

National Heart Failure Audit 2010



National Heart Failure Audit Report for the audit period ending March 2010

This third 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 was submitted between April 2009 and March 2010. Aimed at healthcare professionals, managers and clinical governance leads, the report describes progress to date, clinical findings and patient outcomes, and implementation issues.

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The NHS Information Centre for Health and Social Care (The NHS IC) is England's central, authoritative source of essential data and statistical information for frontline decision makers in health and social care. The NHS IC managed the publication of the 2009/10 annual report.



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.



The British Society for Heart Failure (BSH) is a national organisation of health care professionals dedicated to improving heart failure outcomes in the UK. The BSH was responsible for providing clinical leadership and strategic direction to the 2009/10 annual report.

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Report for the audit period between
April 2009 and March 2010

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Acknowledgements

The National Heart Failure Audit is managed by The NHS Information Centre for health and social care (**The IC**) and has been developed in partnership with the British Society for Heart Failure. 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, Health Boards and the individual clinicians, nurses and audit teams who are participating in the audit.

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Foreword

There is good evidence that optimal care improves survival and quality of life for the many patients that suffer from heart failure. It is also clear that recent developments in the treatment of this long term condition reduce admissions to hospital and increasingly allow those affected to be monitored and cared for at home.

While this report concentrates on the hospital aspects of care, it is vital that there is close collaboration between primary and secondary care if the improved outlook for heart failure patients is to be realised.

The analysis presented here reinforces the value of clinical data and its importance in delivering the ambitions set out in the White Paper 'Liberating the NHS'. Engagement of clinicians in garnering this information is central to sustaining such service improvement and is to be commended.

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1. Executive Summary

The National Service Framework for Coronary Heart Disease (NSF for CHD) sets national standards of care relating to CHD, including providing better care for people with heart failure. The National Institute of Clinical Excellence (NICE) has issued guidelines on the management of heart failure in primary and secondary care. 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 one in every 100 people in the UK, increasing steeply with age to about 7 per cent in men and women over 75 years. The number of patients with heart failure is set to rise in the next twenty 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 commonest reasons for emergency medical admissions (about 5 per cent), readmissions 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 per cent to 50 per cent depending on severity. Annual mortality in hospitalised patients from our last audit confirmed that the prognosis remains poor 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 ongoing support can improve quality of life, help reduce morbidity and mortality and reduce hospital admission. 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 The NHS Information Centre 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, enabling comparisons between Trusts or Health Boards and bring about 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.

This report summarises key findings from the second 12 months of the national roll out of the audit between April 2009 and March 2010.

1.3 Summary of key findings and main recommendations

As of June 2010.

- The prognosis of heart failure remains poor, even for patients aged under 75 years, despite current therapy. There is substantial scientific evidence that more might be done.
- Within the year of admission for heart failure, 32 per cent of patients died
- Mortality is significantly better for those who have access to specialist care i.e. those seen by cardiologists or specialist heart failure services (23 per cent)
- Patients with heart failure enrolled in the audit were mostly admitted under either cardiology (46 per cent) or general medicine (42 per cent)

- Patients admitted to cardiology wards were almost half as likely to die (6 per cent) in hospital as those admitted to other wards (12 per cent).
- Echocardiography, a key investigation for heart failure, was performed in 79 per cent of cases.
- Specialist services (inpatient and out-patient) are associated with better prescribing and better outcomes
- Beta-blockers are underused
- Although many patients were not receiving target doses of therapy at hospital discharge, it is possible that these were achieved subsequent to discharge. This requires more follow-up data.
- Many patients with heart failure are elderly and with multiple co-morbidities. The impact of existing conventional therapies may be limited in such patients.
- Prognosis of heart failure due to valve disease and in those with left ventricular ejection fraction (LVEF) greater than 40 per cent requiring admission to hospital is as poor as that of patients with LVEF less than 40 per cent.
- On average, patients with a home address in the most deprived quintile are admitted for heart failure 5 years earlier than those in the most affluent
- 132 out of 155 (85 per cent) Trusts and Health Boards had registered with the audit. Of the Trusts and Health Boards registered 121, (92 per cent) submitted data for the period April 2009-March 2010, totalling 21294 patients for the year
- Nationally the audit represents approximately 42 per cent of all patients discharged from hospital with a primary discharge diagnosis of heart failure and is a vast improvement in case ascertainment from the 6190 patients in the 2008/09 audit
- Data completeness for core fields achieved similar high rates as in 2008/09

Recommendations

- 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 and that treatment is managed by specialist staff.
- All secondary care Trusts in England and Health Boards Wales treating patients with heart failure should participate in the audit.
- All participating Trusts and Health Boards should continue to submit at least 20 cases per month (or the maximum numbers if that is less than 20). As a move towards fuller participation, all secondary care Trusts and Health Boards should be encouraged to submit every patient discharged with a primary diagnosis of heart failure.
- Strategic Health Authorities should recommend the inclusion of heart failure related Indicators for Quality Improvement in quality accounts.
- 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 collecting 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.

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 around 1 per cent of the adult population rising to 7 per cent in those aged over 75 years and 15 per cent for those aged 85 and over (1). Most cases of heart failure are due to coronary heart disease (approximately 70 per cent) and most cases 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 (2). 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 over 60 and fall within two age groups: 60-74 (24.6 per cent) and over 75 (68.3 per cent).

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 per cent of patients who die in the weeks, months and years after a heart attack will first develop heart failure (3).

2.2 Patient outcomes

Survival rates in epidemiological series are worse than for breast and prostate cancer, with annual mortality ranging from 10 per cent to 50 per cent depending on severity, and a high risk of sudden death. Newly diagnosed patients have a 40 per cent risk of dying within a year of diagnosis (4). Last year's audit report underlined the continuing poor outcomes showing a one year mortality following hospitalisation for heart failure of 30 per cent.

Patients with heart failure experience a poor quality of life, with over a third experiencing severe and prolonged depressive illness (5).

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 per cent of heart failure admissions are emergency admissions (6) and it accounts for 5 per cent of all emergency medical admissions.

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 (7). The National Service Framework (NSF) for Coronary Heart Disease (CHD) (8) and the Cardiac Disease National service Framework for Wales (9) both emphasise the need to develop a systematic approach to the diagnosis, investigation, treatment and ongoing support of people with heart failure throughout the NHS. Evidence-based clinical guidelines (10) published by the National Institute for Health and Clinical Excellence aim to assist health professionals in clinical decision making. These guidelines have been updated this year and should lead to further streamlining of the process of care.

Figure 1
Emergency admissions by primary diagnosis 2008-2009

Primary diagnosis: 3 character code and description	Number of Bed days	Admissions (First Diagnostic Position)
R69 Unknown & Unspecified Causes of Morbidity	3,698,873	54,831
F20 Schizophrenia	2,226,226	11,854
S72 Fracture of femur	1,710,038	66,343
J18 Pneumonia organism Unspecified	1,500,829	121,472
I63 Cerebral infarction	1,260,483	39,741
N39 Other disorders of urinary system	1,242,479	112,969
J44 Other Chronic obstructive pulmonary disease	846,532	106,561
I50 Heart Failure	740,697	58,164
Z38 Live-born infants according to place of birth	652,293	459,884
J22 Unspecified acute lower respiratory infection	641,934	88,032

Source: HES online (6)

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 ⁽¹¹⁾. 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 subsequent review of heart failure services (2007) ⁽¹²⁾ showed that substantial progress had been made in the two years after the NSF review. However, there was still variation across the country in relation to the confirmation of diagnosis, 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 PCTs in England when compared with expected levels.

The second piece of work ⁽¹³⁾ focused on the inpatient admission routes and access to diagnostics and key treatments. The results indicated that many patients admitted to hospitals in England, Wales and Northern Ireland are not managed fully in accordance with national & 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 per cent) have a lead consultant for the care of patients with heart failure, only 22 per cent of patients admitted to hospital with heart failure were referred to specialists or a general cardiologist.

Data from last year's audit shows that there is still much to be done. The key finding that patients admitted to cardiology wards have a 20 per cent lower mortality rate (after adjusting for known confounders) than those admitted to general medicine underlines the need to develop specialist in-patient services for heart failure patients.

2.6 Improving quality: Indicators for quality improvement

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 ⁽¹⁴⁾. The indicators have been developed in partnership with professionals across the NHS and the first set of indicators for Heart Failure include the following:

1. The Trust has registered with the National Heart Failure Audit
2. The Trust submitted 10 or more cases per month between April 2008 and March 2009. This was increased to 20 (or the maximum number if less than 20) from July 2009.

From 2010, healthcare providers will be required to publish 'quality accounts' just as they publish financial accounts. These will be reports to the public about the quality of services they provide and will look at safety, experience and outcomes. The content of Quality Accounts is still to be confirmed but it is likely that some indicators will be compulsory at either a national or SHA level.

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 ongoing basis. Information can also be used to inform patients about the quality of local care and to support patient choice.

The Heart Failure Audit: 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 IC and the BSH have chosen to focus initially on auditing inpatient care within secondary care.

The Heart Failure Audit: 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 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.

2.8 Organisation of the Audit

The National Heart Failure Audit is project managed by The Information Centre for Health and Social Care with specialist clinical knowledge provided by the British Society for Heart Failure. The audit was initially commissioned by the Healthcare Commission for two years (2006-2008) and has since been renewed for a further four years until March 2012. The first full year of audit using agreed criteria was 2008-2009 and has recently been published in detail. Commissioning arrangements transferred to the Healthcare Quality Improvement Partnership in April 2008. Information about the role of the NHS information centre and the IT infrastructure is available in previous National Heart Failure Audit reports. These are all available via the following link: <http://www.ic.nhs.uk/services/national-clinical-audit-support-programme-ncasp/audit-reports/heart-disease> .

2.9 The British Society for Heart Failure

The British Society for Heart Failure (**BSH**) is a national organisation of health care 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 IC to design a national audit dataset for heart failure. The BSH project steering group have collaborated with The IC 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

The Heart Failure Audit was used as a clinical indicator by the Care Quality Commission for 2009-10. Trusts were expected to have registered in the audit and to continually submit data.

Number of Trusts

There are 149 NHS Trusts in England and 6 out of the 7 Health Boards in Walesⁱ that discharge adult patients with a heart failure code in the HES primary diagnosis position. As of March 2009, 132 eligible organisations (85 per cent) had registered with the audit. Many Trusts and Health Boards have more than one hospital submitting data to the audit and as a consequence, 165 individual hospitals participated.

There is a wide variation in the number of records submitted by each Trust or Health Board per month. Only 83 (63 per cent) are submitting more than 10 records per month on a regular basis. However this is a substantial improvement from the 25 per cent reported in the Heart Failure Annual Report 2008-09.

A list of registered and non-registered Trusts, Health Boards and numbers of submitted records is provided in Appendix 1.

Number of patients

Between 2009-2010, hospitals submitted admission data on 21294 patients for the period April 1st 2009 to March 31st 2010. There were 4236 readmissions recorded in the database. The number of records submitted increased from 6170 admissions and 710 readmissions in 2008 – 2009,

Nationally, the number of cases submitted to the audit represents approximately 42 per cent of patients discharged from hospital with a diagnosis of heart failure in the primary positionⁱⁱ.

Figure 1 shows the estimated proportion of missing cases. This is an improvement from last year when the number of cases submitted to the audit represented 11% of patients discharged with a diagnosis of heart failureⁱⁱⁱ.

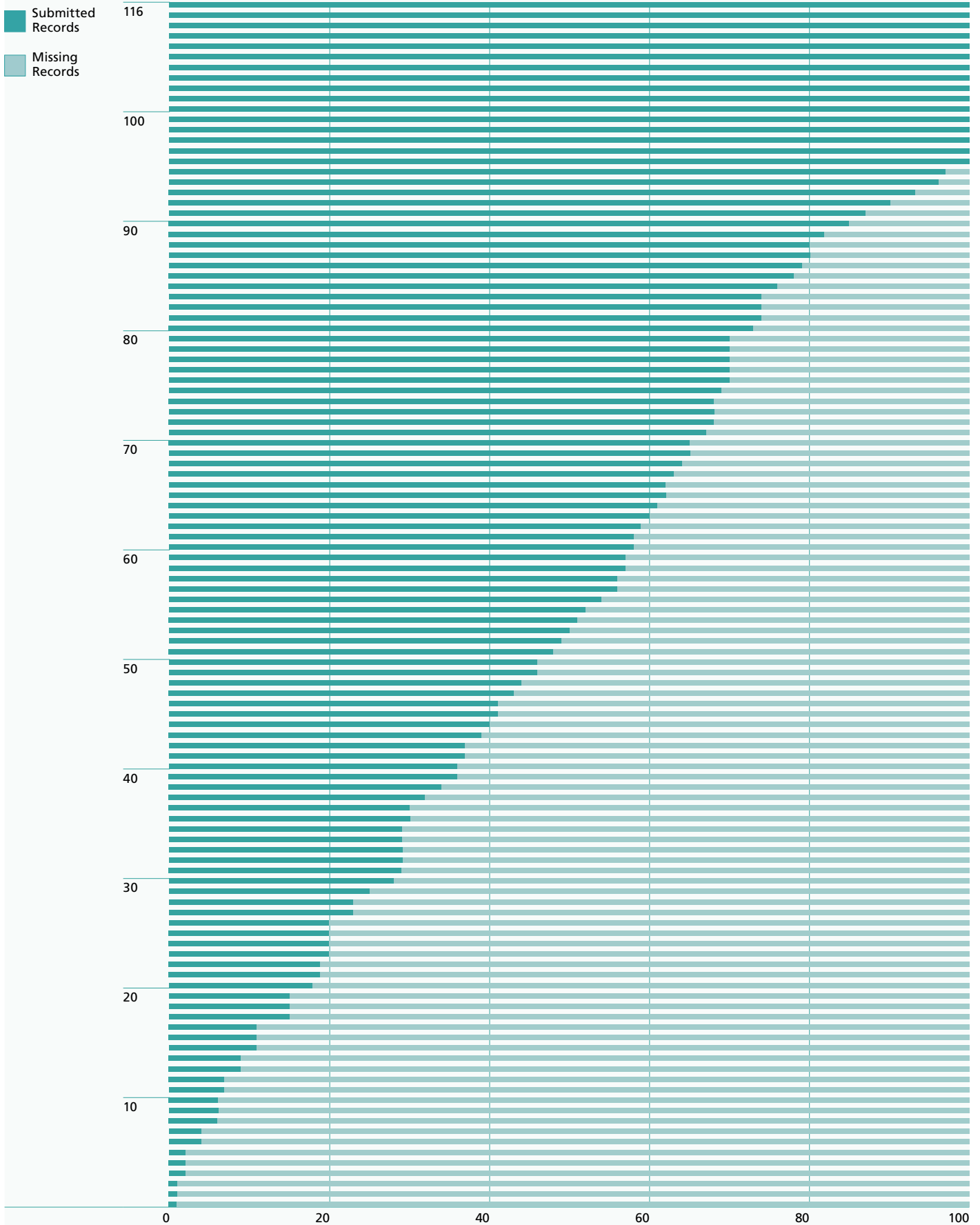
ⁱ Powys Health Board patients are admitted to English NHS Hospitals in Hereford and Shrewsbury

ⁱⁱ Based on HES Data 2008-2009

ⁱⁱⁱ Based on HES Data 2008-2009

Figure 1

Missing cases based on a comparison of audit submissions and HES discharge data



Data completeness

There are 36 core data items for which completion is mandatory. There is an 'unknown' option within each core data item. This 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 10 per cent for diagnostic tests and less than 5 per cent for all clinical treatments (Figure 2).

The quality of data completeness has been maintained from last year despite a large increase in the number of patients enrolled.

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. 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 national findings from the heart failure audit. The median age at admission was 79 years and there are more cases of men (n= 5217; 67 per cent) than women (2477; 33 per cent) until ages 75. Above 75 there are slightly more women (n= 6962; 51 per cent) have heart failure than men (6638, 49 per cent) (Figure 3).

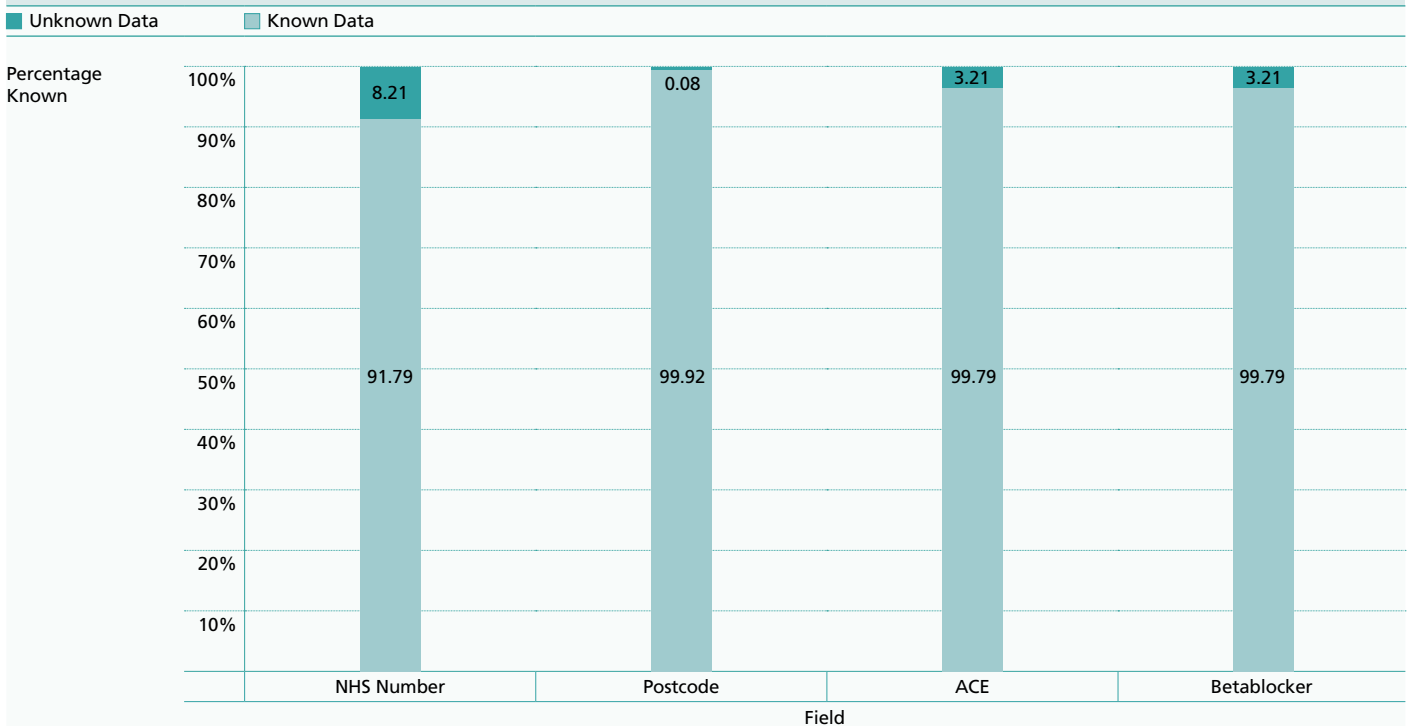
Research shows that younger patients are more likely to have left ventricular systolic dysfunction (LVSD) as the cause of heart failure. This is an important reason why clinical trials of heart failure that require a low left ventricular ejection fraction (LVEF) as an entry criterion recruit younger 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 (HFPEF). Women have low rates of myocardial infarction until about a decade after they reach the menopause but have similar rates of hypertension.

Ethnicity was recorded in 15,293 (Caucasian=12,775, Asian=622, Black=356).

Age on admission and the effect of deprivation

The average age on admission decreases with social deprivation for both women and men. On average, men and women with a home address in the highest quintile of deprivation are admitted for heart failure 5 years earlier than those in the most affluent.

Figure 2
Percentage Data completeness



3.3 Aetiology of Heart Failure

Hypertension (49 per cent) and ischaemic heart disease (46 per cent) were considered the commonest contributory causes of heart failure and many patients had both. About one third of those with heart failure and ischaemic heart disease were not reported to have had a prior myocardial infarction. Atrial fibrillation and a reduced Left ventricular ejection fraction (LVEF) both made an important contribution to the development of heart failure. Diabetes (27 per cent) and valve disease (20 per cent) were also common.

Patients with LVEF greater than 40 per cent were more likely to have a history of hypertension (54 per cent), atrial fibrillation (55 per cent) and valve disease (32 per cent). Those with LVEF less than 40 per cent were more likely to have ischaemic heart disease (51 per cent). These data are generally consistent with the previous year's audit and with comparable surveys.

Symptoms

Breathlessness at rest was present in only 28 per cent of patients on admission but greatly limited exercise capacity in a further 40 per cent, while 43 per cent reported moderate or severe oedema. These are almost identical to the previous year's data.

Monitoring and follow up

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 is necessary and will involve healthcare professionals in both primary and secondary care.

3.4 Variation in access to key treatment and specialist staff

Work undertaken by the Healthcare 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.

Patients were admitted to either cardiology (46 per cent) or general medicine (42 per cent) wards. Patients admitted to a cardiology ward were younger and more often men. This is a very similar result to that obtained from the 2008/09 audit.

3.5 Access to specialist follow up services

Most patients referred to the heart failure liaison service were men, Only 38 per cent of patients referred were women. Patients admitted to cardiology wards remain more likely to access heart failure liaison services (63 per cent) than those admitted to general medicine (33 per cent) or to other wards (28 per cent).

Almost 70 per cent of all patients under 45 were referred to the heart failure liaison services. This figure falls rapidly across the age groups to under 21 per cent in the over 95 age group.

Although prognosis for heart failure is poor, referral to palliative care is very low with less than 4 per cent of patients accessing these services.

Figure 3
Age Distribution by sex of patients enrolled in the audit

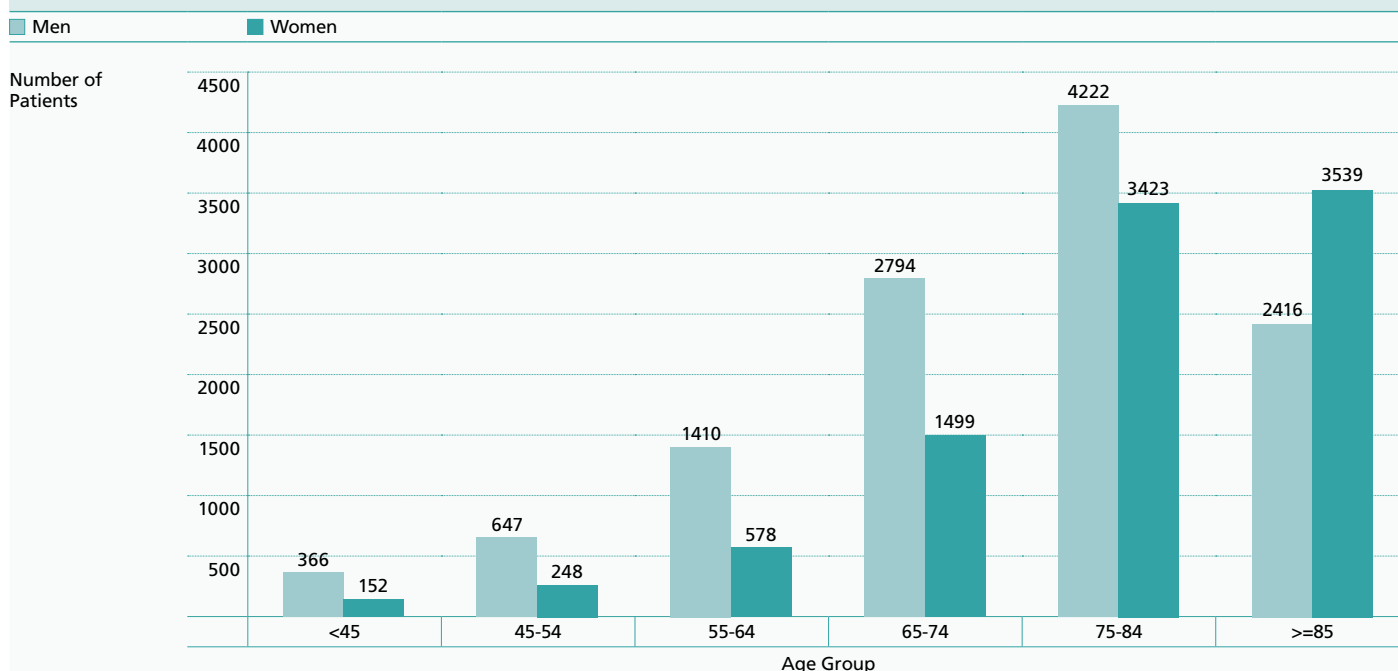


Figure 4
Average age on admission for heart failure by deprivation quintile and sex

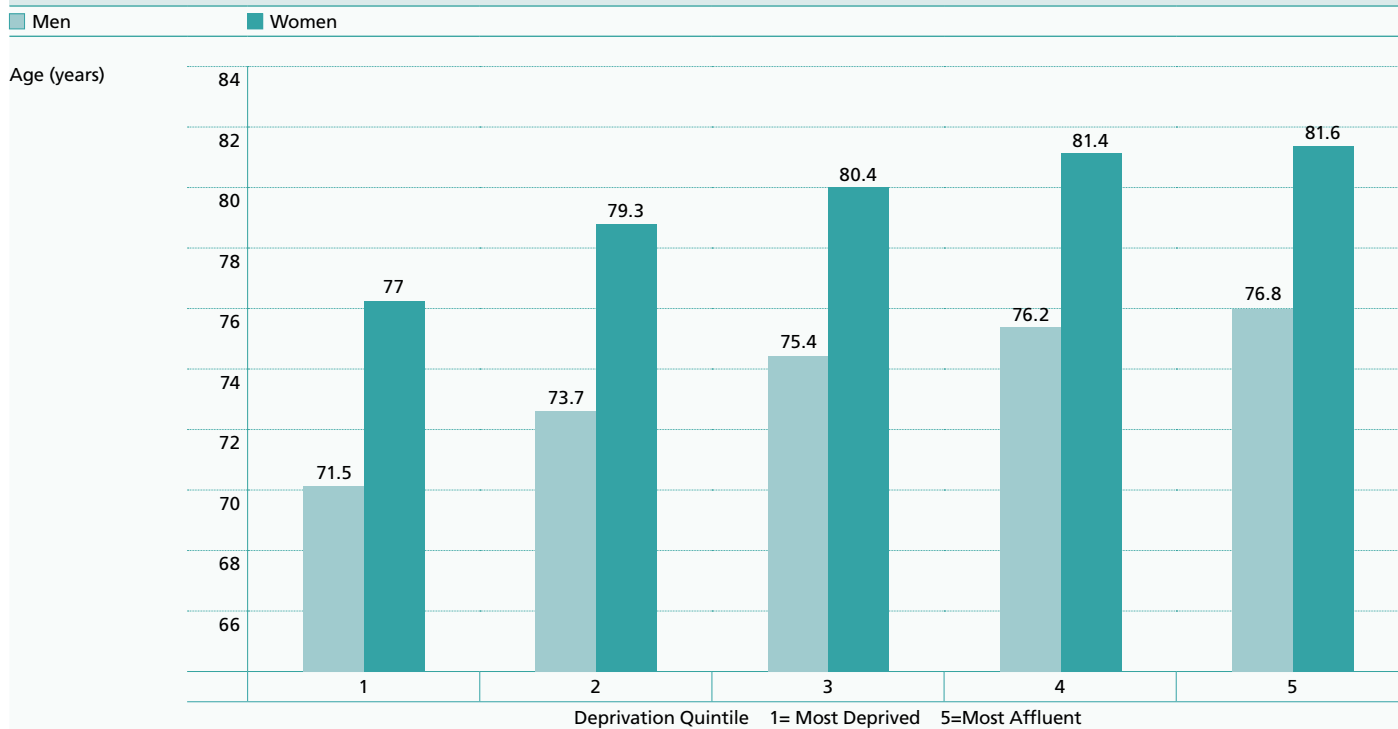
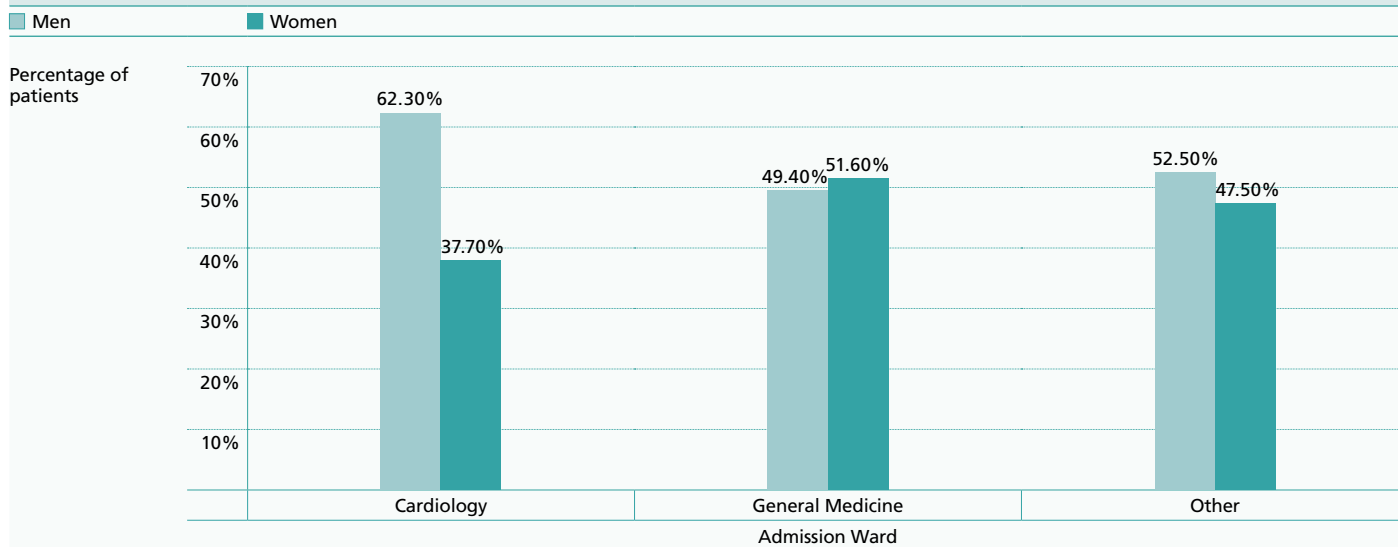


Figure 5
Admission ward by sex



3.6 Treatment on Discharge

Loop Diuretics

Of 19,240 patients that survived the index hospitalisation, 16,340 (85 per cent) were discharged on loop diuretics, the 'hall-mark' treatment for the presence of symptomatic heart failure. A similar proportion of patients with LVEF above and below 40 per cent received loop diuretics. Treatment with these agents is not known to alter prognosis.

ACE Inhibitors (ACEi) and Angiotensin Receptor Blockers (ARB)

This class of agent may halve mortality from heart failure in the year after admission when used at target doses. Of 19,240 patients 14,421 (75 per cent) were reported to have been prescribed these agents with ACE inhibitors, the more evidenced-based therapy, dominating this result. Data were missing for about 3,000 patients for one or other agent and so amongst patients with recorded data the proportion was even higher (perhaps greater than 85 per cent).

Age under 75 years, treatment on a cardiology ward, prior history of myocardial infarction or hypertension, LVEF less than 40 per cent and use of loop diuretics were most strongly associated with the use of these agents in a logistic regression model. Doses of ACE inhibitors were often not reported (5,715).

Of 5,929 patients with a reported dose of an ACE inhibitor, 49 per cent received less than 50 per cent of the target dose. Men, patients aged under 75 years and those with hypertension or diabetes were more likely to receive target doses. Doses may have been titrated up at a later stage but, in clinical practice, this often does not happen unless the patient receives specialist follow-up. Use of lower than target doses may be less effective.

Beta-Blockers

This class of agent may reduce mortality by about one third in the year after admission when used at target doses. Of 17,523 patients with recorded data on beta-blockers, 10,544 (60 per cent) were prescribed them.

Age under 75 years, treatment on a cardiology ward, prior history of myocardial infarction or hypertension, ischaemic heart disease, atrial fibrillation, LVEF less than 40 per cent and use of loop diuretics were most strongly associated with the use of beta-blockers in a logistic regression model. Doses of beta-blockers were often not reported (5,330).

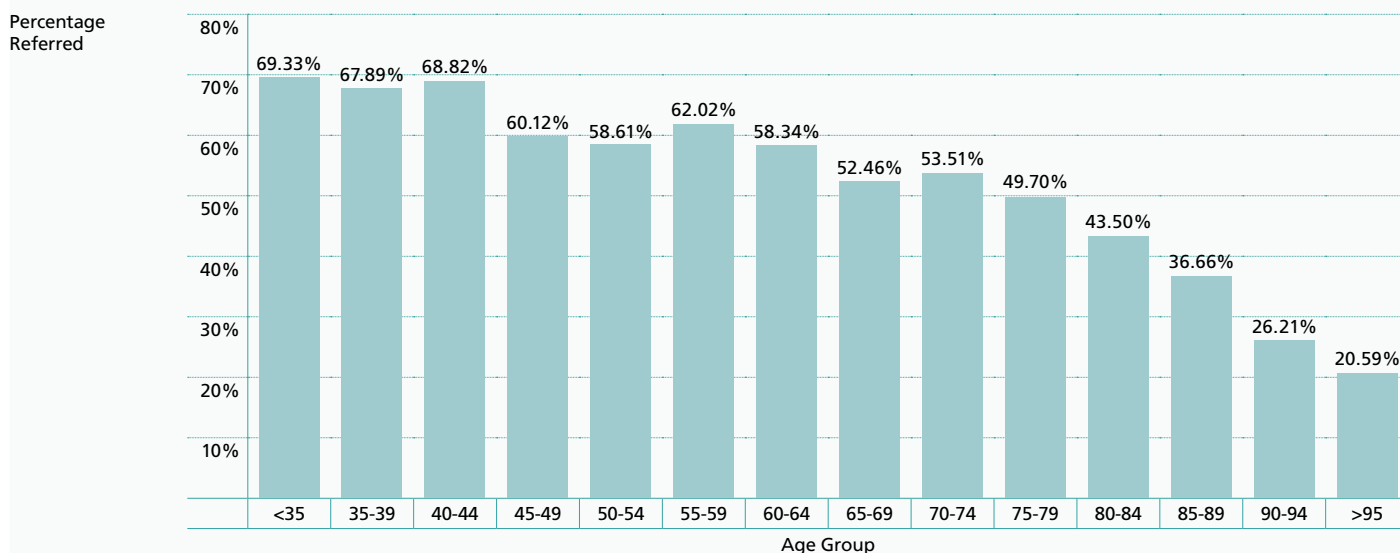
Of 5,214 patients with a reported dose of a beta-blocker, 66 per cent received less than 50 per cent of the target dose. Men and patients aged under 75 years were likely to receive higher doses. Doses may have been titrated up at a later stage but, in clinical practice, this often does not happen unless the patient receives specialist follow-up. Use of lower than target doses may be less effective.

Aldosterone Receptor Antagonists (ARA)

This class of agent may reduce mortality by about one third in the year after admission with benefits additional to those of ACE inhibitors and beta-blockers. Of 17,461 patients with recorded data, only 6,310 (36 per cent) were discharged on an aldosterone antagonist.

This reflects the smaller evidence base for ARAs compared to ACE Inhibitors or beta blockers and is likely to improve in future audits in the light of recent evidence which further strengthens the case for ARAs.

Figure 6
Referral rates to heart failure liaison services by age group.



Age under 75 years, men, severe breathlessness, severe oedema, treatment on a cardiology ward, valve disease, ischaemic heart disease and use of loop diuretics were most strongly associated with the use of aldosterone antagonists in a logistic regression model.

Most patients with a dose recorded (3374) received 25mg/day of spironolactone or equivalent of another agent (74 per cent). Higher doses were more likely to be given on medical wards and to men.

3.7 Patient outcomes

Length of Stay

The median duration of hospitalisation was 9 days and was similar in cardiology and other wards. The strongest independent associations with greater length of stay were greater age, women, moderate or severe breathlessness and moderate or severe oedema.

Mortality

From ONS death registrations, 32% of all patients admitted for heart failure in the year 2009/10 died within the year.

During the index admission, 2,054 patients (10 per cent) died (273 within the first 24 hours). Age over 75 years, admission

to wards other than cardiology, presence of atrial fibrillation on the ECG, more severe breathlessness and more severe oedema all predicted an adverse outcome.

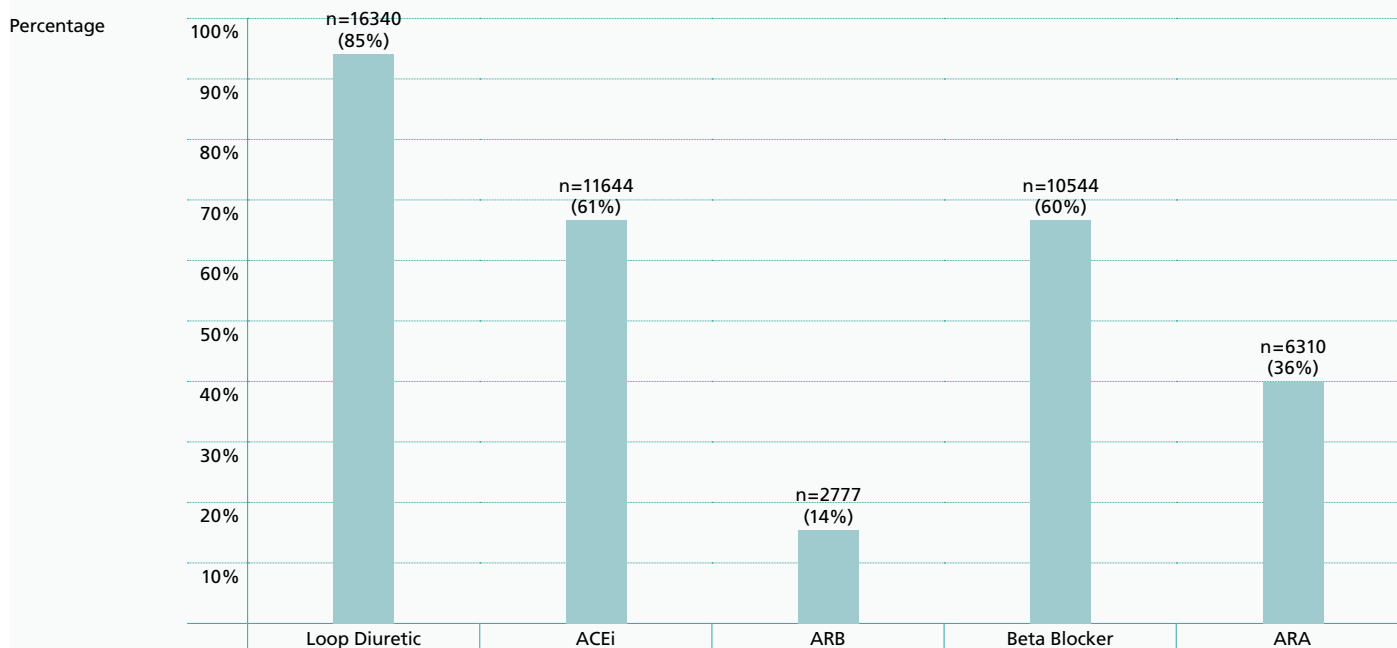
Mortality was 6 per cent on cardiology wards and 12 per cent on other wards, which was only partly explained by age differences. Patients with an LVEF less than 40 per cent had a slightly lower in-patient mortality (875 patients; 7 per cent), reflecting, in part, the younger age of this group.

Of patients discharged, analyses indicate that 26% will die within the following year. For those that were referred to cardiology or specialist heart failure services for follow-up, outcomes were significantly better than the overall mortality figure. Of the patients followed up by a Cardiologist or by Heart Failure Liaison services, only 23 per cent died within the year as opposed to 32 per cent for those who were not.

Prediction models suggested that age over 75 years, male sex, admission to wards other than cardiology, absence of ACE inhibitors or angiotensin blockers at discharge, LVEF less than 40 per cent, prior myocardial infarction, valve disease, severe breathlessness or oedema and failure to refer on to specialist services were all strong independent predictors of an adverse outcome (all $p=0.001$ and each factor carrying about a 30 per cent increase in risk). Kaplan Meier analyses for these outcomes are detailed in Appendix 3.

Figure 7
Drug Treatment on discharge from hospital

Note: Percentage of all patients including those with missing data. This is worst case scenario for uptake.



4. Implementation issues

The audit has grown both in terms of the number of participating hospitals and the number of patients per hospital being reported. Despite the increase in numbers data completeness of core fields is excellent. Completeness of data for non-core fields, however, is poor.

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. An exercise by the project support staff in The IC Clinical Audit Support Unit has placed considerable effort into continually updating the contacts for each organisation. Any changes to key audit staff should be notified to the CASU helpdesk (Tel. 0845 3006016 or email: helpdesk@ccad.org.uk).

Organisation support

It is likely that the heart failure audit, will feature in a wider, strategic role of 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." (15)

It should be born 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 & nursing staff in each participating organisation unless there are improvements in the efficiency of data recording.

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.

Many of the best performing organisations have developed IT solutions to perform the majority of the data loading. This is strongly encouraged.

Accuracy of Coding

Reassuringly, health professionals participating in the survey confirmed the coded diagnosis of heart failure in 84 per cent of cases and refuted it in only 9 per cent (no response in 6 per cent). 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. Conclusion

Quality information remains at the core of improving services. The National Heart Failure Audit is now providing consistent, credible and important information about the quality of care and patient outcomes on a representative sample of 43 per cent of deaths and discharges coded for heart failure in England and Wales. There have been huge positive steps over the last year. A major factor is that a greater number of Trusts and Health Boards have registered with the audit and of these many more are reporting the requisite amount of patients. With the much higher participation rates from last year, we can now be confident that we are seeing a representative spectrum of care-patterns and outcomes for heart failure and are not likely to be representing the results of just a few selected patients or high quality centres

The audit demonstrates some positive steps towards improving access to a gold standard diagnostic test such as echocardiography although the access to B-type Natriuretic Peptide (BNP) testing, as recommended by NICE, is still disappointing. A confirmed diagnosis is the key to accessing the right treatment.

This year's audit finding confirms the improvement suggested last year in the use of key treatments such as ACE inhibitors and beta blockers since the Healthcare Commission survey work in 2005-2006 (16).

The audit shows however that not all those with a confirmed diagnosis are provided with the full range of optimal treatments to manage their symptoms and improve their quality of life. Patients admitted to general medicine wards are less likely to access the recommended NICE treatments than those admitted to cardiology wards.

Research has shown that effective care for patients with heart failure can reduce mortality. This and last year's audits are consistent in showing high mortality for patients

hospitalised with heart failure, with 32 per cent dying within the year. Outcomes are substantially better if the patient accesses specialist care. Mortality at one year in those followed up by cardiologists or by specialist heart failure services is only 23 per cent. The factors influencing mortality rates need to be confirmed but the process of specialist management, tailoring therapy to the patients needs may be key, rather than simply access to drugs. This will need to be explored further and addressed in future versions of the audit tool.

Access to palliative care is very low. NICE highlighted the considerable unmet palliative care needs of patients with heart failure in 2003. The hospice movement has made a great impact in opening access to people with all forms of terminal care.

All stakeholders, including the public, have a right to expect open reporting. More important is the expectation that audit will make a difference. Whilst there has been significant improvement in developing heart failure services, inequity of access first identified by the Healthcare Commission in 2005 continues. All stakeholders have a responsibility to ensure findings are used to drive improvement and make a positive difference to the experience of patients living with heart failure. There is a definite need for a more integrated approach to using audit findings to support local improvement.

These data provide a powerful incentive to reorganise heart failure care in the UK. We need to deliver the same streamlined specialist care that we do for the treatment of heart attacks to this group of patients who have a far greater morbidity and mortality.

6. Recommendations

Since the launch of the national heart failure audit, most (85 per cent) of NHS Trusts and Health Boards have registered with 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.

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.
- The NHS Information Centre should ensure the audit process is clearly defined for both clinical and non-clinical roles and to move towards a more flexible web-based system.

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 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 collecting 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.
- The NHS Information Centre, in discussion with partner organisations including the Heart Improvement Programme and Cardiac Networks, to identify ways of supporting implementation of the audit through training and information sessions and using audit findings to support the local improvements of heart failure services.

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Appendix 1: Participating and non participating NHS Trusts/ Health Boards 2009-10 (as of June 2010)

Registered Trusts/Health Boards submitting more than 20 records per month	Registered	Submitted Record 2009/10	HES Data 2009/10	% Data Completeness
Aintree University Hospitals NHS Foundation Trust	Y	646	362	178
Basildon and Thurrock University Hospitals NHS Foundation Trust	Y	601	441	136
North Tees and Hartlepool NHS Foundation Trust	Y	465	399	117
Sheffield Teaching Hospitals NHS Foundation Trust	Y	460	903	51
Sandwell and West Birmingham Hospitals NHS Trust	Y	459	815	56
Pennine Acute Hospitals NHS Trust	Y	454	927	49
Northumbria Healthcare NHS Foundation Trust	Y	448	656	68
East Sussex Hospitals NHS Trust	Y	439	624	70
South Tees Hospitals NHS Foundation Trust	Y	430	542	79
North West London Hospitals NHS Trust	Y	420	566	74
Epsom and St Helier University Hospitals NHS Trust	Y	409	375	109
Heart of England NHS Foundation Trust	Y	406	1141	36
South London Healthcare NHS Trust	Y	401	#	#
Royal Berkshire NHS Foundation Trust	Y	397	376	106
Western Sussex Hospitals NHS Trust	Y	393	#	#
Brighton and Sussex University Hospitals NHS Trust	Y	383	520	74
Maidstone and Tunbridge Wells NHS Trust	Y	375	507	74
Salisbury NHS Foundation Trust	Y	367	213	172
Imperial College Healthcare NHS Trust	Y	366	603	61
Aneurin Bevan Health Board	Y	354	†	†
Royal Brompton and Harefield NHS Foundation Trust	Y	341	504	68
South Tyneside NHS Foundation Trust	Y	340	168	202
University Hospitals Birmingham NHS Foundation Trust	Y	337	570	59
North Cumbria University Hospitals NHS Trust	Y	334	430	78
Luton and Dunstable Hospital NHS Foundation Trust	Y	333	317	105
Guy's and St Thomas' NHS Foundation Trust	Y	320	419	76
Hull and East Yorkshire Hospitals NHS Trust	Y	317	331	96
University College London Hospitals NHS Foundation Trust	Y	310	268	116
West Hertfordshire Hospitals NHS Trust	Y	301	434	69
Burton Hospitals NHS Foundation Trust	Y	297	291	102
Walsall Hospitals NHS Trust	Y	291	366	80
Royal Devon and Exeter NHS Foundation Trust	Y	287	456	63
Portsmouth Hospitals NHS Trust	Y	285	504	57
Salford Royal NHS Foundation Trust	Y	278	313	89
Sherwood Forest Hospitals NHS Foundation Trust	Y	278	465	60
James Paget University Hospitals NHS Foundation Trust	Y	271	398	68
Heatherwood and Wexham Park Hospitals NHS Foundation Trust	Y	265	454	58
South Devon Healthcare NHS Foundation Trust	Y	265	379	70
St Helens and Knowsley Teaching Hospitals NHS Trust	Y	264	233	113
Ipswich Hospital NHS Trust	Y	262	424	62
Scarborough and North East Yorkshire Health care NHS Trust	Y	262	307	85
University Hospitals Coventry and Warwickshire NHS Trust	Y	259	543	48
Northampton General Hospital NHS Trust	Y	255	252	101
Frimley Park Hospital NHS Foundation Trust	Y	250	199	126
West Middlesex University Hospital NHS Trust	Y	249	189	132
East Lancashire Hospitals NHS Trust	Y	242	485	50

Registered Trusts/Health Boards submitting between 10 & 20 records per month	Registered	Submitted Record 2009/10	HES Data 2009/10	% Data Completeness
City Hospitals Sunderland NHS Foundation Trust	Y	237	255	93
Worcestershire Acute Hospitals NHS Trust	Y	234	534	44
Whipps Cross University Hospital NHS Trust	Y	231	413	56
The Queen Elizabeth Hospital King's Lynn NHS Trust	Y	230	358	64
Buckinghamshire Hospitals NHS Trust	Y	228	325	70
Kettering General Hospital NHS Foundation Trust	Y	228	277	82
Royal Liverpool & Broadgreen University Hospitals NHS Trust	Y	225	293	39
Leeds Teaching Hospitals NHS Trust	Y	224	764	29
Bedford Hospital NHS Trust	Y	223	230	97
The Newcastle Upon Tyne Hospitals NHS Foundation Trust	Y	222	701	32
Bradford Teaching Hospitals NHS Foundation Trust	Y	220	482	46
Central Manchester University Hospitals NHS Foundation Trust	Y	218	312	70
North Middlesex University Hospital NHS Trust	Y	215	309	70
The Dudley Group of Hospitals NHS Foundation Trust	Y	213	500	43
Derby Hospitals NHS Foundation Trust	Y	211	586	36
Northern Devon Healthcare NHS Trust	Y	207	317	65
Yeovil District Hospital NHS Foundation Trust	Y	206	229	90
Royal Free Hampstead NHS Trust	Y	205	236	87
Peterborough and Stamford Hospitals NHS Foundation Trust	Y	198	366	54
Tameside Hospital NHS Foundation Trust	Y	193	310	62
Hereford Hospitals NHS Trust	Y	187	186	101
Shrewsbury and Telford Hospital NHS Trust	Y	182	542	34
Oxford Radcliffe Hospitals NHS Trust	Y	181	780	23
The Hillingdon Hospital NHS Trust	Y	171	171	100
The Whittington Hospital NHS Trust	Y	163	251	65
Blackpool, Fylde and Wyre Hospitals NHS Foundation Trust	Y	162	393	41
University Hospitals Bristol NHS Foundation Trust	Y	159	307	52
South Warwickshire General Hospitals NHS Trust	Y	157	196	80
George Eliot Hospital NHS Trust	Y	154	270	57
The Lewisham Hospital NHS Trust	Y	148	324	46
Harrogate and District NHS Foundation Trust	Y	143	196	73
Gateshead Health NHS Foundation Trust	Y	139	208	67
Mid Yorkshire Hospitals NHS Trust	Y	139	669	21
Calderdale and Huddersfield NHS Foundation Trust	Y	131	455	29
North Bristol NHS Trust	Y	129	447	29
Royal Surrey County Hospital NHS Foundation Trust	Y	128	219	58
Betsi Cadwaladr University Health Board	Y	122	992†	13†

Registered Trusts/Health Boards submitting less than 10 records per month	Registered	Submitted Record 2009/10	HES Data 2009/10	% Data Completeness
Northern Lincolnshire & Goole Hospitals NHS Foundation Trust	Y	119	296	40
Barts & The London NHS Trust	Y	118	319	37
Royal Cornwall Hospitals NHS Trust	Y	108	539	20
St George's Healthcare NHS Trust	Y	97	487	20
Lancashire Teaching Hospitals NHS Foundation Trust	Y	96	530	18
Kings College NHS Foundation Trust	Y	95	321	30
Liverpool Heart & Chest NHS Foundation Trust	Y	93	396	23
Royal United Hospital Bath NHS Trust	Y	93	476	20
United Lincolnshire Hospitals NHS Trust	Y	91	828	11
Dorset County Hospital NHS Foundation Trust	Y	89	218	41
Kingston Hospital NHS Trust	Y	87	291	30
Southend University Hospital NHS Foundation Trust	Y	86	442	19
Barnet & Chase farm Hospitals NHS Trust	Y	79	541	15
Milton Keynes Hospital NHS Foundation Trust	Y	78	212	37
Taunton & Somerset NHS Foundation Trust	Y	76	504	15
Mid Cheshire Hospitals NHS Foundation Trust	Y	62	218	28
Nottingham University Hospitals NHS Trust	Y	59	939	6
East & North Hertfordshire NHS Trust	Y	57	382	15
Gloucestershire Hospitals NHS Foundation Trust	Y	56	616	9
Norfolk & Norwich University Hospitals NHS Foundation Trust	Y	51	744	7
Mayday Healthcare NHS Trust	Y	46	243	19
Basingstoke & North Hampshire NHS Foundation Trust	Y	45	154	29
Barnsley Hospital NHS Foundation Trust	Y	34	306	11
Chelsea & Westminster Hospital NHS Foundation Trust	Y	34	135	25
Cwm Taf Health Board	Y	30	507†	6†
York Hospitals NHS Foundation Trust	Y	29	270	11
Cambridge University Hospitals NHS Foundation Trust	Y	25	385	6
University Hospital of North Staffordshire NHS Trust	Y	23	614	4
West Suffolk Hospitals NHS Trust	Y	20	305	7
Surrey & Sussex Healthcare NHS Trust	Y	19	303	6
Newham University Hospital NHS Trust	Y	18	206	9
County Durham & Darlington NHS Foundation Trust	Y	13	652	2
Homerton University Hospital NHS Foundation Trust	Y	7	181	4
Great Western Hospitals NHS Foundation Trust	Y	*	287	*
Doncaster & Bassetlaw Hospitals NHS Foundation Trust	Y	*	598	*
Poole Hospital NHS Foundation Trust	Y	*	254	*
Colchester Hospital University NHS Foundation Trust	Y	*	470	*
Trafford Health Care NHS Trust	Y	*	97	*

Registered Trusts not submitting data	Registered	Submitted Record 2009/10	HES Data 2009/10	% Data Completeness
Ashford & St Peters's Hospitals NHS Trust	Y	0	347	0
Barking, Havering and Redbridge University Hospitals NHS Trust	Y	0	695	0
Ealing Hospital NHS Trust	Y	0	279	0
Hinchingbrooke Health Care NHS Trust	Y	0	177	0
Mid Staffordshire NHS Foundation Trust	Y	0	310	0
Southampton University Hospitals NHS Trust	Y	0	495	0
The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust	Y	0	698	0
Warrington and Halton Hospitals NHS Foundation Trust	Y	0	304	0
Weston Area Health NHS Trust	Y	0	218	0
Wolverhampton City Primary Care Trust	Y	0	#	0
Wrightington, Wigan and Leigh NHS Foundation Trust	Y	0	391	0

Trusts/Health Boards not registered with the audit for 2009/10	Registered	Submitted Record 2009/10	HES Data 2009/10	% Data Completeness
Abertawe Bro Morgannwg Health Board	N	0	810†	0
Airedale NHS Trust	N	0	277	0
Cardiff & Vale University Health Board	N	0	542†	0
Chesterfield Royal Hospital NHS Foundation Trust	N	0	320	0
Countess of Chester Hospital NHS Foundation Trust	N	0	206	0
Dartford and Gravesham NHS Trust	N	0	254	0
East Cheshire NHS Trust	N	0	219	0
East Kent Hospitals University NHS Foundation Trust	N	0	791	0
Hywel Dda Health Board	N	0	643†	0
Isle Of Wight NHS Primary Care Trust	N	0	#	0
Medway NHS Foundation Trust	N	0	310	0
Mid Essex Hospital Services NHS Trust	N	0	412	0
Papworth Hospital NHS Foundation Trust	N	0	275	0
Plymouth Hospitals NHS Trust	N	0	563	0
Royal Bolton Hospital NHS Foundation Trust	N	0	348	0
Southport and Ormskirk Hospital NHS Trust	N	0	267	0
Stockport NHS Foundation Trust	N	0	413	0
The Princess Alexandra Hospital NHS Trust	N	0	235	0
The Rotherham NHS Foundation Trust	N	0	362	0
University Hospital of South Manchester NHS Foundation Trust	N	0	393	0
University Hospitals of Leicester NHS Trust	N	0	1306	0
University Hospitals of Morecambe Bay NHS Trust	N	0	486	0
Winchester and Eastleigh Healthcare NHS Trust	N	0	208	0
Wirral University Teaching Hospital NHS Foundation Trust	N	0	560	0

Notes:

- # HES data not available for this organisation in 2009/10
- † Welsh Hospitals submit a separate dataset named PEDW to the Welsh Assembly Government. HES data are collected from English hospitals only.
- * Denotes value of between 0 and 5, or a rate / percentage derived from such a value

Appendix 2: Returned Analysis

Table A
Characteristics of all patients by age, sex and admission ward (2009/2010 audit)

Variable	Missing Data #	Overall	Women <75 years	Men <75 years	Women >=75 years	Men >=75 years	Cardiology	Gen. Med	Other
Number of patients		21294	2477 (12%)	5217 (24%)	6962 (33%)	6638 (31%)	9733 (46%)	8974 (42%)	2587 (12%)
Women	NA	9439 (44%)	NA	NA	NA	NA	3666 (38%)	4544 (51%)	1229 (48%)
Age (years)		79 (75,85)	NA	NA	NA	NA	75 (66,82)	81 (74,87)	81 (73,87)
Women >=75 years		6962 (33%)	NA	NA	NA	NA	2302 (24%)	3685 (41%)	975 (38%)
Men >= 75 years		6638 (31%)	NA	NA	NA	NA	2854 (29%)	2912 (32%)	872(34%)

Admission Ward

Cardiology	NA	9733 (46%)	1364 (55%)	3213 (62%)	2302 (33%)	2854 (43%)	NA	NA	NA
General Medicine		8974 (42%)	859 (35%)	1518 (29%)	3685 (53%)	2912 (44%)	NA	NA	NA
Other		2587 (12%)	254 (10%)	486 (9%)	975 (14%)	872 (13%)	NA	NA	NA

Tests Done

Sinus Rhythm on ECG	2426 (11%)	7507 (35%)	1143 (46%)	2140 (41%)	2238 (32%)	1986 (30%)	3652 (38%)	3049 (34%)	806 (31%)
Atrial Fibrillation on ECG		7787 (37%)	647 (26%)	1546 (30%)	2912 (42%)	2682 (40%)	3323 (34%)	3515 (39%)	949 (38%)
Echocardiogram Done	1267 (6%)	16878 (79%)	2107 (85%)	4564 (87%)	4966 (71%)	5241 (79%)	8723 (90%)	6269 (70%)	1886 (73%)
LVEF <40%	1267 (6%)	11864 (70% of echocardiograms)	1476 (70%)	3744 (82%)	2768 (56%)	3876 (74%)	6737 (77%)	3890 (43%)	1237 (66%)
Diagnosis Confirmed	1339 (6%)	17969 (84%)	2070 (84%)	4559 (87%)	5684 (82%)	5656 (85%)	8710 (89%)	7212 (80%)	2047 (79%)
Diagnosis Refuted		1986 (9%)	264 (11%)	423 (8%)	724 (10%)	575 (9%)	684 (7%)	1039 (12%)	263 (10%)

Aetiology

IHD	1576 (7%)	9700 (46%)	886 (36%)	2417 (46%)	2797 (40%)	3600 (54%)	4722 (49%)	3911 (44%)	1067 (41%)
Prior MI	2122 (10%)	6306 (30%)	571 (23%)	1734 (33%)	1666 (24%)	2335 (35%)	3302 (34%)	2349 (26%)	655 (25%)
Valve Disease	2153 (10%)	4269 (20%)	510 (21%)	853 (16%)	1522 (22%)	1374 (21%)	2121 (22%)	1691 (19%)	457 (18%)
Hypertension	1570 (7%)	10436 (49%)	1184 (48%)	2280 (44%)	3735 (54%)	3237 (49%)	4570 (47%)	4691 (52%)	1175 (45%)
Diabetes	1121 (6%)	5760 (27%)	837 (34%)	1670 (32%)	1539 (22%)	1714 (26%)	2688 (28%)	2475 (28%)	597 (23%)

Symptoms

Breathless markedly limiting activity	2120 (10%)	8447 (40%)	1017 (41%)	2156 (41%)	2595 (37%)	2679 (40%)	4144 (43%)	3447 (38%)	856 (33%)
Breathless at rest or minor activity		5928 (28%)	633 (26%)	1269 (24%)	2075 (30%)	1951 (29%)	2552 (26%)	2679 (30%)	679 (26%)
Moderate or Severe Oedema	2806 (13%)	9230 (43%)	1001 (40%)	2117 (41%)	3049 (44%)	3063 (46%)	4141 (43%)	4000 (45%)	1089 (42%)

Table B
Characteristics of Patients with LVEF <40% by age, sex and admission ward

Variable	Missing Data #	Overall	Women <75 years	Men <75 years	Women >=75 years	Men >=75 years	Cardiology	Gen. Med	Other
Number of patients		11864	1476 (12%)	3744 (32%)	2768 (23%)	3876 (33%)	6737 (57%)	3890 (33%)	1237 (10%)
Women		4244 (36%)	NA	NA	NA	NA	2170 (32%)	1591 (41%)	483 (39%)
Age (years)	NA	76 (67,83)	NA	NA	NA	NA	74 (64,81)	79 (71,85)	69 (70,85)
Women >=75 years		2768 (23%)	NA	NA	NA	NA	1229 (18%)	1195 (31%)	344 (28%)
Men >=75 years		3876 (33%)	NA	NA	NA	NA	2037 (30%)	1399 (36%)	440 (36%)
Admission Ward									
Cardiology		6737 (57%)	941 (64%)	2530 (68%)	1229 (44%)	2037 (53%)	NA	NA	NA
General Medicine	NA	3890 (33%)	396 (27%)	900 (24%)	1195 (43%)	1399 (36%)	NA	NA	NA
Other		1237 (10%)	139 (9%)	314 (8%)	344 (12%)	400 (10%)	NA	NA	NA
Tests Done									
Sinus Rhythm on ECG		4496 (38%)	737 (50%)	1553 (41%)	982 (35%)	1224 (32%)	2646 (37%)	1429 (37%)	421 (34%)
Atrial Fibrillation on ECG	1050 (%)	4076 (34%)	336 (23%)	1132 (30%)	1059 (38%)	1549 (40%)	2214 (33%)	1469 (38%)	393 (32%)
Diagnosis Confirmed		10836 (91%)	1332 (90%)	3454 (92%)	2504 (90%)	3546 (91%)	6273 (93%)	3475 (89%)	1088 (88%)
Diagnosis Refuted	268 (%)	760 (6%)	103 (7%)	213 (6%)	198 (7%)	246 (6%)	339 (5%)	344 (9%)	77 (6%)
Aetiology									
IHD	608 (%)	6003 (51%)	552 (37%)	1792 (48%)	1344 (49%)	2315 (60%)	3457 (51%)	1958 (50%)	588 (42%)
Prior MI	866 (%)	4250 (36%)	378(26%)	1372 (37%)	905 (33%)	1595 (41%)	2558 (38%)	1287 (33%)	405 (33%)
Valve Disease	852 (%)	2235 (19%)	268 (18%)	582 (16%)	594 (21%)	791 (20%)	1284 (19%)	734 (19%)	217 (18%)
Hypertension	772 (%)	5482 (46%)	643 (44%)	1542 (41%)	1437 (52%)	1860 (48%)	3001 (45%)	1934 (50%)	547 (44%)
Diabetes	430 (%)	3239 (27%)	448 (30%)	1136 (30%)	632 (23%)	1023 (26%)	1858 (28%)	1098 (28%)	283 (23%)
Symptoms									
Breathless markedly limiting activity		4998 (42%)	603 (41%)	1589 (42%)	1161 (42%)	1645 (42%)	2934 (44%)	1605 (41%)	459 (37%)
Breathless at rest or minor activity	946 (%)	3163 (27%)	386 (26%)	899 (24%)	775 (28%)	1103 (28%)	1710 (25%)	1168 (30%)	285 (23%)
Moderate or Severe Oedema	1291 (%)	5102 (43%)	562 (38%)	1476 (39%)	1246 (45%)	1818 (47%)	2805 (42%)	1771 (46%)	526 (43%)

Table C
Characteristics of Patients with LVEF >40% by age, sex and admission ward

Variable	Missing Data #	Overall	Women <75 years	Men <75 years	Women >=75 years	Men >=75 years	Cardiology	Gen. Med	Other
Numbers of patient		5014	631 (13%)	820 (16%)	2198 (44%)	1365 (27%)	1986 (40%)	2379 (47%)	649 (13%)
Women		2829 (56%)	NA	NA	NA	NA	1048 (53%)	1422 (60%)	359 (55%)
Age (years)	NA	81 (73,86)	NA	NA	NA	NA	78 (70,84)	82 (78,87)	82 (74,88)
Women >= years		2189 (44%)	NA	NA	NA	NA	1048 (%)	1422 (60%)	359 (55%)
Men >= years		1365 (27%)	NA	NA	NA	NA	938 (47%)	957 (40%)	290 (45%)

Admission Ward

Cardiology		1986 (40%)	317 (50%)	412 (50%)	731 (33%)	526 (39%)	NA	NA	NA
General Medicine	NA	2579 (51%)	253 (40%)	306 (37%)	1169 (53%)	651 (48%)	NA	NA	NA
Other		649 (13%)	61 (10%)	102 (12%)	298 (14%)	188 (14%)	NA	NA	NA

Tests Done

Sinus Rhythm on ECG		1700 (34%)	271(43%)	347 (42%)	696 (32%)	386 (28%)	683 (34%)	821 (35%)	196 (30%)
Atrial Fibrillation on ECG	557 (11%)	2104 (42%)	209 (33%)	265 (32%)	1028 (47%)	602 (44%)	813 (41%)	1014 (43%)	277 (43%)
Diagnosis Confirmed		3977 (79%)	480 (76%)	630 (77%)	1772 (81%)	1095 (80%)	1672 (84%)	1808 (76%)	497 (77%)
Diagnosis Refuted	275 (5%)	762 (15%)	110 (17%)	138 (17%)	315 (14%)	199 (15%)	235 (12%)	438 (18%)	89 (14%)

Aetiology

IHD	391 (8%)	1891 (38%)	197 (31%)	338 (41%)	751 (34%)	605 (14%)	803 (40%)	869 (37%)	219 (34%)
Prior MI	541 (11%)	1017 (20%)	120 (19%)	177 (22%)	376 (17%)	344 (25%)	445 (22%)	462 (19%)	110 (17%)
Valve Disease	403 (8%)	1585 (32%)	191 (30%)	431 (53%)	743 (34%)	443 (32%)	704 (35%)	708 (30%)	173 (27%)
Hypertension	325 (6%)	2699 (54%)	337 (53%)	208 (25%)	1239 (56%)	692 (51%)	1085 (55%)	1310 (55%)	304 (47%)
Diabetes	248 (5%)	1350 (27%)	247 (39%)	297 (36%)	490 (22%)	316 (23%)	558 (28%)	632 (27%)	160 (25%)

Symptoms

Breathless markedly limiting activity		2040 (41%)	266 (42%)	350 (43%)	842 (38%)	582 (43%)	870 (44%)	963 (40%)	207 (32%)
Breathless at rest or minor activity	457 (9%)	1483 (30%)	160 (25%)	203 (25%)	701 (32%)	419 (31%)	579 (29%)	696 (29%)	208 (32%)
Moderate or Severe Oedema	592 (12%)	2468 (49%)	292 (46%)	404 (49%)	1063 (48%)	709(52%)	1004 (51%)	1151 (48%)	313 (48%)

Table D
Characteristics of Patients in whom LVEF was not reported by age, sex and admission ward

Variable	Missing Data #	Overall	Women <75 years	Men <75 years	Women >=75 years	Men >=75 years	Cardiology	Gen. Med	Other
Number of patients	NA	4416	370 (8%)	653 (15%)	1996 (45%)	1397 (32%)	1010 (23%)	2705 (61%)	701 (16%)
Women		2366 (54%)	NA	NA	NA	NA	448 (44%)	1531 (57%)	387 (55%)
Age (years)		83 (75,88)	NA	NA	NA	NA	79 (70,86)	83 (77,89)	84 (78,89)
Women >= years		1996 (45%)	NA	NA	NA	NA	342 (34%)	1321 (49%)	333 (48%)
Men >= years		1397 (32%)	NA	NA	NA	NA	291 (29%)	862 (32%)	244 (35%)

Admission Ward

Cardiology	NA	1010 (23%)	106 (29%)	271 (42%)	342 (17%)	291 (21%)	NA	NA	NA
General Medicine		2705 (61%)	210 (57%)	312 (48%)	1321 (66%)	862 (62%)	NA	NA	NA
Other		701 (16%)	94 (25%)	70 (11%)	333 (17%)	244 (17%)	NA	NA	NA

Tests Done

Sinus Rhythm on ECG	819 (19%)	1311 (30%)	135 (36%)	240 (37%)	560 (28%)	376 (27%)	323 (32%)	799 (30%)	189 (27%)
Atrial Fibrillation on ECG		1607 (36%)	102 (28%)	149 (23%)	825 (41%)	531 (38%)	296 (29%)	1032 (38%)	279 (40%)
Diagnosis Confirmed	796 (18%)	3156 (71%)	258 (70%)	475 (73%)	1408 (71%)	1015 (73%)	765 (76%)	1929 (71%)	462 (66%)
Diagnosis Refuted		464 (11%)	51 (14%)	72 (11%)	211 (11%)	130 (9%)	110 (11%)	257 (10%)	97 (14%)

Aetiology

IHD	577 (13%)	1806 (41%)	137 (37%)	287 (44%)	707 (35%)	680 (49%)	462 (46%)	1084 (40%)	260 (37%)
Prior MI	715 (16%)	1039 (25%)	73 (20%)	185 (28%)	385 (19%)	396 (28%)	299 (30%)	600 (22%)	140 (20%)
Valve Disease	898 (20%)	449 (10%)	51 (14%)	73 (11%)	185 (9%)	140 (10%)	133 (13%)	249 (9%)	67 (10%)
Hypertension	523 (12%)	2255 (51%)	204 (55%)	307 (47%)	1059 (53%)	685 (49%)	484 (48%)	1447 (53%)	324 (46%)
Diabetes	443 (10%)	1171 (27%)	142 (38%)	237 (36%)	417 (21%)	375 (27%)	272 (27%)	745 (28%)	154 (22%)

Symptoms

Breathless markedly limiting activity	717 (16%)	1409 (32%)	148 (40%)	217 (33%)	592 (30%)	452 (32%)	340 (34%)	879 (32%)	190 (27%)
Breathless at rest or minor activity		1282 (29%)	87 (24%)	167 (26%)	599 (30%)	429 (31%)	263 (26%)	833 (31%)	186 (27%)
Moderate or Severe Oedema	923 (21%)	1660 (38%)	147 (40%)	237 (36%)	740 (47%)	536 (38%)	332 (33%)	1078 (40%)	250 (36%)

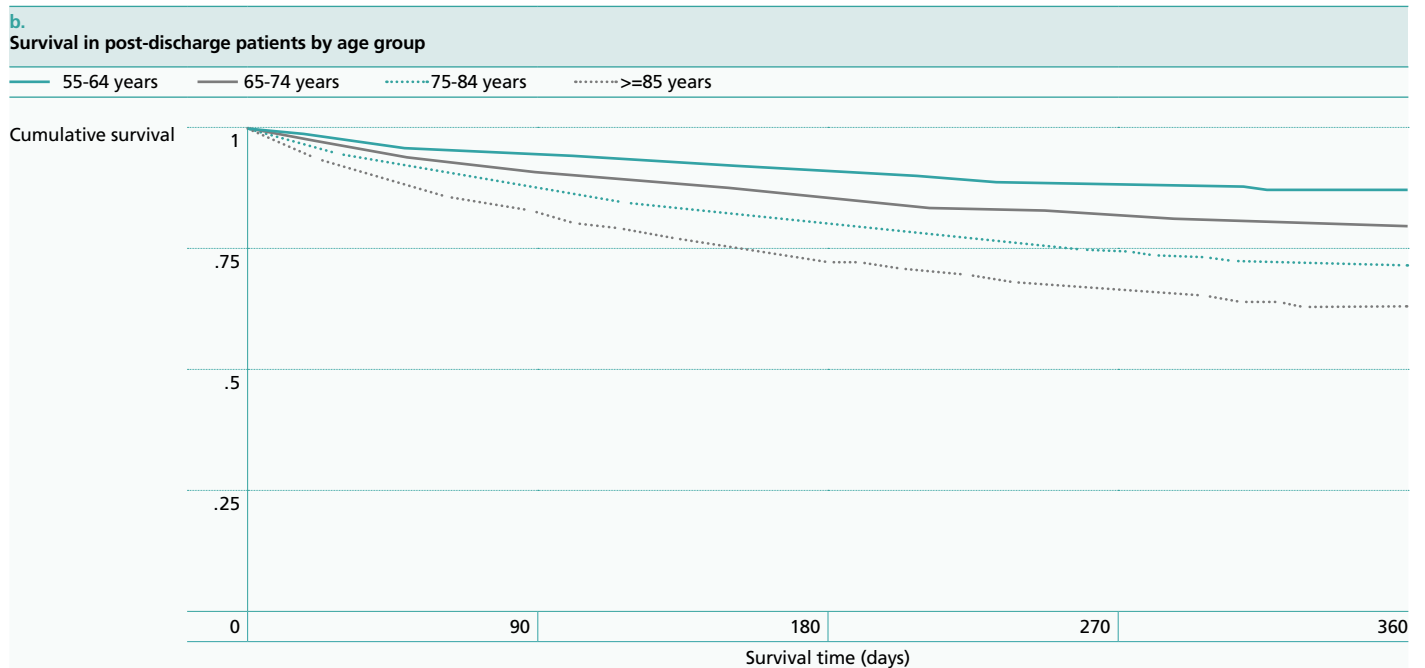
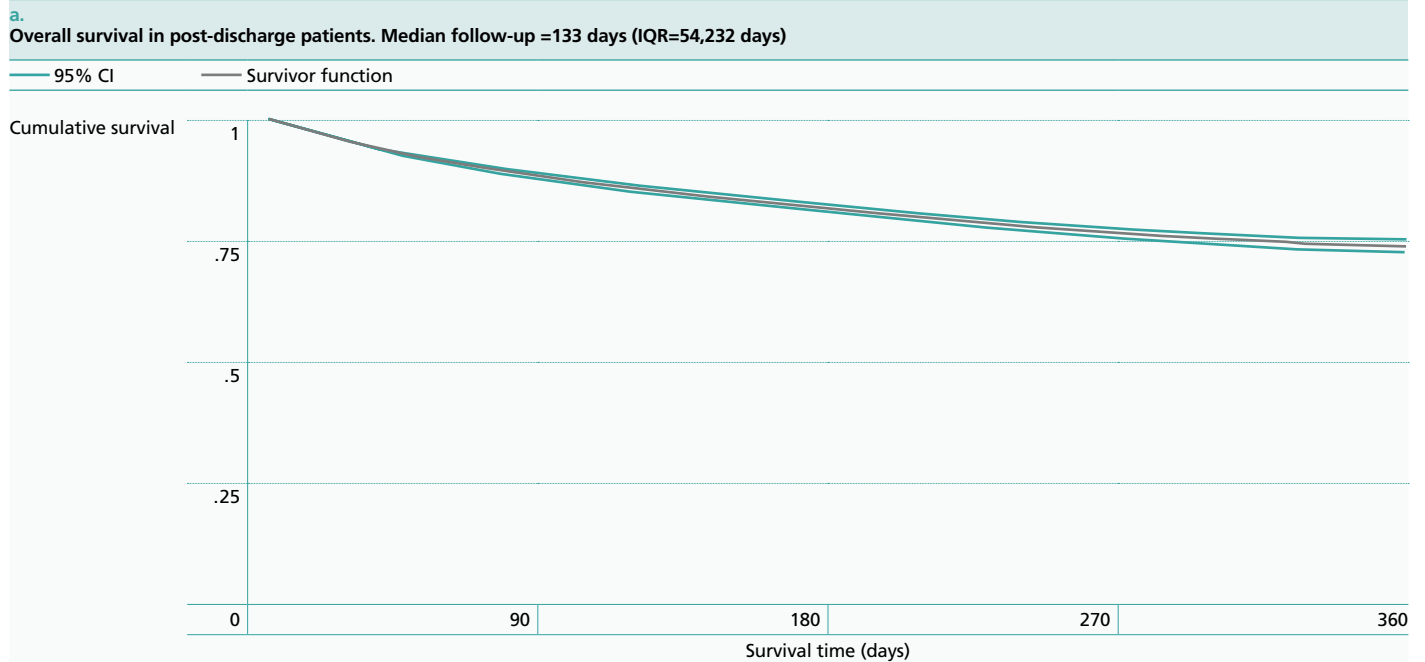
Data are median and inter-quartile range or numbers and percentages of the population for age and sex and admission ward

Table E
Treatment at Discharge. Data are numbers (percentages) of the population surviving until discharge

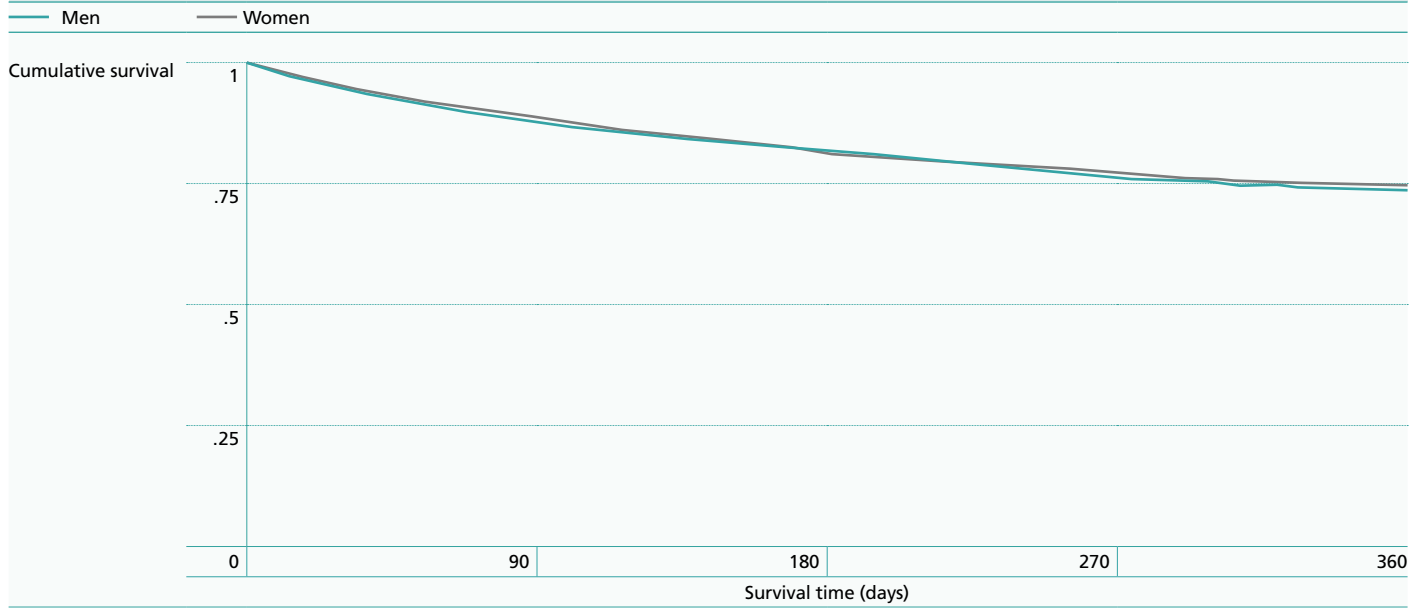
Variable	Missing Data #	Overall in Survivors	Women <75 years	Men <75 years	Women ≥75 years	Men ≥75 years	Cardiology	Gen. Med	Other
Patients		19240	2377	4980	6050	5833	9114	7888	2238
Loop Diuretic	690 (4%)	16340 (85%)	1969 (83%)	4071 (82%)	5224 (86%)	5076 (87%)	7667 (84%)	6872 (91%)	1801 (80%)
ACE inhibitor	1444 (8%)	11644 (61%)	1472 (62%)	3465 (70%)	3249 (54%)	3458 (59%)	5991 (66%)	4469 (59%)	1184 (53%)
ARB	2605 (14%)	2777 (14%)	427 (18%)	715 (14%)	880 (15%)	755 (13%)	1337 (15%)	1148 (15%)	292 (13%)
ACEi or ARB		14000 (73%)	1852 (77%)	4040 (81%)	4025 (67%)	4083 (70%)	7108 (78%)	5449 (72%)	1443 (64%)
Beta-Blocker	1717 (9%)	10544 (55%)	1364 (57%)	3289 (66%)	2852 (47%)	3039 (52%)	5929 (65%)	3579 (47%)	1036 (46%)
ARA	1779 (9%)	6310 (33%)	898 (38%)	2122 (43%)	1488 (25%)	1802 (31%)	3468 (38%)	2096 (28%)	566 (25%)
LVEF <40%		10989	1431	3592	2468	3498	6405	3489	1095
Loop Diuretic	313 (3%)	9400 (86%)	1205 (84%)	2948 (82%)	2192 (89%)	3055 (87%)	5437 (85%)	3090 (89%)	873 (80%)
ACE inhibitor	577 (5%)	7521 (68%)	1002 (70%)	2690 (75%)	1567 (63%)	2262 (65%)	4562 (71%)	2295 (66%)	664 (61%)
ARB	1399 (13%)	1629 (15%)	253 (18%)	513 (14%)	393 (16%)	470 (13%)	941 (45%)	523 (15%)	165 (15%)
ACEi or ARB		8916 (81%)	1235 (86%)	3102 (86%)	1915 (78%)	2664 (76%)	5363 (84%)	2742 (79%)	811 (74%)
Beta-Blocker	786 (7%)	6991 (64%)	938 (66%)	2595 (72%)	1397 (57%)	2061 (59%)	4493 (70%)	1893 (54%)	605 (55%)
ARA	866 (8%)	4329 (39%)	641 (45%)	1676 (47%)	769 (31%)	1243 (36%)	2823 (44%)	1184 (34%)	322 (29%)
LVEF >40%		4528	602	788	1939	1199	1837	2119	572
Loop Diuretic	146 (8%)	3880 (86%)	487 (81%)	650 (82%)	1680 (87%)	1063 (89%)	1569 (85%)	1844 (87%)	467 (82%)
ACE inhibitor	463 (10%)	2268 (50%)	287 (48%)	442 (56%)	918 (47%)	621 (52%)	966 (53%)	1044 (49%)	258 (45%)
ARB	627 (14%)	662 (15%)	111 (18%)	123 (16%)	275 (14%)	153 (13%)	270 (15%)	324 (15%)	68 (12%)
ACEi or ARB		2811 (62%)	383 (64%)	536 (68%)	1155 (60%)	737 (61%)	1174 (64%)	1321 (62%)	316 (55%)
Beta-Blocker	476 (11%)	2093 (46%)	281 (47%)	415 (53%)	856 (44%)	541 (45%)	982 (53%)	877 (41%)	234 (41%)
ARA	425 (9%)	1224 (27%)	177 (29%)	270 (34%)	448 (23%)	329 (27%)	601 (33%)	494 (23%)	129 (23%)
No LVEF report		3723	344	600	1643	1136	872	2280	571
Loop Diuretic	231 (6%)	3060 (82%)	277 (81%)	473 (79%)	1352 (82%)	958 (84%)	661 (76%)	1938 (85%)	461 (81%)
ACE inhibitor	404 (11%)	1855 (50%)	183 (53%)	333 (56%)	764 (47%)	575 (51%)	463 (53%)	1130 (50%)	262 (46%)
ARB	579 (16%)	486 (12%)	63 (18%)	79 (13%)	212 (13%)	132 (12%)	126 (14%)	301 (13%)	59 (10%)
ACEi or ARB		2273 (61%)	234 (68%)	402 (67%)	955 (58%)	682 (60%)	571 (65%)	1386 (61%)	316 (55%)
Beta-Blocker	455 (12%)	1460 (39%)	145 (42%)	279 (47%)	599 (36%)	437 (38%)	454 (52%)	809 (35%)	197 (35%)
ARA	488 (13%)	757 (20%)	80 (23%)	176 (29%)	271 (16%)	230 (20%)	224 (26%)	418 (18%)	115 (20%)

Excluding deaths in hospital (n=2054). Drugs at discharge includes the following where treatment was stopped or contraindicated: Loop diuretic (n=168); ACEi (n=497); ARB (n=126), Beta blocker (n=355); ARA (n=232). These are included in the separate drug totals.

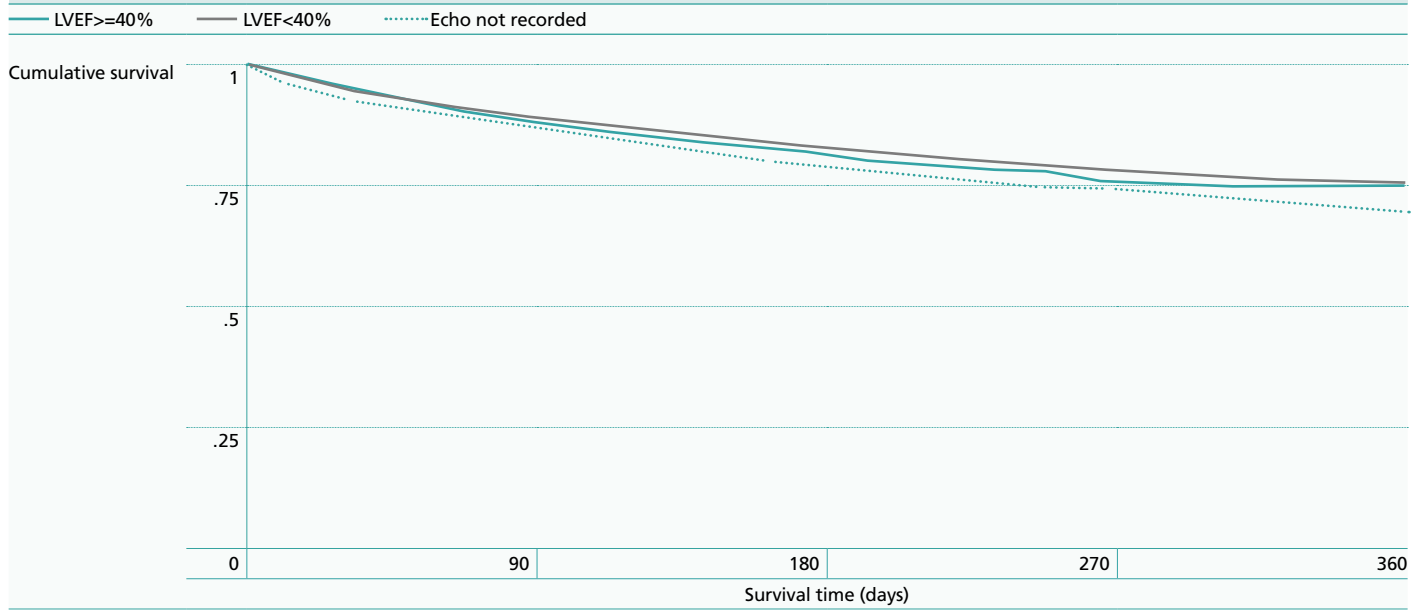
Appendix 3: Kaplan Meier Mortality Analyses



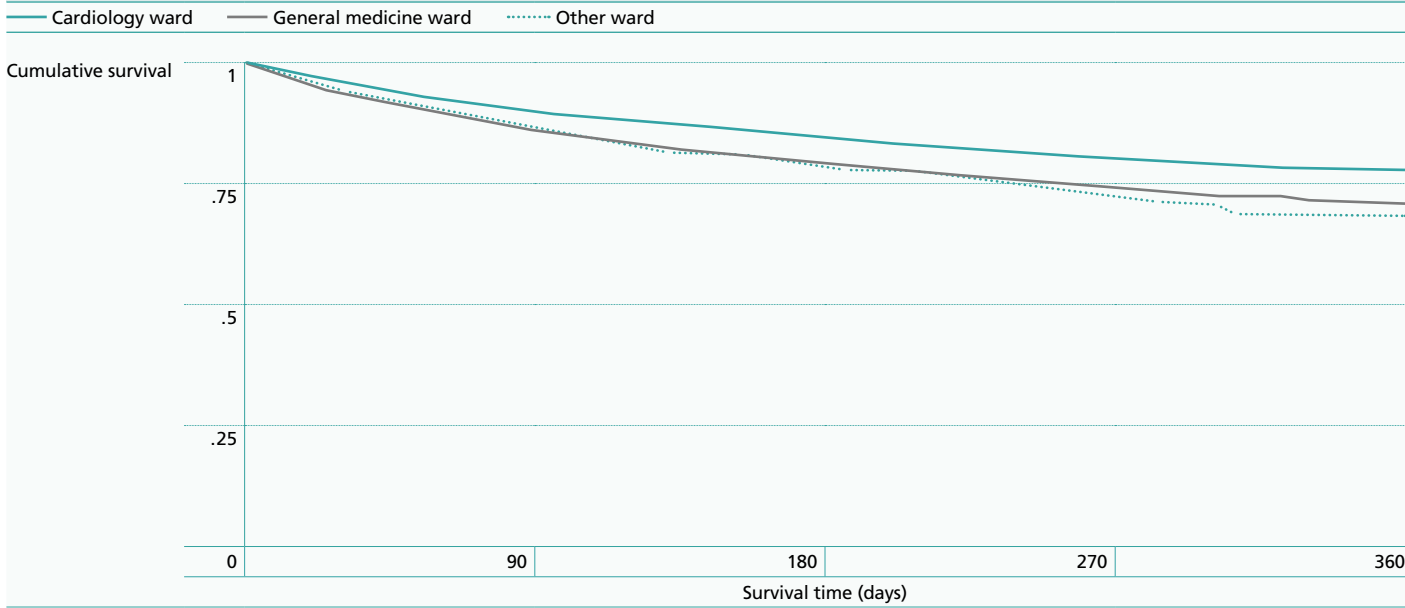
c.
Survival in post-discharge patients by sex.



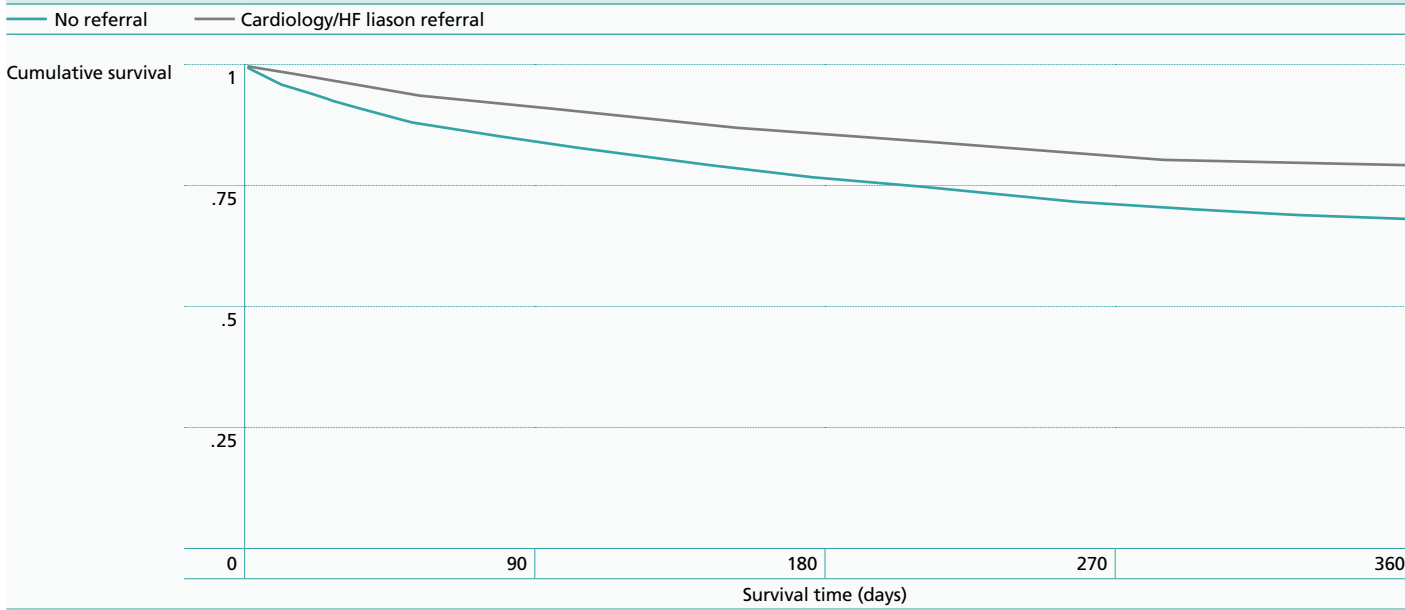
d.
Survival in post-discharge patients by LVEF



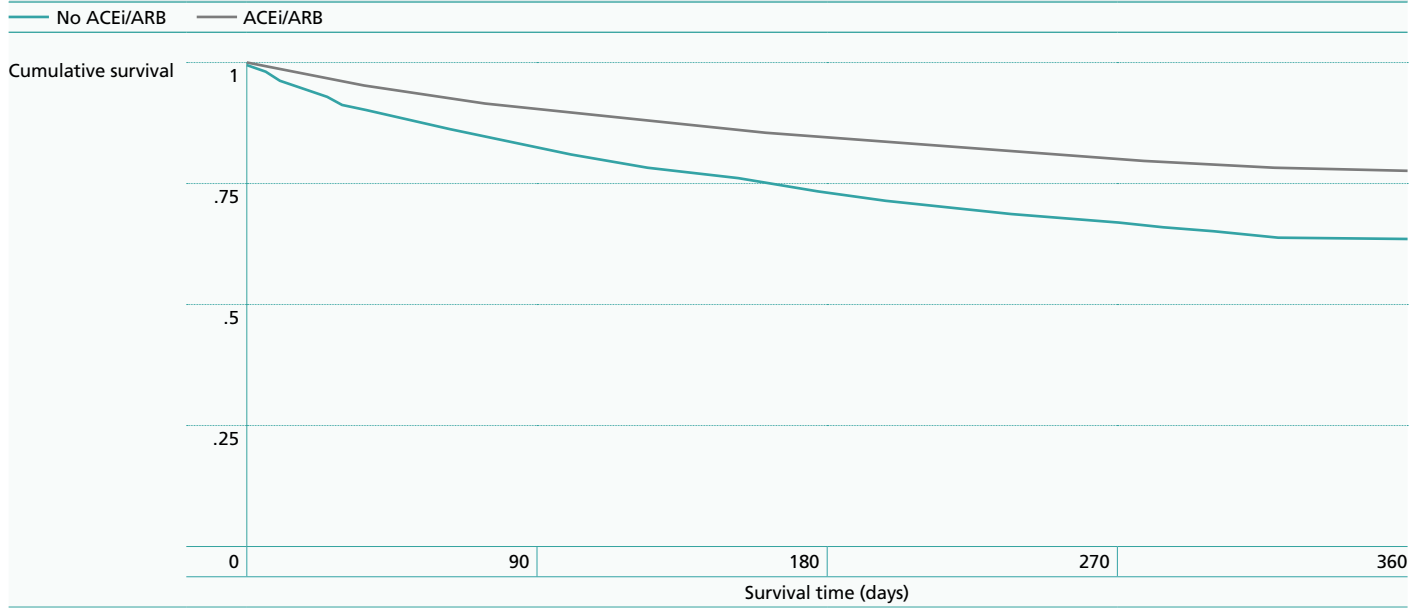
e. Survival in post-discharge patients by ward of admission



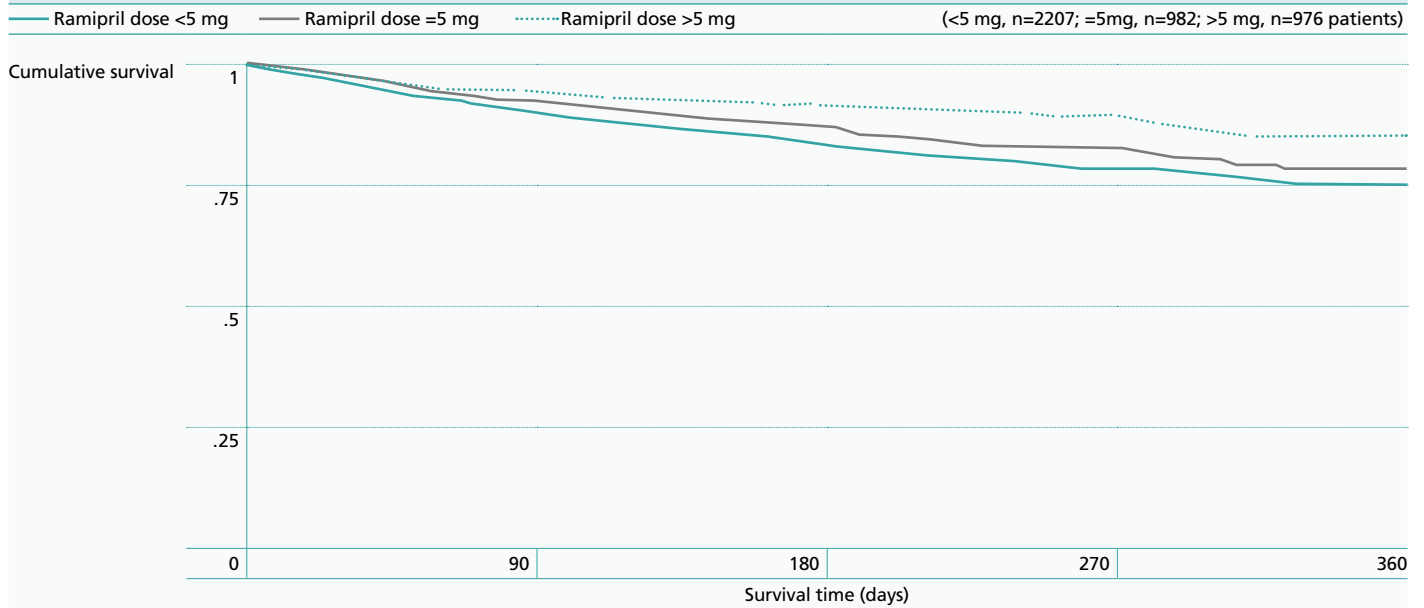
f. Survival in post-discharge patients by referral to specialist services



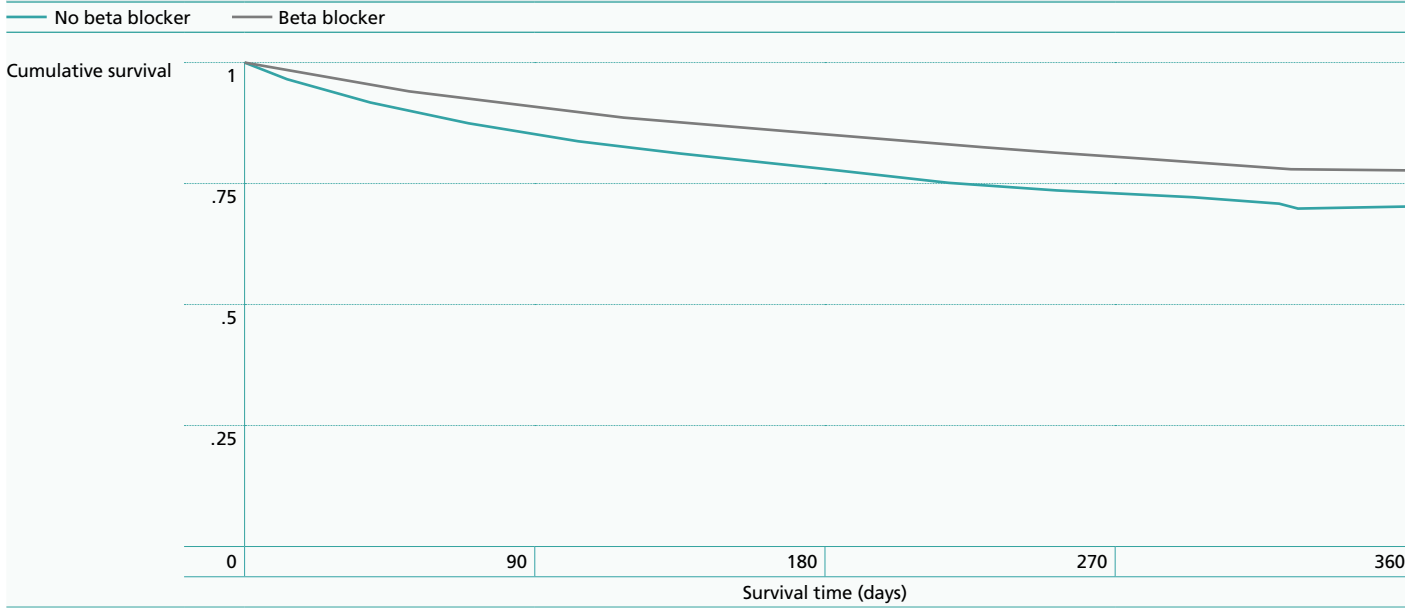
g.
Survival in post-discharge patients by treatment with ACEi/ ARB



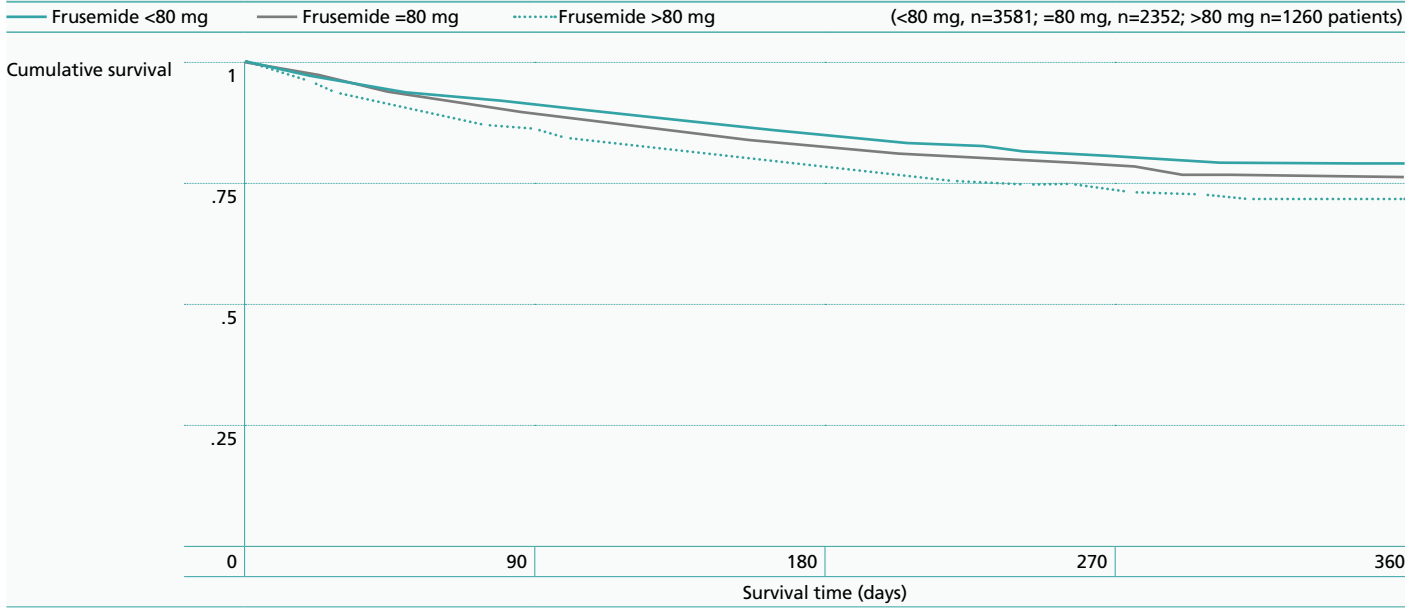
h.
Survival in post-discharge patients by treatment with Ramipril.



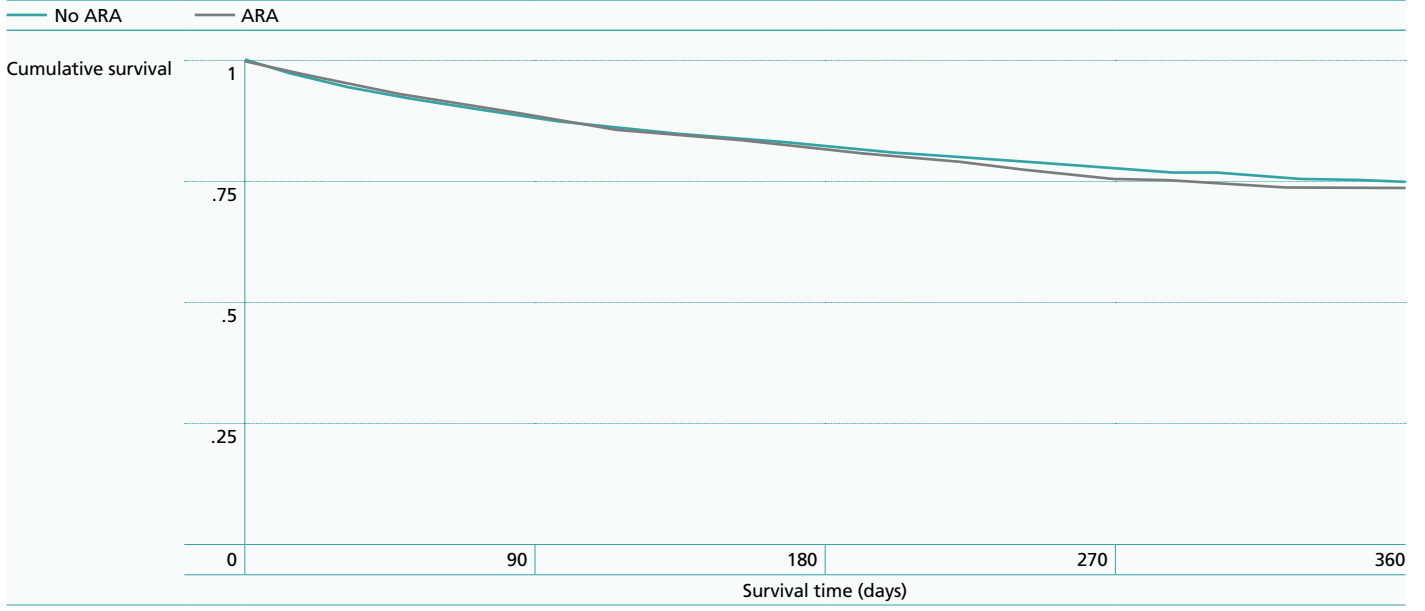
i. Survival in post-discharge patients by treatment with Beta Blocker



i. Survival in post-discharge patients by treatment with Loop Diuretics



k.
Survival in post-discharge patients by ARA.



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