission for ADHF and admission heart rate were not found to be significant in predicting in-hospital mortality.[14]

A study from Nigeria in 2007 on hospitalized AHF patients reported 8 deaths and all with LVEF ≤ 40. The mortality was highest among patients with acute Myocardial Infarction (66.7%), followed by patients with rheumatic heart disease (20.0%) and hypertensive heart disease (4.4%). [21]Another study in Nigeria performed in 2016, peripartal cardiomyopathy was the underlying etiology which had the highest mortality accounting for 66.6% of deaths in those patients admitted with AHF followed by HHD(28.6%).[16]

Using the aforementioned data as background knowledge, and considering the absence of adequate data in the local context, this study aims at determining mortality in hospitalized HF patients and the factors associated with it in the particular context of JUMC.

3. Significance of the study

- The finding of this study would help in understanding the hospitalized HF patients, defining the factors related to poor outcome.
- Outcomes from this study would help in describing the characteristics, underlying etiology and management of hospitalized HF patients, giving more emphasis to those with the highest risk so that a purpose of identifying and filling the gaps of information is achieved in the country, as a whole and particularly in JUMC.
- The findings of this study can also serve as a guide for the institution regarding the care of patients admitted with heart failure and their outcome, identifying the critical points to be addressed so that improved patient care is given and further influence policy makers towards targeted resource allocation to tackle the problem.
- The results of this research would serve in laying down a hypothesis for future longitudinal studies to be held on the topic.

4. Objectives of the study

4.1 General objective

- To assess the mortality rate and identify the associated factors among patients hospitalized with heart failure at Jimma University Medical Centre, Jimma, Ethiopia, from September 11, 2016 to September 10, 2017.

4.2 Specific objective

- To assess the mortality rate among patients hospitalized with heart failure at Jimma University Medical Centre, Jimma, Ethiopia, from September 11, 2016 to September 10, 2017

- To identify factors associated with mortality among hospitalized heart failure patients at Jimma University Medical Centre, Jimma, Ethiopia, from September 11, 2016 to September 10, 2017.

5. Methods

5.1 Study area and period

The study was conducted at Jimma University Medical Centre, one of the teaching hospitals located in Oromia Region, Jimma Zone; at Jimma Town. Jimma town is located at about 346km, south west of Addis Ababa. It provides services for approximately 9000 inpatient and 80,000 outpatient attendants in a year coming to the hospital from the catchment population of about 15 million people within the catchments area covering a 250km radius. Patients who need hospitalization for HF are directly admitted to general medical wards and are managed with a team of clinicians which include; Nurses, Medical Interns, Residents, Internists and Cardiologists.

The study was conducted from February1, 2018 – May31, 2018.

5.2 Study design

Hospital based, Retrospective, Cross-sectional analytic study was conducted.

5.3 Population

5.3.1. Source population

All cases of HF patients aged ≥14years of age, admitted to Jimma University Medical Centre, general medical wards from September 11, 2016 to September 10, 2017.

5.3.2. Study population

All cases of randomly selected eligible HF patients aged ≥14 years of age, admitted to Jimma University Medical Centre, general medical wards from September 11, 2016 to September 10, 2017.

5.3.3. Study unit

A case of HF patient aged≥14 years of age, admitted to Jimma University Medical Centre, general medical wards within the study period

5.4. Eligibility Criteria

5.4.1. Inclusion criteria

- ✓ All cases of admitted HF patients aged ≥14, treated in Jimma University Medical Centre from September 11, 2016 to September 10, 2017 were included in the study.

5.4.2. Exclusion criteria

- ✓ Those medical records whose card is lost and incomplete data on outcome variable were excluded from study.
- ✓ Records of those who were readmitted within the study period were excluded.

5.5 Sample

Sampling Technique

- Simple random sampling was used
- Sample size was calculated using single population proportion formula:

$$n_0 = \left(\frac{z_{1-\alpha}}{\delta}\right)^2 p(1-p)$$

The sample size was calculated based on the assumption of margin of error of 5 %, with 95% Confidence Interval. Since there is no prior experience regarding mortality of patients hospitalized with heart failure in the setup, sample proportion was taken as 50%. This would give a sample size of **385**. This was again corrected for a population size of N<10000, using the formula:

$$n = n_0 \div (1 + n_0/N)$$

$$n_0 = 385 \qquad N = 566$$

$$n = 229$$

Finally, an additional 10% was taken for the non-retrieval rate; 229+23= **252**

5.6 Sampling Procedure

To select study participants randomly, openepi software version 2.3 was used to generate random numbers. First Medical record number was retrieved from patient registry in the wards. Medical record number from smallest to the highest was entered to software to select the calculated sample size. Thereafter, using the corresponding Medical record number, a random sample was selected and patients' card was retrieved from record room based on Medical record number.

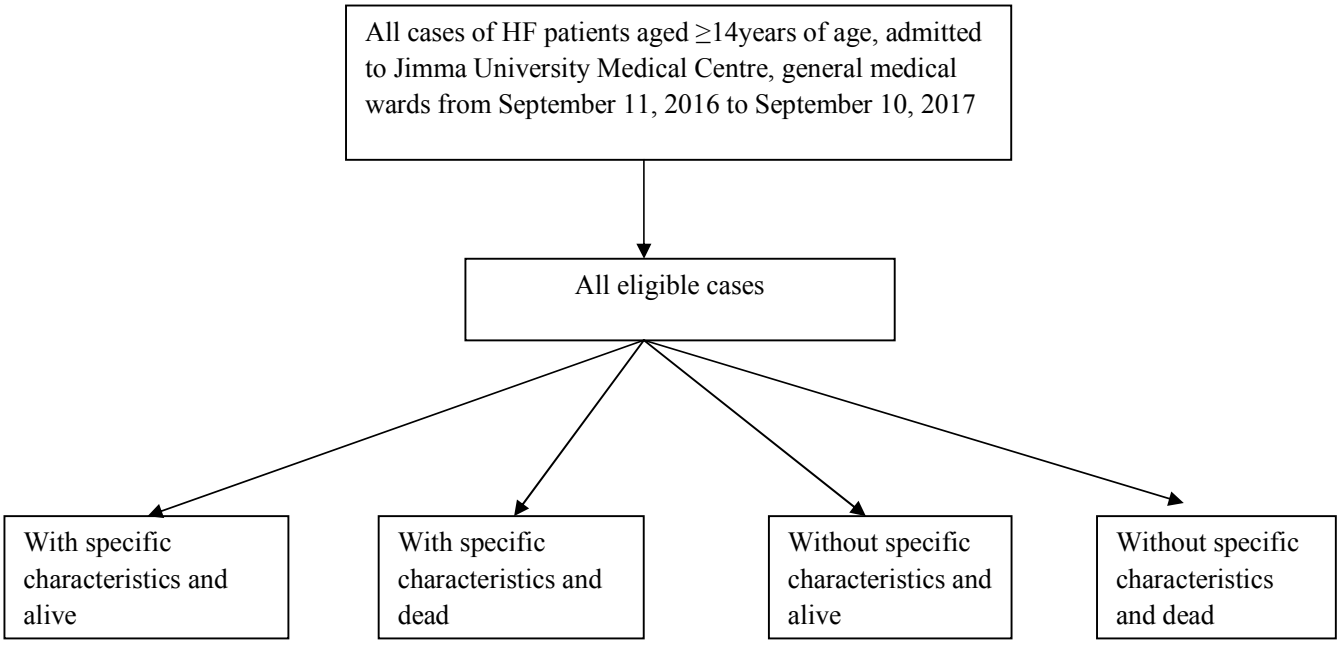

Figure 1. schematic presentation of sampling procedure for mortality and associated factors among hospitalized heart failure patients at Jimma University Medical Centre, Jimma, Ethiopia, from September 11, 2016 to September 10, 2017

5.7 Data collection Method

Data was collected using pretested data collection tool. Structured and pretested data collection tool was used to collect the data from medical records. It was collected from registries of patient intake forms and patients' cards were retrieved from card room using medical record number .Six medical interns were recruited to collect the data from the patient medical record. Before actual data collection, the data collection tool was pretested. One supervisor with principal investigator followed the data collection closely.

5.8. Variables of the study

5.8.1 Dependent Variable

- ✓ Mortality rate

5.8.2 Independent Variable

- ✓ **Socio-demographic characteristics:** Age, Sex
- ✓ **Clinical presentation at admission:** Blood pressure, pulse rate, respiratory rate, cardiogenic shock, pulmonary edema
- ✓ **Lab parameters at admission: Hemoglobin**, creatinine, BUN, Serum sodium level
- ✓ **Etiology of HF**
- ✓ **ECG findings:** rhythm disturbance, QT_c prolongation
- ✓ **Echocardiography findings:** Ejection faction
- ✓ **Co-morbidity**: Hypertension, Diabetes Mellitus, COPD/Asthma, CKD, Stroke/TIA, Thyrotoxicosis
- ✓ **Complications**: Pneumonia, Venous Thromboembolism, AKI, Stroke/TIA
- ✓ **Previous diagnosis of heart failure, hospitalization for HF**
- ✓ **Treatment given:** Inotropes, ACE inhibitors, ß-blockers, Ventilatory support
- ✓ **Length of stay**

5.9 Operational definition

- **Abnormal LFT:** Serum alanine transaminase level>47U/L, >37 U/L for aspartate transaminase (AST), and >135 U/L for alkaline phosphatase.
- **Anemia**: A hemoglobin level of <13 g/dl and <12 g/dl in men and women respectively.
- **Average length of stay**: Average length of stay = sum of length of stay/No of admission
- **Cardiogenic shock**: HF accompanied by low blood pressure (SBP< 90 mmHg) and a a diagnosis of cardiogenic shock made by a physician.
- **Death**: referred to the patient that died while he/she is in the hospital.
- **Heart failure:** a clinical syndrome with a physician diagnoses of heart failure
- **Hypertensive HF**: high blood pressure (>180/100 mmHg) accompanied by symptoms of HF (dyspnea and tachycardia) and radiological findings of pulmonary congestion or edema and with preserved left ventricular (LV) function.
- **Length of stay**: the number of days the patient stayed in hospital from admission until the development of event of interest
- **Mortality rate**: Number of patients died in the hospital/ total Number of admitted
- **New-onset ('de novo') HF:** a sudden or gradual development of sign and symptoms of HF for the first time
- **Non-responder rate**: Number of non-responder/ total Number of admitted
- **Prolonged QTc**: a QTc value >440 ms and >460 ms in males and females respectively, or more than 500 ms if there is ventricular depolarization abnormality
- **Pulmonary edema**: A physician diagnosis of pulmonary edema presumed to be of cardiogenic cause.
- **Renal impairment: a** serum creatinine of >1.2 mg/dl

5.10 Data Quality Control

To assure data quality the data were pretested on 5% of total sample size of patients admitted with HF in Jimma University Medical Centre. After the pretest, the necessary amendment of tool was done for the final data collection. Then the data collection tool was corrected and data collectors were made aware of the data collection. Intensive two day training was given for six data collectors, on how to extract the data from patient registry. The daily collected data were checked by supervisor and principal investigator for completeness and consistencies.

Data form in EpiData were managed in such a way that it would not allow illegal values through specifying range of legal values and it was coded carefully to increase accuracy and quality of data collected.

The data entry clerks were given two day training on how to enter data to EpiData software and were made aware of the common mistakes in data entry.

Double data entry to EpiData software by two independent data clerk was done. Then the two data sets were validated in the software for consistency and mismatches were checked with cross checking with the questionnaire until the two data sets match perfectly.

5.11 Data processing and analysis

After entering and checking the data with EpiData software Version 3.02, the data were exported to SPSS version 24 for cleaning and analysis. Percentages(number) was used for Categorical variables

Independently associated factors of mortality were identified using binary logistic regression model. Adjusted and crude odds ratio with 95% CI was used. P-value less than 0.05 was used to declare statistical significance.

5.12 Ethical Consideration

Ethical clearance was obtained from Jimma University, institute of health, institutional ethical review board and supporting letter was written to administrative body of Jimma university medical centre. They were informed about the importance of this study in improving the management of patients admitted with heart failure in the particular context. Information collected was kept confidential and will never be disclosed to others without an informed consent from the hospital. Medical record numbers, rather than name of patients, was recorded. Written informed consent was taken from the hospital manager for accessing the medical records of these patients.

5.13 Dissemination plan

The result and finding of this study will be communicated and presented to concerned bodies. First it will be presented to the respective advisors. Then, the result will be communicated to Jimma University Medical Centre & medical management teams. Finally efforts will be made to publish the findings.

6. Result

The overall prevalence of mortality among hospitalized heart failure patients in this study was 21.29% and majority (79.91%) of them were discharged as improved.

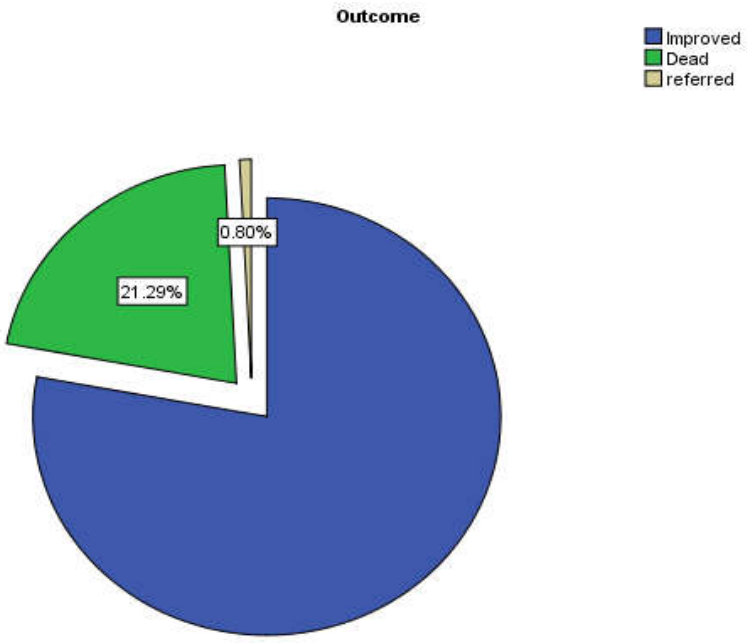

Figure 2. pie chart showing the treatment outcome of hospitalized heart failure patients at JUMC from September 11, 2016 to September 10, 2017

6.1 Descriptive results

As shown in the figure above mortality rate among admitted heart failure patients is 21.29%, where as majority of them i.e 79.91% of them were discharged improved.

Table 1: Socio demographic characteristics of hospitalized heart failure patients at JUMC, Jimma, Ethiopia, from September 11, 2016 to September 10, 2017

Variables	Category	Frequency	Percentage
sex	Male	114	45.2
	Female	138	54.8
Age	15-30	54	21.4
	30-45	58	23.0
	45-60	76	30.2
	≥60	64	25.4

More than half (54.8%) of the participants were females and a big share (30.2%) of participants were found in the 45-60 age category.

Table 2: Clinical presentation related characteristics of hospitalized heart failure patients at JUMC, Jimma, Ethiopia, from September 11, 2016 to September 10, 2017

Variables	Category	Frequency	Percentage
Systolic BP	≥140	64	26.1
	90-140	174	71.0
	<90	7	2.9
Diastolic BP	≥90	58	23.7
	60-90	175	71.4
	<60	12	4.9
Pulse rate	≥120	54	35.8
	100- 120	97	64.2
Respiratory rate	>24	191	75.8
	14-24	61	24.2
Cardiogenic shock	Yes	8	3.2
	No	244	96.8
Pulmonary edema	Yes	42	16.7
	No	210	83.3

At admission, majority (71%) of the patients had a systolic blood pressure in the range of 90-140; similarly majority (71.4%) of participants had a diastolic Bp in the range of 60-90. Most (64.2%) of the patients had a pulse rate in the range of 100-120mmHg and 191(75.8%) had respiratory rate >24. Only 3.2% of the patients had cardiogenic shock at admission and 16.7% of the patients had pulmonary edema.

Table 3 : Laboratory result related characteristics among hospitalized heart failure patients at JUMC, Jimma, Ethiopia, from September 11, 2016 to September 10, 2017

Variables	Category	Frequency	Percentage
Hemoglobin	>12	98	39.7
	≤12	149	60.3
Creatinine	>1.2	179	71.9
	≤1.2	70	28.1
BUN	>20	222	90.6
	<=20	23	9.4
Sodium	Hypo	67	60.4
	Normal	44	39.6

Regarding laboratory findings, 149(60.3%) have hemoglobin count less than or equal to 12, majority 179(71.9%) have creatinine > 1.2, where as 90.4% of the patients have BUN of greater than 20 and 60.4% found to have hyponatremia.

Table 4: ECG and Echocardiographic findings of hospitalized heart failure patients at JUMC, Jimma, Ethiopia, from September 11, 2016 to September 10, 2017

Variables	Category	Frequency	Percentage
Arrhythmia	Yes	95	54.6
	No	79	45.4
Long QTc	Yes	76	44.2
	No	96	55.8
Ejection fraction	<30	60	34.7
	30-50	65	37.6
	>50	48	27.7

Regarding ECG and echo findings 54.6% were found to have some form of arrhythmia at admission, and 44.2% of the participants had long QTc. An ejection fraction in the range of 30-50% was found in 37.6% of the patients.

Table 5 : Past history and complication related characteristics of hospitalized heart failure patients at JUMC, Jimma, Ethiopia, from September 11, 2016 to September 10, 2017

Variables	Category	Frequency	Percentage
Previous HF	Yes	107	42.5
	No	145	57.5
Hx of hosp for HF.	None	145	60.4
	1 hospitalization	39	16.3
	>1 hospitalization	24	10.0
	Not mentioned	32	13.3
Comorbidity	Yes	118	46.8
	No	134	53.2
Complication at admission	Yes	112	44.4
	No	140	55.6
Complication aft admission	Yes	237	94.0
	No	15	6.0

Regarding past history and complication related factors, 145(57.5%) of the patients did not have a previous diagnosis of heart failure. Nearly sixty percent of the patients did not have a previous history of hospitalization for HF. Close to half (53.2%) of the patients do not have comorbidity at admission. One hundred forty (55.6%) of the patients did not have any complication at admission whereas 94% of the patients developed complication after admission.

Table 6: treatment related characteristics of hospitalized heart failure patients at JUMC, Jimma, Ethiopia, from September 11, 2016 to September 10, 2017

Variables	Category	Frequency	Percentage
Pare Inotropes	Yes	5	2.0
	No	247	98.0
B-block	Yes	143	56.7
	No	109	43.3
ACEI	Yes	130	51.6
	No	122	48.4
Ventilation support	Yes	63	25.0
	No	189	75.0
Length of stay	<7	76	30.5
	7-30	155	62.2
	>=30	18	7.2

Regarding treatment related factors, almost all (98%) of the patients have not taken parenteral inotropes, but 143(56.7%) patients have taken beta blockers and nearly half (51.6%) of the patients have taken ACEI. Sixty three (25%) patients were on ventilatory support. Length of stay for more than half (62.2%) of the patients was 7-30 days.

6.2 Bivariate and Multivariate analysis

Table 7: Bi-variate analysis of variables for hospitalized heart failure patients at JUMC, Jimma, Ethiopia, from September 11, 2016 to September 10, 2017

Variables	Category		COR	P-value
sex	Male	114	2.65	0.002*
	Female	138	1	
Age	15-30	54	0.93	0.926
	30-45	58	0.69	0.439
	45-60	76	0.96	0.935
	≥60	64	1	
Systolic BP	≥140	64	0.083	0.006*
	90-140	174	0.089	0.005*
	<90	7	1	
Diastolic BP	≥90	58	0.184	0.013*
	60-90	175	0.229	0.015*
	<60	12	1	
Pulse rate	≥120	54	2.27	0.041*
	100- 120	97	1	
Respiratory rate	>24	191	5.02	0.003*
	14-24	61	1	
Cardiogenic shock	Yes	8	29.67	0.002*
	No	244	1	
Pulmonary edema	Yes	42	2.15	0.039*
	No	210	1	
Hemoglobin	>12	98	0.837	0.587
	≤12	149	1	
Creatinine	>1.2	179	0.698	0.281
	≤1.2	70	1	
BUN	>20	222	1.369	0.58

	≤20	23	1	
Arrhythmia	Yes	95	1.65	0.21*
	No	79	1	
Long QTc	Yes	76	1.78	0.15*
	No	96	1	
Previous HF	Yes	107	1.2	0.56
	No	145	1	
History of hosp.	None	145	1.01	0.996
	1 hospitalization	39	0.946	0.983
	>1 hospitalization	24	0.902	0.876
	Not mentioned	32	1	
Comorbidity	Yes	118	0.712	0.281
	No	134	1	
Complication at adm	Yes	112	0.28	0.000*
	No	140	1	
Complication aft adm	Yes	237	0.377	0.077*
	No	15	1	
Inopare	Yes	5	6.5*10^8	0.997
	No	247	1	
B-block	Yes	143	0.425	0.007*
	No	109	1	
ACEI	Yes	130	0.296	0.000*
	No	122	1	
Ventilation support	Yes	63	2.76	0.002*
	No	189	1	
Length of stay	<7	76	1.336	0.641
	7-30	155	0.772	0.668
	>=30	18	1	
Sodium	Hypo	67	5.942	0.007*
	Normal	44	1	
Ejection fraction	<30	60	7.67	0.059*
	30-50	65	18	0.006*
	>50	48	1	

*variables with p-value of <= 0.25

On bivariate analysis sex, systolic Bp, diastolic Bp, pulse rate, respiratory rate, cardiogenic shock, pulmonary edema, arrhythmia, long QTc, complication at admission, complication after admission, B-block, ACEI and sodium were found to be candidate for multivariable analysis with p-value < 0.25.

Table 8: Multi –variable model showing significantly associated variables

Variables	Category	Frequency	AOR	95% CI	P-value
Complication at admission	Yes	112	5.25	1.28-21.6	0.021*
	No	140	1		
Cardiogenic shock	Yes	8	1	0.001-0.267	0.004**
	No	244	0.016		
Ejection fraction	<=30	60	1		
	30-50	65	0.112	0.022-0.562	0.008**
	>=50	48	1.365	0.115-16.16	0.805

**variables with p-value of <0.01, *variables with p-value of <0.05

On multivariable analysis three significantly associated independent variables were found. Patients admitted with complication are 5.25 times more likely to die as compared to those patients admitted without complication. Patients without cardiogenic shock are 98.4% less likely to die as compared to those patients with cardiogenic shock. Patients with ejection fraction of 30-50% were 88.8% less likely to die as compared to those patients with ejection fraction of ≤30.

7. DISCUSSION

This study has tried to assess the in-hospital mortality rate among patients admitted with acute heart failure and its associated factors. In this study the in-hospital mortality rate was found to be 21.29%.This was much higher than that found in studies carried out in other countries. A study from Brazil found an in-hospital mortality rate of 11.2%.[13] Similarly, a prospective study carried out in India found an in-hospital mortality rate of 11%.[14]

From reports in Africa, the Sub-Saharan Africa Survey of Heart Failure (THESUS–HF) which was conducted in 1006 patients with AHF admitted to 12 university hospitals in 9 countries, had the lowest rates of in-hospital mortality rate of 4.2%.[10] While a study from Cameroon shows an in-hospital mortality rate of 9% and a Nigerian study shows a 15.7% mortality rate.[15,16]

The higher mortality rate which was found from our study can be explained by the fact that there is excessive patient load due to a very large catchment area of the hospital together with lack of adequate infrastructures including advanced care services. Delayed referral to the centre from primary care centers might also contribute to the scenario.

In our study the presence of any complications at admission was strongly associated with mortality; as those patients admitted with complication were 5.25 times more likely to die as compared to those patients admitted without complication. This finding was also evidenced from a study done in Brazil, which showed that the non-survivor group had more complications during hospitalization, such as pulmonary thromboembolism , need for dialysis and respiratory infection.[13]

The presence of cardiogenic shock was another factor found to be strongly associated with mortality in our study. Patients without cardiogenic shock were 98.4% less likely to die as compared to those patients with cardiogenic shock. This finding goes in line with findings from other studies such as a study from Italy on inpatient outcome of AHF which reported the highest mortality rate (23.8%) in patients with cardiogenic shock. Strong association was also found between in-hospital mortality and SBP.[17] The EuroHeart Failure Survey II also found that among clinical groups, in-hospital mortality was extremely high in cardiogenic shock patients (39.6%).[9]

Furthermore, LVEF was also found to be strongly associated factor with mortality in our study. It was revealed that patients with a higher ejection fraction of 30-50% were 88.8% less likely to die as compared to those patients with lower ejection fraction, ≤30. Other studies also noted this similar effect of lower EF on mortality. As an example, a report from India showed that, the severity of systolic dysfunction was among the strong predictors of in-hospital mortality.[14] Another evidence comes from Nigeria in 2007 on hospitalized AHF patients in which all the reported deaths had a LVEF ≤ 40.[21]

8. Conclusion and recommendation

8.1 Conclusion

The findings of our study revealed an unacceptably high in-hospital mortality rate among patients hospitalized with heart failure.Moreover, the presence of complications at admission, cardiogenic shock and a lower LVEF were found to have a statistically significant association with in-hospital mortality among patients admitted with heart failure..

8.2 Recommendation

Based on the above finding of this study the following recommendations are forwarded

For Jimma university medical center

- ✓ The in-hospital mortality rate is unacceptably high. Adherence to the standard CHF guidelines should be strengthened.
- ✓ Early initiation of Management for patients admitted with AHF with a special focus on those presenting with complications and cardiogenic shock.

For Jimma city and Jimma zone health bureau

- ✓ More resources should be dedicated for continuous training of the staff caring for these patients together with the supply of adequate equipments and expertise esp focusing on ICD or CRT implantation for those which are indicated.
- ✓ Referral of cases of heart failure at primary health care level should be given emphasis.

For researchers

- ✓ Future studies on acute heart failure using strong prospective study designs are needed.

Strength and limitation of the study

Strength of the study

- ✓ Gives an insight for researchers especially for prospective study

Limitation of the study

- ✓ Reliability of the recorded data could not be ascertained
- ✓ There may be a potential bias due to excluded records and unknown status of defaulters**.**
- ✓ Cross sectional study design could not ascertain cause and effect relationship

9. Reference

1. Reddy KS: Cardiovascular diseases in the developing countries: dimensions, determinants, dynamics and directions for public health action. Public Health Nutr 2002, 5:231-237.
2. Damasceno A, Cotter G, Dzudie A, Sliwa K, Mayosi BM: Heart failure in Sub-Saharan Africa: time for action. J Am Coll Cardiol 2007, 50(17):1688-1693
3. The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology: 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. European Heart Journal (2016) 37, 2129–2200
4. Fonarow GC; ADHERE Scientific Advisory Committee. The Acute Decompensated Heart Failure National Registry (ADHERE): opportunities to improve care of patients hospitalized with acute decompensated heart failure. Rev Cardiovasc Med. 2003;4 Suppl. 7:S21-30.
5. Kengne A, Dzudie A, Sobngwi E: Heart failure in sub-Saharan Africa: A literature review with emphasis on individuals with diabetes. Vascular Health and Risk Management 2008:4(1) 123–130
6. Global Health Estimates 2015: Deaths by cause, age, sex, by country and by region, 2000–2015. Geneva, World Health Organization; 2016. (http://www.who.int/healthinfo/global_burden_disease/estimates/en/index1.html)
7. Hunt SA, Abraham WT, Chin MH, Feldman AM, Francis GS, Ganiats TG, et al. ACC/AHA 2005 guideline update for the diagnosis and management of chronic heart failure in the adult: a report of the American College of Cardiology/ American Heart Association Task Force on practice guidelines [http://content.onlinejacc.org/cgi/reprint/46/6/eI].
8. Bardgett HP, Dixon M, Beeching NJ. 2006. Increase in hospital mortality from non-communicable disease and HIV-related conditions in Bulawayo, Zimbabwe, between 1992 and 2000. Trop Doct, 36:129–31.
9. Nieminen MS, Brutsaert D, Dickstein K, et al; EuroHeart Survey Investigators; Heart Failure Association, European Society of Cardiology. EuroHeart Failure Survey II (EHFS II): a survey on hospitalized acute heart failure patients: description of population. Eur Heart J. 2006;27(22):2725-2736.
10. Damasceno, A., Mayosi, B. M., Sani, M., Ogah, O. S., Mondo, C., Ojji, D., et al. (2012). The causes, treatment, and outcome of acute heart failure in 1006 Africans From 9 countries. Arch Intern Med, 172(18), 1386-1394.
11. Abraham WT, Fonarow GC, Albert NM, et al; OPTIMIZE-HF Investigators and Coordinators. Predictors of in-hospital mortality in patients hospitalized for heart failure: insights from the Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients with Heart Failure (OPTIMIZE-HF). JACC. 2008 Jul 29;52(5):347- 56.
12. Sasaki N, Kunisawa S, Ikai H, et al. Differences between determinants of in-hospital mortality and hospitalization costs for patients with acute heart failure: a nationwide observational study from Japan. BMJ Open 2017; 7: e013753.
13. Poffo et al. Profile of Patients Hospitalized for Heart Failure in Tertiary Care Hospital. International Journal of Cardiovascular Sciences. 2017;30(3):189-198
14. Dr. Mpalaniappan, Dr. N Karthikeyan, Dr. P Praveen Kumar, Dr B Vetriveeran, Dr T Ravikumar, et al. Factors Predicting Mortality In Indian Patients Hospitalized For Acute Decompensated Heart Failure. IOSR-JDMS: 2016 sep 15(9)Ver. II; 90-95

15. Kingue S, Dzudie A, Menanga A, Akono M, Ouankou M, Muna W. A new look at adult chronic heart failure in Africa in the age of the Doppler echocardiography: experience of the medicine department at Yaounde General Hospital (in French). Ann Cardiol Angeiol (Paris) 2005;54:276–83.
16. Hadiza S, Abdullahi U, Yau J. Heart Failure Admissions in Medical Wards of a Nigerian Tertiary Hospital. IOSR-JDMS: Volume 16, Issue 10 Ver. III (Oct. 2017), PP 63-66
17. Oliva F, Mortara A,Cacciatore G, Chinaglia A, Lenarda A, Gorini M, et al. Acute heart failure patient profiles, management and in-hospital outcome: results of the Italian Registry on Heart Failure Outcome. European Journal of Heart Failure (2012) 14, 1208–1217.
18. Gheorghiade M, Abraham W, Albert N, Greenberg B, et al. Systolic Blood Pressure at Admission, Clinical Characteristics, and Outcomes in Patients Hospitalized With Acute Heart Failure. JAMA. 2006;296:2217-2226.
19. Gheorghiade M, Abraham W, Albert N, Greenberg B, et al. Relationship between admission serum sodium concentration and clinical outcomes in patients hospitalized for heart failure: an analysis from the OPTIMIZE-HF registry. European Heart Journal (2007) 28, 980–988.
20. Cowie M, Komajda M, Thomas T M, Underwood J, Ticho B. Prevalence and impact of worsening renal function in patients hospitalized with decompensated heart failure: results of the prospective outcomes study in heart failure (POSH). European Heart Journal (2006) 27, 1216–1222
21. Karaye K, Sani M. Factors associated with poor prognosis among patients admitted with heart failure in a Nigerian tertiary medical centre: a cross-sectional study. BMC Cardiovascular Disorders 2008, 8:16

Annexes

Hospital Consent Form

This is a study that will be conducted in Jimma University Medical Centre. The main objective of this study is to assess the mortality rate and identify the associated factors among patients hospitalized with heart failure patients at Jimma University Medical Centre. Such type of study is expected to yield a good insight for future patient care. This study cannot be done without the cooperation of the hospital. Therefore, the hospital's participation and collaboration is very much helpful in generating the required information and will be very much appreciated.

In this study, data will be collected from the patients' chart retrospectively. Information regarding any specific personal identifiers like the name of the clients will not be collected and information generated will be disclosed in totality. In addition, confidentiality of any personal information will be maintained throughout the study process and no unauthorized access to the information is allowed. The hospital has all the right to refuse to participate in this study and shall withdraw from the study at any time. If you would like to participate in this study, would you please confirm it by signing here?

Thank you!

Hospital manager: ---------- Principal investigator: ----------

Data collection Instrument

Data Extraction Format for Research Project in Jimma University Medical Centre

Title: ***Mortality and associated factors among patients hospitalized with heart failure at Jimma University Medical Centre*****.**

Dear my data collectors thank you for your time, energy and willingness to participate in this study. All the data are to be collected from patient registries and patient card. The data collected need to be logical, and based only on the information from records, not arbitrarily. So I kindly request you to collect the actual data from patient card honestly. The data extraction form contains nine sections, starting from socio-demographic characteristics to treatment outcome. The choice form should be selected by encircling. Other data should be filled as in obtained from the information card. The data should be filled with a pencil.

S. No	**Questions**	**Response**	**Skip**	**Code**
Medical record number……				
Date of data collection……..name of data collector…….				
PART-I Socio- demographic characteristics				
101	Sex	1. Male 2. Female		
102	Age	_____ Years		
103	Date of admission	Date____month____year		
Part II : Admission clinical status & lab parameters				
201	Symptoms at presentation (>1 answer allowed)	1. Dyspnea 2. Orthopnoea 3. PND 4. Fatigue 5. Chestpain 6. Body swelling 7. Altered mental status 8. Cough 9. Other(specify)		
202	Duration of symptoms prior to presentation(days)	_____		
203	Admission BP(mmHg)	_____		
204	Pulse rate (per min)	_____		
205	Respiratory rate			
206	Oxygen saturation			
207	Signs of congestion at presentation (>1 answer allowed)	1. None 2. Rales 3. Peripheral edema 4. Ascites 5. Hepatomegally 6. ↑JVP		
208	Cardiogenic shock present?	1. Yes 2. No		
209	Pulmonary edema present?	1. Yes 2. No		
209	NYHA functional Class	1. Class II 2. Class III 3. Class IV		
210	Precipitating factors at admission	1. ACS 2. Arrythmia 3. Pneumonia 4. Anemia 5. Poor Tx compliance 6. HTN 7. Other(specify) 8. Not identified		

211	HIV screening	1. Reactive 3. Not available 2. Non reactive		
212	Hemoglobin level(g/dl)	_____		
213	WBC count(per µl)	_____		
214	Serum creatinine(mg/dl)	_____		
215	Serum BUN(mg/dl)	_____		
216	Serum ALT(U/L)	_____		
217	Serum AST(U/L)	_____		
218	Serum ALP(U/L)	_____		
219	Serum sodium level(meq/l)	_____		
220	Serum potassium(meq/l)	_____		
Part III: ECG Finding				
301	ECG present?	1. Yes 2. No	If 2, skip to **P IV**	
302	Rhythm disturbance present?	1. Yes 2. No	If 2, skip to Q303	
303	What type of rhythm disturbance?	1. Sinus tachycardia 4. Atrial flutter 2. Sinus bradycardia 5. VT 3. Atrial fibrillation 6. Other(specify)		
304	Conduction disturbance present?	1. Yes 2. No	If 2, skip to Q305	
305	What type of conduction disturbance?(>1 ans allowed)	1. AV block (1^{st},2^{nd},3^{rd}) 4. Hemiblock 5. Other(specify) 2. Complete LBBB 3. Complete RBBB		
306	Long QT_c present?	1. Yes 2. No		
307	QRS duration	_____		
Part IV: Echocardiography finding				
401	Systolic dysfunction present?	1. Yes 2. No		
402	Severity of systolic dysfunction	1. Mild 3. Severe 2. Moderate		
403	Ejection fraction,%	_____		

404	Diastolic dysfunction present?	1. Yes 2. No		
405	Grade of diastolic dysfunction?	1. Grade I 2. Grade II 3. Grade III		
406	Severe MR present?	1. Yes 2. No		
407	Severe TR present?	1. Yes 2. No		
408	Echocardiographic Impression	_____		
Part V: Underlying Etiology				
501	Etiology of Heart Failure	1. Ischemic heart disease 2. Rheumatic valvular heart disease 3. Dilated cardiomyopathy 4. Hypertensive heart disease 5. Cor-pulmonale 6. Other(specify)		
Part VI: Previous History of Heart Failure				
601	Previous diagnosis of HF?	1. Yes 2. No	If 2 skip to Q701	
602	Time since diagnosis of HF	_____		
602	Any history of Hospitalization for Heart Failure	1. None 2. One Hospitalization 3. >1 Hospitalizations 4. No Mention of Hospitalizations		
Part VII: Co-morbidity/Complications				
701	Comorbidities identified	1. None 5. CKD 2. Hypertension 6. Thyrotoxicosis 3. DM 7. Stroke/TIA 4. COPD/Asthma 8. Other(specify)		
702	Complications diagnosed at admission time	1. None 4. Stroke/TIA 2. VTE 5. AKI 3. Pneumonia 6. Other, specify		
703	Complications which developed after admission	1. None 4. VTE 2. AKI 5. Stroke/TIA 3. Pneumonia 6. Other, specify		

Part VIII: Medication administered				
801	Loop diuretic	1. Yes 2. No		
802	Inotropes, parenteral	1. Yes 2. No		
803	Vasodilator, parenteral	1. Yes 2. No		
804	Digoxin	1. Yes 2. No		
805	ß-biockers	1. Yes 2. No		
806	ACE inhibitor	1. Yes 2. No		
807	Aldosterone antagonist	1. Yes 2. No		
808	ASA	1. Yes 2. No		
809	Statin	1. Yes 2. No		
810	Anticoagulation(therapeutic	1. Yes 2. No		
811	Anticoagulation(prophylaxis	1. Yes 2. No		
812	Blood transfusion	1. Yes 2. No		
813	Ventilatory support	1. Yes 2. No		
814	Other(specify	_____		
Part IX: Treatment Outcome				
901	Outcome	1. Alive, improved 2. Dead 3. Referred		
902	Length of stay(days)	_____		