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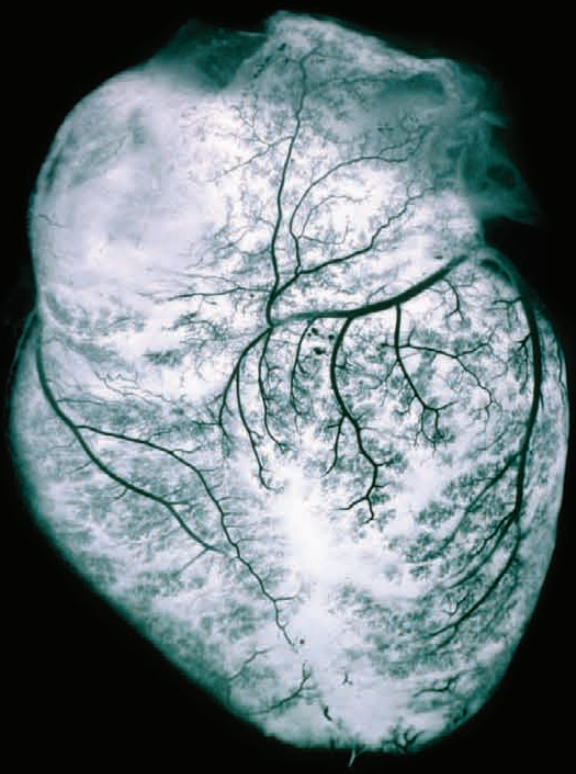

NATIONAL HEART FAILURE AUDIT

APRIL 2010 - MARCH 2011

The British Society for Heart Failure

The British Society for Heart Failure (BSH) is a national organisation of healthcare professionals dedicated to improving heart failure outcomes in the UK. The BSH was responsible for providing clinical leadership and strategic direction to the National Heart Failure Audit annual report 2010/11.

NICOR
THE NATIONAL INSTITUTE FOR CARDIOVASCULAR OUTCOMES RESEARCH

NICOR provides information to improve heart disease patients' quality of care and outcomes. We are a unique partnership of clinicians (from local hospitals, the national specialist societies and the Department of Health), IT experts, analysts, academics, and managers.

HQIP Healthcare Quality Improvement Partnership

The Healthcare Quality Improvement Partnership (HQIP) promotes quality in healthcare. HQIP holds commissioning and funding responsibility for the National Heart Failure Audit and other national clinical audits.

Acknowledgments

The National Heart Failure Audit is managed by National Institute for Cardiovascular Outcomes Research (NICOR) at University College London and has been developed in partnership with the British Society for Heart Failure (BSH). It has been commissioned by the Healthcare Quality Improvement Partnership (HQIP).

We would like to acknowledge the important contribution of NHS Improvement and by all NHS Trusts, Heath Boards and the individual clinicians, nurses and audit teams who participate in the audit.

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NATIONAL HEART FAILURE REPORT
APRIL 2010-MARCH 2011

This fourth annual report for the National Heart Failure Audit presents key findings and recommendations from the audit which was launched in July 2007. The data included in this report were submitted between April 2010 and March 2011.

Aimed at healthcare professionals, managers and clinical governance leads, the report describes:

- progress to date
- clinical findings
- patient outcomes
- implementation issues

Electronic copies of this report can be found at http://www.ucl.ac.uk/nicor/audits/heartfailure/.
If you have any queries or comments on this publication, please contact Polly Mitchell on **0203 108 3927** or by email at **polly.mitchell@ucl.ac.uk**.

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FOREWORD

Much progress has been made in the management and outcome of patients with cardiovascular disease in the UK, but important challenges remain. For example, death rates from ST elevation and non ST elevation myocardial infarction have declined by about 40% in six years (Myocardial Ischaemia National Audit Project 2011). The mortality for acute and chronic heart failure is high, and is illustrated in the 2010/11 National Heart Failure Audit, one-third of patients die during or after their initial hospitalisation. Many patients with heart failure are elderly and the mortality for those over 80 years of age was 43%. Importantly, and as illustrated in this report, patients are more likely to receive evidence based heart failure management in cardiology wards than in general medical wards and mortality rates are significantly better in those who receive cardiology follow up and those referred to heart failure specialist nursing services, compared to those who do not.

The 2010/11 National Heart Failure Audit represents about 54% of all patients discharged from hospital with a primary diagnosis of heart failure. The audit provides critically important information on management and outcome. Comprehensive, robust annual and longitudinal data are essential measures to drive quality improvement and to enable appropriate choices by patients, healthcare professionals and commissioning groups.

The British Cardiovascular Society strongly supports the development of the National Heart Failure Audit, recognising that mortality for patients with heart failure often exceeds that of common malignancies. Critically, application of evidence based prevention and management can improve outcome. The British Cardiovascular Society report on Acute Cardiac Care Units recognises the importance of heart failure and heart failure management in such cardiac care units, for all hospitals that admit such patients with heart failure. Progress has been made, but much more needs to be done to improve outcomes in those with heart failure.

Professor Keith AA Fox
President of the British Cardiovascular Society

1 EXECUTIVE SUMMARY

The National Service Framework for Coronary Heart Disease (NSF for CHD) has set national standards of care relating to CHD, including providing better care for people with heart failure.[1] The National Institute for Health and Clinical Excellence (NICE) has issued guidelines on the management of heart failure in primary and secondary care.[2] Both play an important role in improving health standards and ensuring high quality care is available and accessible to all who need it.

1.1 HEART FAILURE

Heart failure affects at least 1% of people in the UK, increasing steeply with age. The number of patients with heart failure is set to rise in the next 20 years, due to the combined effects of improved survival in patients who develop cardiovascular disease, such as heart attacks, and an ageing population.

Heart failure is one of the most common reasons for emergency medical admission, readmission and hospital bed-days occupancy. Survival rates for heart failure in epidemiological studies are worse than for breast and prostate cancer, with annual mortality ranging from 10% to 50% depending on severity. Annual mortality in hospitalised patients from the 2009/10 National Heart Failure Audit report confirmed that the prognosis remains poor with mortality rates at 30% at one year. In addition, patients with heart failure have a poor quality of life, with over a third experiencing severe and prolonged depressive illness.

There is good evidence that appropriate diagnosis, treatment and on-going support can improve quality of life, reduce morbidity and mortality and reduce the length of hospital admissions. Evidence suggests that progress in meeting the NSF standards and implementing evidence based clinical guidance has, until recently, been slow. Whilst substantial progress has been made over the last two years, there is variation across the country and between different groups of patients in relation to the confirmation of diagnosis and access to evidence based treatment and heart failure specialist staff.

1.2 NATIONAL HEART FAILURE AUDIT

The National Heart Failure Audit is run jointly by NICOR and the British Society for Heart Failure, and is funded by the Healthcare Quality Improvement Partnership (HQIP). The audit focuses on the care and treatment of all patients with an unscheduled admission to hospital with heart failure. The main purposes of the audit are to measure the quality of care and clinical outcomes; to enable comparisons between Trusts or Health Boards; and to recommend changes and promote improvement where necessary.

The national audit consists of 36 core data items that reflect national guidance on the care and treatment of patients with heart failure. The heart failure database provides users with immediate feedback on data quality.

Below are the key findings from the audit on admissions in 2010/11.

1.3 KEY FINDINGS

- Between April 2010 and March 2011, 133 out of 156 (85%) NHS Trusts and Welsh Health Boards participated in the audit and submitted data on 36,504 patient records. This is a 71% increase in the number of records collected from 2009/2010.
- Nationally the audit represents approximately 54% of all patients discharged from hospital with a primary discharge diagnosis of heart failure - this is an improvement in case ascertainment from 42% of all patients represented in the 2009/10 audit. However, case ascertainment differs significantly between England (58%) and Wales (7%) and also between individual Trusts.
- Data completeness for core fields achieved similarly high rates as in 2009/10.
- Treatment rates at discharge for contemporary disease modifying therapies are similar to last year.
- Treatment rates for diuretics (86%) and angiotensin-converting enzyme (ACE) inhibitors/angiotensin receptor blockers (ARB) (81%) remain high.
- Beta blocker prescription rates are similar to those of last year (65%). This is still suboptimal.
- Only 36% of patients were prescribed aldosterone receptor antagonists (ARA).
- Treatment rates for ACE inhibitors/ARBs and beta blockers are significantly better when patients are admitted to cardiology rather than general medical wards.
- Mortality rates remain high, with 33% of patients in the audit dead at the end of the follow up period (median follow up of 306 days).
- In hospital mortality rates were at 11.6%, higher than in contemporary US and European registries.
- The overall death and/or readmission rate to hospital with heart failure during the period of the audit was 51%, almost identical to last year's data.
- In-patient mortality rates are better for those admitted to cardiology wards (8%) compared to those in general medical wards (14%) and other wards (17%), figures which are only partly accounted for by known confounders such as age and co-morbidity.
- Mortality rates after discharge are significantly better for those who receive cardiology follow up (18% vs. 31%) and those referred to heart failure specialist nursing services (22% vs. 27%) compared to those who do not. Again these differences are not solely due to differences in patient characteristics.
- Mortality rates with key medical treatment (ACE Inhibitors/ ARBs, beta blockers, ARAs) are substantially lower than without such therapy. Access to these drugs is higher for patients admitted to cardiology wards.

1.4 RECOMMENDATIONS

The audit

- The audit should aim for >90% participation of relevant hospitals by 2012.
- It should aim to acquire data on >70% of all patients with a primary discharge diagnosis of heart failure.
- The minimal dataset should be expanded so that the use of key interventions (e.g. cardiac resynchronization therapy (CRT) devices) and attainment of key targets (e.g. heart rate) can be assessed. This would enable better risk stratification so that outcomes across institutions can be more easily compared and would also allow NICE quality standards to be more readily assessed.

Clinical Practice

- The use of beta blockers in patients with left ventricular systolic dysfunction (LVSD) still appears sub-optimal. We need to renew efforts to educate clinicians about their safety and efficacy. In line with NICE guidance, beta blockers should be used in all patients with heart failure due to LVSD, including patients with COPD without reversibility.
- Where possible, patients admitted to hospital with heart failure should be cared for in a cardiology ward, and should have input from a consultant cardiologist and heart failure specialist nurses.
- In accordance with NICE quality standards for chronic heart failure, a personalised management plan should be developed for all patients admitted to hospital with heart failure. The plan should be developed with input from a multidisciplinary heart failure team.
- Greater emphasis needs to be placed on creating synergies with community follow-up services, especially amongst older patients and those who are economically disadvantaged.
- On discharge, patients should continue to receive support from cardiology services in the community. This may include enrollment on a cardiac rehab programme, referral to heart failure nurse liaison services, and cardiology follow-up, as well as continued interaction with a multidisciplinary heart failure team.

Research

- There is an ongoing need to understand the processes driving the progression of heart failure.
- There is a need for better deployment of existing treatments.
- There is a need for new treatments to control symptoms and favourably alter the natural history of disease.
- There is a need for further investigation as to whether provision of palliative care according to a conventional oncology model is appropriate for patients with heart failure.

2 INTRODUCTION TO THE NATIONAL HEART FAILURE AUDIT

2.1 BACKGROUND TO HEART FAILURE

Heart failure is a complex syndrome that can result from any structural or functional cardiac disorder that impairs the ability of the heart to function as a pump to support the circulation in the normal physiological range. The syndrome of heart failure is characterised by symptoms such as breathlessness and fatigue, and signs such as fluid retention.

Heart failure occurs in 1-2% of the adult population rising to 16.4% in men over the age of 75.[3] Most cases of heart failure are due to coronary heart disease (approximately 70%) and most heart failure patients have or have had hypertension. Atrial fibrillation and renal dysfunction are common precipitating factors and complications of heart failure. Although there has been an overall decline in mortality from coronary heart disease, the number of patients with heart failure is increasing.[4] This is due to an ageing population combined with improved survival rates in patients who have developed other cardiovascular diseases, especially those surviving a heart attack but with left ventricular dysfunction. The majority of patients admitted to hospital are aged over 60, with 25% aged between 60 and 74 and 68% over the age of 75.

In 2001, over 11,000 deaths due to heart failure were officially recorded in the UK. The number of deaths directly attributed to heart failure however underestimates the actual number of deaths it contributes to, which may be in excess of 100,000 per year. Guidance given on death certificates, that heart failure is not a cause but a mode of death, discourages doctors from recording heart failure as the underlying cause of death. This means that other causes of death, such as coronary heart disease, are more commonly recorded. More than 80% of patients who die in the weeks, months and years after a heart attack will first develop heart failure.[5]

2.2 PATIENT OUTCOMES

Survival rates in epidemiological series are worse than for breast and prostate cancer, with annual mortality ranging from 10% to 50% depending on severity, with a high risk of sudden death. Newly diagnosed patients have a 40% risk of dying within a year of diagnosis.[6] Last year's audit report underlined the continuing poor outcomes showing a one year mortality following hospitalisation for heart failure of 30%.

Patients with heart failure experience a poor quality of life, with over a third experiencing severe and prolonged depressive illness.[7]

2.3 IMPACT ON SERVICES

Providing services to patients with heart failure costs the NHS an estimated £625 million per year. Heart failure is in the top ten diagnoses for use of hospital bed days and places a significant demand on hospital facilities and resources through emergency admissions and readmissions. Almost 90% of heart failure admissions are emergency admissions.[8] 4% to 5% of emergency admissions have heart failure coded as a primary or other diagnosis.

2.4 QUALITY OF CARE

There is good evidence that appropriate diagnosis, treatment and management can improve quality of life and help reduce admissions and readmissions, morbidity and mortality.[9-13] The National Service Framework (NSF) for Coronary Heart Disease (CHD)[14] and the Cardiac Disease National Service Framework for Wales[15] both emphasise the need to develop a systematic approach to the diagnosis, investigation, treatment and on-going support of people with heart failure throughout the NHS. Evidence-based clinical guidelines published by NICE aim to assist health professionals in clinical decision making.[16] These guidelines have recently been updated and should lead to further streamlining of the process of care.

2.5 VARIATION IN PRACTICE AND IMPACT ON PATIENT OUTCOMES

In a 2005 national review of CHD services, the Healthcare Commission found that despite significant progress in implementing the NSF, progress in meeting the heart failure standards had been slow.[17] In response, two further pieces of work were commissioned to provide an in-depth picture of the quality of heart failure services across the country.

A review of heart failure services in 2007 showed that substantial progress had been made in the two years after the NSF review.[18] However, there was still variation across the country in relation to the confirmation of diagnosis and access to evidence based treatment and heart failure specialist staff. This variability appeared to have an impact on patient outcomes. Data pooled for the years 2002/2003 and 2004/2005 demonstrated wide variation in the level of observed re-admission and mortality across Primary Care Trusts in England when compared with expected levels.

The second piece of work focused on the inpatient admission routes and access to diagnostics and key treatments.[19] The results indicated that many patients admitted to hospitals in England, Wales and Northern Ireland are not managed fully in accordance with national and international evidence-based guidelines. Only a minority of patients with heart failure were seen, or followed up, by a specialist service. Whilst most Trusts and Health Boards (87%) have a lead consultant for the care of patients with heart failure, only 22% of patients admitted to hospital with heart failure were referred to specialists or a general cardiologist.

Data from the 2009/10 audit report showed that there is still much to be done. The key finding that patients admitted to cardiology wards have a 20% lower mortality rate (after adjusting for known confounders) than those admitted to general medical wards underlines the need to develop specialist in-patient services for heart failure patients. Collection and access to comparative national data will provide crucial support to this process.

2.6 IMPROVING QUALITY: HOW AUDIT DATA IS USED NATIONALLY

The importance of national clinical audits is reflected in the inclusion of national audit in the NHS Standard Terms and Conditions for Acute Hospitals, which came into effect on 1st April 2011.[20]

Clause 12.1.2 states that "The Provider shall participate in the national clinical audits within the National Clinical Audit Patients Outcome Programme (NCAPOP) relevant to the services". The National Heart Failure Audit is included in the NCAPOP portfolio of audits.

The Department of Health and the NHS Information Centre have identified an initial, but evolving, set of indicators to describe the quality of a broad range of services – the Indicators for Quality Improvement. The indicators were developed in partnership with professionals across the NHS and the indicators for Heart Failure, include the following:

1. The hospital has registered with the National Heart Failure Audit
2. The Trust submitted 20 or more cases per month between April 2010 and March 2011

Healthcare providers are required to publish 'quality accounts' just as they publish financial accounts. These are public reports about the quality of services Trusts provide and look at safety, experience and outcomes. NHS provider organisations must report on participation in their 2010/11 Quality Accounts.

Information about selected standards of care and national audit data quality is provided on request to the Care Quality Commission (CQC). The exact nature of what CQC uses in its regulatory assessments of NHS organisations varies each year.

2.7 THE AUDIT

The National Heart Failure Audit aims to provide national comparative data to help clinicians and managers improve the quality and outcomes of their services. Findings can be used to assess achievement against NSF goals and milestones and NICE guidelines for heart failure on an on-going basis. Information can also be used to inform patients about the quality of local care and to support patient choice.

2.8 SECONDARY CARE

The provision of comprehensive and high quality services for patients with heart failure is complex. A multidisciplinary approach is advocated, often involving healthcare professionals from both primary and secondary care as well as involving social care services. It requires good coordination at all stages of the patient pathway. Such complexity poses a number of challenges and an audit that encompasses all organisations would be extremely large and potentially unwieldy, and would be difficult to evaluate. This being the case, the BSH has chosen to focus initially on auditing inpatient care within secondary care.

2.9 KEY OBJECTIVES

The first objective of the audit is to identify the proportion of in-patients with a primary diagnosis of heart failure that have their quality of care recorded. The audit captures data on a representative sample of patients with a death or discharge code for heart failure in the primary position. The primary position is the main condition treated or investigated during the episode of care. The following ICD-10 codes are used:

I50.0 Congestive heart failure
I50.1 Left ventricular failure
I50.9 Heart failure, unspecified
I11.0 Hypertensive heart disease with (congestive) heart failure
I42.0 Dilated cardiomyopathy
I25.5 Ischaemic cardiomyopathy
I42.9 Cardiomyopathy, unspecified

A second objective is to describe current clinical practices in heart failure diagnosis, care and treatment, and to explain variation in practice using data on patient characteristics and healthcare provider identity.

A third objective is to assess outcome. Initially, this will focus on length of hospital stay and mortality but in future years will include readmission rates.

2.10 ORGANISATION OF THE AUDIT

The National Heart Failure Audit is project managed by NICOR with specialist clinical knowledge provided by the British Society for Heart Failure. The audit was initially commissioned by the Healthcare Commission for two years (2006/07 and 2007/08) and has since been renewed for a further six years until March 2014. The first full reporting year of audit using agreed criteria was 2007/08. Commissioning arrangements transferred to HQIP in April 2008.

2.11 THE BRITISH SOCIETY FOR HEART FAILURE

The British Society for Heart Failure is a national organisation of healthcare professionals dedicated to improving heart failure outcomes in the UK. It is a charitable organisation and functions as an affiliated group of the British Cardiovascular Society. As part of the BSH strategy to improve patient care in heart failure, several of its board members have worked with the Central Cardiac Audit Database (CCAD) to design a national audit dataset for heart failure. The BSH project steering group have collaborated with CCAD during the development and design of the heart failure dataset and database, and the pilot phase and roll out phases of the audit, providing clinical input and direction.

3 FINDINGS

3.1 PARTICIPATION

Number of Trusts

150 NHS Trusts in England and six out of the eight Health Boards in Wales[i] discharge adult patients with a heart failure code in the Hospital Episode Statistics (HES) primary diagnosis position. Of these, 133 eligible organisations (85%) had participated in the audit. Many Trusts and Health Boards have more than one hospital submitting data to the audit and as a consequence, 176 individual hospitals participated.

A list of participating and non-participating Trusts and Health Boards, and the number of submitted records by each organisation, is provided in Appendix 1.

Number of patients

Hospitals submitted data on 36,504 patients for the period April 1st 2010 to March 31st 2011. The audit recorded 36,901 discrete admissions, which included 30,099 first admissions and 6,802 readmissions. The number of records submitted increased from the previous year, when 21,294 records were submitted.

Nationally the audit represents approximately 54% of all patients discharged from hospital with a primary discharge diagnosis of heart failure and is an improvement on a case ascertainment of 42% in the 2009/10 audit.[ii]

Whilst there has been a significant improvement, there is a wide variation in the number of records submitted by each Trust or Health Board per month in England (Figure 1), and submissions by Welsh Health Boards remain low (Figure 2). During the reporting period, 77 Trusts (58%) submitted an average of 20 records per month.

In 2009/10, 67,158 patients in England and Wales were discharged with a primary diagnosis of heart failure.[iii] If case ascertainment is based on this data, then approximately 93 (70%) Trusts submitted at least 50% of records and 29 (22%) submitted 100% of patients.

Case ascertainment also differs significantly between England (58%) and Wales (7%).

The geographic location of cases registered in the audit is shown in Figure 3.

FIG 1: MISSING CASES (ENGLAND) BASED ON A COMPARISON OF AUDIT SUBMISSIONS AND HES DISCHARGE DATA

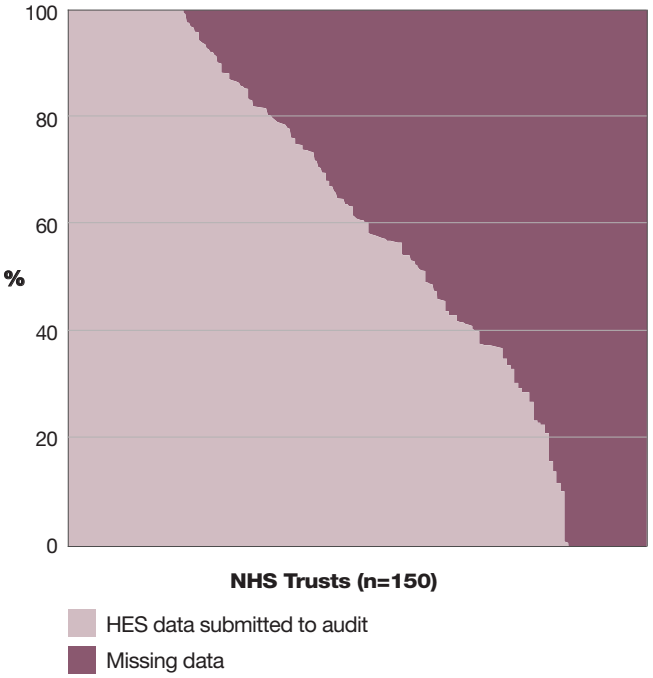
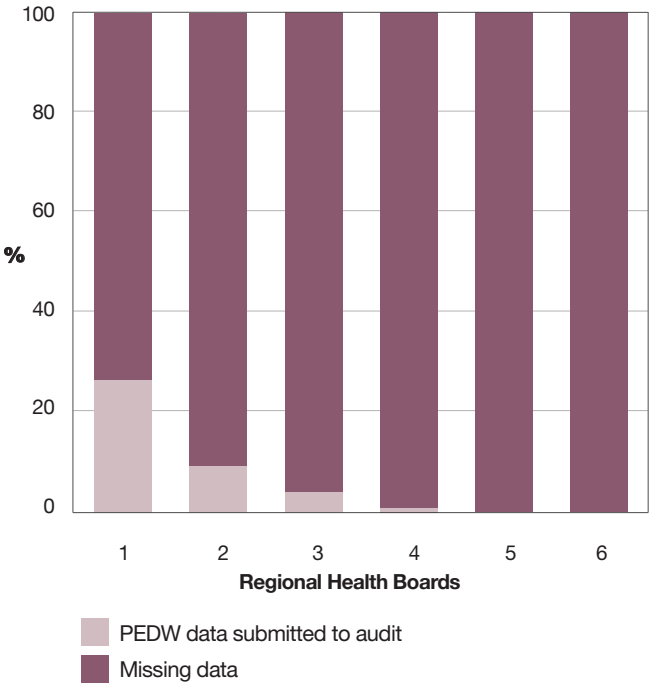


FIG 2: MISSING CASES (WALES) BASED ON A COMPARISON OF AUDIT SUBMISSIONS AND PEDW DISCHARGE DATA



i. Trusts and Health Boards that discharged more than 50 adult patients with a primary diagnosis of heart failure in 2009-2010.
ii. The NHS Information Centre for Health and Social Care, National Heart Failure Audit 2010, p.9.
iii. Based on HES (Hospital Episode Statistics) 2009-10 (http://www.hesonline.nhs.uk) and PEDW (Patient Episode Database for Wales) data.

FIGURE 3: GEOGRAPHIC LOCATION OF ALL CASES REGISTERED IN THE AUDIT

Data completeness

There are 36 core data items for which completion is mandatory. There is an 'unknown' option within each core data item which allows the user to save the record even if a specific piece of information is missing from the patient record. The percentage of unknown responses was less than 5% for key diagnostic tests and clinical treatments.

3.2 PATIENT DEMOGRAPHICS: AGE AND GENDER

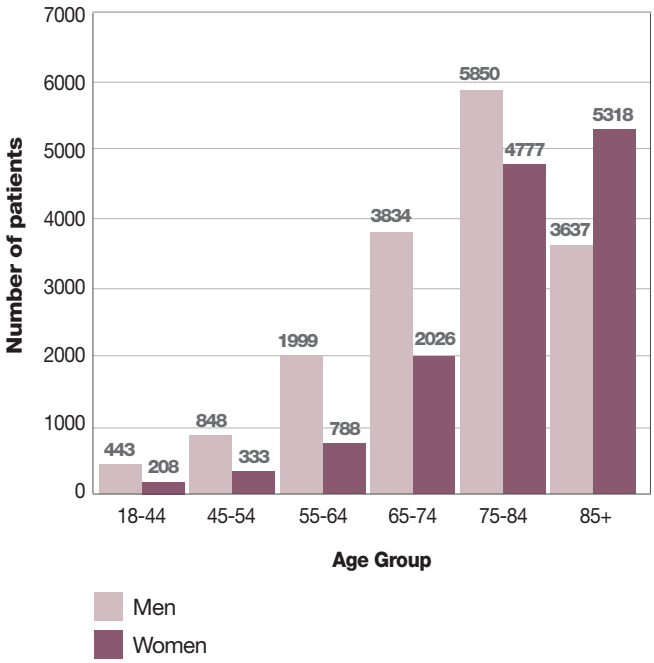
The prevalence of heart failure increases steeply with advancing age but there are differences in age of onset between men and women (Figure 4). On average, men are admitted for heart failure at an age 5 years younger than women. Below the age of 75 years, the majority of patients with heart failure are men but above this age the proportion of men and women is similar. This pattern is reflected in the findings of this report.

On first admission, the mean age at admission was 77.3, but was 74.9 for men and 80.2 for women ($p<0.00001$).

There were more men than women (55% vs. 45%) until the age of 85. Above 85, there were more women than men (59% vs. 41%). The pattern has changed slightly from last year when the majority for women appeared earlier at age 75.

On readmission, the overall mean age is 76 years (74 for men and 79 for women). A similar pattern is observed with more men (58%) than women (42%) until the age of 85, above which 56% of the readmissions are women.

FIG 4: AGE DISTRIBUTION BY SEX OF PATIENTS

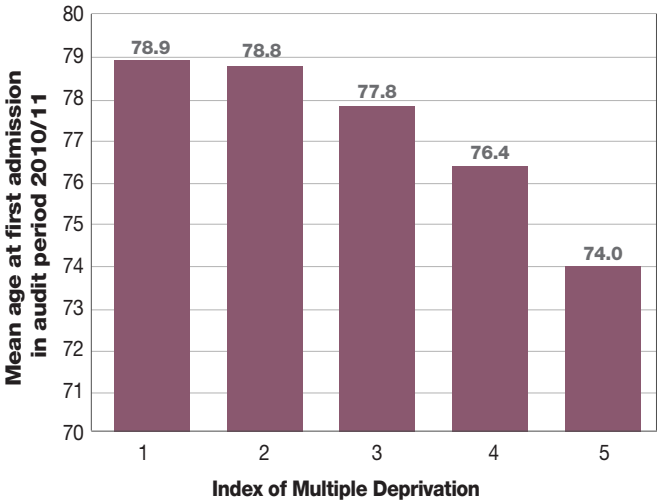


3.3 AGE ON ADMISSION AND THE EFFECT OF DEPRIVATION

The Index of Multiple Deprivation was derived for all valid postcodes of residence, and was recoded into quintiles, with 1=affluent and 5=deprived.

The age at admission was strongly related to deprivation, with affluent patients being older and deprived patients significantly younger (Figure 5).

FIG 5: THE EFFECT OF DEPRIVATION ON THE AGE OF ADMISSION OF PATIENTS



1=most affluent 5=most deprived

3.4 DIAGNOSING HEART FAILURE

NICE quality standards 3 and 4 state:[21]

QS3 People referred for specialist assessment including echocardiography, either because of suspected heart failure and previous myocardial infarction or suspected heart failure and high serum natriuretic peptide levels, are seen by a specialist and have an echocardiogram within 2 weeks of referral.

QS4 People referred for specialist assessment including echocardiography because of suspected heart failure and intermediate serum natriuretic peptide levels are seen by a specialist and have an echocardiogram within 6 weeks of referral.

Aetiology of heart failure

Research shows that younger patients are more likely to have left ventricular systolic dysfunction (LVSD) as the cause of heart failure. This is an important reason why clinical trials of heart failure that require a low left ventricular ejection fraction (LVEF) as an entry criterion recruit younger male patients, whilst trials of patients with preserved LVEF recruit more older women. Myocardial infarction is a major cause of LVSD and hypertension is a cause of heart failure with preserved ejection fraction. Women have low rates of myocardial infarction until about a decade after they reach the menopause but have similar rates of hypertension in all age categories.

Hypertension (53%) and ischaemic heart disease (47%) were considered the most common contributory causes of heart failure. 26% of patients had a history of both. 34% of those with heart failure and ischaemic heart disease were not reported to have had a prior myocardial infarction. Diabetes (28%) and valvular heart disease (21%) were also common. Patients with LVSD were more likely to have a history of ischaemic heart disease, myocardial infarction, atrial fibrillation and valve disease, but were less likely to have a history of renal disease or hypertension.

TABLE 1: PREVIOUS MEDICAL HISTORY AND LEFT VENTRICULAR SYSTOLIC DYSFUNCTION

	LVSD (%)	no LVSD (%)	p
Ischaemic heart disease	52	38	p<0.001
Atrial fibrillation	36	40	p=0.001
Myocardial infarction	37	21	p<0.001
Valvular heart disease	18	11	p<0.001
Hypertension	51	56	p<0.001
Renal impairment	4	15	p<0.001
Diabetes	28	30	not significant

Symptoms

Breathlessness at rest was present in 29% of patients on admission and severely limited exercise capacity in a further 39%, while 43% reported moderate or severe oedema. These are almost identical to the previous year's data.

On readmission, slightly more severe symptoms are observed. Breathlessness at rest was present in 33% of patients on admission and severely limited exercise capacity in a further 41%, while 49% reported moderate or severe oedema.

Access to diagnostic tests

On admission, 82% of patients had access to a NICE recommended gold standard diagnostic tests such as echocardiography. Access to echo is comparable across all groups although patients admitted to cardiology had greater access (89%) than those on general medical (69%) or other wards (72%).

There were similar findings for readmitted patients.

Of the patients who did not have access to echo, the majority (over 70%) were aged 75 and above.

Diagnosis

Of patients who had access to key diagnostic tests, 68% were diagnosed with LVSD. More men (64%) than women (37%) were diagnosed with LVSD, whereas more women were diagnosed with LV hypertrophy (54%), valve disease (60%) and diastolic dysfunction (56%).

3.5 VARIATION IN ACCESS TO KEY TREATMENT AND SPECIALIST STAFF

The Care Quality Commission highlighted that many patients admitted to acute hospitals are not managed fully in accordance with evidence-based guidelines. Factors such as access to specialist wards and services and sex of the patient may impact on access to key treatments.

In the 2010/11 audit, the great majority of patients were admitted to either cardiology wards (45%) or general medical wards (45%).

Patients admitted to cardiology were more often men (62%). Younger age groups (74 and under) were more likely to be admitted to cardiology than those aged 75 and over. These have been consistent findings over the last three years.

3.6 TREATING HEART FAILURE

NICE Clinical Guidance for Chronic Heart Failure states: [22]

> Offer both angiotensin-converting enzyme (ACE) inhibitors and beta-blockers licensed for heart failure to all patients with heart failure due to left ventricular systolic dysfunction. Use clinical judgement when deciding which drug to start first.
>
> Seek specialist advice and consider adding one of the following if a patient remains symptomatic despite optimal therapy with an ACE inhibitor and a beta-blocker:
>
> - an aldosterone antagonist licensed for heart failure (especially if the patient has moderate to severe heart failure [NYHA class III–IV] or has had an MI within the past month)
> - an angiotensin II receptor antagonist (ARB) licensed for heart failure (especially if the patient has mild to moderate heart failure [NYHA class II–III])
> - hydralazine in combination with nitrate (especially if the patient is of African or Caribbean origin and has moderate to severe heart failure [NYHA class III–IV]).

On first admission, there were 16,872 (56%) patients diagnosed with heart failure due to left ventricular dysfunction. The following results summarise prescribing rates for this group of patients. Prescribing rates are similar to those reported in 2009/2010. Findings also indicate that age, sex and admission ward continue to be key factors that determine access to NICE recommended drug therapies.

Loop diuretics

86% of patients were discharged on loop diuretics, the recognised hallmark treatment for the presence of symptomatic heart failure. Loop diuretics were more likely to be prescribed in older age groups and on cardiology wards.

ACE inhibitors and angiotensin receptor blockers

This class of agent may halve mortality from heart failure in the year after admission, when used at target doses. 68% of patients were prescribed ACEI and 15% were prescribed ARB on discharge. 81% were prescribed one or both.

Patients admitted to cardiology were more likely to be prescribed ACEI (74%) than those admitted to general medicine (65%). Men were also more likely to be prescribed ACEI than women (72% vs 68%) as were patients under the age of 75 (76% vs 66%).

Beta blockers

This class of agent may reduce mortality by about one third in the year after admission, when used at target doses. 65% of patients were prescribed beta blockers on discharge. As with ACEI, patients treated on cardiology wards (78%) were more likely to be prescribed beta blockers than those on general medicine (63%). Again, patients under the age of 75 were more likely to be prescribed beta blockers than those over 75, as were men.

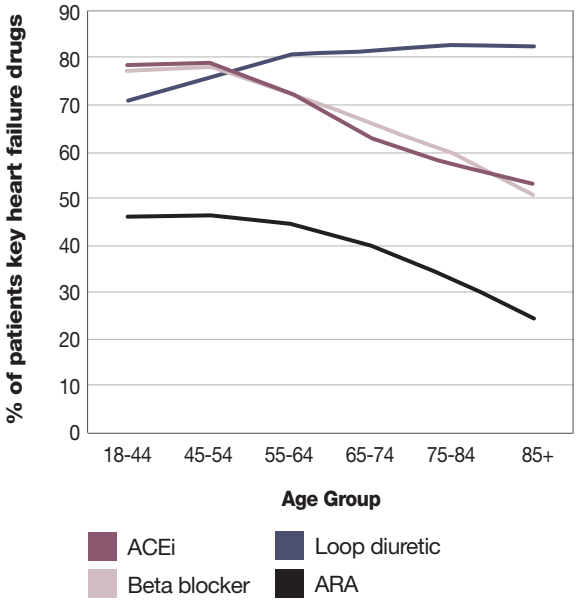
Aldosterone receptor antagonists

This class of agent may reduce mortality by about one third in the year after admission with benefits additional to those of ACEI and beta blockers. 36% patients were prescribed ARAs. Men were more likely to be prescribed an ARA than women (39% vs 30%), and older patients were less likely to be prescribed an ARA than younger patients.

Thiazide diuretic

4.3% of patients were prescribed a thiazide diuretic on discharge. Of those, 62% were treated on cardiology and 30% on general medical wards. Men were more likely to be prescribed a thiazide diuretic than women, as were younger age groups.

FIG 6: DRUG TREATMENT ON DISCHARGE FROM HOSPITAL BY AGE GROUP



The reduced prescribing rates by age are only partially explained by clinical reasons. Figure 6 suggests that patients in older age groups may become less tolerant of heart failure drugs, in this instance ACE inhibitors.

Readmission

On readmission, there were 4325 (64%) patients diagnosed with heart failure due to left ventricular dysfunction. The prescribing patterns were similar to those for patients on first admission.

Diagnosis and therapy

Both the CHD NSF and NICE clinical guidelines emphasise that only patients with a confirmed diagnosis should be prescribed the recommended heart failure drugs.[iv] Early studies have shown that some people who are treated for heart failure do not have heart failure. Historic reasons for this were poor access to diagnostic tests and symptoms of heart failure are similar to other conditions such as chronic obstructive pulmonary disease and asthma. NICE first published heart failure guidelines in 2003. By now all patients with heart failure should have a confirmed diagnosis.

Within the audit there are two groups of patients that could be classified as not having a confirmed diagnosis of heart failure: a) those with no diagnosis of heart failure and b) those with a normal echocardiogram.

For patients that do not have a diagnosis of heart failure (10%) 49% were prescribed ACEI and 47% were prescribed beta-blockers. These patients were predominantly in the older age groups of 75 and older; 51% had history of hypertension and 27% of diabetes.

For patients that had a normal echocardiography reading (6%), 45% were prescribed ACEI on discharge and 44% were prescribed beta blockers.

There was no obvious difference in prescribing rates between admission ward or sex.

3.7 MONITORING PATIENTS WITH HEART FAILURE

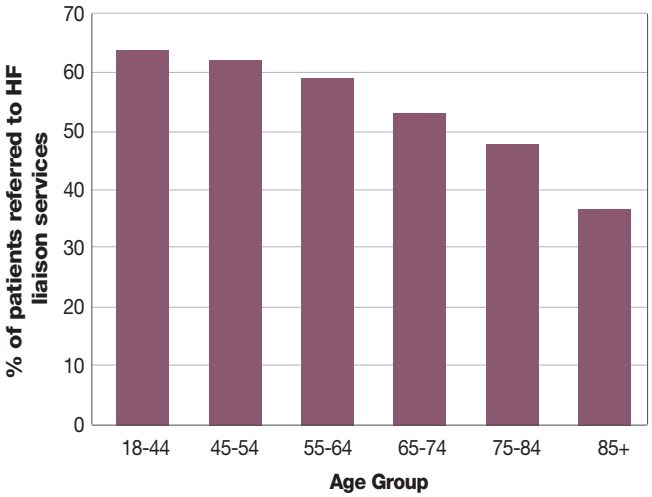
The clinical condition of a person with heart failure may fluctuate and repeated admission to hospital is common, particularly for patients with more severe heart failure. Monitoring of clinical status following discharge is necessary and will involve healthcare professionals in both primary and secondary care. NICE quality standard 9 for chronic heart failure states: [23]

> QS9 People with stable chronic heart failure receive a clinical assessment at least every 6 months, including a review of medication and measurement of renal function.

Of those with confirmed diagnosis of heart failure, 47% were referred to heart failure liaison services (which involve input from a heart failure specialist nurse). Of these, 62% were men.

Patients admitted to cardiology wards were more likely to be referred to heart failure liaison services (58%) than those admitted to general medicine (37%). Almost 64% of all patients under 45 were referred to the heart failure liaison services. This fell with increasing age to 37% in the over 85 age group (Figure 7). Although the pattern is similar to last year, access rates for older age groups have improved slightly.

FIG 7: PATIENTS REFERRED TO HEART FAILURE LIAISON SERVICES AFTER FIRST ADMISSION



On readmission, 55% of patients were referred to HF liaison services.

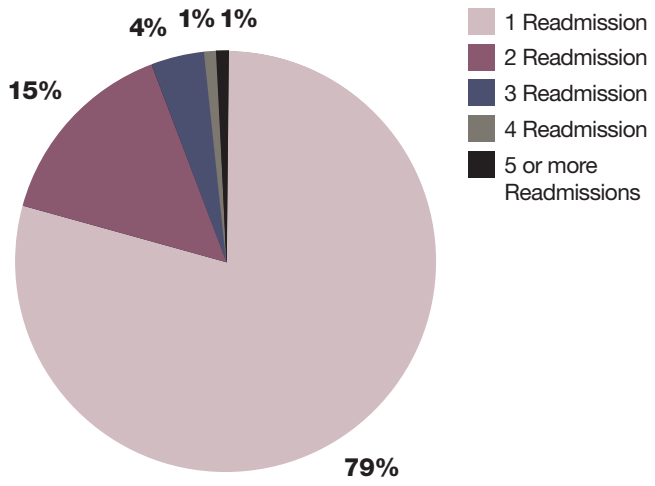
Although prognosis for heart failure is poor, referral to palliative care is very low with less than 4% of patients accessing these services. Referral to palliative care increases slightly to 6% for those readmitted to hospital.

3.8 PATIENT OUTCOMES

6,802 patients were readmitted at least once during 2010/11. The median number of readmissions was 1 although number of readmissions ranges from 1 to 13. Figure 8 shows the proportion of multiple readmissions.

iv. "Confirmed heart failure or left ventricular systolic dysfunction" implies either a) estimation of left ventricular ejection fraction (e.g. by echocardiography) or b) documented by specialist clinician's diagnosis.

FIG 8: MULTIPLE READMISSIONS WITHIN AUDIT PERIOD 2010/11



Length of stay

The overall mean length of stay was 11 days (Figure 9) and the median length of stay was nine days (Figure 10). Both are comparable to length of stay reported by HES.

The mean length of stay was similar in cardiology and other wards and for both men and women. There was a difference between age groups.

On readmission, the mean length of stay was 13 days although there was a slight difference between cardiology (14 days) and general medical wards (12 days) and other wards (13 days). Again there was no difference between men and women, although longer lengths of stay were observed for older age groups.

FIG 9: MEAN LENGTH OF STAY BY HOSPITAL

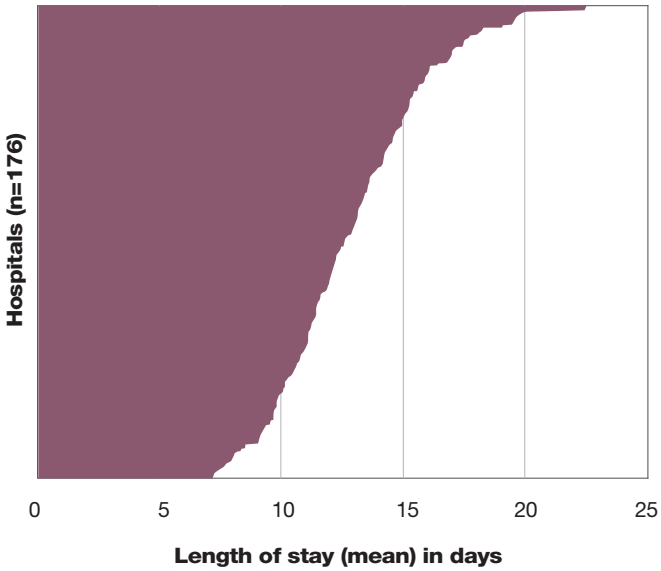
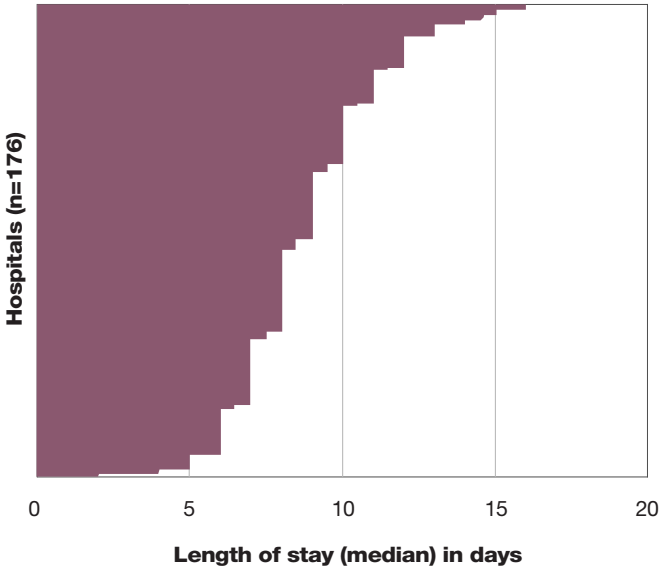


FIG 10: MEDIAN LENGTH OF STAY BY HOSPITAL



Mortality

Validated life status was available for 27, 850 of those admitted with heart failure during the 2010/11 audit period.

33.1% (9,223) patients died during or after a hospitalisation (32.0% for men and 34.4% for women). The analysis was censored for survival at 12/8/11. The median follow up time was 237 days for all, and 306 for survivors.

In-patient mortality was 11.6% (10.6% for men and 12.8% for women: p<0.001). Deaths in hospital were significantly lower for those admitted to a cardiology ward (8%) compared to those whose stay was in a general medical (14%) or other ward (17%), p<0.001.

Both in-patient and post-discharge mortality increased with age. Patients ≤70 years had a total mortality rate of 16.9% compared to 37.9% for those >70 years at admission (p<0.0001). Mortality rates were 9.4% (<40 years), 9.3% (41-50 years), 13.3% (51-60 years), 20.5% (61-70 years), 28.7% (71-80 years) and 43.1% for those >80 years at admission.

Kaplan-Meier actuarial survival curves for mortality on all admissions that survived to discharge are shown in Figures 11-20. Age is stratified at both 70 years (Fig 11), and by age decades described above (Fig 12).

Post-discharge mortality varied by admission ward (Fig 13). Total mortality was 26.2%, 38.2% and 42.0% for those admitted to cardiology, general medical and other wards respectively (p<0.001).

Post-discharge, men appeared to have a very slightly better survival than women, but this did not reach statistical significance (Fig 14). There was no difference in survival between those with LVSD compared to those with no LVSD (Fig 15).

Post-discharge survival was significantly better for those receiving ACE inhibitors and beta blockers, compared to those who were

not prescribed these treatments (Figs 16-19) (all p<0.0001). The effect of disease modifying treatments on survival rates was additive, with lower mortality rates for those patients prescribed multiple drugs (Figs 20, 21) (p<0.0001). Survival rates were significantly worse for those on loop diuretics (Fig 22), (p<0.0001).

The overall mortality rate for those discharged from hospital alive and followed up in cardiology was 18% compared to 30.8% of those without cardiology follow up, p<0.001 (Fig 23). Patients referred to the heart failure nurse liaison services also had a lower mortality of 22.3% versus 26.7%, p<0.001 (Fig 24).

Predictors of mortality[v]

TABLE 2: POST-DISCHARGE SURVIVAL

In a Cox Proportional Hazards Model, the independent predictors of higher mortality at the end of follow up for those discharged alive were:

Predictor	Hazard Ratio (HR)	Range of HR	Significance
Previous MI	1.3	1.2-1.3	p<0.0001
Age at admission			p<0.0001
Male sex	1.2	1.1-1.3	p<0.001
NYHA class III or IV	1.4	1.1-1.6	p<0.001
No ACEI therapy	1.4	1.3-1.6	p<0.0001
No beta blocker therapy	1.5	1.3-1.6	p<0.001
Loop diuretic therapy	1.2	1.0-1.3	p<0.04
No cardiology follow-up	1.5	1.4-1.6	p<0.001

TABLE 3: IN-HOSPITAL MORTALITY

Multivariate Logistic Regression analysis for Death in Hospital demonstrated that the independent predictors of mortality were:

Predictor	Hazard Ratio (HR)	Significance
Previous MI	1.3	p=0.006
Age at admission		p<0.001
Moderate oedema	2.1	p<0.001
NYHA class III or IV	1.6	p=0.03
No ACEI therapy	1.6	p<0.001
No beta blocker therapy	2.8	p<0.001
LV Systolic Dysfunction	1.3	p=0.02
Not admitted to a cardiology ward	1.3	p=0.006

FIG 11: SURVIVAL POST-DISCHARGE BY AGE ABOVE OR BELOW 70

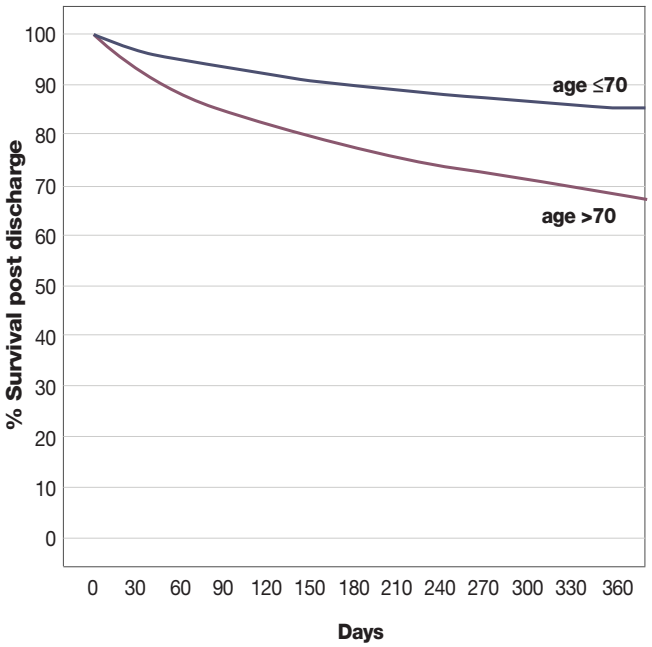
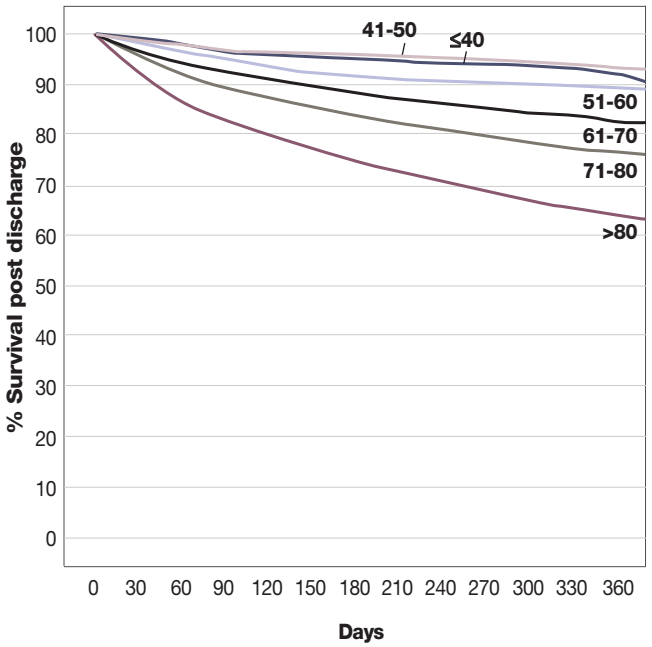


FIG 12: SURVIVAL POST-DISCHARGE BY DECADE OF AGE



v. See appendix 3 for mortality data supporting the analyses in this section.

FIG 13: SURVIVAL POST-DISCHARGE BY ADMISSION WARD

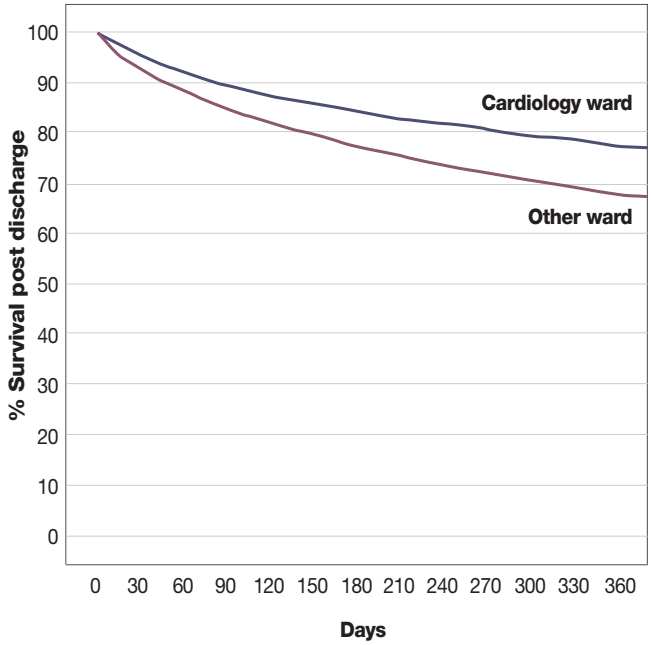


FIG 14: SURVIVAL POST-DISCHARGE BY SEX

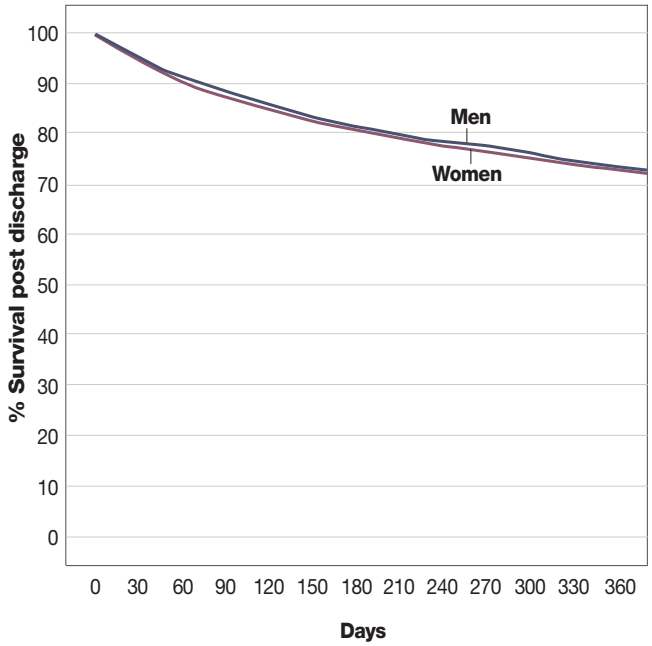


FIG 15: SURVIVAL POST-DISCHARGE BY PRESENCE OR ABSENCE OF LEFT VENTRICULAR SYSTOLIC DYSFUNCTION

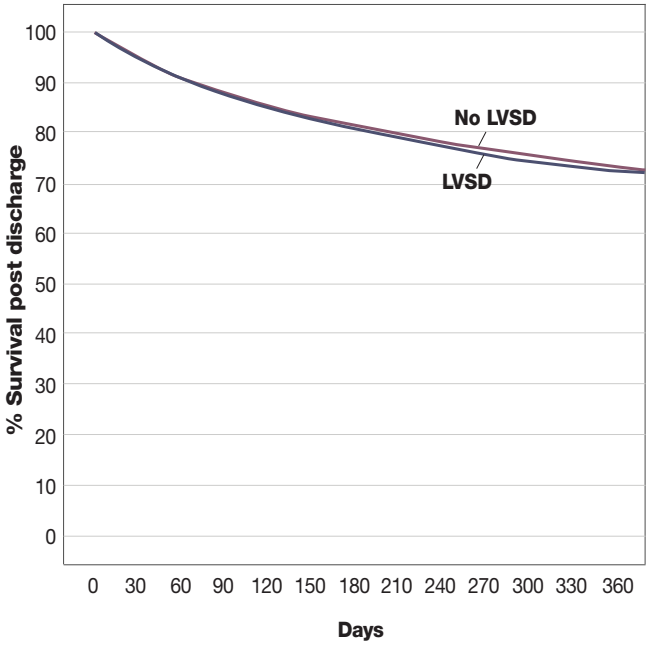


FIG 16: SURVIVAL POST-DISCHARGE BY ACE INHIBITOR PRESCRIPTION

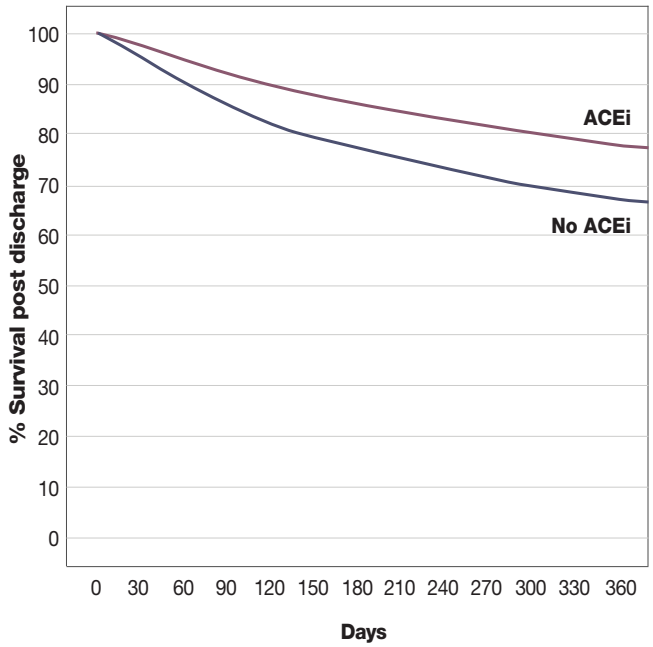


FIG 17: SURVIVAL POST-DISCHARGE BY ACE INHIBITOR PRESCRIPTION IN THOSE WITH LVSD

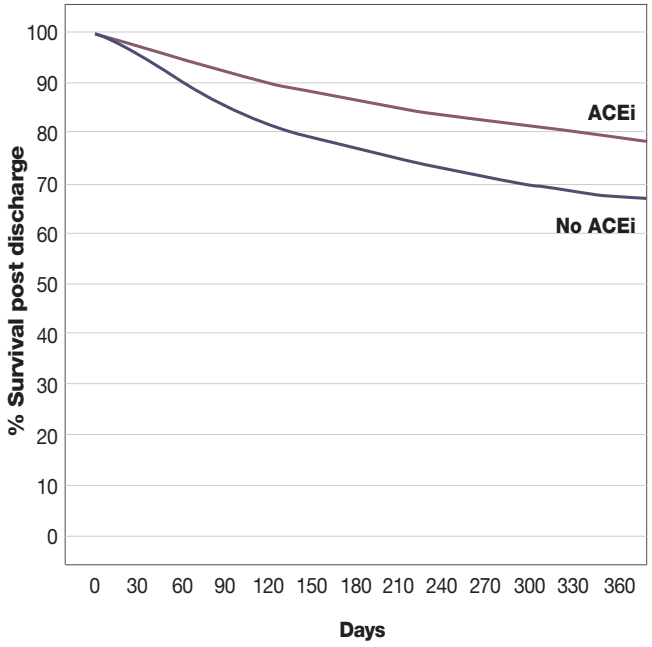


FIG 18: SURVIVAL POST-DISCHARGE BY BETA BLOCKER PRESCRIPTION

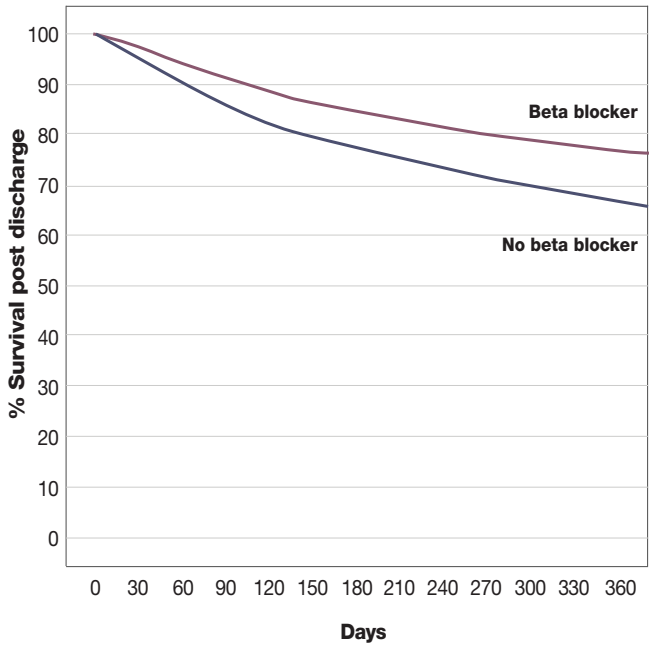


FIG 19: SURVIVAL POST-DISCHARGE BY BETA BLOCKER PRESCRIPTION IN THOSE WITH LVSD

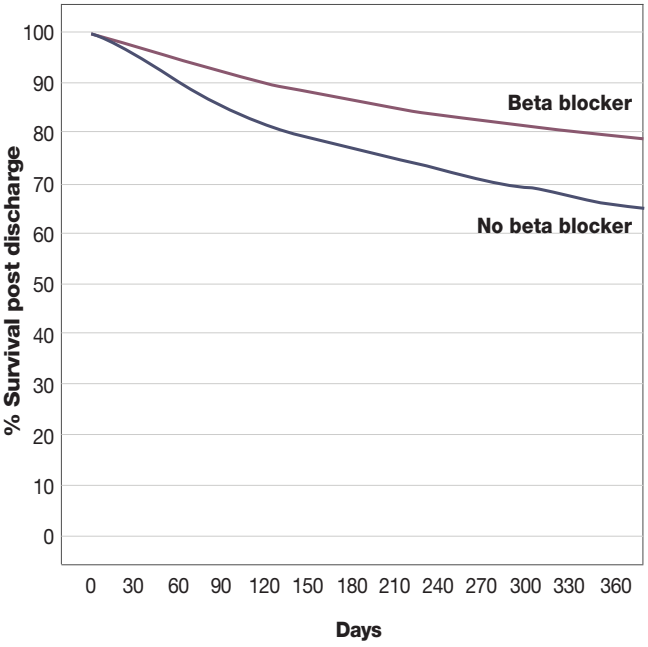


FIG 20: SURVIVAL POST-DISCHARGE BY NUMBER OF DISEASE MODIFYING DRUGS

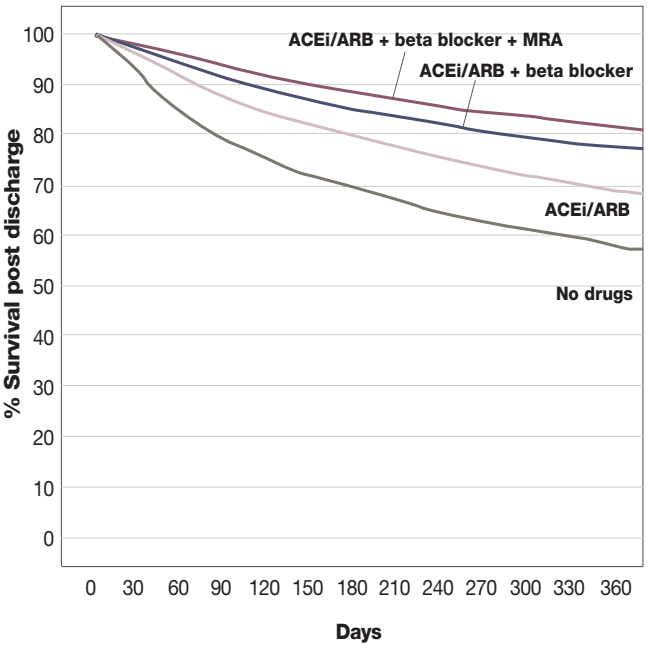


FIG 21: SURVIVAL POST-DISCHARGE BY NUMBER OF DISEASE MODIFYING DRUGS FOR THOSE WITH LVSD

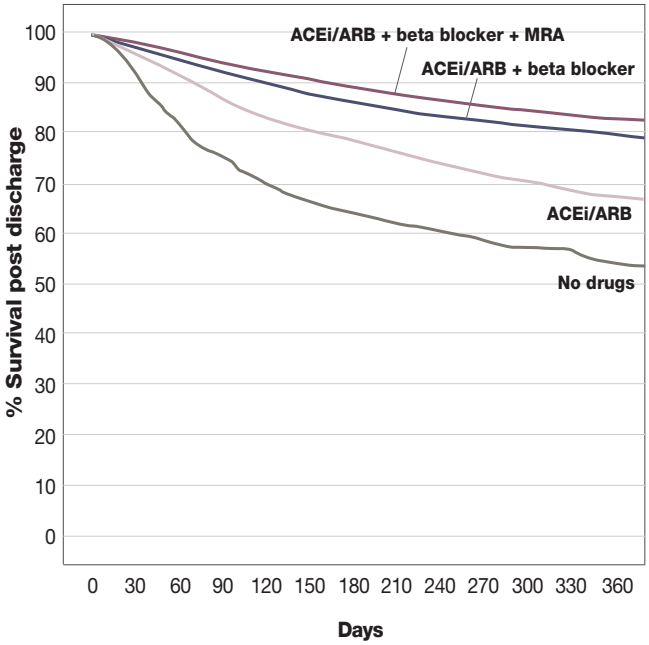


FIG 22: SURVIVAL POST-DISCHARGE BY LOOP DIURETIC PRESCRIPTION

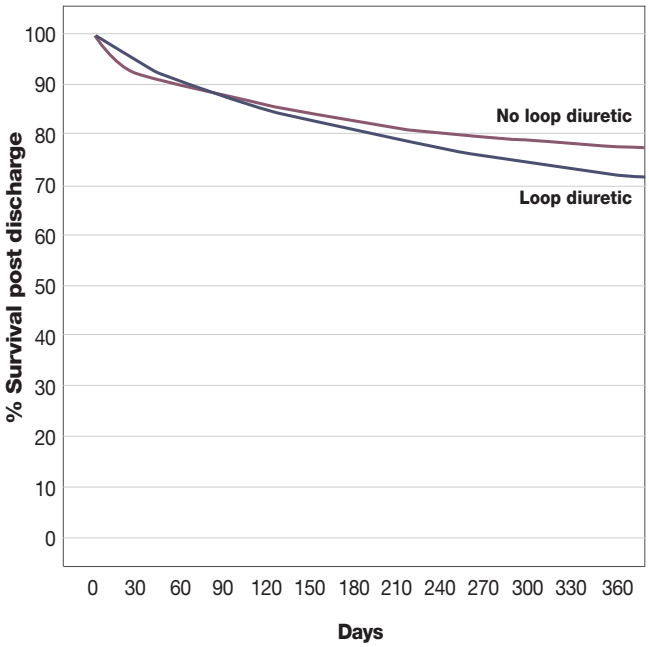


FIG 23: SURVIVAL POST-DISCHARGE BY TYPE OF FOLLOW-UP

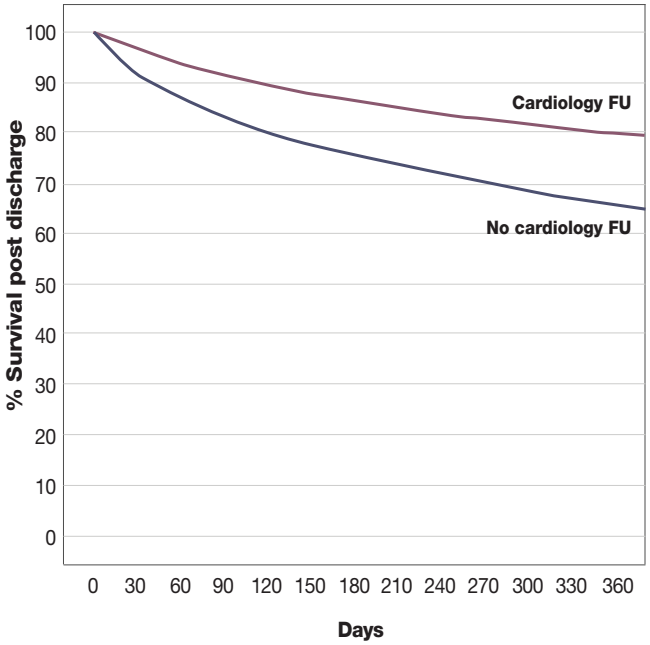
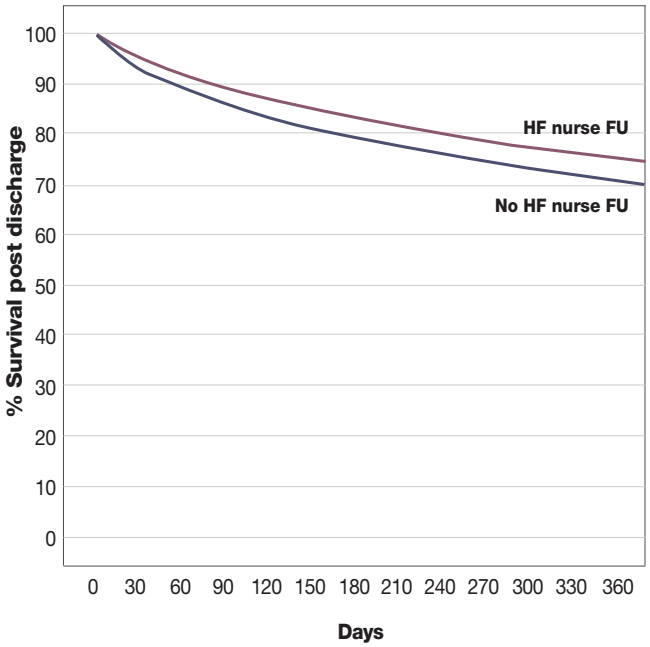


FIG 24: SURVIVAL POST-DISCHARGE BY REFERRAL TO HEART FAILURE NURSE SERVICE



4 IMPLEMENTATION ISSUES

The audit has grown both in terms of the number of participating hospitals and the average number of patients reported per hospital. Despite the increase in numbers data completeness of core fields is excellent.

Local restructuring within the NHS and changes in key clinical, nursing and support staff within the audit have led to difficulties in maintaining communications from the audit project team with all participating organisations.

Any changes to key audit staff should be notified to Polly Mitchell on 0203 108 3927 or by email at polly.mitchell@ucl.ac.uk.

4.1 ORGANISATION SUPPORT

It is likely that the National Heart Failure Audit will feature in a wider strategic role in health policy. The Government White Paper *Equity and Excellence: Liberating the NHS* published in July 2010 states that "…outcome measures, patient experience surveys and national clinical audit are not used widely enough. We [the government] will expand their validity, collection and use. The Department [of Health] will extend national clinical audit to support clinicians across a much wider range of treatments and conditions."[24]

It should be borne in mind that any resulting increase in the numbers of patients and volume of data collected for the audit will increase the workload of administrative, clinical and nursing staff in each participating organisation unless there are improvements in the efficiency of data recording.

4.2 IT ISSUES

As highlighted in last year's report, the complex pathway means that users need a flexible system. The heart failure database is based on Lotus Notes and hospitals are provided with one licence which is restricted to a single computer. If audit responsibilities are divided across directorates and roles then additional licences or a more flexible web-based system will be required.

4.3 ACCURACY OF CODING

Reassuringly, the coded diagnosis of heart failure was confirmed in 84% of cases in the audit, and refuted in only 9% (no response in 6%). Accordingly, when a diagnosis of heart failure is coded in the first position it seems fairly accurate. The number of missed diagnosis however cannot be ascertained by our survey methodology and may be substantial. The number of patients with heart failure coded in positions other than first may exceed 300,000 per year. These patients have similar characteristics and outcome to patients coded in the first position. This large additional pool of patients with heart failure must be kept in mind.

5 CONCLUSIONS

The provision of accurate, high quality data on patient care is at the core of improving services. The National Heart Failure Audit now provides consistent, credible and important information about the quality of care and patient outcomes on more than 60% of patients with a primary death or discharge code for heart failure in England and Wales. We can now be confident that we are reporting a representative spectrum of care-patterns and outcomes for heart failure and are not just the results of a few selected patients or high quality centres.

This year's audit confirms the improvement suggested last year in the use of key treatments such as ACE inhibitors and beta blockers, although beta blocker use remains far from optimal. The audit shows that not all those with a confirmed diagnosis receive optimal management to improve their symptoms, quality of life and prognosis.

Patients admitted to general medical wards are less likely to access the recommended NICE treatments than those admitted to cardiology wards. This is perhaps the greatest challenge to the NHS. NICE Quality Standards Statement (number 11) recommends:[25]

> People admitted to hospital because of heart failure receive input to their management plan from a multi-disciplinary heart failure team.

In other words, this, and the other 12 Quality Standards, if implemented will have a huge impact on patient outcomes but will require radical changes to staff deployment.

Research has shown that effective care for patients with heart failure can reduce morbidity and mortality. This audit has consistently shown high mortality for patients hospitalised with heart failure, with 33% dying within a year. Outcomes are substantially better if the patient accesses specialist care - mortality at one year in those followed up by cardiologists is substantially lower at 18% and this difference is not accounted for by age and recorded co-morbidities.

All stakeholders, including the public, have a right to expect open reporting. More importantly, audit should make a difference. Whilst there has been significant improvement in developing heart failure services, the challenge facing stakeholders now is to re-organise heart failure care to deliver the specialist care which can improve outcomes for all heart failure patients effectively.

6 RECOMMENDATIONS

Since the launch of the National Heart Failure Audit, most (85%) NHS Trusts and Heath Boards are participating in the audit. Organisations such as Cardiac Networks, the Heart Improvement Programme, 1000 Lives Plus and the Care Quality Commission also have a remit to support and promote improvement in the quality of heart failure services.

The British Society for Heart Failure has identified a number of key areas for attention. These fall into two categories: improving data completeness and improving the quality of patient care.

6.1 RECOMMENDATIONS FOR IMPROVING DATA COMPLETENESS

- All secondary care Trusts and Health Boards treating patients with heart failure should participate in the audit.
- Ideally, all units should be encouraged to submit every patient discharged with a primary diagnosis of heart failure. As a move towards full participation, all secondary care Trusts and Health Boards should continue to submit at least 20 (or if less than 20, the maximum number) of patients discharged with a diagnosis of heart failure in the primary position.
- Strategic Health Authorities should recommend the inclusion of heart failure related Indicators for Quality Improvement in quality accounts.

6.2 RECOMMENDATIONS FOR IMPROVING THE QUALITY OF CARE AND PATIENT OUTCOMES

- All secondary care service providers should streamline the heart failure care pathway to ensure all patients, regardless of admission ward, have access to recommended medication in line with NICE guidelines[16] and that treatment is managed by specialist staff.
- Commissioners should use evidence of participation in the National Heart Failure Audit within the effective commissioning process to ensure that all patients with a confirmed diagnosis of heart failure have access to evidence based treatment as recommended by NICE.
- Consideration should be given to reporting survival (and if possible re-hospitalisation) data for future years. A median follow-up of just 133 days from discharge (partly explained by the high mortality) is inadequate to describe the full impact of heart failure on survival.

APPENDIX 1
PARTICIPATION OF NHS TRUSTS/HEALTH BOARDS (ASSESSED ON 1 JUNE 2011)

Participating Trusts

NHS Trust	Records Submitted	HES	% HES Submitted
AINTREE UNIVERSITY HOSPITALS NHS FOUNDATION TRUST	480	320	150
BARNET AND CHASE FARM HOSPITALS NHS TRUST	516	594	87
BARNSLEY HOSPITAL NHS FOUNDATION TRUST	137	318	43
BARTS AND THE LONDON NHS TRUST	194	394	49
BASILDON AND THURROCK UNIVERSITY HOSPITALS NHS FOUNDATION TRUST	242	446	54
BASINGSTOKE AND NORTH HAMPSHIRE NHS FOUNDATION TRUST	116	182	64
BEDFORD HOSPITAL NHS TRUST	265	253	105
BLACKPOOL, FYLDE AND WYRE HOSPITALS NHS FOUNDATION TRUST	334	291	115
BRADFORD TEACHING HOSPITALS NHS FOUNDATION TRUST	208	504	41
BRIGHTON AND SUSSEX UNIVERSITY HOSPITALS NHS TRUST	577	580	99
BUCKINGHAMSHIRE HOSPITALS NHS TRUST	243	258	94
BURTON HOSPITALS NHS FOUNDATION TRUST	265	294	90
CALDERDALE AND HUDDERSFIELD NHS FOUNDATION TRUST	458	436	105
CAMBRIDGE UNIVERSITY HOSPITALS NHS FOUNDATION TRUST	118	350	34
CENTRAL MANCHESTER UNIVERSITY HOSPITALS NHS FOUNDATION TRUST	115	308	37
CHELSEA AND WESTMINSTER HOSPITAL NHS FOUNDATION TRUST	120	152	79
CHESTERFIELD ROYAL HOSPITAL NHS FOUNDATION TRUST	96	334	29
CITY HOSPITALS SUNDERLAND NHS FOUNDATION TRUST	312	297	105
COLCHESTER HOSPITAL UNIVERSITY NHS FOUNDATION TRUST	354	432	82
COUNTESS OF CHESTER HOSPITAL NHS FOUNDATION TRUST	317	242	131
COUNTY DURHAM AND DARLINGTON NHS FOUNDATION TRUST	316	542	58
DERBY HOSPITALS NHS FOUNDATION TRUST	254	555	46
DONCASTER AND BASSETLAW HOSPITALS NHS FOUNDATION TRUST	192	518	37
DORSET COUNTY HOSPITAL NHS FOUNDATION TRUST	203	190	107
EALING HOSPITAL NHS TRUST	27	194	14
EAST AND NORTH HERTFORDSHIRE NHS TRUST	536	392	137
EAST CHESHIRE NHS TRUST	98	234	42
EAST LANCASHIRE HOSPITALS NHS TRUST	278	531	52
EAST SUSSEX HOSPITALS NHS TRUST	463	585	79
EPSOM AND ST HELIER UNIVERSITY HOSPITALS NHS TRUST	357	405	88
FRIMLEY PARK HOSPITAL NHS FOUNDATION TRUST	323	257	126
GATESHEAD HEALTH NHS FOUNDATION TRUST	180	231	78
GEORGE ELIOT HOSPITAL NHS TRUST	209	279	75
GLOUCESTERSHIRE HOSPITALS NHS FOUNDATION TRUST	122	521	23

NHS Trust	Records Submitted	HES	% HES Submitted
GREAT WESTERN HOSPITALS NHS FOUNDATION TRUST	226	260	87
GUY'S AND ST THOMAS' NHS FOUNDATION TRUST	198	345	57
HARROGATE AND DISTRICT NHS FOUNDATION TRUST	172	195	88
HEART OF ENGLAND NHS FOUNDATION TRUST	342	1274	27
HEATHERWOOD AND WEXHAM PARK HOSPITALS NHS FOUNDATION TRUST	372	436	85
HINCHINGBROOKE HEALTH CARE NHS TRUST	89	146	61
HOMERTON UNIVERSITY HOSPITAL NHS FOUNDATION TRUST	242	186	130
HULL AND EAST YORKSHIRE HOSPITALS NHS TRUST	716	380	188
IMPERIAL COLLEGE HEALTHCARE NHS TRUST	417	612	68
IPSWICH HOSPITAL NHS TRUST	254	446	57
ISLE OF WIGHT HEALTHCARE NHS PCT	29	184	16
JAMES PAGET UNIVERSITY HOSPITALS NHS FOUNDATION TRUST	225	391	58
KETTERING GENERAL HOSPITAL NHS FOUNDATION TRUST	283	257	110
KING'S COLLEGE HOSPITAL NHS FOUNDATION TRUST	393	403	98
KINGSTON HOSPITAL NHS TRUST	72	343	21
LANCASHIRE TEACHING HOSPITALS NHS FOUNDATION TRUST	355	494	72
LEEDS TEACHING HOSPITALS NHS TRUST	250	871	29
LIVERPOOL HEART AND CHEST NHS FOUNDATION TRUST	203	350	58
LUTON AND DUNSTABLE HOSPITAL NHS FOUNDATION TRUST	331	260	127
MAIDSTONE AND TUNBRIDGE WELLS NHS TRUST	419	447	94
MAYDAY HEALTHCARE NHS TRUST	221	270	82
MID CHESHIRE HOSPITALS NHS FOUNDATION TRUST	134	247	54
MID STAFFORDSHIRE NHS FOUNDATION TRUST	233	290	80
MID YORKSHIRE HOSPITALS NHS TRUST	305	641	48
MILTON KEYNES HOSPITAL NHS FOUNDATION TRUST	77	220	35
NEWHAM UNIVERSITY HOSPITAL NHS TRUST	24	205	12
NORFOLK AND NORWICH UNIVERSITY HOSPITALS NHS FOUNDATION TRUST	367	751	49
NORTH BRISTOL NHS TRUST	471	491	96
NORTH CUMBRIA UNIVERSITY HOSPITALS NHS TRUST	157	425	37
NORTH MIDDLESEX UNIVERSITY HOSPITAL NHS TRUST	229	275	83
NORTH TEES AND HARTLEPOOL NHS FOUNDATION TRUST	468	346	135
NORTH WEST LONDON HOSPITALS NHS TRUST	634	559	113
NORTHAMPTON GENERAL HOSPITAL NHS TRUST	240	293	82
NORTHERN DEVON HEALTHCARE NHS TRUST	257	253	102
NORTHERN LINCOLNSHIRE AND GOOLE HOSPITALS NHS FOUNDATION TRUST	301	311	97
NORTHUMBRIA HEALTH CARE NHS FOUNDATION TRUST	446	665	67

NHS Trust	Records Submitted	HES	% HES Submitted
NOTTINGHAM UNIVERSITY HOSPITALS NHS TRUST	228	987	23
OXFORD RADCLIFFE HOSPITALS NHS TRUST	476	838	57
PENNINE ACUTE HOSPITALS NHS TRUST	768	767	100
PETERBOROUGH AND STAMFORD HOSPITALS NHS FOUNDATION TRUST	201	268	75
POOLE HOSPITAL NHS FOUNDATION TRUST	212	209	101
PORTSMOUTH HOSPITALS NHS TRUST	289	563	51
ROYAL BERKSHIRE NHS FOUNDATION TRUST	399	436	92
ROYAL BROMPTON AND HAREFIELD NHS FOUNDATION TRUST	191	443	43
ROYAL CORNWALL HOSPITALS NHS TRUST	210	557	38
ROYAL DEVON AND EXETER NHS FOUNDATION TRUST	256	404	63
ROYAL FREE HAMPSTEAD NHS TRUST	175	237	74
ROYAL LIVERPOOL AND BROADGREEN UNIVERSITY HOSPITALS NHS TRUST	293	201	146
ROYAL SURREY COUNTY NHS FOUNDATION TRUST	108	246	44
SALFORD ROYAL NHS FOUNDATION TRUST	258	236	109
SALISBURY NHS FOUNDATION TRUST	400	217	184
SANDWELL AND WEST BIRMINGHAM HOSPITALS NHS TRUST	449	776	58
SCARBOROUGH AND NORTH EAST YORKSHIRE HEALTH CARE NHS TRUST	34	333	10
SHEFFIELD TEACHING HOSPITALS NHS FOUNDATION TRUST	498	875	57
SHERWOOD FOREST HOSPITALS NHS FOUNDATION TRUST	270	507	53
SHREWSBURY AND TELFORD HOSPITAL NHS TRUST	354	546	65
SOUTH DEVON HEALTHCARE NHS FOUNDATION TRUST	406	390	104
SOUTH LONDON HEALTHCARE NHS TRUST	561	794	71
SOUTH TEES HOSPITALS NHS FOUNDATION TRUST	303	501	60
SOUTH TYNESIDE NHS FOUNDATION TRUST	318	167	190
SOUTH WARWICKSHIRE NHS FOUNDATION TRUST	55	181	30
SOUTHAMPTON UNIVERSITY HOSPITALS NHS TRUST	154	521	30
SOUTHEND UNIVERSITY HOSPITAL NHS FOUNDATION TRUST	688	500	138
SOUTHPORT AND ORMSKIRK HOSPITAL NHS TRUST	173	281	62
ST GEORGE'S HEALTHCARE NHS TRUST	245	533	46
ST HELENS AND KNOWSLEY HOSPITALS NHS TRUST	281	279	101
SURREY AND SUSSEX HEALTHCARE NHS TRUST	452	346	131
TAMESIDE HOSPITAL NHS FOUNDATION TRUST	237	274	86
TAUNTON AND SOMERSET NHS FOUNDATION TRUST	342	399	86
THE DUDLEY GROUP OF HOSPITALS NHS FOUNDATION TRUST	251	486	52
THE HILLINGDON HOSPITAL NHS TRUST	215	263	82
THE LEWISHAM HOSPITAL NHS TRUST	206	318	65

NHS Trust	Records Submitted	HES	% HES Submitted
THE NEWCASTLE UPON TYNE HOSPITALS NHS FOUNDATION TRUST	249	665	37
THE QUEEN ELIZABETH HOSPITAL KING'S LYNN NHS TRUST	265	348	76
THE ROTHERHAM NHS FOUNDATION TRUST	112	299	37
THE ROYAL WOLVERHAMPTON HOSPITALS NHS TRUST	4	521	1
THE WHITTINGTON HOSPITAL NHS TRUST	172	247	70
UNITED LINCOLNSHIRE HOSPITALS NHS TRUST	240	726	33
UNIVERSITY COLLEGE LONDON HOSPITALS NHS FOUNDATION TRUST	387	282	137
UNIVERSITY HOSPITAL BIRMINGHAM NHS FOUNDATION TRUST	359	634	57
UNIVERSITY HOSPITAL OF NORTH STAFFORDSHIRE NHS TRUST	158	699	23
UNIVERSITY HOSPITAL OF SOUTH MANCHESTER NHS FOUNDATION TRUST	194	484	40
UNIVERSITY HOSPITALS BRISTOL NHS FOUNDATION TRUST	377	406	93
UNIVERSITY HOSPITALS COVENTRY AND WARWICKSHIRE NHS TRUST	441	668	66
WALSALL HOSPITALS NHS TRUST	288	361	80
WEST HERTFORDSHIRE HOSPITALS NHS TRUST	287	389	74
WEST MIDDLESEX UNIVERSITY HOSPITAL NHS TRUST	286	220	130
WEST SUFFOLK HOSPITALS NHS TRUST	124	297	42
WESTERN SUSSEX HOSPITALS NHS TRUST	684	743	92
WHIPPS CROSS UNIVERSITY HOSPITAL NHS TRUST	235	386	61
WIRRAL UNIVERSITY TEACHING HOSPITAL NHS FOUNDATION TRUST	200	495	40
WORCESTERSHIRE ACUTE HOSPITALS NHS TRUST	422	574	74
WYE VALLEY NHS TRUST	148	188	79
YEOVIL DISTRICT HOSPITAL NHS FOUNDATION TRUST	247	166	149
YORK HOSPITALS NHS FOUNDATION TRUST	98	237	41

Non-participating Trusts

NHS Trust	Records Submitted	HES	% HES Submitted
ASHFORD AND ST PETER'S HOSPITALS NHS FOUNDATION TRUST	0	369	0
BARKING, HAVERING AND REDBRIDGE UNIVERSITY HOSPITALS NHS TRUST	0	705	0
DARTFORD AND GRAVESHAM NHS TRUST	0	253	0
EAST KENT HOSPITALS UNIVERSITY NHS FOUNDATION TRUST	0	806	0
MEDWAY NHS FOUNDATION TRUST	0	319	0
MID ESSEX HOSPITAL SERVICES NHS TRUST	0	389	0
PAPWORTH HOSPITAL NHS FOUNDATION TRUST	0	307	0
PLYMOUTH HOSPITALS NHS TRUST	0	633	0

ROYAL BOLTON HOSPITAL NHS FOUNDATION TRUST	0	356	0
ROYAL UNITED HOSPITAL BATH NHS TRUST	0	477	0
STOCKPORT NHS FOUNDATION TRUST	0	372	0
THE PRINCESS ALEXANDRA HOSPITAL NHS TRUST	0	233	0
THE ROYAL BOURNEMOUTH AND CHRISTCHURCH HOSPITALS NHS FOUNDATION TRUST	0	704	0
TRAFFORD HEALTHCARE NHS TRUST	0	125	0
UNIVERSITY HOSPITALS OF LEICESTER NHS TRUST	0	1364	0
UNIVERSITY HOSPITALS OF MORECAMBE BAY NHS TRUST	0	492	0
WARRINGTON AND HALTON HOSPITALS NHS FOUNDATION TRUST	0	289	0
WESTON AREA HEALTH NHS TRUST	0	170	0
WINCHESTER AND EASTLEIGH HEALTHCARE NHS TRUST	0	223	0
WRIGHTINGTON, WIGAN AND LEIGH NHS FOUNDATION TRUST	0	322	0

Participating Welsh Health Boards

Welsh Health Boards	Records Submitted	PEDW data	% PEDW Submitted
ANEURIN BEVAN LOCAL HEALTH BOARD	148	1067	14
BETSIC ADWALADRU NIVERSITYLOC ALH EALTHBOARD	48	1078	4
CWM TAF LOCAL HEALTH BOARD	5	568	1
HYWEL DDA LOCAL HEALTH BOARD	193	753	26

Non-participating Welsh Health Boards

Welsh Health Boards	Records Submitted	PEDW data	% PEDW Submitted
ABERTAWEBROM ORGANNWGU NIVERSITYLOC ALH EALTHBOARD	0	994	0
CARDIFF AND VALE UNIVERSITY LOCAL HEALTH BOARD	0	654	0

APPENDIX 2
GLOSSARY OF TERMS

ACE inhibitors	Angiotensin-converting enzyme (ACE) inhibitors are a group of drugs used primarily for the treatment of high blood pressure and heart failure. They stop the body's ability to produce angiotensin II, a substance which causes blood vessels to contract, thus dilating blood vessels and increasing the supply of blood and oxygen to the heart.
ARA	Aldosterone antagonists (ARAs) are diuretic drugs, whose main action is to block the response to the hormone aldosterone, which promotes the retention of salt and the loss of potassium and magnesium. ARAs increase urination, reduce water and salt, and retain potassium. They help to lower blood pressure and increase the pumping ability of the heart.
ARB	Angiotensin II receptor antagonists, also known as angiotensin receptor blockers (ARBs) are usually prescribed for those patients who are intolerant of ACE inhibitors. Rather than lowering levels of angiotensin II, they instead prevent the chemical from having any effect on blood vessels.
Beta blocker	Beta blockers are drugs which slow the heart rate, decrease cardiac output and lessen the force of heart muscle and blood vessel contractions. They are used to treat abnormal or irregular heart rhythms, and abnormally fast heart rates.
CCAD	The Central Cardiac Audit Database is the technology platform that has been collecting the national clinical audit data for cardiology since its inception in 1996.
COPD	Chronic obstructive pulmonary disease (COPD) is the co-occurrence of chronic bronchitis and emphysema, a pair of commonly co-existing diseases of the lungs in which the airways become narrowed. This leads to a limitation of the flow of air to and from the lungs, causing shortness of breath (dyspnoea). In clinical practice, COPD is defined by its characteristically low airflow on lung function tests. In contrast to asthma, this limitation is poorly reversible and usually gets progressively worse over time.
CRT	A biventricular pacemaker, also known as CRT (cardiac resynchronization therapy) is a type of pacemaker that can pace both the septal and lateral walls of the left ventricle. By doing so, the pacemaker can resynchronize a heart whose opposing walls do not contract in synchrony, which occurs in approximately 25-50% of heart failure patients. CRT devices have at least two leads, one in the right ventricle to stimulate the septum, and another inserted through the coronary sinus to pace the lateral wall of the left ventricle. Often, for patients in normal sinus rhythm, there is also a lead in the right atrium to facilitate synchrony with the atrial contraction. CRT can be combined with an implantable cardioverter-defibrillator (ICD).
HES	HES (Hospital Episode Statistics) is the national statistical data warehouse for England of the care provided by NHS hospitals and for NHS hospital patients treated elsewhere. HES is the data source for a wide range of healthcare analysis for the NHS, government and many other organisations and individuals.
Left ventricular ejection fraction	In cardiovascular physiology, ejection fraction (EF) is the fraction of blood pumped out of the right and left ventricles with each heart beat. The term ejection fraction applies to both the right and left ventricles: left ventricular ejection fraction (LVEF) and the right ventricular ejection fraction (RVEF).
Left ventricular systolic dysfunction	Left ventricular systolic dysfunction (LVSD) is a progressive process which begins with injury to the myocardium. In the body's efforts to compensate for this wall injury, the left ventricle wall thickens due to increased impairment of myocardial contractility. The ventricle then eventually hypertrophies and dilates. This process changes the normal left ventricle geometrical shape from oval to spherical, which in turn decreases the mechanical performance as well as increases blood flow back through the mitral valve.
National Institute for Health and Clinical Excellence	The National Institute for Health and Clinical Excellence (NICE) provides guidance, sets quality standards and manages a national database to improve people's health and prevent and treat ill health. NICE makes recommendations to the NHS on new and existing medicines, treatments and procedures, and on treating and caring for people with specific diseases and conditions.
NICOR	The National Institute for Cardiovascular Outcomes Research (NICOR) is based in the Institute of Cardiovascular Sciences at University College London. It manages six national cardiovascular audits, including the National Heart Failure Audit.
NYHA Class	NYHA (New York Heart Association) classification is used to describe degrees of heart failure by placing patients in one of four categories based on how much they are limited during physical activity, as below: **Class I (Mild)** No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, or dyspnoea (shortness of breath). **Class II (Mild)** Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in fatigue, palpitation, or dyspnoea. **Class III (Moderate)** Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity causes fatigue, palpitation, or dyspnoea. **Class IV (Severe)** Unable to carry out any physical activity without discomfort. Symptoms of cardiac insufficiency at rest. If any physical activity is undertaken, discomfort is increased.

APPENDIX 3
MORTALITY ANALYSIS

All-cause mortality for April 2010-March 2011 admissions

	Number	Denominator
ALL DEATHS	**9,223**	**27,850**
MEN	4,908	15,314
WOMEN	4,312	12,527
≤70 YEARS	1,067	6,317
>70 YEARS	8,156	21,533
≤40 YEARS	29	304
41-50 YEARS	65	694
51-60 YEARS	210	1,574
61-70 YEARS	756	3,695
71-80 YEARS	2,202	7,663
>80 YEARS	5,917	13,737
CARDIOLOGY WARD	3,298	12,611
GENERAL MEDICAL WARD	4,799	12,577
OTHER WARD	1,121	2,666
	Number	**Denominator**
IN-HOSPITAL DEATHS	**3,221**	**27,850**
MEN	1,622	15,314
WOMEN	1,598	12,527
CARDIOLOGY WARD	1,013	12,611
GENERAL MEDICINE WARD	1,753	12,577
OTHER WARD	454	2,666

Mortality for survivors to discharge

	Number	Denominator
ALL DISCHARGES	**6,043**	**24,629**
MEN	3,305	13,692
WOMEN	2,736	10,929
≤ 70 YEARS	764	5,996
> 70 YEARS	5,279	18,633
≤40 YEARS	21	294
41-50 YEARS	43	672
51-60 YEARS	160	1,521
61-70 YEARS	536	3,462
71-80 YEARS	1,482	6,933
>80 YEARS	3,771	11,578
CARDIOLOGY WARD	2,310	11,598
GENERAL MEDICAL WARD	3,056	10,804
OTHER WARD	673	2,212
LVSD	3,306	14,465
NO LVSD	2,734	10,156
ACEI	2,792	14,148
NO ACEI	2,268	7,597
ACEI AND LVSD	1,727	9,337
NO ACEI AND LVSD	1,063	4,805
BETA BLOCKER	2,875	14,190
NO BETA BLOCKER	2,373	7,827
BETA BLOCKER AND LVSD	1,789	9,543
NO BETA BLOCKER AND LVSD	1,121	3,575
LOOP DIURETIC	468	2251
NO LOOP DIURETIC	5252	21352
CARDIOLOGY FOLLOW-UP	2,189	12,130
NO CARDIOLOGY FOLLOW-UP	3,809	12,345
HF NURSE FOLLOW-UP	2,654	11,911
NO HF NURSE FOLLOW-UP	3,378	12,631

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